**Pennsylvania State Briefing Book
for
Low-Level Radioactive
Waste Management**

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PENNSYLVANIA STATE BRIEFING BOOK
FOR
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT

Prepared for

EG&G Idaho, Inc.

under

Subcontract No. K-1934

Prepared by

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April, 1981

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1. INTRODUCTION

The Pennsylvania State Briefing Book for low-level radioactive waste management has been prepared to assist in the planning and formulation of an implementation strategy leading to the creation of a suitable low-level radioactive waste management program in the United States. The Pennsylvania Briefing Book is one of a series of briefing books now being prepared that will provide coverage on waste management practices in the States, along with relevant demographic, government, and media information.

Low-level radioactive waste management is increasingly becoming a major concern in the United States. Low-level radioactive waste may contain less than 10 nanocuries of transuranic contaminants per gram of material or only be suspected of radioactive contamination.¹ These wastes are disposed of according to the type and/or concentration of radioactivity. Low-level radioactive waste may consist of a solid, liquid or gas. A significant amount of solid low-level waste that is buried consists of dry waste materials with low levels of radioactivity. Examples of these wastes are paper trash, packing material, protective clothing, broken glassware, plastic sheeting and tubing, defective or obsolete equipment, building rubble, etc.

The low-level radioactive waste that has been disposed of at burial sites has generally come from several different sources: institutional and industrial (41 percent); commercial power reactors (50 percent); and government/military wastes (nine percent).² Forty-nine of 50 States and the District of Columbia generate both institutional and industrial waste, 24 States generate commercial power reactor waste, and 14 States generate government waste.

Part of the reason for producing this report is to obtain more accurate information on the volume of low-level radioactive waste shipped, the sources of the waste (e.g., nuclear reactor, sealed or unsealed sources, etc.), the physical form of the waste, the disposal method (e.g., release

to sewer, ship to commercial repository, burn on site, etc.) and the type of processing of the waste (e.g., absorption, mechanical compaction, solidification, etc.).

The need to develop a program that is able to effectively manage the low-level wastes in the nation is due to the fact that as medical, engineering and other disciplines use more nuclear materials for health care, academic and industrial research and for energy production, the volume of low-level waste has, and will continue to increase. To date, there are only three sites in the United States that accept low-level waste for burial. Two of these three sites have been closed intermittently because of the concern over packaging and shipping operations. The Governors of Washington State, Nevada, and South Carolina, where such commercial low-level radioactive waste facilities are located, are extremely concerned about the volume and packaging used in the disposal of waste.

When the Governors of Washington and Nevada took action in 1979 to temporarily close the commercial low-level radioactive waste burial sites located in their respective States, the action shocked many of the waste generators as well as many of the States in which large amounts of low-level waste are generated. Preliminary projections of total national low-level waste generation and capacity of existing commercial disposal facilities indicate that if no changes in current practices or trends occur, the current disposal sites could be filled by the mid-1990s.³ This capacity could also be suddenly reduced if the Governors of the States where waste disposal facilities are located decide to further restrict the volumes accepted for disposal.

Limitations were imposed on the yearly burial quantities to be accepted by the Barnwell disposal site in South Carolina in October of 1979. Washington State passed an initiative in November of 1980 that will restrict the Richland site to in-State or medical waste by July of 1981. These actions will further reduce the availability of burial space. Another concern is the current escalation of costs for transporting and disposing

of each drum of low-level waste. Price escalation is increasing the costs for utilities, medical institutions, and industrial facilities using nuclear materials that require commercial disposal.

These concerns have led the U.S. Department of Energy, as the lead agency for formulating a low-level waste management plan, to embark upon a cooperative effort involving the National Governors' Association (NGA), the National Conference of State Legislatures (NCSL) and other interest groups to formulate an approach for a low-level radioactive waste management program.

Section 2.0 of this Briefing Book presents an overview of past and present low-level radioactive waste management practices in Pennsylvania. Section 3.0 identifies relevant topography, demography, and energy trends that may affect the quantity and nature of low-level radioactive wastes within the State. An overview of the government and politics of the State is presented in Section 4.0. Section 5.0 reviews present and proposed low-level radioactive waste management policy. Policies affecting the generation, handling and disposal of radioactive waste are reviewed. A review of interest group concerns vis a vis low-level waste management is presented in Section 6.0. A review of public officials' views and media concerns is presented in Section 7.0. Comparisons are made of mass media coverage of low-level radioactive waste concerns. The survey methodology used to gather information on the volume, method of disposal, physical form and other relevant information pertaining to the shipment of low-level waste is presented in Section 8.0. Finally, the results of the low-level waste generator survey are presented in Section 9.0.

REFERENCES

1. U.S. Department of Energy, Interagency Review Group Final Report, p. 106.
2. N.U.S. Corporation, The 1979 State-by-State Assessment of Low-level Radioactive Wastes Shipped to Commercial Burial Grounds, 1979.
3. National Governors' Association, Task Force on Low-level Radioactive Waste Disposal, Final Report, (August, 1980).

2. OVERVIEW OF STATE LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PRACTICES

The Commonwealth of Pennsylvania was the site of the first civilian operated power reactor (Shippingport, Pennsylvania). Ironically, the Commonwealth was also the site of the most serious nuclear power plant incident in the United States 22 years later, when TMI unit No. 2 had to shut down due to a combination of mechanical difficulties and other complicating factors.

The history of Pennsylvania in the area of nuclear research and development dates back to 1911, the year after Marie Curie isolated radium, a radioactive metal. From 1929 to 1965 uranium was processed at Canonsburg, Pennsylvania, which is located south of Pittsburgh. Today the site is privately owned and consists of an industrial park where 14 non-nuclear companies are now located. The site has become a major item of concern of Federal and State officials and local inhabitants. Efforts have been underway to negotiate a settlement between Federal, State and local interests to clean up the site, which is one of 22 sites in the United States requiring remedial cleanup as part of a Federal uranium mill tailings restoration program. It has been estimated that up to 11,000 tons of uranium mill tailings were buried there in 1956 and 1957. Canonsburg is still an unresolved issue.

On December 9, 1979, it was announced in the media that the Pennsylvania Department of Environmental Resources (DER) would commission a study to locate suitable low-level waste disposal facilities in the Commonwealth. However, the controversy surrounding TMI and the need to vent radioactive gas from the containment building led to a postponement of the study. DER officials, however, have indicated that there is still an interest in completing the study and a recognized need to formulate a low-level radioactive waste management program. Recently, Governor Thornburgh announced that he was "examining in Pennsylvania those sites, possibly restricted to State-owned lands, we can use in the short run," (Philadelphia Inquirer, 1/31/81).

Pennsylvania has other facilities that generate low-level radioactive waste. There is Bettis Laboratory which is operated by Westinghouse Electric and owned by DOE. Bettis is involved in the design and development of nuclear fuel components for the U.S. Navy. There is a nuclear fuel manufacturing facility owned by Babcock and Wilcox at Apollo Pennsylvania. This facility produces highly enriched plutonium and uranium for the U.S. Government. There is also a Westinghouse facility in Cheswick, Pennsylvania, which also manufactures enriched uranium and plutonium.

Today, Pennsylvania has four nuclear power plants in operation totaling 3,327 megawatts of capacity from six reactors. Nuclear power provides 15 percent of the total electricity generated in the Commonwealth. However, excess electricity is generated in Pennsylvania and is wheeled to adjacent States. Utilities in Pennsylvania also have part ownership of nuclear generation stations in Ohio and New Jersey.

In Pennsylvania, a significant number of NRC licensees have two or more licenses to handle radioactive materials. Excluding multiple license holders, NRC data shows that there are 693 separate license holders in the State. A facility with two or more licenses was considered one licensee for survey analysis. A firm having multiple locations in a State was considered a separate potential waste generator for surveying. This distinction was made in order to prevent multiple reporting and to reduce survey costs.

It was also realized that nuclear power reactors are usually owned by a number of license holders who may use significant amounts of radioactive material. Thus for purposes of response calculation, the six power reactors in Pennsylvania were considered as separate "licensees" for a total of 699 respondents to be surveyed.

Information on the disposal practices was solicited with the survey presented in Section 8.0 of this report. Appendix A presents the name and

address of each license holder, the type of contact made to obtain information, the degree of response to the questionnaire, the type of facility, and whether low-level radioactive waste is shipped to a commercial disposal site.

The type of facility was classified as either medical, educational, industrial, power reactor, or governmental, according to Part I of the survey. It should also be noted that the medical classification includes medical education facilities, and that the governmental classification excludes both medical and educational facilities.

The data in Table 2-1 show that the overall response rate is close to 50 percent. The response rate for "Top" priorities and "Middle" priorities categories exceeded 50 percent. The highest response rate by type of facility was for medical facilities. Furthermore, 65 respondents indicated that they ship radioactive wastes to commercial facilities. Nineteen percent of facility respondents reported using commercial disposal facilities.

The priority categories in the table are based on consultation with the NRC regional offices near Chicago, Illinois, and in King of Prussia, Pennsylvania, regarding the NRC license category and priority codes that are expected to include generators of significant volumes of low-level radioactive waste. The following categories of licensees are expected to be major generators of low-level radioactive waste:

- I-B Processors/Distributors
- III-F1A Academic, Type A, Broad
- III-G1 Medical, Broad License
- IV-E Industrial
- IV-E1A Industrial, Type A, Broad
- IV-G Medical
- VI-F Academic.

TABLE 2-1. USE OF COMMERCIAL LOW-LEVEL WASTE FACILITIES

PRIORITY CATEGORY	Number of Licensees	Number of Respondents	Percent of Response	Respondents Using a Commercial Facility		
				Number	Percent of all Respondents	Percent of Respondents in Priority/Facility
1. Top Priorities	26	23	88.46	22	6.36	95.65
2. Middle Priorities	354	204	57.63	39	11.27	19.12
3. All Others	319	119	37.30	4	1.16	3.36
TYPE OF FACILITY (All Priorities)						
Medical	221	149	67.42	33	9.54	22.15
Educational	59	35	59.32	9	2.60	25.71
Industrial	356	141	39.60	19	5.49	13.48
Governmental	57	18	31.57	1	0.29	5.56
Power Reactor	6	3	50.00	3	0.87	100.00
TOTAL	699	346	49.50	65	18.79	18.79

These categories were stratified into "top" and "middle" priorities, the top priorities being I-B, III-F1A, III-G1, and IVE1A. Nuclear reactors were also added to the top priority. The second priority consists of VI-F, IV-G, and IV-E. The "All Others" category includes the remaining NRC licensees surveyed.

Table 9-2 further disaggregates the survey data by showing the type of survey responses (written, telephone, or post-card) received from the licensees.

Table 2-2 presents the waste disposal practices employed, including disposal method other than shipment to commercial disposal facilities. Over 50 percent of the medical facilities reported combining low-level radioactive waste with common refuse after the waste decayed to background levels. Only eight percent of the medical facilities surveyed reported venting to the atmosphere. The largest percentage of industrial low-level waste generators reported returning low-level radioactive waste to vendors (35.5 percent) the most common type of waste disposal for generators (34 percent). However, the largest percentage of industrial respondents reported "no waste generated." Slightly over a third of the medical and educational respondents reported releasing low-level radioactive wastes to the sewer.

Table 2-3 provides data on the sources of radioactivity requiring disposal. The data show that 77 percent of the reporting medical institutions use unsealed radioactive materials, while 60 percent of the medical facilities used sealed sources. One-hundred percent of the reporting industries use sealed sources, and 31 percent of the industries reported using unsealed radioactive materials. Only two percent of the respondents stated that nuclear reactors were sources of radioactive materials as compared to 73 percent of all the respondents noting that sealed sources were used. In contrast to survey results it should be noted that a number of hospital authorities contacted as part of the telephone survey, stated that all hospitals using unsealed material were required to

TABLE 2-2. DISPOSAL PRACTICES USED FOR LOW-LEVEL WASTES

Type Of Facility	Number Of Respondents	Ship To Commercial Repository		Release To Sewer		Combine With Refuse		Vent To Atmosphere		Return To Vendor		Distribute In Product		No Waste Generated	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Medical	149	33	22.1	52	34.9	79	53.0	30	20.1	56	37.6	6	4.0	18	12.1
Educational	35	9	25.7	12	34.3	5	14.3	3	8.6	3	8.6	0	0.0	11	31.4
Industrial	141	19	13.5	12	8.5	3	2.1	12	8.5	50	35.5	9	6.4	69	48.9
Power Reactor	3	3	100.0	0	0.0	0	0.0	1	33.3	1	33.3	0	0.0	0	0.0
Governmental	18	1	5.6	1	5.6	1	5.6	1	5.6	6	33.3	0	0.0	11	61.1
TOTAL	346	65	18.8	77	22.3	88	25.4	47	13.6	116	33.5	15	4.3	109	31.5

TABLE 2-3. SOURCES OF RADIOACTIVITY REQUIRING DISPOSAL

<u>Type Of Facility</u>	<u>Number Of Respondents</u>	<u>Nuclear Reactor</u>		<u>Sealed Sources</u>		<u>Unsealed Radioactive Material</u>	
		<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Medical	131	0	0.0	79	60.3	101	77.1
Educational	24	2	8.3	13	54.2	14	58.3
Industrial	72	0	0.0	72	100.0	23	31.9
Power Reactor	3	3	100.0	1	33.3	0	0.0
Governmental	<u>7</u>	<u>0</u>	<u>0.0</u>	<u>7</u>	<u>100.0</u>	<u>1</u>	<u>14.3</u>
TOTAL	237	5	2.1	172	72.6	139	58.7

have sealed calibration sources as well. Thus, though not reported as such, the number of sealed source responses should be greater than or equal to the number of unsealed material responses.

3. ENVIRONMENTAL CHARACTERISTICS

This section provides a description of the physical and economic parameters which impact low-level radioactive waste generation and disposal. Information is reviewed concerning Pennsylvania's geology, hydrology and climate. Data describing the composition, growth and distribution of economic activity are also presented. Finally, an energy profile of the State is developed including electrical generation and the present and projected utilization of nuclear power.

3.1 Physical Characteristics

3.1.1 Location

Pennsylvania is located in the Middle Atlantic U.S. Census Region. It is bordered on the north by New York, and separated from New Jersey to the east by the Delaware River. Pennsylvania's southern border is contiguous with Delaware, Maryland and West Virginia. Its western and northwestern border reach Ohio and Lake Erie. Figure 3-1 displays the counties within Pennsylvania.

3.1.2 Geology

The mountains and rivers dominating Pennsylvania's natural landscape have had a major influence in determining the area's use.¹ Most of the rocks that underlie the State were formed prior to the end of the Permian Period, about 200 million years ago. The shales, sandstones, and coals were created as sediments deposited, stratified and solidified since the Precambrian Age became the metamorphic rocks of the Appalachian Ridge and the coal beds of the Appalachian Plateau. The great mountain folding at the end of the Paleozoic Era (250 million years ago), known as the Appalachian Revolution, placed great stress on the subterranean rock, forming distinctive parallel ridges. Subsequent volcanic action, deposition, erosion (especially in the southeastern portion of the State), and glacier activity (in the northwestern regions) reduced the highest elevations and produced fertile valleys.

Figure 3-1. Pennsylvania county map.

Source: American Map Company

Pennsylvania lies within seven physiographic regions: the Atlantic Coastal Plain, the Piedmont, the New England Upland, the Blue Ridge, the Appalachian Ridge and Valley Region, the Appalachian Plateau, and the Great Lakes Plain.

The narrow, fertile area of the Atlantic Coastal Plain, is located in the southeastern corner of the State, predominantly within the Philadelphia Standard Metropolitan Statistical Area (SMSA). In-land to the northwest is the Piedmont, an area of gradually rising hills extending for nearly 100 miles. This area of rich limestone soils and prosperous farmlands is the mainstay of Pennsylvanian agriculture. North of the Piedmont lies the Reading Prong, part of the New England Upland, which is an eastern range of low hills known locally as the Blue Mountains. West of the Piedmont, the northernmost finger of the Blue Ridge extends into south central Pennsylvania.

The Appalachian Ridge and Valley Region, which runs southwestward across the State, comprises a series of parallel ridges - the Blue, Tuscarora and Bald Eagle Mountains; and wide valleys - Lehigh, Lebanon and Cumberland. Beneath this area lie marble, slate, and schist, formed by exposure to extreme heat and pressure.

The Appalachian Plateau, a rather new geological formation, covers over half the State, occupying the entire northern and western regions. The Pocono Mountains comprise the northeastern part of the plateau. Elevations in the north average 2,000 feet, with Mt. Davis at 3,213 feet being the State's highest point. The western area, averaging 1,200 feet above sea level, provides the mainstay for the mining industry. The sandstone soils of this region are poor for farming. The plateau slopes to a low narrow strip of gravelly but fertile soil known as the Great Lakes Plain in the extreme northwest corner of the State. Figure 3-2 displays the geologic formations existing in Pennsylvania.

3.1.3 Hydrology

Three river systems - the Delaware, Susquehanna, and Ohio drain 95 percent of the State. The Delaware River, fed mainly by the Lehigh and

Figure 3-2. Geological map of Pennsylvania.

Source: Pennsylvania Department of Internal Affairs, Geologic and Topographic Survey.

Schuylkill Rivers, drains Pennsylvania's eastern region. The Delaware River is navigable, and is second only to the Mississippi in terms of commerce.

The West Branch and Juniata Rivers drain into the Susquehanna River, which is only partially navigable. The Susquehanna River drains the center third of the State, flowing south to the Chesapeake Bay and the Atlantic Ocean.

Western Pennsylvania is drained by the Ohio River basin system which includes the Allegheny and Monongahela Rivers and their tributaries. The Ohio River is formed by the confluence of the Allegheny and Monongahela Rivers at Pittsburgh. The Ohio drains to the Mississippi River and eventually to the Gulf of Mexico.

Minor river basins drain into Lake Erie in northwest Pennsylvania and into the Potomac River in the southeast. There are approximately 4,400 smaller streams and 300 lakes, both natural and man made in the State. Conneant Lake, covering 929 acres in the northwest, is the largest natural lake. Several man-made lakes and reservoirs are much larger. Flood control projects such as dams and dikes, especially on the Juniata, Susquehanna and Allegheny Rivers, have reduced but not eliminated major floods.

Surface water accounted for 95 percent of all water consumed by the State in 1970 as illustrated by the following chart.

<u>Source</u>	<u>Million Gallons/Day</u>
Total Groundwater Withdrawal	743.76 (4.6%)
Total Surface Water Withdrawal	15,542.34 (95.4%)
<hr/>	
Total Withdrawal	16,286.10

Metropolitan areas, including Philadelphia, Pittsburgh, Scranton, Wilkes-Barre, Harrisburg, Lancaster, Reading, Pottstown, Erie and York, all rely

upon surface water sources. The lack of high-storage capacity reservoirs periodically results in serious shortages in the southeast.

Pennsylvania is a water-rich State in terms of groundwater. Over one-third of all rainfall filtrates to groundwater, yet the water table is very shallow. The sparcity of deep flow sources is reflected by the fact that only five percent of all wells are artesian. Of freshwater available to the State (excluding Lake Erie), 95 percent is groundwater.

The two primary high-yield aquifers found in the State are limestone in central and southcentral Pennsylvania, and the sand and gravel in the northwest. In terms of total State area covered, they represent 25 percent and 10 percent, respectively.

3.1.4 Climate

The Allegheny Mountains and the Atlantic Ocean are the predominant influences on the State's climate, which can be subdivided into four areas. In the Southeastern Coastal Plain and Piedmont Plateau precipitation ranges from 36 to 46 inches in the region with snowfall averaging about 30 inches, with lower amounts in Philadelphia because of its location near the ocean. In the Ridge and Valley region (Williamsport) precipitation averages about three to four inches more than the Piedmont but it is more unevenly distributed due to the terrain. Snowfall varies considerably from almost 90 inches in Somerset County to less than 40 inches in Mifflin County. In the Allegheny Plateau (Wilkes-Barre, Pittsburgh) precipitation averages about 41 inches, ranging from 35 inches in the northern part of the Plateau to 45 inches in the extreme northeast and northwest portions. Snowfall averages about 54 inches in the north and a few inches less in the southern part of the Plateau. The City of Erie and the surrounding plain have their own weather pattern due to the presence of Lake Erie. Snowfall is extremely heavy due to northwest winds forming snow squalls off the lake but total precipitation remains under 40 inches.

Flooding occurs regularly in Pennsylvania, usually due to heavy rains combined with melting snow. Thunderstorms are common in the summer resulting in local flash flooding. Occasionally a tropical storm travelling north along the Atlantic Coast will cause heavy rains in the southeast part of the State.² Climatological data for selected Pennsylvania cities appear in Table 3-1.

3.2 Population

Pennsylvania had experienced sluggish population growth during the period from the end of the depression until the 1970 Census. Pennsylvania's population increased from 9.9 million to 11.8 million during this period, equal to an annual growth rate of 0.59 percent. This is a surprisingly low historical growth rate, considering that the eastern industrial States grew, on average, at a rate of 1.20 percent while the nation's population increased annually by 1.44 percent during the same time span.

The 1970's saw an abrupt change in the pattern of national growth. While the Pacific and Mountain States had been growing faster than the national average since World War II, during the decade of the 1970's southern and southwestern States grew most rapidly. Pennsylvania fell victim to this phenomenon, losing its rank as the third most populous State in 1970 to Texas. Pennsylvania ranks fourth following the 1980 Census with 11.81 million residents. The 0.01 percent annual growth rate prevalent in Pennsylvania during the 1970's is well below the national average of 1.09 percent. The decline of birth rates and out-migration were responsible for Pennsylvania's relative decline. There are 11 Standard Metropolitan Statistical Areas in Pennsylvania (see Figure 3-3) representing 28 counties. The 39 counties which do not fall into any SMSA comprise only 23.1 percent of the Commonwealth's population.

Pennsylvania's SMSA population, as a proportion of State population, declined from 78.4 percent in 1970 to 76.9 percent in 1980. Table 3-2 gives the population of the SMSA's for 1970 and 1980, as well as projections to the year 2000. Figure 3-4 shows the distribution of population across the State.³

TABLE 3-1. CLIMATOLOGICAL DATA FOR SELECTED CITIES

City	Temperature					Annual Precipitation (in.)	Annual Snowfall (in.)
	Annual Average (F ^O)	January		July			
		Daily Max. (F ^G)	Daily Min. (F ^O)	Daily Max. (F ^O)	Daily Min. (F ^O)		
Allentown	51	36	20	85	63	42.5	32.4
Wilkes-Barre	49	34	18	83	61	34.8	50.8
Erie	47	32	19	77	60	38.2	83.9
Harrisburg	53	38	23	87	65	36.5	35.4
Pittsburgh	55	35	21	83	61	36.2	45.6
Williamsport	50	35	19	84	61	40.0	44.3
Philadelphia	54	40	24	87	68	39.9	21.9

Source: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Climate of Pennsylvania

Figure 3-3. Standard Metropolitan Statistical Areas (SMSA's)
Map of Pennsylvania.

Source: U. S. Department of Commerce, Census of Manufactures,
Geographic Area Surveys.

TABLE 3-2. PENNSYLVANIA POPULATION DATA AND PROJECTIONS

Region	Population			Annual Growth Rate	
	1970	1980	2000	1970-1980 (%)	1980-2000 (%)
United States	203,211,926	226,504,825	265,637,000	1.09	0.80
Pennsylvania	11,800,766	11,807,984	12,632,200	0.01	0.34
SMSA:	9,250,924	9,075,123	9,860,800	-0.19	0.42
Allentown/Bethlehem/Easton	520,422	549,700	590,800	0.55	0.36
Altoona	135,356	136,372	151,400	0.07	0.52
Erie	263,654	279,290	296,300	0.58	0.30
Harrisburg	410,505	447,263	471,400	0.86	0.26
Johnstown	262,822	264,241	269,900	0.05	0.11
Lancaster	320,079	361,998	371,100	1.24	0.12
Philadelphia	3,872,006	3,662,506	3,965,100	-0.56	0.40
Pittsburgh	2,401,362	2,244,620	2,443,900	-0.68	0.43
Northeastern Pennsylvania	621,882	629,979	746,500	0.13	0.85
Williamsport	113,296	118,550	122,600	0.45	0.17
York	329,540	380,604	431,800	1.45	0.63
Remainder of State	2,549,842	2,732,861	2,771,400	0.70	0.07

Source: Pennsylvania Bureau of Statistics, 1979 Pennsylvania Abstract

Figure 3-4. Population density for Pennsylvania counties.

Source: Synergic Resources Corporation, primary data from U. S. Census.

The two largest SMSAs, Philadelphia and Pittsburgh, experienced the largest population decline between 1970 and 1980, with Philadelphia losing 209,500 residents while Pittsburgh declined by 156,742 people. At the same time some smaller SMSAs grew during this period, York (51,064), Lancaster (41,919) and Harrisburg (36,758). Rural counties as a whole grew substantially, adding 183,019 residents during the decade.

Population projections prepared by the State estimate the population for the year 2000 to be 12,632,200. This would require an increase in Pennsylvania's growth rate during a period when the Bureau of Economic Analysis (BEA) expects the national growth rate for the rest of the country to decline to 0.8 percent. The BEA projection for Pennsylvania, when adjusted for the 1980 Census, would result in a 2000 population of 11,903,000, with an annual growth rate of 0.04 percent. The growth rate experienced over the previous decade, if continued for the remainder of the century, would result in a population of 11,832,000.

3.3 Economics

3.3.1 Economic Indicators

Pennsylvania's economy is centered on the manufacturing sector. Despite an increase of in-place capital, 88,300 jobs were lost over five years in the manufacturing sector (1972-1977). Pennsylvania had an unemployment rate below the national average in 1970, but averaged an unemployment rate almost a percentage point greater than the national average for the last three years of the 1970's (see Table 3-3)⁴.

Due to the relatively slow population growth of Pennsylvania, it is not surprising that total personal income declined relative to the nation from 6.41 percent in 1960 to 5.32 percent in 1978 (see Table 3-4). Table 3-5 shows that per capita personal income also declined relative to the national average during the same period. However the BEA projections show per capita income regaining a slight edge over the national average during the next two decades. The Gross State Product also declined relative to the national product, but at a slower pace than total personal income (see Table 3-6).

TABLE 3-3. PENNSYLVANIA UNEMPLOYMENT DATA
(%)

	<u>1970</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
United States	4.9	8.5	7.7	7.0	6.0	5.8
Pennsylvania	4.4	8.3	7.9	7.7	6.9	6.9

Source: U. S. Department of Commerce, Bureau of Economic Analysis,
BEA Regional Economic Projections.

TABLE 3-4. PENNSYLVANIA TOTAL PERSONAL INCOME
(millions of 1980 dollars)

	<u>1960</u>	<u>1969</u>	<u>1978</u>	<u>1990</u>	<u>2000</u>
United States	999,844	1,509,833	2,062,937	3,207,633	4,229,798
Pennsylvania	64,074	87,314	109,795	156,485	193,473
Pennsylvania as a percentage of the U.S.	6.41	5.78	5.32	4.88	4.57

Source: U. S. Department of Commerce, Bureau of Economic Analysis, State
Projections of Personal Income to the Year 2000.

TABLE 3-5. PENNSYLVANIA PER CAPITA PERSONAL INCOME
(1980 dollars)

	<u>1960</u>	<u>1970</u>	<u>1978</u>	<u>1990</u>	<u>2000</u>
United States	5,555	7,618	9,461	13,202	16,277
Pennsylvania	5,671	7,589	9,345	13,289	16,324
Pennsylvania/U.S.	1.02	1.00	0.99	1.01	1.00

Source: U. S. Department of Commerce, Bureau of Economic Analysis,
State Projections of Personal Income to the Year 2000.

TABLE 3-6. PENNSYLVANIA GROSS STATE PRODUCT
(millions of 1980 dollars)

	<u>1962</u>	<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>Rate of Growth</u> <u>1962-1978</u>
United States GNP	1,462	1,946	2,176	2,532	3.5%
Pennsylvania GSP	85	109	118	134	2.8%
GSP as a percent of GNP	5.8%	5.7%	5.4%	5.3%	--

Source: U. S. Department of Commerce, Bureau of Economic Analysis, BEA Regional Economic Projections.

3.3.2 Economic Composition

The dominant economic sectors for Pennsylvania are manufacturing, trade, F.I.R.E. (Finance, Insurance & Real Estate), services and T.C.U. (Transportation, Communication, and Utilities). The annual growth rates for these industries were very disparate for the period 1960-1978. Services are growing at 4.5 percent, F.I.R.E. at 3.3 percent, trade and T.C.U. above two percent, while manufacturing is shrinking at a rate of 0.4 percent. Table 3-7 displays these figures. The sectors which will grow the fastest during the next two decades according to BEA projections are mining (4.6 percent), services (3.8 percent), and F.I.R.E. (3.3 percent).⁵

Figure 3-5 shows the relative proportion of each sector relative to the Commonwealth's Gross State Product (GSP) and the Gross National Product (GNP). Manufacturing is far more important to Pennsylvania than to the nation. For all other sectors, the percentage of Pennsylvania Gross State Product is slightly below that of Gross National Product.⁶

Among manufacturing sectors, the most important to Pennsylvania are primary metals, non-electrical machinery, food, fabricated metals, and electric and electronic equipment. As Table 3-8 illustrates, Pennsylvania is responsible for 15.4 percent of total U.S. value added for primary metal manufacturing. Next in importance are stone, clay and glass, and apparel at 8.4 percent and 8.3 percent, respectively, of national industry.⁷ Value added is a measure of industrial activity derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the products produced or reviews rendered.

3.4 Agriculture

Pennsylvania is ranked 20th in the country in overall farm value (by products sold). Table 3-9 provides the quantity, value and rank of various crops and livestock and poultry in Pennsylvania. The value of all agricultural products sold in 1979 was approximately 2.5 billion dollars. Corn, hay, mushrooms and apples are the most important crops, while milk and eggs are the major livestock products.

TABLE 3-7. GROSS STATE PRODUCT BY INDUSTRY SECTOR
(millions of 1980 dollars)

Sector	1962	1970	1978	Annual Growth Rate
				1960-1978
Agriculture	1,195	1,410	1,937	3.07
Mining	1,403	1,515	2,279	3.08
Construction	3,441	5,562	5,935	3.47
Manufacturing	45,744	36,754	42,801	-0.42
T.C.U. ^a	8,547	10,002	12,029	2.16
Trade	13,662	17,760	21,559	2.89
F.I.R.E. ^b	10,417	13,584	17,575	3.32
Services	8,109	12,337	16,489	4.54
Government	7,001	11,126	12,350	3.61

a. Transportation, Communication and Utilities.

b. Finance, Insurance and Real Estate.

Source: U.S. Dept. of Commerce, Bureau of Census, Census of Manufactures

Figure 3-5. Industrial sectors as percentages of Pennsylvania gross state product and United States gross national product.

Source: Synergic Resources Corporation, Primary data from U.S. Statistical Abstract and the 1979 Pennsylvania Abstract

TABLE 3-8. VALUE ADDED BY MAJOR MANUFACTURING SECTOR
(millions of 1980 dollars)

Sector	SIC Code	1977	1972	Pennsylvania as a percentage of U.S.	
				1977	1972
Total	-	46,019	42,569	6.19	6.64
Food	20	4,094	3,759	5.7	5.8
Textiles	22	1,026	1,278	5.0	6.0
Apparel	23	2,053	2,333	8.3	9.6
Paper	26	1,783	1,415	6.4	6.0
Printing	27	2,396	2,136	6.0	5.8
Chemicals	28	3,528	3,216	4.9	5.5
Petroleum	29	1,359	632	6.6	6.0
Rubber and Plastics	30	1,309	1,180	5.2	5.6
Stone, Clay and Glass	32	2,016	2,016	8.4	8.9
Primary Metal	33	7,349	6,692	15.4	15.9
Fabricated Metal	34	3,843	3,323	6.7	6.8
Machinery, except Electrical	35	4,731	4,302	5.5	6.3
Electric and Electronic	36	3,730	3,987	5.9	7.2
Transportation Equipment	37	2,847	2,453	3.5	3.4
Instruments	38	1,472	1,090	6.2	5.7
Miscellaneous	39	954	965	7.3	8.0

Source: U.S. Dept. of Commerce, Bureau of Census, Census of
Manufactures

Note: Value added is considered to be the best measure available
for comparing the relative economic importance of manufacturing
among industries and geographic areas.

TABLE 3-9. PENNSYLVANIA AGRICULTURAL PRODUCTION
(thousands)

<u>Crop</u>	<u>Unit</u>	<u>1979 Production</u>	<u>1979 Farm Value (Current Dollars)</u>	<u>Rank</u>	<u>Percent of U.S. Production</u>
Total Crops			1,079,368		
Field Crops			826,349		
Corn for Grain	Bushel	115,425	340,504	15	1.5
Hay	Ton	4,293	229,676	12	2.9
Corn for Silage	Ton	6,150	123,000	5	5.4
Wheat	Bushel	8,122	33,706	21	0.5
Fresh Vegetables	Cwt.	1,377	15,389	20	0.5
Processing Vegetables	Ton	98	7,574	14	0.8
Mushrooms	lb.	214,000	152,893	1	47.3
Fruit	Ton	357	78,619		
Apples	lb.	505,000	45,955	6	6.5
Livestock and Poultry					
Milk	lb.	8,084,000	1,043,644	5	
Cattle and Calves	lb.	905,000	321,641	11	
Eggs	eggs	3,836,000	178,055	4	
Broilers	lb.	448,000	123,130	11	2.9
Hogs and Pigs	lb.	744,000	90,119		

Source: Pennsylvania Dept. of Agriculture, 1979 Crops and Livestock Annual Survey

3.5 Energy

3.5.1 Energy Consumption

Pennsylvania ranks third in the country in energy consumed, accounting for over five percent of the energy consumed in the country. Annual per capita consumption is 368 million Btu, slightly above the national average. Pennsylvania is a major consumer of coal and nuclear power, and natural gas and petroleum constitute a smaller proportion of Pennsylvania's energy mix than for the nation.⁸

Energy consumption, as shown by Figure 3-6, grew at a rate of 2.3 percent per year until the oil embargo. From 1973-1978 energy consumption, growth slowed to a 0.2 percent annual growth rate. Coal consumption which had grown slowly before the embargo, dropped by three percent per year in the five years afterwards, as did natural gas. Petroleum consumption continued to increase after the embargo, though at a slower pace.⁹

Figure 3-7 shows the relative importance of each fuel for Pennsylvania. Petroleum is the State's most important fuel, followed closely by coal. Together they account for almost 80 percent of the State's energy consumed. Figure 3-8 displays sector consumption: almost half of the State's energy consumption is accounted for by industry, with residential, transportation and commercial sectors consuming the remainder in that order. Table 3-10 illustrates how energy consumption has grown for each sector. The growth rates for energy consumption show that the oil embargo may have had no impact on energy use in the commercial sector, some impact on the residential and transportation sectors, and a drastic impact on industrial energy consumption.

3.5.2 Energy Production

Pennsylvania is one of the major producers of coal in the United States, ranking second only to Kentucky. Coal production averaged about 90 million tons per year. Coal reserves occur in two major sections. In western Pennsylvania vast deposits of bituminous coal lie under a large portion of the region, contiguous with the coal fields in Ohio and West

Figure 3-6. Consumption of energy by fuel type - Pennsylvania.

Source: Synergic Resources Corporation, primary data from DOE State Energy Data Report, 1978.

Pennsylvania 1978

Figure 3-7. Consumption of energy by fuel.

Source: Synergic Resources Corporation, Primary data from DOE State Energy Data Report, 1978

Figure 3-8. Consumption of energy by end-use.

Source: Synergic Resources Corporation, Primary data from DOE State Energy Data Report, 1978

TABLE 3-10. PENNSYLVANIA ENERGY CONSUMPTION BY END-USE SECTOR
(Trillion Btu)

	<u>Year</u>	<u>Residential</u>	<u>Commercial</u>	<u>Industrial</u>	<u>Transportation</u>	<u>Total</u>
	1960	630.3	405.6	1624.4	523.2	3183.5
	1965	680.8	439.1	2019.1	559.7	3698.7
	1970	826.6	518.2	2035.7	710.9	4091.5
	1975	820.0	528.7	1807.5	763.6	3919.8
	1978	938.8	654.9	1868.6	863.0	4325.3
Growth	1960-1973	2.52%	2.78%	1.75%	3.32%	2.31%
Rate	1973-1978	1.50%	2.48%	-1.71%	1.53%	0.19%

Source: U.S. Dept. of Energy, State Energy Data Report, 1978

Virginia. In the eastern half of the State anthracite beds can be found in the center of the region. Anthracite production has gradually declined to about five million tons per year, with bituminous coal production increasing sufficiently to maintain total production at a constant level.¹⁰

Oil and gas production are much less important to Pennsylvania than coal. Petroleum production and reserves have dropped steadily over the last two decades, presently accounting for less than one percent of the State's consumption. Natural gas production has reversed its decline, but the State still produced less gas in 1978 than in 1955. However, the upsurge in gas reserves during the last few years may be translated into increased production in the coming decade.¹¹

3.6 Electricity and Nuclear Power

Pennsylvania lies within the boundaries of two Regional Electric Reliability Council Areas. Part of western Pennsylvania and an isolated segment of central Pennsylvania belong to the Eastern Central Area Reliability Coordination Agreement (ECAR). The remainder of the State belongs to the Mid-Atlantic Area Council (MAAC). Within ECAR there are two electric regions in which Pennsylvania utilities are associated, the Allegheny Power System (APS) and Central Area Power Coordination (CAPCO). The boundaries of MAAC are contiguous with the membership of the Pennsylvania-New Jersey-Maryland Interchange (PJM).

Table 3-11 gives the expected generation requirements and peak demands projected by the Reliability Councils for the three electric regions. The staff of the Division of Power Supply and Reliability of the Economic Regulatory Administration consider these projections overly optimistic. They expect electric growth rates to be about two percent less than predicted by the Reliability Councils. Since a reserve margin of 20 percent is considered sufficient, lower peak demands would allow a reduction in capacity additions.¹²

TABLE 3-11. PROJECTED DEMAND FOR ELECTRIC REGIONS SURVEY PENNSYLVANIA

	Electrical Requirements (GWE)	Peak Demand (MW)	Reserve Margin (%)
<u>APS</u>			
1979	31,813	5,272	29.5
1989	49,200	8,823	19.6
Annual Growth Rate	4.46%	5.28%	--
<u>CAPCO</u>			
1979	65,900	10,809	25.3
1989	90,470	15,479	19.5
Annual Growth Rate	3.22%	3.66%	--
<u>PJM</u>			
1979	172,540	31,780	42.5
1989	236,938	42,370	33.5
Annual Growth Rate	3.22%	2.92%	--

Source: Pennsylvania Public Utility Commission, Staff Report, Present and Future Electric Demand and Capacity

Pennsylvania's electric generation relies primarily on coal and nuclear power. Figure 3-9 gives the percentage of each fuel used for generating electricity. Though petroleum accounts for almost 10 percent of generation, the quantity used declined by 25 percent despite the (TMI) accident. Pennsylvania serves as an exporter of electricity; 20 percent of the electricity generated by plants located in Pennsylvania in 1979 was exported to adjacent States.¹³

There are currently four operating nuclear power plants in Pennsylvania, as displayed on Table 3-12, excluding the two units at TMI. Five more plants are scheduled to begin operating during the next decade. Pennsylvania ranks third in the quantity of electricity generated by nuclear power plants.

Figure 3-9. Generation fuel mix of power plants in Pennsylvania.

Source: Edison Electric Institute, Statistical Yearbook of the Electric Industry, 1979.

TABLE 3-12. NUCLEAR PLANTS IN PENNSYLVANIA

Plant	Location	Capacity	Ownership	Year
Beaver #1	Beaver County	923.4 MW	Duquesne Light Ohio Edison Pennsylvania Power	47.5% 35.0% 17.5% 1976
#2	Beaver County	923 MW	Duquesne Light Cleveland Electric Ohio Edison Toledo Edison Pennsylvania Power	13.7% 24.5% 35.6% 19.9% 6.3% 1986
Shippingsport	Beaver County	100 MW	Duquesne Light	100% 1977
Susquehanna #1	Luzerne County	1152 MW	Pennsylvania Power and Light	90% 1982
#2		1152 MW	Allegheny Power	10% 1983
Peach Bottom #1	York County	1152 MW	Philadelphia Electric	42.4% 1974
#2		1152 MW	Public Service Gas and Electric DELMARVA Atlantic City	42.4% 7.6% 7.6% 1974
Limerick #1	Montgomery County	1098 MW	Philadelphia Electric	100% 1985
#2		1055 MW		1987
Three Mile Island #1	Dauphin County	871 MW	Metropolitan Edison	50.0% 1974
#2		961 MW	Jersey Central Power and Light Pennsylvania Electric	25.0% 25.0% 1978

Source: U.S. Dept. of Energy, Energy Information Administration, Inventory of Power Plants in the United States

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4. GOVERNMENT AND PUBLIC ASPECTS

4.1 Congressional Representation

Pennsylvania will be represented in the 97th Congress by two Republican Senators along with 13 Democratic and 12 Republican Representatives.¹ This represents a net gain of two seats in the House of Representatives for Republicans over their representation in the 96th Congress. In the Senate, Arlen Specter (Republican) replaces the retiring Richard Schweiker. In the House, Republican candidates defeated incumbent Democrats in two districts: James Coyne defeated Peter Kostmayer in the 8th district; and James Nelligan defeated Raphael Musto in the 11th district.² Freshmen Democrats were elected in two districts: Thomas Foglietta, running as an Independent, defeated Michael "Ozzie" Myers in the 1st district; and William Coyne was elected to replace the retiring William Moorhead in the 14th district.

The size of Pennsylvania's delegation to the House of Representatives has declined substantially in recent decades. Following the 1940 Census, Pennsylvania had 33 seats. In the 1950's, this number fell to 30. It was further reduced to 27 in the 1960's, and is 25 currently. The State is expected to lose two more seats following the reapportionment based on the 1980 Census. Moreover, this reapportionment will be completed by a legislature with Republican majorities in both chambers.³ Current Congressional districts are shown in Figure 4-1.

Democrats have held a majority of the State's Congressional seats since 1964. They achieved their greatest success in the post-Watergate election of 1974 when they captured 17 of the State's 25 seats. Prior to 1964, the Republicans generally held a majority of Pennsylvania's seats.

Pennsylvania's two Senators are John Heinz (Republican) and Arlen Specter (Republican), who assumed office in January 1981. Both men are relatively young and new to the office. Heinz was elected to office in 1976, winning a close race over then Congressman William Green of

Figure 4-1. Pennsylvania Congressional Districts.

Philadelphia. Heinz is a liberal Republican and has specialized in money matters with seats on the Finance and Banking Committees. He has voted for recent legislation (H.R. 7590, S. 2332, and S. 2189) dealing with nuclear waste control. Senator Heinz's committee assignments do not bring him into close contact with legislation dealing with low-level radioactive waste; however, he has continued to be a supporter of the development of nuclear power. Specter, a former district attorney from Philadelphia, won a close election in 1980 over Peter Flaherty, the former mayor of Pittsburgh. Specter is a moderate Republican within the tradition of recent Republican statewide candidates.

Pennsylvania's 25 members of the House of Representatives, along with the State's two Senators, are listed in Table 4-1. This table indicates each member's district, party affiliation, date of initial election, and committee assignments.

Having six nuclear power plants, the Three Mile Island accident, and several recent incidents of illegal dumping of toxic waste materials, issues relating to nuclear power and waste control are important issues to Pennsylvania voters and the State's Congressional delegation. Members of the House of Representatives have voted in favor of most recent legislation providing for Federal involvement in nuclear waste control efforts. Members' votes on these bills are provided in Table 4-2.⁴ The Pennsylvania delegation generally supported the following bills: H.R. 6865, authorizing \$5.0 million for a demonstration project to solidify high-level radioactive wastes; and H.R. 7590, making appropriations for energy and water development, including an atomic weapons program. However, a majority of Pennsylvania's delegation voted against H.R. 8378. This bill would have included, among other provisions, authorization of State compacts for the establishment and operation of regional repositories for low-level radioactive wastes.

TABLE 4-1

PENNSYLVANIA MEMBERS OF THE UNITED STATES CONGRESS

<u>State Delegate</u>	<u>District</u>	<u>Political Affiliation</u>	<u>Beginning of Present Service</u>	<u>Congressional Committees</u>
Arlen Specter ^a	State	Democratic	1980	Appropriations Judiciary Veterans Affairs
John Heinz	State	Republican	1976	Banking, Housing and Urban Affairs
Thomas Foglietta ^b	First	Democratic*	1980	Armed Services Merchant Marine and Fisheries
William H. Gray, III	Second	Democratic	1978	Appropriations District of Columbia Foreign Affairs
Ray Lederer	Third	Democratic	1976	None
Charles F. Dougherty	Fourth	Republican	1978	Armed Services Merchant Marine and Fisheries
Richard T. Schulze	Fifth	Republican	1974	Ways and Means
Gus Yatron	Sixth	Democratic	1968	Foreign Affairs Post Office and Civil Service
Roger W. Edgar	Seventh	Democratic	1974	Public Works and Transportation Veterans Affairs
James K. Coyne ^c	Eighth	Republican	1980	Banking, Finance and Urban Affairs
Bud Shuster	Ninth	Republican	1942	Budget Public Works and Transportation
Joseph M. McDade	Tenth	Republican	1962	Appropriations Small Business (Ranking Member)

TABLE 4-1 (Continued)

<u>State Delegate</u>	<u>District</u>	<u>Political Affiliation</u>	<u>Beginning of Present Service</u>	<u>Congressional Committees</u>
James Nelligan ^d	Eleventh	Republican	1980	Armed Services
John P. Murtha	Twelfth	Democratic	1974	Appropriations
Lawrence Coughlin	Thirteenth	Republican	1968	Appropriations
William J. Coyne ^e	Fourteenth	Democratic	1980	Banking, Finance and Urban Affairs House Administration
Don Ritter	Fifteenth	Republican	1978	Energy and Commerce
Robert S. Walker	Sixteenth	Republican	1976	Governmental Operations Science and Technology
Allen Ertel	Seventeenth	Democratic	1976	Science and Technology Public Works and Transportation
Doug Walgren	Eighteenth	Democratic	1976	Energy and Commerce Science and Technology
William F. Goodling	Nineteenth	Republican	1974	Education and Labor Foreign Affairs
Joseph Gaydos	Twentieth	Democratic	1968	Education and Labor Foreign Affairs
Don Bailey	Twenty-First	Democratic	1978	Ways and Means Standards of Official Conduct
Austin J. Murphy	Twenty-Second	Democratic	1976	Education and Labor Interior and Insular Affairs Veterans Affairs
William F. Clinger, Jr.	Twenty-Third	Republican	1978	Public Works and Transportation Government Operations
Marc L. Marks	Twenty-Fourth	Republican	1976	Energy and Commerce
Eugene V. Atkinson	Twentieth-fifth	Democratic	1978	Government Operations Public Works and Transportation

TABLE 4-1 (Continued)

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- a. Specter replaces Richard Schweiker, a Republican, who served on Appropriations, Labor and Human Resources, and Rules and Administration. On the Appropriations Committee, Schweiker served on the Energy and Water Development subcommittee.
 - b. Foglietti was elected as an Independent, but will serve as a Democrat. He replaced Michael "Ozzie" Myers, a Democrat, who served on Education and Labor, and Merchant Marine and Fisheries.
 - c. Coyne defeated Peter Kostmayer, a Democrat, who served on Government Operations, and Interior and Insular Affairs.
 - d. Nelligan defeated Ray Muste, a Democrat, who was elected to fill the unexpired term of Dan Flood.
 - e. Coyne replaces William Moorhead, a Democrat, who served on Banking, Finance and Urban Affairs, and Government Operations.
-

TABLE 4-2. VOTES OF PENNSYLVANIA CONGRESSMEN
ON RECENT RELEVANT LEGISLATION⁴

<u>I. Senate</u>	<u>HR7590</u>	<u>S2332</u>	<u>S2332(a)</u>	<u>S2189</u>	<u>S2189(a)</u>	<u>S2189(b)</u>
Heinz (R)	Y	Y	Y	Y	Y	N
Schweiker (R)	Y	Y	N	Y	Y	Y
<u>II. House</u>	<u>HR6865</u>	<u>HR7265</u>	<u>HR7590</u>	<u>HR7590(a)</u>	<u>HR7590(b)</u>	<u>HR8372(a)</u>
1. Vacancy (Myers)		?		Y	?	?
2. Gray (D)	?	N	Y	Y	Y	Y
3. Lederer (D)	?	Y	Y	Y	N	N
4. Dougherty (R)	?	Y	Y	Y	N	N
5. Schulze (R)	Y	Y	Y	Y	Y	N
6. Yatron (D)	?	Y	Y	Y	N	Y
7. Edgar (D)	Y	N	N	N	N	Y
8. Kostmayer (D)	?	Y	N	N	N	Y
9. Shuster (R)	?	Y	Y	Y	Y	X
10. Mc Dade(R)	?	?	Y	Y	Y	Y
11. Musto (D)	?	Y	Y	?	#	Y
12. Murtha (D)	Y	?	Y	Y	Y	N
13. Coughlin (R)	Y	Y	Y	N	N	N
14. Moorhead (D)	Y	Y	Y	Y	Y	?
15. Ritter (R)	Y	Y	N	N	N	N
16. Walker (R)	Y	Y	N	N	N	N
17. Ertel (D)	Y	Y	Y	Y	N	Y
18. Walgren (D)	?	Y	Y	Y	N	Y
19. Goodling (R)	Y	Y	N	N	N	N
20. Gaydos (D)	?	Y	Y	Y	Y	N
21. Bailey (D)	Y	Y	Y	Y	Y	N
22. Murphy (D)	Y	Y	Y	Y	N	N
23. Clinger (R)	Y	Y	N	Y	Y	N
24. Marks (R)	?	Y	Y	Y	N	N
25. Atkinson (D)	?	Y	N	N	N	N

KEY: HR7590 -- A bill to appropriate \$12 billion for energy and water projects in fiscal 1981, including \$10 million for "away-from-reactor" storage of spent nuclear fuel from commercial power plants. Approved in House. Approved in Senate 83-9.

HR7590(a) -- Conference report on HR7590. Passed 273-117.

HR7590(b) -- Motion to agree to Senate amendments to authorize a \$284 million flood control project in the Tug Fork River Valley along the Kentucky-West Virginia border. Motion agreed to 230-164.

TABLE 4-2. (Continued)

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- S2332 -- A bill to authorize appropriations to the Department of Energy for civilian programs for fiscal 1981 and fiscal 1982. Passed 78-14.
- S2332(a) -- An amendment to restrict the use of \$300 million authorization for interim Federal storage of nuclear waste until an overall Federal nuclear waste disposal policy was legally in place. Passed 49-44.
- S2189 -- A bill to establish a program for Federal storage of spent fuel from civilian nuclear power plants, to set forth a Federal policy and initiate a program for the disposal of nuclear waste from civilian activities. Passed 88-7.
- S2189(a) -- An amendment sponsored by Glenn (D-Ohio) to allow a State's objection to the storage of nuclear waste within its boundaries to be upheld if either house of Congress endorses the State's position. Adopted 83-0.
- S2189(b) -- A motion made by Johnston (D-LA.) to table the Hart (D-Colo.) amendment to restrict the use of Federal away-from-reactor storage of nuclear waste products to those utilities that no longer had storage space available at reactor sites. Motion agreed to 51-44.
- HR6865 -- Demand for a second on the McCormack (D-Wash.) motion to suspend the rules and pass the bill to authorize \$5 million for the Energy Department demonstration project at West Valley, New York, to solidify high-level liquid radioactive wastes. Second ordered 244-0. Bill subsequently passed by voice vote.
- HR7265 -- A bill to authorize fiscal 1981 spending of \$3.5 billion by the Department of Energy for research, development and production of nuclear warheads and other items used by the Defense Department. Two amendments, one which added \$10 million for design of a radioactive waste processing facility at Savannah River, South Carolina, were passed by voice vote. Passed on November 20, 1980, but later vacated for S3074.
- HR8372(a) -- Amendment to HR8372 (passed by voice vote) to permit States to veto Federally selected nuclear waste sites within their borders unless both houses of Congress voted to override the veto. Rejected 161-218.
-

TABLE 4-2. (Continued)

Vote Symbols

Y = For

N = Against

? = Did not vote or otherwise make position known

= Paired for

X = Paired against.

In the 96th Congress, several of Pennsylvania's Congressmen served on committees relevant to issues of low-level radioactive waste.⁵ Serving on Government Operations were Peter Kostmayer (D-8th district, defeated in 1980), William Moorhead (R-14th district, did not seek reelection in 1980), Robert Walker (R-16th district), and Eugene Atkinson (D-25th district). Serving on Science and Technology were Robert Walker, Allen Ertel (D-17th district), which includes the site of Three Mile Island nuclear reactor, and Doug Walgren (D-18th district). Serving on Interstate and Foreign Commerce were Walgren and Marc Marks (R-24th district).

4.2 State Government

4.2.1 Constitution

The structure and authority of Pennsylvania State Government is given broad definition in the Pennsylvania Constitution. Pennsylvania's current Constitution was adopted in 1874 and is the State's fourth constitution. This Constitution was a consequence of the nationwide reform movement of the 1870's. It included reforms such as a four-year term for the Governor, the item veto, increased membership in the General Assembly, and biennial legislative sessions.

Six major attempts to replace the 1874 Constitution failed but culminated in a Constitutional Convention of 1967-1968 that resulted in a series of important constitutional amendments. These have fundamentally altered the nature of the State's Constitution and are commonly referred to as the Constitution of 1968. These changes include the following: prohibition of the denial of anyone's civil rights; ability of the Governor and other elected officials to succeed themselves; creation of a unified judicial system; creation of a Commonwealth Court and modernization of inferior courts; extension of county and local home rule possibilities; and making the General Assembly continuous over the two-year session.

4.2.2 Executive Branch

Article IV of the State Constitution provides for an "Executive Department" consisting of a Governor, Lieutenant Governor, Attorney General, Auditor General, State Treasurer, Secretary of Education and "such other officers as the General Assembly may from time to time prescribe." Elected officials include the Governor, Lieutenant Governor, Auditor General, State Treasurer, and, for the first time in 1980, the Attorney General. All elected State officers serve four year terms. The Governor's Cabinet consists of the heads of 18 separate departments. The executive branch in Pennsylvania also includes 28 State agencies, boards and commissions. Together, these officials administer the executive powers of State government as provided by the State Constitution, the Administrative Code of 1929, and various State statutes.

4.2.2.1 Governor. The Governor of Pennsylvania is Dick Thornburgh, Republican, who was elected in November 1978, and whose term will expire in January 1983. Thornburgh served as United States Attorney for western Pennsylvania between 1969 and 1975, at which time he was named an Assistant United States Attorney General by President Ford. He won the Republican primary for Governor in 1978. He won the general election with 53 percent of the vote over former Pittsburgh Mayor Pete Flaherty. Thornburgh ran a well-financed and smoothly organized campaign that capitalized on the voters' interest in ridding the State of corruption and political cronyism. He also successfully challenged Flaherty's record as Mayor of Pittsburgh.⁶

The Governor of Pennsylvania is granted supreme executive power in the State. Among the duties and responsibilities of the Governor are:

- To appoint the heads of all departments, and some boards, agencies and commissions, with the advice and consent of the Senate.
- To present to the General Assembly annually a budget and financial plan for not less than five years.

- To serve as a member of various State agencies, boards, and commissions.
- To convene the General Assembly on extraordinary sessions.
- To approve or veto all bills passed by the General Assembly.
- To serve as Commander-in-Chief of the State's military forces.
- To grant reprieves, commutations and pardons, except in cases of impeachment.

Pennsylvania's Governor is one of the strongest in the Nation, with extensive powers of appointment, budget and veto.⁷ The office was particularly strengthened by the 1968 Constitutional amendments, but the powers of the Governor have been somewhat limited by a tradition of legislative opposition to Governors' leadership efforts. This has been encouraged by frequent division of party control of the executive and legislative branches. The current situation of Republican control of the Governor's office and both Houses of the General Assembly may provide conditions supportive of strong executive leadership.

4.2.2.2 Lieutenant Governor. The Lieutenant Governor of Pennsylvania is William W. Scranton, III, a Republican whose term expires in January 1983. The Lieutenant Governor is elected jointly with the Governor, and is authorized to act as Governor in the case of death, conviction or impeachment, failure to qualify, or resignation of the Governor. The Lieutenant Governor is the President of the State Senate, Chairman of the Board of Pardons, and serves as a member of the Executive Department.

4.2.2.3 State Treasurer. The State Treasurer of Pennsylvania is Budd Dwyer, a Republican, whose four-year elective term expires in January 1985. The office of State Treasurer is the oldest elected office in the Executive branch. The major duties of the Treasury Department, which the State

Treasurer heads, include: the receipt and deposit of State monies; investment of monies; management of securities; and, pre-audit and disbursement.

4.2.2.4 Auditor General. The Auditor General of Pennsylvania is Al Benedict, a Democrat, whose four-year elected term expires in January 1985. The Auditor General is head of the State Department of Auditor General.

4.2.2.5 Attorney General. The Attorney General of Pennsylvania is Leroy S. Zimmerman, a Republican, whose four-year elected term expires in January 1985. In 1978, voters of the State adopted a constitutional amendment making the office elected. Mr. Zimmerman is the State's first elected Attorney General. The Attorney General heads the Justice Department which is responsible for providing legal advice to all departments, boards, and commissions of State government. The department also represents the Commonwealth in litigation to which it is a party.

4.2.2.6 Departments. The statutes of the Commonwealth of Pennsylvania have established 19 departments within the executive branch. With the exception of the departments of Auditor General, Treasury, and Justice, the heads of these departments are appointed by the Governor and are responsible to him. These departments are:

- Department of Aging.
- Department of Agriculture.
- Department of Auditor General.
- Department of Banking.
- Department of Commerce.

- Department of Community Affairs.
- Department of Education.
- Department of Environmental Resources.
- Department of General Services.
- Department of Health.
- Insurance Department.
- Department of Justice.
- Department of Labor and Industry.
- Department of Military Affairs.
- Department of Public Welfare.
- Department of Revenue.
- Department of State.
- Department of Transportation.
- Treasury Department.

In addition to these departments, there are 28 State authorities, boards and commissions. A listing of State agencies by area of policy responsibility is provided in Figure 4-2.

There are a number of executive bodies whose authority relates directly to nuclear energy and waste control. They are:

AIR POLLUTION CONTROL

James K. Hambright, Director
Bureau of Air Quality and
Noise Control
Department of Environmental
Resource
Fulton Bldg., 18th Floor
200 N. 3rd St.
P. O. Box 2063
Harrisburg, PA. 17120
(717) 787-9702

COMMUNITY AFFAIRS

Shirley M. Dennis, Secretary
Department of Community Affairs
Room 317, Forum Bldg.
Harrisburg, PA. 17120
(717) 787-7160

EMERGENCY MANAGEMENT

Dewitt C. Smith
Pennsylvania Emergency
Management Agency
B151 Transportation and
Safety Bldg.
Commonwealth and Forster Sts.
P. O. Box 3321
Harrisburg, PA. 17120
(717) 783-8150

ENERGY

Robert A. Shinn, Executive Dir.
Governor's Energy Council
Office of the Governor
State Street Bldg., 12th Floor
State and 3rd Sts.
Harrisburg, PA. 17101
(717) 783-9983

ENVIRONMENTAL AFFAIRS

Clifford L. Jones, Secretary
Department of Environmental
Resources
202 Evangelical Press Bldg.
3rd and Reily Sts.
P. O. Box 1467
Harrisburg, PA. 17120
(717) 787-2814

GEOLOGY

Arthur A. Socolow, State Geologist
and Director
Topographic and Geological Survey
Department of Environmental
Resources
914 Executive House
2nd and Chestnut Sts.
Harrisburg, PA. 17101
(717) 787-2169

HEALTH

H. Arnold Muller, M.D.
Department of Health
802 Health and Welfare Bldg.
P. O. Box 90
Harrisburg, PA. 17120
(717) 787-6436

HIGHWAY SAFETY

John T. Zogby, Deputy Secretary
for Safety Administration
Department of Transportation
216 Transportation and Safety Bldg.
Commonwealth and Forster Sts.
Harrisburg, PA. 17120
(717) 787-3928

HIGHWAYS

David C. Sims, Deputy Secretary
for Highway Administration
Department of Transportation
1200 Transportation and Safety Bldg.
Commonwealth and Forster Sts.
Harrisburg, PA. 17120
(717) 787-6875

LEGISLATIVE RESEARCH

Joseph T. Doyle, Director
Legislative Reference Bureau
Main Capitol Bldg.
P. O. Box 1127
Harrisburg, PA. 17120
(717) 787-5323

Figure 4-2. Pennsylvania State agencies and contact individual organized by function.

Source: Pennsylvania Administrative Manual

NATURAL RESOURCES

Clifford Jones, Secretary
Department of Environmental
Resources
202 Evangelical Press Bldg.
3rd and Reily Sts.
P. O. Box 1467
Harrisburg, PA. 17120
(717) 787-2814

NUCLEAR ENERGY

Thomas M. Gerusky
Bureau of Radiation Protection
Department of Environmental
Resources
Fulton Bldg., 5th Floor
200 N. 3rd St.
P. O. Box 2063
Harrisburg, PA. 17120
(717) 787-3479

OCCUPATIONAL SAFETY AND HEALTH

George A. Groves, Director
Bureau of Occupational and
Industrial Safety
Department of Labor and Industry
Labor and Industry Bldg.
Harrisburg, PA. 17120
(717) 787-3323

POLICE

Daniel F. Dunn, Commissioner
State Police
1800 Elmerton Ave.
Harrisburg, PA. 17120
(717) 783-5558

SOLID WASTE MANAGEMENT

Donald A. Lazarchak, Chief
Division of Solid Waste
Management
Bureau of Land Protection
Department of Environmental
Resources
Fulton Bldg., 8th Floor
200 N. 3rd St.
P. O. Box 2063
Harrisburg, PA. 17120
(717) 787-9870

TRANSPORTATION

Larson Thomas, Secretary
Department of Transportation
1200 Transportation and
Safety Bldg.
Commonwealth and Forster Sts.
Harrisburg, PA. 17120
(717) 787-5574

WATER POLLUTION CONTROL

Louis W. Bercheni, Director
Bureau of Water Quality Management
Department of Environmental Resources
Fulton Bldg.
200 N. 3rd St.
P. O. Box 2063
Harrisburg, PA. 17120
(717) 787-2666

WATER RESOURCES

Walter N. Peechatka, Director
Bureau of Soil and Water Conservation
Office of Resource Management
Department of Environmental Resources
114 Evangelical Press Bldg.
3rd and Reily Sts.
Harrisburg, PA. 17120
(717) 787-5267

Figure 4-2. (Continued)

The Governor's Energy Council in the Governor's Office was created by Executive Order of Governor Thornburgh. Its purpose is to ensure energy security for the Commonwealth. It develops short-term and long-range policies through coordination with State agencies, local governments, the business community, and consumers. It also serves as the recipient and coordinator of Federal and private funds assigned to Pennsylvania for planning, energy conservation, and research and development of new energy sources.

The Office of Policy and Planning in the Governor's Office provides a policy analysis and planning capability. It provides research and policy recommendations for the orderly development of State resources, coordinates planning among State agencies, monitors the success of the State in achieving its goals, and conducts research and develops means by which to achieve goals.

The Department of Community Affairs was created in 1966 and is the direct link between State government and its 2,569 local governments. Among its many responsibilities are assisting local governments in conservation programs, developing disaster plans, and giving technical assistance in planning, zoning and sub-division regulations. It has recently been charged in cooperation with other State departments and agencies, with the development of a statewide solid waste plan (Public Act Number 1980-97).

The Department of Environmental Resources was created in 1970 to provide for and encourage the development of a balanced ecological system encompassing the social, cultural, and economic needs of the Commonwealth through the harmonious development of environmental resources. It is responsible for the State's land and water management programs, all aspects of environmental control, and the regulation of all mining operations. The Solid Waste Management Act of 1980 gives the department major responsibilities for solid waste management programs. This includes presenting to the Environmental Quality Board a proposed Pennsylvania Hazardous Waste Facilities Plan. It includes major offices of Legislation

and Boards, Administration, Environmental Protection, Resources Management, Chief Council, and Deep Mine Safety. There are also five major advisory boards and commissions serving the department. The major departmental units relating to low-level radioactive wastes are listed below.

The Environmental Quality Board formulates rules and regulations for the performance of the department; receives and reviews reports from the department and advises the department and establishes rules and regulations for the control, management, protection, utilization, development, occupancy and use of lands and resources for State parks and forests. The board has recently been given, through Public Act No. 1980-97, major responsibilities for the development of solid waste policy in the State. These include: inspection of hazardous waste treatment and disposal facilities; encouragement of cooperative agreements between local communities and hazardous waste facilities operators to minimize local concerns; and the adoption of a Pennsylvania Hazardous Waste Facilities Plan.

The Bureau of Radiation Protection carries out the responsibilities of the Atomic Energy Development and Radiation Control Act. These responsibilities include: the licensing of users of radium and accelerator-produced radioactive materials; regulation and inspection of certain users of sources of ionizing radiation; conducting programs for the monitoring of environmental radiation; maintaining liaison with State and Federal agencies involving the use and control of ionizing radiation; the review and evaluation of environmental and operational aspects of nuclear power stations and other large facilities; and providing for the management of the radiological aspects of accidents involving radioactive materials in the public domain.

The Pennsylvania Hazardous Waste Facilities Planning Advisory Committee was created by the Solid Waste Management Act (No. 1980-97) to assist the Department of Natural Resources in the development of a Pennsylvania Hazardous Waste Facilities Plan. It consists of

representatives of four groups: private citizens, public interest groups, public officials, and citizens or representatives of organizations with substantial economic interest in the plan.

The Pennsylvania Emergency Management Agency was created in 1978 as the emergency preparedness and response agency of the State. Its principal power and duty is to develop and keep current a comprehensive emergency plan and program for the defense of the Commonwealth in both attack and natural disaster situations.

The Department of Health was created in 1905 and now has authority to enforce all statutes pertaining to public health, safety, and to determine the most efficient and practical means for the prevention and suppression of disease.

The Department of Transportation was created in 1970 and given the responsibility of developing programs to assure adequate, safe, and efficient transportation facilities and services at the lowest reasonable cost. The department is advised by a Hazardous Substances Transportation Board which prescribes regulations for the transportation of hazardous substances and provides for the investigation of accidents involving hazardous substance haulers.

4.2.3 Legislative Branch

4.2.3.1 General Features. The Constitution of Pennsylvania establishes the legislative power of the Commonwealth in the General Assembly. The General Assembly is a bicameral body consisting of a 203-seat House of Representatives and a 50-seat Senate. Members of the House of Representatives are elected for two-year terms. Members of the Senate are elected for four-year terms, with half the membership elected every two years. Elections for members of the General Assembly are held in November of even-numbered years.

The General Assembly is a continuing body during the term for which its Representatives are elected. Special sessions may be called by the Governor

on petition of a majority of the members of each house, or may be called by the Governor when, in his opinion, the public interest requires.

4.2.3.2 Legislative Procedures. A number of provisions regarding legislative procedure are included in the State Constitution. These include:

- No bill may be amended to change its original purpose.
- No bill, except a general appropriation, may have more than one subject.
- All bills must be referred to committee before being considered by either House.
- All amendments must be printed before being voted upon.
- All bills must be passed by a majority of elected members (26 Senators and 102 Representatives) on a roll call vote.
- The Governor's veto may be overridden by a two-thirds majority of each House.
- All revenue bills must originate in the House of Representatives.

Two forms of legislation may be enacted: bills and resolutions. Bills are the most common form of legislation. When passed by the General Assembly and when approved by the Governor they become Acts.⁸ Resolutions are formal expressions of the opinions and wishes of the General Assembly, and do not require approval of the Governor.

A committee system serves to reduce the number of bills introduced in each house to a manageable number. Decisions made and votes of members within the committee are not made public. Hearings may be held on a bill, but they are optional.

Before a bill goes to the full House, each political party caucus may meet to discuss the bill, explain it to House members who may be unfamiliar with it, and agree upon party position and strategy. Caucus proceedings are particularly important in the majority caucus because party unity can determine the fate of the bill.

4.2.3.3 Organization of the Senate. The membership of the Senate consists of 26 Republicans (including one Democrat who switched parties to give the Republicans a majority) and 24 Democrats.⁹ In the 1979-1980 General Assembly there were 28 Democrats and 22 Republicans. Senators are elected from 50 Senatorial districts which are required by the State Constitution to be compact, contiguous, and nearly equal in population. Figure 4-3 shows current Senate districts. Table 4-3 provides information concerning members of each district.

The presiding officer of the Senate is the Lieutenant Governor and, in his absence, the President Pro Tempore. The President Pro Tempore is the leader of the majority party in the Senate and is elected by the membership. The presiding officer presides, refers bills to committee, appoints chairmen, signs bills, and appoints employees of the Senate. The majority party also selects a Majority Leader, Majority Whip, Majority Caucus Chairman, Majority Caucus Secretary, Majority Policy Committee Chairman, and Majority Caucus Administrator. The minority party selects a Minority Leader, Minority Whip, Minority Caucus Chairman, Minority Caucus Secretary, Minority Policy Committee Chairman, and Minority Caucus Administrator. Both the majority and minority leaders have prime responsibility for developing their party's position on legislative proposals. They are elected by their party's caucus and use that body for developing party positions and unity. Party leadership in the General Assembly of Pennsylvania has been strong, reflecting the relatively strong party system within the State.¹⁰

Presently, the officers of the Senate are:

- President: William W. Scranton III, Lieutenant Governor (R-Annville).

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TABLE 4-3. MEMBERS OF THE PENNSYLVANIA SENATE

MEMBERS OF THE SENATE							
Name	Dist.	Seat No.	Term Expires Nov. 30	Address		Occupation	Previous Legislative Service
				Home	Harrisburg Zip Code 17120		
ANDREZESKI, ANTHONY B. (D)	49	36	1984	713 West 10th Street, Erie 16502. (Office: 3211 Peach Street, Erie 16508.)	Senate of Penna.	State Senator	
BELL, CLARENCE D.(R)	9	41	1984	(Office: 22 West State Street, Media 19063.)	Senate of Penna.	Attorney	HR. 1955-60 Sen. 1961-80
BODACK, LEONARD J.(D)	38	46	1982	4922 Hatfield Street, Pittsburgh 15201. (Office: 4213 Butler Street, Pittsburgh 15201.)	Senate of Penna.	State Senator	Sen. 1979-80
CORMAN, J. DOYLE, JR.(R)	34	23	1982	1230 Sylvan Circle, Bellefonte 16823. (Office: 219 West High Street, Bellefonte 16823.)	Senate of Penna.	State Senator	Sen. June 7, 1977-80
DWYER, R. BUDD(R)	50	6	1982	738 Maple Street, Meadville 16335. (Office: P. O. Drawer 1450, Meadville 16335.)	Senate of Penna.	State Senator	HR. 1965-70 Sen. 1971-80
EARLY, EDWARD M.(D)	40	26	1982	(Office: 3439 Babcock Boulevard, Pittsburgh 15237.)	Senate of Penna.	State Senator	HR. 1971-74 Sen. 1975-80
FISHER, D. MICHAEL(R)	37	35	1984	339 Alamo Drive, Pittsburgh 15241. (Office: 71 McMurray Road, Pittsburgh 15241.)	Senate of Penna.	State Senator - Attorney	HR. 1975-80
FUMO, VINCENT J.(D)	1	40	1984	(Office: 1208 Tasker Street, Philadelphia 19148.)	Senate of Penna.	Lawyer	Sen. Apr. 3, 1978-80
GEKAS, GEORGE W.(R)	15	15	1984	(Office: Senate Post Office, Harrisburg 17120.)	Senate of Penna.	Attorney	HR. 1967-74 Sen. 1977-80
GREENLEAF, STEWART J.(R)	12	33	1982	(Office: 66 Easton Road, Willow Grove 19090.)	Senate of Penna.	Attorney	HR. 1977-78 Sen. 1979-80
HAGER, HENRY G.(R)	23	2	1984	1604 James Road, Williamsport 17701. (Office: 35 West Third Street, Post Office Box 1267, Williamsport 17701.)	Senate of Penna.	Attorney	Sen. 1973-80
HANKINS, FREEMAN(D)	7	7	1984	4075 Haverford Avenue, Philadelphia 19104.	Senate of Penna.	Funeral Director	HR. 1961-67 Sen. Nov. 29, 1967-80
HELFRICK, EDWARD W.(R)	27	44	1984	(Office: 23 East Second Street, Mt. Carmel 17851.)	Senate of Penna.	Executive	HR. 1977-80
HESS, RALPH W.(R)	28	14	1982	Post Office Box 216, Spring Grove 17362.	Senate of Penna.	State Senator	Sen. 1971-80
HOLL, EDWIN G.(R)	24	4	1982	(Office: 331 North Broad Street, Lansdale 19446.)	Senate of Penna.	Business Executive	HR. 1961-66 Sen. 1967-80
HOPPER, JOHN D.(R)	31	24	1984	(Office: 1104 Fernwood Avenue, Camp Hill 17011.)	Senate of Penna.	Insurance Executive	Sen. 1977-80
HOWARD, EDWARD L.(R)	10	13	1982	(Office: 18 North Main Street, Post Office Box 1010, Doylestown 18901.)	Senate of Penna.	President National Fibersilk Corp.	Sen. 1971-80
JUBELIRER, ROBERT C.(R)	30	1	1982	(Office: 221 Central Trust Building, P. O. Box 2024, Altoona 16603.)	Senate of Penna.	Attorney	Sen. 1975-80
KELLEY, JAMES R.(D)	39	49	1984	(Office: 104 West Otterman Street, Greensburg 15601.)	Senate of Penna.	Attorney at Law	Sen. June 17, 1974-80
KUSSE, ROBERT J.(R)	25	25	1984	390 Follett Run Road, Warren 16365.	Senate of Penna.	State Senator	HR. 1973-June 7, 1977; Sen. June 7, 1977-80
LEWIS, H. CRAIG(D)	6	50	1982	(Office: 2 Neshaminy Interplex, Suite 207, Old Lincoln Highway and Roosevelt Boulevard, Treviso 19047.)	Senate of Penna.	Attorney	Sen. 1975-80
LINCOLN, J. WILLIAM(D)	32	39	1982	(Office: Post Office Box 313, Hopwood 15443.)	Senate of Penna.	State Senator	HR. 1973-78 Sen. 1979-80
LLOYD, JAMES R. JR.(D)	5	38	1984	(Office: 7618 Castor Avenue, Philadelphia 19152.)	Senate of Penna.	State Senator	Sen. April 23, 1979-80
LOEPER, F. JOSEPH, JR.(R)	26	22	1982	(Office: 403 Burmest Road, Dreitz Hill 19026.)	Senate of Penna.	State Senator	Sen. 1979-80
LYNCH, FRANCIS J.(D)	2	48	1982	(Office: 2508 South Broad Street, Philadelphia 19143.)	Senate of Penna.	State Senator	HR. 1967-Mar. 25, 1973 Sen. Mar. 26, 1973-80

TABLE 4-3.1. (Continued)

MEMBERS OF THE SENATE							
Name	Dist.	Sess. No.	Term Expires Nov. 30	Address		Occupation	Previous Legislative Service
				Home	Harrisburg Zip Code 17120		
MANBECK, CLARENCE F.(R)	48	3	1982	R. D. #1, Box 224, Fredericksburg 17026.	Senate of Penna.	Farmer	HR. 1961-66 Sen. 1967-80
McKINNEY, PAUL(D)	8	27	1982	5741 Chestnut Street, Philadelphia 19139.	Senate of Penna.	State Senator	Sen. 1975-80
MELLOW, ROBERT J.(D)	22	28	1982	(Office: 703 Penn Security Bank Building, North Washington Avenue and Spruce Street, Scranton 18503.)	Senate of Penna.	State Senator	Sen. 1971-80
MESSINGER, HENRY C.(D)	16	19	1982	1001 South 6th Street, Allentown 18103. (Office: 735 St. John Street, Allentown 18103.)	Senate of Penna.	State Senator	Sen. 1971-80
MOORE, WILLIAM J.(R)	33	21	1984	R. D. #2, Box 85-B, New Bloomfield 17068. (Office: Center Square, New Bloomfield 17068.)	Senate of Penna.	State Senator	HR. 1971-72 Sen. 1973-80
MURRAY, MARTIN L.(D)	14	8	1982	(Office: 1222 I.B.E. Building, Wilkes-Barre 18701.)	Senate of Penna.	Owner Insurance Agency	HR. 1945-46 Sen. 1957-64 Sen. 1967-80
O'CONNELL, FRANK J.(R)	20	34	1982	(Office: 701 Market Street, Kingston 18704.)	Senate of Penna.	State Senator	HR. 1967-78 Sen. 1979-80
O'PAKE, MICHAEL A.(D)	11	18	1984	(Office: 643 Penn Street, Reading 19601.)	Senate of Penna.	State Senator - Lawyer	HR. 1969-72 Sen. 1973-80
PECORA, FRANK A.(R)	44	31	1982	(Office: 15 Duff Road, Pittsburgh 15235.)	Senate of Penna.	State Senator	Sen. 1979-80
SINGEL, MARK S.(D)	35	37	1984	1805 Manno Drive, Johnstown 15902.	Senate of Penna.	State Senator	
SMITH, JOSEPH F.(D)	4	9	1982	(Office: 2630 Memphis Street, Philadelphia 19125.)	Senate of Penna.	State Senator	Sen. 1971-80
SNYDER, RICHARD A.(R)	13	5	1984	(Office: 115 East King Street, Lancaster 17602.)	Senate of Penna.	Attorney	Sen. Nov. 11, 1962-80
STAPLETON, PATRICK J.(D)	41	17	1984	710 Croyland Avenue, Indiana 15701.	Senate of Penna.	State Senator	Sen. June 8, 1970-80
STAUFFER, JOHN(R)	19	11	1984	1215 Dorothy Avenue, Phoenixville 19460. (Office: Senate Post Office, Harrisburg 17120.)	Senate of Penna.	State Senator	HR. 1963-70 Sen. Nov. 19, 1970-80
STOUT, J. BARRY(D)	46	47	1982	(Office: Post Office Box 944, Bentleyville 15314.)	Senate of Penna.	State Senator	HR. 1971-76 Sen. June 7, 1977-80
STREET, T. MILTON(R)	3	42	1984	(Office: 4804 North Broad Street, Philadelphia 19140.)	Senate of Penna.	State Senator	HR. 1979-80
TILGHMAN, RICHARD A.(R)	17	12	1984	406 Ostrcombe Lane, Bryn Mawr 19010	Senate of Penna.	State Senator	HR. 1967-68 Sen. 1969-80
ZEMPRELLI, EDWARD F.(D)	45	10	1984	(Office: 528 St. Clair Avenue, Clairton 15025.)	Senate of Penna.	Attorney	HR. 1963-68 Sen. 1969-80

- President Pro Tempore: Henry G. Hager (R-Williamsport).
- Majority Leader: Rober C. Jubelirer (R-Altoona).
- Majority Whip: John Stauffer (R-Phoenixville).
- Majority Caucus Chairman: William J. Moore (R-New Bloomfield).
- Majority Caucus Secretary: F. Joseph Loeper (R-Drexel Hill).
- Majority Policy Committee Chairman: Edward L. Howard (R-Doylestown).
- Majority Caucus Administrator: Ralph W. Hess (R-Spring Grove).
- Minority Leader: Edward P. Zemprelli (D-Clairton).
- Minority Whip: Eugene F. Scanlon (D-Pittsburgh).
- Minority Caucus Chairman: James E. Ross (D-Beaver).
- Minority Caucus Secretary: Robert J. Mellow (D-Peckville).
- Minority Policy Committee Chairman: Henry C. Messinger (D-Allentown).
- Minority Caucus Administrator: Francis J. Lynch (D-Philadelphia).

All detailed work on legislation is performed in committee. There are several types of committees in the Pennsylvania General Assembly:

1) Standing committees operate throughout the session and primarily study bills assigned to them; 2) Interim committees are appointed for specific work and meet between legislative sessions; 3) Conference committees are

appointed to resolve differences between similar bills passed by the two chambers; 4) Select committees are appointed for a specific purpose and with a definite time limit; 5) Joint committees have members from both chambers serving together (these are extensively used);¹¹ and 6) the Committee of the Whole is the entire membership of the House sitting together as a committee in order to allow more informal consideration of a question. There are also four legislative commissions which have professional staffs and have members from both chambers. They are: the Joint State Government Commission, the Legislative Budget and Finance Commission, the Local Government Commission, and the Pennsylvania Commission on Interstate Cooperation. Among those committees relevant to low-level radioactive wastes are: Appropriations; Environmental Resources; Public Health and Welfare; and Transportation.

4.2.3.4 Organization of the House of Representatives. The membership of the House of Representatives consists of 103 Republicans and 100 Democrats following the 1980 election. In the 1979-80 General Assembly there were also 103 Republicans and 100 Democrats. Members of the House are elected from 203 districts, which must be relatively equal in population, compact, and composed of contiguous territory. Figure 4-4 shows current House districts. Table 4-4 provides information about the members of each district.

The membership of the House of Representatives elects by majority vote a Speaker of the House, who is the leader of the majority party. The Speaker of the House in Pennsylvania is a powerful officer with the power to appoint committee chairmen, refer bills to committees, preside over proceedings, and appoint all House employees. Committee assignments are made by a Committee on Committees. The majority party, through its caucus, also selects a Majority Leader, Majority Whip, Caucus Chairman, Caucus Secretary, Administrator, and Policy Committee Chairman. The minority party, through its caucus, selects a Minority Leader, Minority Whip, Caucus Chairman, Caucus Secretary, Administrator, and Policy Committee Chairman.

Figure 4-4. Pennsylvania's 203 representative districts
1972 apportionment.

TABLE 4-4. MEMBERS OF THE PENNSYLVANIA HOUSE OF REPRESENTATIVES

<u>District</u>	<u>Name</u>	<u>Hometown</u>	<u>Party</u>
1	Bernard J. Dombrowski	Erie	Democratic
2	Italo S. Cappabianca	Erie	Democratic
3	Karl Boyles	Erie	Republican
4	Harry E. Bowser	North East	Republican
5	Jim Merry	Linesville	Republican
6	Tom Swift	Cambridge Springs	Republican
7	Mike Gruitza	Hermitage	Democratic
8	Roy W. Wilt	Greenville	Republican
9	Thomas J. Fee	New Castle	Democratic
10	Ralph D. Pratt	New Castle	Democratic
11	Joseph A. Steighner	Butler	Democratic
12	James M. Burd	Saxonburg	Republican
13	Earl H. Smith	Coatesville	Republican
14	Joseph P. Kolter	New Brighton	Democratic
15	Nick Colafella	Aliquippa	Democratic
16	Charles Laughlin	Conway	Democratic
17	Thomas J. Murphy	Pittsburgh	Democratic
18	Edward F. Burns, Jr.	Bensalem	Republican
19	K. Leroy Irvis	Pittsburgh	Democratic
20	Stephen S. Grabowski	Pittsburgh	Democratic
21	Frank J. Pistella	Pittsburgh	Democratic
22	Steve Seventy	Pittsburgh	Democratic
23	Ivan Itkin	Pittsburgh	Democratic
24	Bill Pendleton	Pittsburgh	Democratic
25	Lee C. Taddonio	Murrysville	Republican
26	Michael M. Dawida	Pittsburgh	Democratic
27	Thomas Petrone	Pittsburgh	Democratic
28	George Pott	Gibsonia	Republican
29	Lori Heiser	Pittsburgh	Republican
30	Richard J. Cessar	Pittsburgh	Republican
31	Brian D. Clark	Natrona	Democratic
32	Albert Rasco	Pittsburgh	Republican
33	Roger F. Duffy	Oakmont	Democratic
34	Ronald R. Cowell	Pittsburgh	Democratic
35	Tom Michlovic	Braddock	Democratic
36	Robert P. Horgos	Homestead	Democratic
37	Emil Mrkonic	McKeesport	Democratic
38	Richard D. Olasz	West Mifflin	Democratic
39	George Misceovich	Elizabeth	Democratic
40	Frank J. Duke Marmion, Jr.	Pittsburgh	Republican
41	Robert F. Frazier	Pittsburgh	Republican
42	Terry McVerry	Pittsburgh	Republican

TABLE 4-4. (Continued)

<u>District</u>	<u>Name</u>	<u>Hometown</u>	<u>Party</u>
43	Dan Fleck	Pittsburgh	Republican
44	Ron Gamble	Oakdale	Democratic
45	Fred A. Trello	Corapolis	Democratic
46	Victor John Lescovitz	Midway	Democratic
47	Roger Raymond Fischer	Washington	Republican
48	David W. Sweet	Canonsburg	Democratic
49	A. J. Demedio	Donora	Democratic
50	Bill Deweese	Waynesburg	Democratic
51	Fred Taylor	Uniontown	Democratic
52	Harry Young Cochran	Connellsville	Democratic
53	Bert C. Daikeler	North Wales	Republican
54	Terry E. Van Horne	Arnold	Democratic
55	Joseph A. Petrarca	Vandergrift	Democratic
56	Allen G. Kukovich	Manor	Democratic
57	Amos K. Hutchinson	Greensburg	Democratic
58	James J. Manderino	Monessen	Democratic
59	Jess Stairs	Acme	Republican
60	Henry Livengood	Ford City	Democratic
61	Joseph M. Gladeck, Jr.	Ambler	Republican
62	Paul Wass	Indiana	Republican
63	David R. Wright	Clarion	Democratic
64	Joseph Levi, II	Oil City	Republican
65	John E. Peterson	Pleasantville	Republican
66	L. Eugene Smith	Punxsutawney	Republican
67	William D. Mackowski	Bradford	Republican
68	Warren H. Spencer	Wellsboro	Republican
69	William R. Lloyd, Jr.	Somerset	Democratic
70	William Telek	Johnstown	Republican
71	John N. Wozniak	Johnstown	Democratic
72	William J. Stewart	Johnstown	Democratic
73	Edward J. Haluska	Patton	Democratic
74	Camille George	Houtzdale	Democratic
75	Bill Wachob	Johnsonburg	Democratic
76	Russell P. Letterman	Milesburg	Democratic
77	Gregg L. Cunningham	State College	Republican
78	Clarence E. Dietz	Bedford	Republican
79	Richard A. Geist	Altoona	Republican
80	Edwin G. Johnson	Altoona	Republican
81	Samuel E. Hayes, Jr.	Tyrone	Republican
82	Walter F. Deverter	McClure	Republican
83	Anthony J. Cimini	South Williamsport	Republican
84	Joseph V. Grieco	Jersey Shore	Republican
85	John Showers	New Berlin	Democratic
86	Fred C. Noye	New Bloomfield	Republican

TABLE 4-4. (Continued)

<u>District</u>	<u>Name</u>	<u>Hometown</u>	<u>Party</u>
87	Hal Mowery	Camp Hill	Republican
88	John Kennedy	Mechanicsburg	Republican
89	R. Harry Bittle	Chambersburg	Democratic
90	Terry Punt	Waynesboro	Republican
91	Kenneth J. Cole	Gettysburg	Democratic
92	Bruce Smith	Etters	Republican
93	A. Carville Foster, Jr.	Seven Valleys	Republican
94	John Hope Anderson	New Park	Republican
95	Stanford I. Lehr	York	Republican
96	Marvin E. Miller, Jr.	Lancaster	Republican
97	June N. Honaman	Landisville	Republican
98	Kenneth E. Brandt	Bainbridge	Republican
99	Noah W. Wenger	Stevens	Republican
100	Gibson E. Armstrong	Refton	Republican
101	George W. Jackson	Mount Gretna	Republican
102	Nicholas B. Moehlmann	Richland	Republican
103	Pete Wambach, Jr.	Harrisburg	Democratic
104	Jeffrey E. Piccola	Harrisburg	Republican
105	Joseph C. Manmiller	Harrisburg	Republican
106	Rudy Dininni	Harrisburg	Republican
107	Robert E. Belfanti, Jr.	Mount Carmel	Democratic
108	Merle H. Phillips	Sunbury	Republican
109	Ted Stuban	Berwick	Democratic
110	Roger A. Madigan	Towanda	Republican
111	Carmel Sirianni	Hop Bottom	Republican
112	Fred Belardi	Scranton	Republican
113	Gaynor Cawley	Scranton	Democratic
114	Frank A. Serafini	Moosic	Republican
115	Joseph G. Wargo	Olyphant	Democratic
116	Correale F. Stevens	Hazleton	Republican
117	George C. Hasay	Shickshinny	Republican
118	Thomas M. Tigue	Pittston	Democratic
119	Fred J. Shupnik	Luzerne	Democratic
120	Franklin Coslett	Kingston	Republican
121	Kevin Blaum	Wilkes-Barre	Democratic
122	Thomas J. McCall	Summit Hill	Democratic
123	Edward J. Lucyk	Barnesville	Democratic
124	William K. Klingaman, Sr.	Tamaqua	Republican
125	William D. Hutchinson	Schuylkill Haven	Republican
126	Harold L. Brown	Reading	Democratic
127	Thomas R. Caltagirone	Reading	Democratic
128	James J. Gallen	Shillington	Republican
129	John S. Davies	West Lawn	Republican
130	Lester K. Fryer	Boyertown	Democratic

TABLE 4-4. (Continued)

District	Name	Hometown	Party
131	James P. Ritter	Allentown	Democratic
132	Kurt D. Zwikl	Allentown	Democratic
133	George J. Kanuck	Bethlehem	Republican
134	Donald W. Snyder	Orefield	Republican
135	William C. Rybak	Bethlehem	Democratic
136	Edmund J. Sieminski	Easton	Republican
137	Leonard Q. Gruppo	Bangor	Republican
138	Russell Kowalyshyn	Northampton	Democratic
139	William W. Foster	Honesdale	Republican
140	John F. Cordisco	Bristol	Democratic
141	James J. A. Gallagher	Levittown	Democratic
142	James L. Wright, Jr.	Levittown	Republican
143	Jim Greenwood	Point Pleasant	Republican
144	Benj H. Wilson	Chalfont	Republican
145	Paul I. Clymer	Sellersville	Republican
146	Robert D. Reber, Jr.	Pottstown	Republican
147	Marilyn S. Lewis	Lederach	Republican
148	Lqis S. Hagarty	Bala Cynwyd	Republican
149	Richard A. McClatchy, Jr.	Rosemont	Republican
150	Joseph Lashinger, Jr.	Norristown	Republican
151	George Saurman	Ambler	Republican
152	Roy W. Cornell	Hatboro	Republican
153	Joseph M. Hoeffel	Abington	Democratic
154	Charles F. Nahill, Jr.	Glenside	Republican
155	Samuel W. Morris	Pottstown	Democratic
156	Elinor Z. Taylor	West Chester	Republican
157	Peter R. Vroon	Valley Forge	Republican
158	Joseph R. Pitts	Kennett Square	Republican
159	Arthur F. Earley	Chester	Republican
160	Kathrynann Durham	Brookhaven	Republican
161	Thomas Gannon	Woodlyn	Republican
162	Gerald J. Spitz	Prospect Park	Republican
163	Nicholas A. Micozzie	Clifton Heights	Republican
164	Mario J. Civera, Jr.	Upper Darby	Republican
165	Maryann Arty	Springfield	Republican
166	Stephen F. Freind	Havertown	Republican
167	John Alden	Wayne	Republican
168	Matthew J. Ryan	Media	Republican
169	John J. Swaim	Philadelphia	Democratic
170	Frank A. Salvatore	Philadelphia	Republican
171	Roland Greenfield	Philadelphia	Democratic
172	John M. Perzel	Philadelphia	Republican
173	Frances Weston	Philadelphia	Republican
174	Max Pievsky	Philadelphia	Democratic

TABLE 4-4. (Continued)

<u>District</u>	<u>Name</u>	<u>Hometown</u>	<u>Party</u>
175	Robert A. Borski, Jr.	Philadelphia	Democratic
176	Christopher R. Wogan	Philadelphia	Republican
177	Gerald F. McMonagle	Philadelphia	Democratic
178	James M. McIntyre	Philadelphia	Democratic
179	William W. Rieger	Philadelphia	Democratic
180	Clifford Gray, Jr.	Philadelphia	Democratic
181	Alphonso Deal	Philadelphia	Democratic
182	Samuel Rappaport	Philadelphia	Democratic
183	Nicholas J. Maiale	Philadelphia	Democratic
184	Leland M. Beloff	Philadelphia	Democratic
185	Robert C. Donatucci	Philadelphia	Democratic
186	Edward A. Wiggins	Philadelphia	Democratic
187	Norman S. Berson	Philadelphia	Democratic
188	James D. Williams	Philadelphia	Democratic
189	Martin P. Mullen	Philadelphia	Democratic
190	James D. Barber	Philadelphia	Democratic
191	Hardy Williams	Philadelphia	Democratic
192	Nicholas A. Pucciarelli	Philadelphia	Democratic
193	Donald W. Dorr	Hanover	Republican
194	Stephen E. Levin	Philadelphia	Democratic
195	Frank L. Oliver	Philadelphia	Democratic
196	Ruth B. Harper	Philadelphia	Democratic
197	Junius M. Emerson	Philadelphia	Democratic
198	Robert W. O'Donnell	Philadelphia	Democratic
199	M. Joseph Rocks	Philadelphia	Republican
200	John F. White, Jr.	Philadelphia	Democratic
201	David P. Richardson, Jr.	Philadelphia	Democratic
202	Mark B. Cohen	Philadelphia	Democratic
203	Dwight Evans	Philadelphia	Democratic

As in the Senate, the elected leaders serve as party leaders in formulating party positions on legislative matters. The leaders of both parties use the party caucus as a device for establishing their party's position and developing party unity.¹²

Presently, the officers of the House of Representatives are:

- Speaker of the House: Matthew J. Ryan (R-Media).
- Majority Leader: Samuel E. Hayes, Jr. (R-Tyrone).
- Majority Whip: Richard J. Cessar (R-Pittsburgh).
- Majority Caucus Chairman: Fred C. Noye (R-New Bloomfield).
- Majority Caucus Secretary: John Hope Anderson (R-New Park).
- Majority Policy Committee Chairman: Kenneth E. Brandt (R-Bainbridge).
- Majority Administrator: Frank A. Salvatore (R-Philadelphia).
- Minority Leader: K. Leroy Irvis (D-Pittsburgh).
- Minority Whip: James J. Manderino (D-Monessen).
- Minority Caucus Chairman: Robert W. O'Donnell (D-Philadelphia).
- Minority Caucus Secretary: Joseph G. Wargo (D-Olyphant).
- Minority Policy Committee Chairman: James P. Ritter (D-Allentown).
- Minority Administrator: Fred J. Shuprik (D-Luzerne).

As in the Senate, all detailed legislative work in the House is performed in committee. Because of its large size, the House is more dependent upon its committees than is the Senate. The House is served by the same six types of committees that serve the Senate. The House standing committees are the primary arenas of detailed legislative review.¹³ The standing committees relevant to low-level radioactive wastes are: Appropriations; Health and Welfare; Federal-State Relations; Mines and Energy Management; and Transportation.

4.2.3.5 Political Parties. Within both chambers of the General Assembly, the political party has been a major tool for organization and development of legislative proposals. The position of parties in the General Assembly of Pennsylvania is among the strongest of all State legislatures.¹⁴ Legislative parties in Pennsylvania are relatively disciplined and unified, with vigorous party competition on liberal-conservative issues.¹⁵ The party caucus serves as the major device by which the parties select leaders, inform members of pending legislation, and achieve consensus. In the House, committee seats are allocated by party, with the majority receiving 14 seats and the minority nine. In both chambers the party leader (President Pro Tempore in the Senate and Speaker in the House) assigns committee chairmen. Because of the tradition of strong party competition, accommodation between the parties on controversial policy issues is often difficult to achieve.

4.2.4 Judicial Branch

The Pennsylvania Constitution provides for a unified court system consisting of the Supreme Court, the Superior Court, the Commonwealth Court, Courts of Common Pleas, Community Courts, Municipal and Traffic Courts in the City of Philadelphia, "such other courts as may be provided by law," and justices for the peace, or magistrates. The General Assembly is authorized to establish additional courts or divisions, abolish any statutory courts, determine the number of judges for all but the Supreme and Superior Courts, and provide for the jurisdiction of each court.

4.2.5 Local Government

The structure of Pennsylvania local government is typical of that in most States, with counties, municipalities, townships, school districts, and authorities (similar to special districts). Local government in the State today is a mosaic of 5,654 individual units. All have been established by the State, operate under the laws of the Commonwealth, and are distinct and independent of other units. The Constitution of 1968 has provided for substantial changes in local government, including: home rule and optional charters; the ability to participate in intergovernmental cooperation; and to consolidate or merge boundaries.

County government has traditionally served as an agent of the State for law enforcement, and elections. Counties have recently expanded their role, and are involved in regional planning, solid waste disposal, public health, welfare, community development, and cultural facilities. County government is a "no-executive" type with a governing body consisting of a three-member board of county commissioners. There are also a number of other elected officials, including a sheriff, district attorney, clerk of courts, registrar of wills, recorder of deeds, controller, and treasurer. Counties may adopt home rule charters, although thus far only five have done so.¹⁶

There are three classes of municipalities in Pennsylvania:

1) Philadelphia, the State's only first class city, has a strong-mayor home rule charter dating from 1952; 2) Pittsburgh and Scranton, second class and second class A cities, respectively, have strong-mayor charters; and 3) 49 third class cities, which can adopt commission, mayor-council, or council-manager forms of government. Third class cities may also adopt home rule charters. All municipal governments make policy decisions, levy taxes, borrow money, authorize expenditures and direct administration. Major areas of local service include police and fire protection, maintenance of roads and streets, water supply, sewage collection and treatment, parking and traffic control, local planning and zoning, parks and recreation, garbage collection, libraries, licensing of businesses and code enforcement.

There are over 900 boroughs in the State, each governed by a weak-mayor form of government. Boroughs perform many of the same functions as cities, though their authority is generally more limited.

Unincorporated areas are served by township governments. Pennsylvania has two classes of townships. There are 92 first class townships, which are urban townships located within metropolitan areas. They are governed by boards of commissioners. There are 1,459 second class townships, which are generally rural. They are governed by a board of supervisors. Townships provide basic services for residents, such as road repair, fire protection, planning and zoning. Townships generally provide fewer services than municipalities, and are more dependent upon county and State services.

Authorities are special government units established to provide particular services. Authorities are authorized to acquire, construct, improve, maintain and operate projects, and to borrow money and issue bonds to finance them. Services provided may include airports, parking, waterworks, sewage treatment, playgrounds, and transportation facilities. Authorities may be organized by any unit of local government. They are primarily the result of debt limitations placed upon local governments by State law. As of January 1978 there were 2,513 authorities in the State.

NOTES

1. This includes as a Democrat Thomas Foglietta, 1st district, who defeated the incumbent Democrat Michael "Ozzie" Myers as an independent, but will be seated as a Democrat in the 97th Congress.
2. Musto had won a special election to fill the unexpired term of Dan Flood, who resigned.
3. Congressional redistricting in Pennsylvania must be approved by both chambers, unlike State legislative redistricting which is approved by the State Supreme Court.
4. The votes and summaries of bills and amendments are from the Congressional Quarterly Weekly.
5. Although there are approximately 80 subcommittees in the Congress that have some potential relationship to issues involving low-level radioactive waste, there are seven major committees that share responsibility for this area. In the House the committees are Science and Technology, Interstate and Foreign Commerce, Government Operations, and Interior and Insular Affairs. In the Senate the committees are Energy and Natural Resources, Government Affairs, and Environment and Public Works.
6. Michael Barone, et.al., The Almanac of American Politics 1980 (New York: E.P. Dutton, 1979), p. 741.
7. Joseph A. Schlesinger, "A Comparison of the Relative Positions of Governors," in Thad Beyle and J. Oliver Williams, The American Governor in Behavioral Perspective (New York: Harper and Row, 1972), pp. 141-150.
8. If any bill is not returned by the Governor within 10 days after it is presented to him, it shall become law as if he had signed it, unless the General Assembly adjourns within those 10 days. In that case, the bill becomes law unless the Governor files his objections in the Office of Secretary of the Commonwealth and issues a public proclamation within 30 days of adjournment.
9. At the present time the official composition is 26 Republicans and 23 Democrats. This is due to the refusal of the Senate to seat one Democrat, Vincent Fumo, D-Philadelphia, Pennsylvania, who was denied his seat pending his sentencing for his conviction in connection with placing "ghost workers" on the Senate payroll.

NOTES. (Continued)

10. Malcolm E. Jewell and Samuel C. Patterson, The Legislative Process in the United States, 3d ed. (New York: Random House, 1977), p. 137.
11. Ibid., p. 183.
12. Key to the Keystone State (Philadelphia: The League of Women Voters of Pennsylvania, 1972), p. 33.
13. Ibid., p. 34.
14. Jewell and Patterson, p. 160.
15. Ibid., pp. 302-303.
16. The five counties which have adopted home rule are Delaware, Erie, Lackawanna, Lehigh, and Northampton.

5. A REVIEW OF STATE LOW-LEVEL
WASTE MANAGEMENT POLICY:
PRESENT AND PROPOSED

5.1 Overview

Pennsylvania has a substantial body of legislation dealing with low-level radioactive waste, and has recently added numerous new pieces of legislation as a result of TMI. What follows is a review of relevant Pennsylvania legislation, both present and proposed, which gives an indication of nuclear waste management policy in Pennsylvania. Some legislation not pertaining directly to low-level waste has also been included in order to highlight the evolving nature of radiation protection policy in the State.

5.2 Existing Nuclear Waste Management Policy
In Pennsylvania

5.2.1 Act 480 of 1959

Prior to 1971, the Department of Health was responsible for monitoring and regulating radioactive materials. Act 302 of 1959 specifically empowered the Department of Health to regulate the burial of radioactive material through the issue of permits and to enforce regulations.

Attendant legislation, Act 480 of 1959, empowered the Commonwealth to acquire land and operate burial facilities for the disposal of radioactive materials. Operation of such facilities was entrusted to the Secretary of Health or his contractors for this purpose. Charges imposed for burial by the Department of Health were to be appropriated to defray operating costs.

State nuclear policies were formalized with passage of the Atomic Energy Development and Radiation Control Act of 1965. This act and other relevant enabling legislation is summarized below. The full text of these statutes is included in Appendix B of this report.

5.2.2 Purdon's Pennsylvania Statutes, Title 73, Chapter 17, Atomic Energy

In order to encourage the development and use of atomic energy for peaceful purposes, this act provides for the following:

- Creation of an Advisory Committee on Atomic Energy Development and Radiation Control.
- Authority for the Governor to enter into an agreement with the Nuclear Regulatory Commission for the assumption of State nuclear regulatory responsibility.
- Assumption by the Department of Commerce of powers and duties relating to the promotion and development of nuclear energy resources.
- Assumption by the Department of Health of powers and duties relating to control and regulation of radiation sources, including provisions for licensing, registration, and enforcement. (Superceded by Act 275 of 1979, transferring these powers and duties to the Department of Environmental Resources.)

5.2.3 Purdon's Pennsylvania Statutes, Title 35, Pages 841.1 to 841.4, Hazardous Substances Transportation Act

This act was adopted in 1965 in order to regulate the transportation of hazardous substances into and through Pennsylvania and to assure compliance with regulations promulgated pursuant to it by providing for:

- Creation of a Hazardous Substances Transportation Board within the Department of Transportation.
- Authority for the board to prescribe regulations and enforcement procedures.

- Penalties to be imposed for violations of board regulations.

A hazardous substance is defined as: A flammable liquid, flammable solid, oxidizing substance, corrosive liquid, compressed gas, poisonous substance, radioactive substance, explosive or other substance to defined by the Board.

5.2.4 Purdon's Pennsylvania Statutes, Title 71, Ariticle XIX-A.
Powers and Duties of the Department of Environmental Resources

Sections 510-1 (17), (18), and (19) transfer responsibility for radiation control and regulation from the Department of Health to the Department of Environmental Resources (DER). These responsibilities were delegated pursuant to Acts 302 and 480 of 1959 and the Atomic Energy Development and Radiation Control Act of 1965. Act 275, of December 30, 1970, established DER by abolishing the Departments of Forest and Waters, Mines and Mineral Industries and also transferred specific powers from the Departments of Agriculture, Labor and Industry, and the State Planning Board.

Within DER, responsibility for the regulation of radioactive sources lies with Deputy Secretary for Environmental Protection and Regulation. Regulation is carried out by the Bureau of Radiological Health, a program level agency charged to regulate, monitor, and control the use, possession, transfer, and disposal of radioactive material in Pennsylvania. Additionally, the Bureau recently has functioned as the lead State agency in handling the technical aspects of nuclear emergencies (e.g. evacuation, emergency response capabilities, etc.).

The Bureau of Radiation Protection is organized into two divisions and one ongoing program: 1) the Division of Environmental Radiation; 2) the Division of Radiation Control, and 3) the Nuclear Engineering Program. The Division of Environmental Radiation carries out the Bureau's radiation monitoring functions whereas the Division of Radiation Control implements

regulatory procedures, including licensing and registration. The Nuclear Engineering Program provides planning and analysis of nuclear source issues as well as coordinates DER's involvement in such issues, including radioactive waste disposal. Appendix B provides an organizational chart of DER.

DER is advised by three bodies with statutory jurisdiction in radiation management and control.

- Advisory Committee on Atomic Energy Development and Control

Created pursuant to the Atomic Energy and Radiation Control Act of 1965, this body reviews proposed rules and regulations and provides technical advice relating to the regulation and control of radiation sources. Membership includes nine appointees of the Governor and two ex-officio members, the Secretaries of Environmental Resources and Commerce.

- Citizens Advisory Council

Broader in scope, this council reviews environmental legislation and its implementation by DER. The Council contains 19 members, including the Secretary of Environmental Resources. Other members include the President Pro Tempore of the Senate, the Speaker of the House, and six appointees of the Governor.

- Environmental Quality Board

The Board advises DER on matters of policy and formulates and adopts rules and regulations for the performance of the department. The Board's 21 members include the Secretaries of Environmental Resources, Health, Commerce, and Community Affairs as well as the

Executive Directors of the Fish Commission, the Game Commission, the State Planning Board, and the Historical and Museum Commission; the Chairman of the Public Utility Commission; five members of the Citizens Advisory Council; and, four members of the General Assembly.

5.2.5 Regulations and Standards as Promulgated by the Department of Environmental Resources

Rules, regulations, and standards promulgated by the Department of Environmental Resources and its advisory bodies pursuant to the provisions of the Atomic Energy Development and Radiation Control Act are included in Appendix B.

Title 25, Part I, Subpart D, Article V, entitled Radiological Health contains general provisions and standards for control of radiation exposure plus specific chapters addressing: 1) the registration of radiation-producing machines or equipment; 2) the human use of radiation-producing machines or equipment; 3) the licensing of radioactive material; 4) the human use of sealed sources; 5) industrial radiographic operations; and 6) other radiation sources.

Unless specifically exempted, the department requires licenses for the use, manufacture, production, transport, receipt, acquisition, possession, or disposal of any radioactive material. Licenses are issued by category, as defined in Chapter 225, Licensing of Radioactive Material.

Standards for radioactive waste disposal are contained in Chapter 227: Standards for Control of Radiation Exposure, Sections 227.81-.85. The department is forbidden to approve applications for licenses for disposal on land not owned by the Commonwealth or the Federal Government. Provisions for disposal by discharge into the sanitary sewerage systems and for burial in the soil are included; however, incineration, except as specifically approved by the department, is prohibited.

5.2.6 Hazardous Substances Transportation Act of 1965

The Pennsylvania Department of Transportation is charged with the regulation of the transportation of hazardous substances (by definition including radioactive materials) into and through the Commonwealth.

This regulation is enforced by the Hazardous Substances Transportation Board. The Board is composed of eight ex-officio members and seven members appointed by the Governor. Ex-officio members include: 1) the Secretary of Transportation, who sits as Board Chairman; 2) the Attorney General; 3) the Secretaries of Commerce, Labor and Industry, Health, and Environmental Resources; 4) the Commissioner of the Pennsylvania State Police; and 5) a Member of the Public Utility Commission designated by the Governor. The Director of the Bureau of Radiological Health is the proxy representative in the absence of the Secretary of Environmental Resources. The Board was created to prescribe regulations and assure compliance with these regulations for the transportation of hazardous substances. Specific powers and duties include:

- o Classification of hazardous substances according to the nature and degree of risk involved in their transportation and application of separate regulations to each class.
- o Prescription of regulations pertaining to: 1) methods of packing, loading, and unloading hazardous substances; 2) the specifications for marking, inspection, condition, and equipment of vehicles used for such transport; and 3) the routing and parking of vehicles used to transport hazardous materials.
- o Discretion to declare other substances not defined by the Hazardous Substances Transportation Act as hazardous and hence subject to the provisions of the Act.

5.2.7 Hazardous Substances Transportation Board

The Hazardous Substances Transportation Board has adopted regulations pertaining to the transport of all hazardous wastes and to radioactive wastes in particular, however, regulations only apply to intrastate shipments of radioactive materials. All interstate shipments must comply with the U.S. Department of Transportation regulations found in the Code of Federal Regulations, Title 39, Parts 170 through 179 and Parts 290 through 279. Blanket exemptions also apply to:

- "The highway transportation of radioactive materials under the jurisdiction of and in conformity with the requirements of the U.S. Department of Defense and/or the U.S. Atomic Energy Commission."
- "The transportation of Radioactive Materials in the normal and emergency operation of federal agencies such as the Armed Forces, the Federal Bureau of Investigation, the Secret Service; the transportation by fire and police departments (and) the transportation by an agency of the Commonwealth when existing emergency conditions make it necessary."

Radioactive material is defined as:

Any substance or material, or combination of materials, which spontaneously emits ionizing radiation. Materials in which the estimated specific activity is not greater than 0.002 microcuries per gram of material and in which the radioactivity is essentially uniformly distributed are not considered to be radioactive materials.

Specific regulations cover the packaging and labeling of radioactive material, driver qualifications, vehicle maintenance, operation and disposal, loading and unloading of materials and accident procedures. Pertinent sections from the regulations are reproduced in Appendix B.

It should be noted that the Hazardous Substances Transportation Act (Section 841.6(2)) stipulates that regulations prescribed by the board shall "not supercede ordinances of local authorities." Therefore, it is legally possible for lesser subdivisions of the Commonwealth to restrict the transport of hazardous materials through their jurisdictions.

Subsequent to the TMI accident, the Pennsylvania General Assembly has considered the following measures relating to radioactive and hazardous substances. Two of these bills had been enacted at the close of the 1980 Session. The other proposed measures are now dead, but are summarized in order to provide a more complete picture of existing and evolving radioactive waste policy in Pennsylvania.

5.2.8 Act 49 of 1979

This bill is known as the Environmental Radiation Protection Act, enacted to "enhance" DER's authority to conduct environmental radiation surveillance. Act 49 requires DER to carry out a comprehensive program of monitoring levels of radioactivity in Pennsylvania's environment including all appropriate tests for alpha, beta and gamma levels in appropriate media. Sites to be monitored include, but are not limited to, nuclear power reactor sites and other sites with a substantial potential for environmental radioactivity contamination.

DER is also required to assist the Pennsylvania Emergency Management Agency in preparing a radiation emergency response plan for implementation during a nuclear emergency. The department is also required to submit an annual report on radioactivity levels within the State and to notify the Governor, the Nuclear Regulatory Commission and the public if during the course of its activities the department "determines that levels of radiation exceed the normal range of radioactivity in (an) area."

5.2.9 Act 87 of 1980

This bill supplements the powers and duties of DER regarding remedial actions at uranium processing sites in accordance with the Uranium Mill Tailings Radiation Control Act of 1978 (PL95-604, 42 U.S.C. Page 7901). The bill has no further significance to low-level radioactive waste issues.

5.3 Proposed Legislation

The following bills were not enacted during the 1980 Session. It is not known if these bills or similar legislation will be considered during the 1981 Session.

5.3.1 House Bill 761

This bill would have prohibited bringing certain hazardous materials into Pennsylvania for disposal. The bill died in committee.

5.3.2 House Bill 1358

This bill would have prohibited the establishment of shallow land disposal sites for radioactive waste material in Pennsylvania (thus repealing the provisions of Act 480 of 1959, as amended). The bill died in committee.

5.3.3 House Bill 2372

This bill would have established the Radiation Emergency Response Code and Program, assessing the Pennsylvania nuclear industry fees to cover the costs of the program. The bill died in Committee.

6. INTEREST GROUPS

6.1 Introduction

When considering policy options, it is advantageous for decision-makers to know the public's view of different options. As a technical issue, low-level radioactive waste disposal crosses the threshold of public awareness infrequently*, and therefore the public will probably have little understanding and no easily defined opinions on the issue. Certain interest groups, however, may consider low-level radioactive waste as a relevant policy issue due to its potential impacts upon the set of values or economic concerns which they represent.

A survey was designed to solicit information regarding the membership, contact individual, current telephone numbers, etc., for those groups which would possibly have an interest in low-level radioactive waste management. Listed below are those organizations that have both a defined constituency and a potential interest in any low-level radioactive waste activity affecting Pennsylvania. Unless otherwise noted, all groups have a statewide constituency.

Environmental organizations appear to be represented in larger numbers, since these organizations are public interest in nature, often rely upon a voluntary staff and respond to a broad spectrum of value-oriented environmental questions. Professional organizations, on the other hand, tend to have a single legislative liaison organization. Medical organizations are an example of this; there are a number of topical professional organizations (internists, radiologists, etc.) which are primarily involved with internal information transfer. Actual legislative activity is usually left entirely to the American Medical Association affiliate, the Pennsylvania Medical Society.

*This assertion seems to be borne out by the media survey as discussed in Section 7.

6.2 Listing of Relevant Interest Groups

6.2.1 List of Environmental Groups*

Keystone Alliance

3700 Chestnut Street, Philadelphia, Pennsylvania 19140
(215-387-5254)

Contact: Marsha Pripstein or Alan Nogee

An anti-nuclear power organization formed to contest the construction of a nuclear power plant in southeastern Pennsylvania. Membership of approximately 100; Philadelphia orientation.

Pennsylvania Federation of Sportsmen's Clubs, Incorporated

1022 McCarter Avenue, Erie, Pennsylvania 16503 (814-455-4032)

President: James N. Price

An umbrella organization of local sportsmen's clubs affiliated with the National Wildlife Federation. Activities involve the preservation and restoration of natural habitat and wildlife populations.

Izaak Walton League of America, Incorporated

President: Kenneth Shultz

1146 Poplar Street, York, Pennsylvania 14703

The Pennsylvania division of the Izaak Walton League of America Endowment has a membership of approximately 1,500. The organization acquires and manages, or transfers ownership to the government, land parcels of particular natural interest.

Pennsylvania Environmental Council, Incorporated

225 South 15th Street, Philadelphia, Pennsylvania 19102
(215-735-0966)

Executive Director: Eleanor W. Winsor

A citizen organization with a membership in excess of 1,000 primarily devoted to legislative action related to environmental protection. Activities also involve information transfer and services on administrative advisory committess.

League of Conservation Voters

1315 Walnut Street, Philadelphia, Pennsylvania 19107
(215-735-0750)

A non-partisan political committee involved with environmental issues.

*Contact names and telephone numbers are listed where available.

United Citizens Awareness to Radiation Exposure
P. O. Box 101, Straubaune, Pennsylvania 15363

Contact: Agnes Engel

Local organization active with health concerns of local population exposed to radiation from the Canonsburg nuclear dump site.

Pennsylvania Citizens Advisory Council
8th Floor, Executive House, P. O. Box 2357, Harrisburg, Pennsylvania 17120

Chairperson: Russell W. Hallen

An officially appointed advisory board which reviews State environmental laws and regulations. Develops annual reports for both the Governor and Legislature.

6.2.2 Medical/Research Interest Groups

Pennsylvania Medical Society
20 Erford Road, Lemoyne, Pennsylvania 17043 (717-763-7151)
Executive Director: John Reneman
Professional organization representing medical doctors. With a membership in excess of 14,000, the Pennsylvania Medical Society is the primary legislative voice of the Pennsylvania medical community.

The Hospital Association of Pennsylvania
P. O. Box 608, Camp Hill, Pennsylvania 17011 (717-763-7053)
Contact: Curt Wood
The association represents 320 health care institutions within the State. Engages in legislative lobbying and information transfer to member organizations.

Pennsylvania Pharmaceutical Association
508 North Front Street, Harrisburg, Pennsylvania 17101 (717-234-6151)
Executive Director: Stanley Singer
2,500 pharmacists engaged basically in information transfer to its membership.

6.2.3 Public Interest Groups

League of Women Voters of Pennsylvania (Legislative Center)
215 Pine Street, Harrisburg, Pennsylvania 17101 (717-234-1576)
President: Margot Hunt
An umbrella organization representing 66 local leagues and approximately 6,000 members throughout the State. Primary emphasis involves public education on current issues.

6.2.4 Labor Groups

Pennsylvania AFL-CIO

101 Pine Street, Harrisburg, Pennsylvania 17101 (717-238-9351)

President: Harry Boyer

Labor union representing 2,500 local unions with over 1.5 million individual members. Represents local unions on State-level issues; however, different unions will probably have different perspectives on low-level waste, in particular, the International Brotherhood of Electrical Workers and the Oil, Chemical and Atomic Workers International Union.

6.2.5 Other

Pennsylvania Chamber of Commerce

222 North 3rd Street, Harrisburg, Pennsylvania 17101 (717-0255-3252)

Contact: Mrs. Tamming McCorkey

Represents 2,300 member businesses. Active in waste related issues and operates industrial waste exchange.

Pennsylvania League of Cities

2608 North 3rd Street, P. O. Box 5796, Harrisburg, Pennsylvania 17110 (717-236-9496)

Represents approximately 50 municipalities with a mailing list of 1,500 State and local officials. Regularly active in environmental and land-use issues relevant to constituency.

7. MASS MEDIA

7.1 Introduction

A review of media issue coverage provides information on the quantity and coverage of the information citizens and decision-makers are receiving. An analysis of media coverage can thus be highly instructive in determining government concerns and public attitudes toward an issue. In order to characterize the Pennsylvania media coverage of the low-level radioactive waste issue, a review of articles and editorials published during 1979 and 1980 was conducted. This search was not intended to be exhaustive nor yield a representation of all the radioactive issues of concern in Pennsylvania.

Generally, newspapers maintain more detailed records of coverage than either of the electronic media. Therefore, the primary focus of the media review was newspapers. Pennsylvania has 99 daily newspapers. To accomplish a realistic overview of Pennsylvania media coverage, the State was reduced to three "media centers", corresponding to the major urban and political centers within the State: Philadelphia, Harrisburg and Pittsburgh. Within these areas the following newspapers were examined:

Philadelphia Inquirer
Philadelphia Bulletin
Harrisburg Patriot
Harrisburg News
Pittsburgh Press
Pittsburgh Post-Gazette

7.2 Media Coverage

7.2.1 Overview

Due to the east/west polarity existing in Pennsylvania, there is no dominant "media center". Although Philadelphia boasts four daily

papers, the largest number in the nation; three network affiliated VHF television stations; and, numerous radio stations, the influence of these media outlets is surprisingly localized.

Harrisburg, the State capital, is covered by both a morning and evening paper, the Patriot and News, respectively. Both papers are owned by the Newhouse chain and maintain a reputation as excellent papers for their size. Due to the fact that these papers are the most readily accessible to State officials and decision-makers, their influence exceeds their limited circulation numbers.

The Pittsburgh media tends to cater to the industrial interests of their community and display a conservative bias. The Press is the dominant paper, with the morning Post-Gazette losing much of its market to the New York Times, Wall Street Journal, and the Chicago Tribune.

7.2.2 Volume of Coverage

Since Pennsylvania is the State in which the TMI incident occurred, the absolute volume coverage of nuclear issues is great. The media in both Philadelphia and Harrisburg keyed upon the TMI accident and produced extensive and insightful coverage for which the Inquirer won a Pulitzer Prize.

Normally, the Pittsburgh media follows events in Harrisburg more intently than does the Philadelphia media; however, the TMI incident provides an exception to this norm. The Pittsburgh media did not treat TMI as a "local" story; rather it covered the incident in a fashion similar to other urban papers from outside Pennsylvania. The Pittsburgh media, however, did provide extensive coverage of a local low-level radioactive waste management issue involving an industrial park in Canonsburg.

7.2.3 Issues Raised

Safety concerns resulting from disposal and nuclear power operations characterize the Pennsylvania media. The TMI incident looms so large in the Philadelphia and Harrisburg coverage that reactor safety, and the underlying questions of the reasonableness of the nuclear power option, overshadow all other nuclear issues. Generally, the Harrisburg papers and the Bulletin continued to support nuclear power while the Inquirer gradually came to oppose further nuclear development.

The Pittsburgh media raised the question of responsibility for improperly disposed wastes in relation to the Canonsburg industrial site. In general, the Pittsburgh media supported local efforts to force the Federal government to assume responsibility.

7.3 Specific Media Coverage

7.3.1 Philadelphia

The Philadelphia Inquirer devoted the most coverage to nuclear matters in terms of space allotted, number of articles printed and placement of stories on pages of high readership. This was true even prior to TMI. Approximately 100 articles on the subject of nuclear waste have been identified in the Inquirer over the two year period. Although it is known that the Inquirer staff is familiar with the spectrum of low-level and other radioactive waste issues, the TMI story dominated the coverage so much that an account of generators and disposal options, and the basic issues of low-level radioactive wastes, never occurred.

The Bulletin did not have the basic interest in nuclear and radioactive issues displayed by the Inquirer and early surrendered the initiative for nuclear coverage to the Inquirer. The Bulletin

continues to support nuclear power and tends to be less adversarial in its coverage of nuclear issues. State and Federal officials were listed as the most credible sources of information on low-level radioactive wastes by Bulletin editors, in contrast to the pessimistic view of the Inquirer.

Editors for both papers considered low-level radioactive wastes as having only slight to moderate interest to their readers. In general, it merits coverage only when tied to a particular event and is not a subject warranting independent coverage.

7.3.2 Harrisburg

Both the Harrisburg newspapers gave extensive coverage to the TMI incident which, due to its proximity, overshadowed low-level radioactive wastes as an independent issue. The Evening News did attempt to cover the low-level waste issues resulting from TMI and examined the health effects of low-levels of exposure, transportation and disposal issues. The Evening News closely examined the political response to TMI and in relation to this published a story reporting that the State had dropped plans for a low-level disposal site "because of the emotional climate created by TMI". Neither the Philadelphia nor the Pittsburgh media picked up this story.

Low-level radioactive waste never developed as an independent issue in either of the papers, rather it remained bound solely to TMI related concerns. The Harrisburg media tends to eschew the "investigative" pose of the Inquirer and view local officials with empathy similar to that displayed by the Bulletin.

7.3.3 Pittsburgh

Although the Pittsburgh media did not display any more than the usual interest in the TMI story, the Pittsburgh Press in particular

gave extensive coverage to the Canonsburg story. In Canonsburg an industrial park had been constructed over an improperly managed site which had previously been used for uranium processing. The Pittsburgh media has extensively covered (and editorialized in favor of) the issue of Federal responsibility for clean-up operations. In relation to this particular story, the credibility granted Federal officials is very low.

In general, coverage of statewide and national nuclear issues was weakest in the Pittsburgh newspapers. Both papers are basically pro-nuclear and have expressed limited interest in nuclear/radiation issues independent of nuclear power operations.

7.4 Conclusions

In all media centers, "local" stories have tended to dominate coverage to the detriment of an independent perspective on low-level radioactive waste issues. The TMI incident has caused a disproportionate number of articles to focus on nuclear power safety and has hindered the coverage of other low-level radioactive waste issues.

8. SURVEY METHODOLOGY

A mail survey was conducted during December 1980, of Nuclear Regulatory Commission (NRC) licensees in the Commonwealth of Pennsylvania. The names of the license holders were obtained from a computerized listing provided by the NRC. Since the NRC listing did not contain the names of the Radiation Safety Officers (RSO), or an appropriate contact person, the State Radiation Safety Office was contacted in order to see if any registration was required of those licensed to handle radioactive material.

Since Pennsylvania requires the registration of personnel handling radioactive material, it was possible to obtain the names of the individuals in charge of radiation protection. Because some registration forms appeared to have been completed two or more years ago, the name of the contact person from recent NRC correspondence was used if such communication occurred recently. Pennsylvania had copies of the NRC licenses issued within the Commonwealth.

This survey was intended to classify license holders by type of licensed facility and to determine if they disposed of low-level radioactive waste by shipment to commercial disposal facilities and, if not, what other disposal methods were employed. The survey used and instruction sheet are presented in Figure 8-1. A letter of transmittal and a return envelope were also provided (see Figure 8-2). The letter indicated that the State Radiation Safety Office endorsed the survey and that licensee responses were encouraged.

The survey instrument used may primarily be characterized as "closed ended", thus forcing respondents to answer specific alternative responses. However, for those questions where there are a variety of possible responses, some of which may not be reflected in the survey question, "open ended" responses were allowed. The questions used in the survey were limited to those which have a direct bearing on the characterization of

SYNERGIC RESOURCES CORPORATION
LOW-LEVEL WASTE GENERATOR SURVEY

GENERAL INSTRUCTIONS

1. The enclosed Radioactive Waste Survey is self-explanatory. The following instructions provide general guidelines. If you have any specific concerns, please call Todd D. Davis or Steve Isser at:

215-667-2160
2. If possible, all quantitative data should be taken directly from shipment records. If this is not practical, please estimate answers as accurately as possible. We prefer to have actual data rather than estimates.
3. Please explain or specify answers (where requested) as completely as possible. If additional space is needed, please use the "Additional Comments" section on the last page of this questionnaire.
4. When you have completed this questionnaire, please return it in the enclosed stamped, self-addressed envelope.
5. If your facility does not dispose of radioactive materials by use of the commercial radioactive material disposal sites, please fill out the survey form with the amount of material received in each year and where those radioactive materials received were disposed (e.g. Isotopes used in patient treatment residues decayed to background, disposed in trash, or shipped out in finished products).

THANK YOU VERY MUCH FOR YOUR CO-OPERATION

Figure 8-1

PART III - SOURCE OF RADIOACTIVE WASTE

(CHECK EACH SOURCE OF YOUR POTENTIAL RADIOACTIVE WASTE AND, IF YOU SHIP, INDICATE THE PERCENTAGE OF YOUR TOTAL SHIPPED WASTE VOLUME ORIGINATING FROM EACH SOURCE CATEGORY).

<u>SOURCE OF RADIOACTIVITY</u>	<u>PERCENT OF WASTE VOLUME SHIPPED</u>
☐ NUCLEAR REACTOR	_____
☐ NEUTRON GENERATOR	_____
☐ CYCLOTRON OR SYNCHROTRON	_____
☐ SEALED SOURCE	_____
☐ UNSEALED RADIOACTIVE MATERIAL	_____
☐ NATURAL ORES OR MILL TAILINGS	_____
☐ OTHER (SPECIFY) _____	_____
	100%

IF YOU DO NOT SHIP RADIOACTIVE WASTES, YOU HAVE COMPLETED THE QUESTIONNAIRE. THANK YOU. IF YOU DO SHIP, PLEASE CONTINUE WITH THE FOLLOWING QUESTIONS.

PART IV - PHYSICAL FORM OF SHIPPED WASTES

(CHECK EACH FORM OF WASTE WHICH YOU SHIP AND INDICATE THE PERCENTAGE OF YOUR TOTAL SHIPPED WASTE VOLUME REPRESENTING EACH FORM).

	<u>PERCENT OF WASTE VOLUME SHIPPED</u>
☐ DRY SOLIDS, TRASH, IRRADIATED COMPONENTS	_____
☐ SOLIDIFIED OR ABSORBED LIQUIDS, SOLID SLUDGES, SPENT RESINS, FILTER SLUDGES OR EVAPORATOR BOTTOMS	_____
☐ ANIMAL CARCASSES OR OTHER BIOLOGICAL WASTE	_____
☐ SEALED SOURCES	_____
☐ OTHER (SPECIFY) _____	_____
	100%

DOES WASTE CONTAIN ANY MATERIAL WHICH IS POTENTIALLY:

<u>YES</u>	<u>NO</u>	
☐	☐	COMBUSTIBLE
☐	☐	EXPLOSIVE
☐	☐	CHEMICALLY TOXIC

WHAT SHIPPING CONTAINERS DO YOU USE?

☐	55 GALLON STEEL DRUMS
☐	30 GALLON STEEL DRUMS
☐	OTHER (SPECIFY) _____

WHAT ON-SITE PROCESSING OF WASTE DO YOU EMPLOY?

☐	NONE
☐	MECHANICAL COMPACTION
☐	INCINERATION
☐	SOLIDIFICATION OR EVAPORATION OF LIQUIDS
☐	ABSORPTION OF LIQUIDS
☐	OTHER (SPECIFY) _____

Figure 8-1. (Continued)

TABULATION FORM

LICENSEE NAME _____
NAME OF FACILITY _____
STREET ADDRESS _____
CITY/STATE/ZIP _____
TELEPHONE NO. _____
PERSON SUPPLYING INFORMATION _____
TITLE _____

PART I - TYPE OF FACILITY

(CHECK THE ONE CATEGORY WHICH IS MOST APPLICABLE)

MEDICAL

- ☐ HOSPITAL
- ☐ PHARMACEUTICAL MANUFACTURER
- ☐ MEDICAL RESEARCH/EDUCATION
- ☐ OTHER (SPECIFY) _____

INDUSTRIAL

- ☐ INCORPORATES RADIOACTIVITY INTO PRODUCTS
- ☐ USES RADIOACTIVITY IN PROCESS CONTROL
- ☐ COMMERCIAL POWER REACTOR
- ☐ OTHER (SPECIFY) _____

EDUCATIONAL

- ☐ UNIVERSITY
- ☐ HIGH SCHOOL
- ☐ OTHER (SPECIFY) _____

GOVERNMENTAL (NON-MEDICAL OR EDUCATIONAL)

- ☐ FEDERAL
- ☐ MILITARY
- ☐ STATE
- ☐ LOCAL

PART II - DISPOSAL METHOD

CHECK EACH DISPOSAL METHOD WHICH YOU DO EMPLOY

- ☐ SHIP TO COMMERCIAL REPOSITORY
- ☐ RELEASE TO SEWER
- ☐ COMBINE WITH COMMON REFUSE
- ☐ VENT TO ATMOSPHERE
- ☐ BURN ON-SITE
- ☐ RETURN TO VENDOR
- ☐ DISTRIBUTE IN PRODUCT FORM
- ☐ NO WASTE GENERATED
- ☐ OTHER (SPECIFY) _____

Figure 8-1. (Continued)

PART V - WASTE QUANTITY

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE SHIPPED TO A COMMERCIAL DISPOSAL FACILITY.

	<u>CUBIC FEET SHIPPED</u>
ACTUAL SHIPPED IN 1978	_____
ACTUAL SHIPPED IN 1979	_____
ACTUAL SHIPPED IN 1980	_____

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE PROJECTED TO BE GENERATED WHICH WILL BE SHIPPED.

	<u>CUBIC FEET GENERATED</u>
ESTIMATED GENERATION IN 1981	_____
ESTIMATED GENERATION IN 1985	_____
ESTIMATED GENERATION IN 1990	_____

INDICATE THE QUANTITY OF RADIOACTIVITY (IN CURIES) SHIPPED TO A COMMERCIAL FACILITY IN THE YEARS 1978, 1979 AND 1980.

ISOTOPE	QUANTITY SHIPPED (CURIES) IN:		
	1978	1979	1980

Figure 8-1. (Continued)

SYNERGIC RESOURCES CORPORATION

Synergic Resources Corporation (SRC) is a subcontractor to EG&G Idaho, Inc., on a project for the U.S. Department of Energy to develop state briefing books on low level radioactive waste concerns. This project is being conducted with the cooperation and endorsement of Pennsylvania Department of Environmental Resources, Bureau of Radiation Protection.

A major feature of these briefing books will be information on the volume, sources, physical forms, and projections of low level waste. Surveys are being conducted for all Nuclear Regulatory Commission (NRC) licensees. Since you are an NRC licensee, we would appreciate it if you would complete the attached questionnaire today.

Data obtained from these surveys will be kept confidential and will only be reported in aggregated form by type of low level waste generators (e.g., commercial power reactors, medical institutions, etc.). The information you provide will be used to obtain a profile of low-level waste generated in your state and assist in the consideration of alternative approaches in developing a low-level waste management program. We are sure that you are aware of public concerns, government interest, and the desire on the part of the private sector to properly manage low level waste in the United States.

Again, we would appreciate your completing the survey today and returning it in the enclosed self-addressed, stamped envelope. The information you provide will remain confidential. If you need additional time to provide more detailed and accurate information, please take no more than five days to complete this survey. The more detailed the information you provide, the more meaningful the results of the surveys.

Should you have any questions regarding the completion of this survey, please call SRC at 215-667-2160, and ask for Steve Isser, or myself.

Sincerely,

Todd D. Davis, Director
State/Regional Energy Studies

TDD:lc

ONE BALA-CYNWYD PLAZA, SUITE 630 • BALA-CYNWYD, PA. 19004 • 215-667-2160

Figure 8-2.

low-level radioactive waste management practices in the State. Respondents were assured that the data obtained would only be reported in aggregate form.

About two weeks after surveys were mailed, an assessment was made as to the response rate and the type of licensees returning surveys. Based on contacts with the NRC regional offices near Chicago, Illinois, and King of Prussia, Pennsylvania, a listing of NRC licensees was obtained by category that are known to generate a significant volume of low-level radioactive waste and were then contacted by phone in order to encourage their response. Of those licensees contacted, all agreed to return the survey. Not all returned the surveys, however.

It is believed that these categories account for over 75 percent of the low-level radioactive waste generated. For the remaining non-respondents, a follow-up letter and postcard were sent in order to notify licensees that a survey had been sent and that their response was requested (see Figure 8-3). A postcard was provided in order to determine if the licensee: received the survey and did or did not intend to respond, did not receive the survey and would respond if another was sent; or, received the survey but only utilized sealed sources of radiation. If the licensees indicated that they only used sealed sources, no further contact was made. Postcard responses were counted as a specific type of response.

Response rates in the medical category IV-G, containing 207 hospitals and other medical licenses, were felt to be significantly low, as many in this group were believed to be potential shippers. Thus, a selective telephone survey was made by first analyzing the American Hospital Association's 1979 Annual Guide to the Health Care Field to determine which hospitals had significant nuclear medicine or radiation therapy programs. These facilities were then contacted. Of the 43 hospitals contacted, 12 turned out to be shippers of low-level radioactive waste. Data were gathered on disposal methods, the source of radioactive waste, the shipping container used, and actual shipped volumes for 1978, 1979 and 1980.

It was discovered in the survey analysis that nuclear power plants were not included in the original NRC licensee listings, since they are licensed under a different category of license. Title X of the Code of Federal Regulations was referred to for a more detailed breakdown of licensing categories. Nuclear power plants are licensed under Part 50 of the Code. Contact names were then obtained from the utilities which have active nuclear power plants in the State.

The information received from the licensees was then tabulated. The results appear in Sections 2.0 and 9.0 of this report.

9. A PROFILE OF LOW-LEVEL RADIOACTIVE WASTE GENERATION AND DISPOSAL

In the Commonwealth of Pennsylvania, a total of 699 potential shippers of low-level radioactive waste were identified. These potential shippers were initially contacted by mail and some received a follow-up telephone call. The respondents were identified as either a medical, educational, industrial, power reactor or governmental type facility. Section 2.0 presents data on the number of respondents using various disposal methods and the source of radioactivity used at these facilities. Table 9-1 indicates that 18.8 percent (N=65) of the respondents use commercial low-level waste facilities. What follows is a summary of the characteristics and quantity of waste disposed by these facilities.

9.1 Survey Response

Table 9-2 presents, by facility type, the number of potential shippers of low-level radioactive waste surveyed, the total number and percentage of responses obtained, and a breakdown of responses by type of response. If a facility provided at least the facility type and method of disposal, the answer to the survey was considered a response. If no information was obtained, the type of facility was determined by the NRC license category to which the licensee was assigned. The responses were classified into four response groups. Group One responses were responses in which all appropriate information was provided except estimated generation (see Figure 8-1). Group Two includes partial responses that missed one or two questions, but all answered the type of facility and disposal method questions. Group Three contains responses obtained by the follow-up telephone survey, and Group Four are responses obtained by postcard.

Of the 699 potential shippers identified, 49.5 percent provided some degree of response. The range of responses by type of facility was 32

TABLE 9-1. USE OF COMMERCIAL LOW-LEVEL WASTE FACILITIES

PRIORITY CATEGORY	Number of Licensees	Number of Respondents	Percent of Response	Respondents Using a Commercial Facility		
				Number	Percent of all Respondents	Percent of Respondents in Priority/Facility
1. Top Priorities	26	23	88.46	22	6.36	95.65
2. Middle Priorities	354	204	57.63	39	11.27	19.12
3. All Others	319	119	37.30	4	1.16	3.36
TYPE OF FACILITY (All Priorities)						
Medical	221	149	67.42	33	9.54	22.15
Educational	59	35	59.32	9	2.60	25.71
Industrial	356	141	39.60	19	5.49	13.48
Governmental	57	18	31.57	1	0.29	5.56
Power Reactor	6	3	50.00	3	0.87	100.00
TOTAL	699	346	49.50	65	18.79	18.79

TABLE 9-2. ANALYSIS OF OVER-ALL SURVEY RESPONSE

PRIORITY CATEGORY	Degree of Response															
	Non-Shippers								Shippers							
	Group I		Group II		Group III		Group IV		Group I		Group II		Group III		Group IV	
	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.	No. of Resp.	% of Resp.
1. Top Priorities	0	0.00	1	4.35	0	0.00	0	0.00	21	91.30	1	4.35	0	0.00	0	0.00
2. Middle Priorities	79	38.73	20	9.80	31	15.20	35	17.16	19	9.31	8	3.92	12	5.88	0	0.00
3. All Others	92	77.31	23	19.33	0	0.00	0	0.00	4	3.36	0	0.00	0	0.00	0	0.00
TYPE OF FACILITY (All Priorities)																
Medical	56	37.58	12	8.05	31	20.81	17	11.41	15	10.07	6	4.03	12	8.05	0	0.00
Educational	16	45.71	5	14.29	0	0.00	5	14.29	8	22.86	1	2.86	0	0.00	0	0.00
Industrial	36	60.99	23	16.31	0	0.00	13	9.22	17	12.06	2	1.42	0	0.00	0	0.00
Governmental	13	72.22	4	22.22	0	0.00	0	0.00	1	5.56	0	0.00	0	0.00	0	0.00
Power Reactors	0	0.00	0	0.00	0	0.00	0	0.00	3	100.00	0	0.00	0	0.00	0	0.00
TOTAL	171	49.42	44	12.72	31	8.96	35	10.12	44	12.72	9	2.60	12	3.47	0	0.00

percent for "governmental" and 67 percent for "medical". Of all respondents, 31 percent provided all requested information, while 51 percent provided no information or response.

9.2 Sources of Shipped Wastes

9.2.1 Distribution by Type of Facilities Shipping Wastes

Table 9-3 provides data on the number and type of facilities shipping wastes. The type of facility is also broken into subgroupings.

All facilities checking both "medical research/education" and "university" were reported in the medical category and not in the educational. It should also be noted that pharmaceutical manufacturers were classified as "industrial", even though the survey labeled them as "medical". The "other" category in the medical group includes doctors' offices, clinics, out-patient care facilities, blood centers, and medical laboratories.

Hospitals were the largest users of commercial disposal facilities in the medical group (N=26). Universities were the largest shippers in the educational group (N=8). Pharmaceutical manufacturing (N=5), product use (N=8), and other (N=5) industrial uses relied more heavily on commercial disposal facilities. In the industrial category, most of those who checked the "other" response specified some type of testing or logging (e.g., gas chromatography, borehole logging, leak detection, industrial radiography, tracer applications, testing labs, density gauges, inspection, construction testing, quality control, etc.). Some of these responses might properly have belonged in the "process control" category. All power reactor respondents (N=3) indicated that they used commercial disposal facilities.

TABLE 9-3. TYPE OF FACILITIES SHIPPING LOW-LEVEL WASTE

<u>Type Of Facility</u>	<u>Number Of Facilities Shipping</u>	<u>Percent Of All Shippers</u>	<u>Percent Of Facilities Type</u>
Medical			
Hospital	26	40.00	78.79
Research/Education	6	9.23	18.18
Other	1	1.54	3.03
Total	33	50.77	100.00
Educational			
University	8	12.31	88.89
High School	0	0.00	0.00
Other	1	1.54	11.11
Total	9	13.85	100.00
Industrial			
Pharm. Mfg.*	5	7.69	26.32
Product Use	8	12.31	42.11
Process Control	1	1.54	5.26
Other	5	7.69	26.32
Total	19	29.23	100.00
Power Reactor Total	3	4.62	100.00
Government			
Federal	0	0.00	0.00
Military	0	0.00	0.00
State	1	1.54	100.00
Local	0	0.00	0.00
Total	<u>1</u>	<u>0.00</u>	<u>0.00</u>
TOTAL	65	100.00	100.00

*Pharmaceutical Manufacturing

9.2.2 Origin of Radioactivity Resulting in Shipped Wastes

Three major categories were used to define the origin of radioactivity resulting in shipped wastes: nuclear reactor operation, purchases of sealed sources, and purchases of unsealed radioactivity. Table 9-4 presents the distribution of the number of facilities by the type of facility and origin of radioactivity. It should be noted that more than one origin may be appropriate for a given facility. Eighty-nine percent of the licensees reporting the shipping of low-level waste obtain the radioactivity as unsealed radioactive material. In contrast, 40 percent of the respondents reporting the shipping of low-level waste obtain the radioactive material as a sealed source.

9.3 Volume of Shipped Waste

Table 9-5 provides data on the volumes of shipped wastes for the years 1978, 1979 and 1980 for each type of facility and for subgroups of each facility type. Volumes of low-level radioactive wastes shipped to commercial disposal facilities were reported by 64 of the 65 facilities reporting that they shipped wastes.

The data in the table show that a volume of 181,770 cubic feet of low-level radioactive waste was generated by the respondents. The 1980 reported volume is 24.6 percent higher than the level reported in 1978. In 1978, power reactors accounted for 79 percent of the total low-level waste generated, and in 1980 accounted for 58 percent of total volumes reported. In both 1978 and 1980, educational facilities reported a very small percentage of the low-level waste in the State (between 1-3 percent). The volume of low-level waste generated by industry was only five percent of the total respondent generated waste in 1978 and increased to a third of the total respondent generated waste in 1980.

Table 9-6 shows the volumes in cubic feet of estimated future waste generation, as provided by the 41 respondents who provided projections. It

TABLE 9-4. ORIGIN OF RADIOACTIVITY RESULTING IN SHIPPED WASTE

<u>Type Of Facility</u>	<u>Number Of Respondents</u>	<u>Nuclear Reactor</u>		<u>Sealed Sources</u>		<u>Unsealed Radioactive Material</u>	
		<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Medical	33	0	0.00	16	48.48	33	100.00
Educational	9	2	22.22	2	22.22	7	77.78
Industrial	19	0	0.00	6	31.58	17	89.47
Power Reactor	3	3	100.00	1	33.33	0	0.00
Governmental	<u>1</u>	<u>0</u>	<u>0.00</u>	<u>1</u>	<u>100.00</u>	<u>1</u>	<u>100.00</u>
TOTAL	65	6	9.23	26	40.00	58	89.23

TABLE 9-5. VOLUME OF WASTE SHIPPED

Type of Facility	Number Of Respondents	1978		1979		1980	
		Cu. Ft.	Percent	Cu. Ft.	Percent	Cu. Ft.	Percent
Medical							
Hospital	26	4125.40	3.84	5095.90	3.13	4243.10	2.33
Research/Education	5	10667.70	9.93	9107.20	5.60	8765.60	4.82
Other	1	0.00	0.00	0.00	0.00	7.50	0.00
Total	32	14793.09	13.77	14203.09	8.74	13016.20	7.16
Educational							
University	8	2709.60	2.52	2656.40	1.63	2435.10	1.34
High School	0	0.00	0.00	0.00	0.00	0.00	0.00
Other	1	29.00	0.03	17.00	0.01	0.00	0.00
Total	9	2738.60	2.55	2673.40	1.64	2435.10	1.34
Industrial							
Pharm. Mfg.*	5	3138.50	2.92	3419.10	2.10	3247.30	1.79
Product Use	8	1272.80	1.18	48485.80	29.82	57235.40	31.49
Process Control	1	300.00	0.28	75.00	0.05	225.00	0.12
Other	5	555.80	0.52	419.60	0.26	196.00	0.11
Total	19	5267.10	4.90	52399.49	32.23	60903.70	33.51
Power Reactor Total	3	84616.00	78.77	93322.00	57.39	105412.00	57.99
Government							
Federal	0	0.00	0.00	0.00	0.00	0.00	0.00
Military	0	0.00	0.00	0.00	0.00	0.00	0.00
State	1	0.00	0.00	0.00	0.00	2.60	0.00
Local	0	0.00	0.00	0.00	0.00	0.00	0.00
Total	1	0.00	0.00	0.00	0.00	2.60	0.00
TOTAL	64	107414.78	100.00	162597.97	100.00	181769.56	100.00

*Pharmaceutical Manufacturing

TABLE 9-6. ESTIMATED GENERATION (CU. FT.)

Type of Facility	1981		1985		1990	
	Respondents	Volume	Respondents	Volume	Respondents	Volume
Medical						
Hospital	11	3402.0	11	3243.5	10	2900.0
Research/Education	4	5950.0	4	4850.0	4	5250.0
Other	1	7.5	1	7.5	1	7.5
Total	16	9359.5	16	8101.0	15	8157.5
Educational						
University	8	3074.4	8	3472.4	8	3922.4
High School	0	0.0	0	0.0	0	0.0
Other	1	35.0	1	24.0	0	0.0
Total	9	3109.4	9	3496.4	8	3922.4
Industrial						
Pharm. Mfg.*	4	3335.0	4	2635.0	4	2165.0
Product Use	6	71750.0	5	22800.0	5	24950.0
Process Control	1	75.0	1	300.0	1	300.0
Other	5	638.0	3	309.0	3	309.0
Total	16	75798.0	13	26044.0	13	27724.0
Power Reactor Total	3	115000.0	3	158930.0	3	258930.0
Government						
Federal	0	0.0	0	0.0	0	0.0
Military	0	0.0	0	0.0	0	0.0
State	0	0.0	0	0.0	0	0.0
Local	0	0.0	0	0.0	0	0.0
Total	0	0.0	0	0.0	0	0.0
TOTAL	44	203266.9	41	196571.4	39	298733.9

*Pharmaceutical Manufacturing

should be noted that based on telephone interviews, on-site visits and comments written by the respondents on the survey instrument, the projected volumes should be viewed at best as only crude estimates. Therefore, any interpretation of the projected waste volumes should be done cautiously. Another factor to consider is the definition of low-level radioactive waste and NRC rulemaking regarding disposal practices. An increasing number of institutions have reported holding such waste on-site until it decays to background levels, when it is disposed with common refuse. The projected volume of low-level radioactive waste in Pennsylvania is 203,267 cubic feet in 1981; 196,571 cubic feet in 1985; and 198,734 cubic feet in 1990.

9.4 Activity of Shipped Wastes

Table 9-7 shows the amount of activity in shipped waste for the years 1978, 1979 and 1980. The total number of respondents answering this question (N=44) is lower than the total number of shippers (N=65) because 21 respondents provided no information on activity. Of those who did answer, most appeared to carefully and methodically present the data. Still, many of these figures may be approximations. It should also be noted that, while zeros appear for many isotopes, actual data were reported but the coding scheme used does not report data for lower activity levels.

In 1978 and 1979, power reactors accounted for the largest proportion of activity shipped (95 and 99 percent, respectively). In 1980, the share of activity of shipped wastes by power reactors declines to 38 percent, while industry's share increases to over 60 percent. The largest amount of shipped industrial activity is from product use. In 1980, the activity level of shipped waste is three times higher than the activity levels reported in 1978.

Tables 9-8 through 9-13 present the distribution of activity by shipped radionuclide. This listing represents the isotopes as provided by respondents; presumably, other isotopes may be in use by non-respondents. In 1978 and 1979, power reactors accounted for the largest number of radionuclides, while in 1980 industrial sources were the largest contributor.

TABLE 9-7. ACTIVITY OF SHIPPED WASTE

Type Of Facility	Number Of Respondents	1978		1979		1980	
		Curies	Percent	Curies	Percent	Curies	Percent
Medical							
Hospital	11	10.7736	0.20	5.4626	0.07	1.8208	0.01
Research/Education	5	11.9831	0.22	9.3991	0.11	3.2128	0.01
Other	0	0.0000	0.00	0.0000	0.00	0.0000	0.00
Total	16	22.7566	0.42	14.8616	0.18	5.0336	0.02
Educational							
University	7	7.9330	0.15	4.8031	0.06	2.0234	0.01
High School	0	0.0000	0.00	0.0000	0.00	0.0000	0.00
Other	1	0.0002	0.00	0.0002	0.00	0.0000	0.00
Total	8	7.9332	0.15	4.8033	0.06	2.0234	0.01
Industrial							
Pharm. Mfg.*	4	0.9410	0.02	0.9948	0.01	2.2334	0.01
Product Use	8	172.6712	3.21	15.7684	0.19	13989.8848	62.19
Process Control	1	7.3000	0.14	0.7000	0.01	4.1000	0.02
Other	4	20.7140	0.38	20.2073	0.24	20.0785	0.09
Total	17	201.6261	3.74	37.6705	0.45	14016.2969	62.31
Power Reactor Total	2	5154.0000	95.69	8275.0000	99.31	8471.0000	37.66
Government							
Federal	0	0.0000	0.00	0.0000	0.00	0.0000	0.00
Military	0	0.0000	0.00	0.0000	0.00	0.0000	0.00
State	1	0.0000	0.00	0.0000	0.00	0.0070	0.00
Local	0	0.0000	0.00	0.0000	0.00	0.0000	0.00
Total	1	0.0000	0.00	0.0000	0.00	0.0070	0.00
TOTAL	44	5386.3145	100.00	8332.3340	100.00	22494.3555	100.00

*Pharmaceutical Manufacturing

TABLE 9-8. RADIONUCLIDES IN SHIPPED WASTE - MEDICAL

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	9.5862	9.5488	3.4191	IN 111	0.0000	0.0000	0.0000
C 14	2.4885	1.2701	0.4406	SN 119	0.0005	0.0050	0.0000
NA 22	0.0000	0.0000	0.0003	SB 125	0.0000	0.0000	0.0000
P 32	0.0426	0.0333	0.0790	TE 123	0.0000	0.0000	0.0000
P 33	0.0010	0.0050	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.5149	0.0459	0.0277	TE 129	0.0000	0.0000	0.0000
CL 36	0.0000	0.0000	0.0000	I 123	0.0013	0.0000	0.0000
K 40	0.0000	0.0000	0.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0292	0.0143	0.0125	I 125	0.8301	0.5160	0.1910
SC 46	0.0000	0.0000	0.0000	I 131	0.2572	0.3451	0.0381
CR 51	0.1860	0.1197	0.0507	I 133	0.0000	0.0000	0.0000
MN 54	0.0000	0.0000	0.0008	XE 131	0.7000	1.1870	0.1901
FE 55	0.0001	0.0000	0.0000	CS 134	0.0000	0.0000	0.0000
FE 59	7.0134	0.0139	0.0118	CS 137	0.0001	0.0000	0.0000
CO 57	0.0072	0.0071	0.0022	BA 133	0.0000	0.0000	0.0000
CO 58	0.0000	0.0000	0.0000	BA 140	0.0000	0.0000	0.0000
CO 60	0.0000	0.0000	0.0000	LA 140	0.0000	0.0000	0.0000
NI 63	0.0000	0.0000	0.0000	CE 141	0.0000	0.0000	0.0000
CU 64	0.1500	0.3360	0.1855	PM 147	0.0000	0.0000	0.0000
ZN 65	0.0000	0.0000	0.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0137	0.0135	0.0807	HF 181	0.0000	0.0000	0.0000
AS 73	0.0000	0.0000	0.0000	IR 192	0.0870	0.0000	0.0000
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0005	0.0198	0.0087
KR 85	0.0000	0.0000	0.0597	TL 204	0.0003	0.0000	0.0000
RB 81	0.0010	0.0001	0.0000	PB 210	0.0000	0.0000	0.0000
RB 83	0.0000	0.0000	0.0000	RA 226	0.0009	0.0000	0.0000
RB 86	0.0000	0.0000	0.0000	TH 232	0.0000	0.0000	0.0000
SR 85	0.0000	0.0000	0.0000	U 235	0.0000	0.0000	0.0000
SR 90	0.0001	0.0138	0.0000	U 238	0.0000	0.0000	0.0000
MO 99 M	0.0005	0.0000	0.0000	AM 241	0.0000	0.0000	0.0000
TC 99 M	0.5134	0.8732	0.0810	TH MIX	0.0000	0.0000	0.0000
RH 100	0.0000	0.0000	0.0000	U MIX	0.0000	0.0000	0.0000
RH 107	0.0000	0.0000	0.0000	PU MIX	0.0000	0.0000	0.0000
CD 109	0.0000	0.0000	0.0000	MISC.MIX	0.3310	0.4941	0.1541
				TOTAL	22.7566	14.8616	5.0336

TABLE 9-9. RADIONUCLIDES IN SHIPPED WASTE - EDUCATIONAL

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	5.4160	2.9434	1.0500	IN 111	0.0000	0.0000	0.0000
C 14	0.6300	0.6227	0.7624	SN 119	0.0000	0.0000	0.0000
NA 22	0.0000	0.0000	0.0000	SB 125	0.0000	0.0000	0.0000
P 32	0.1410	0.2660	0.0000	TE 123	0.0000	0.0000	0.0000
P 33	0.0000	0.0000	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.0240	0.0630	0.0010	TE 129	0.0000	0.0000	0.0000
CL 36	0.0030	0.0000	0.0000	I 123	0.0000	0.0000	0.0000
K 40	0.0000	0.0000	0.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0200	0.0170	0.0000	I 125	0.4980	0.4102	0.2000
SC 46	0.0000	0.0000	0.0000	I 131	0.0620	0.0390	0.0000
CR 51	0.0160	0.0640	0.0000	I 133	0.0000	0.0000	0.0000
MN 54	0.0000	0.0000	0.0000	XE 131	0.0000	0.0000	0.0000
FE 55	0.0000	0.0000	0.0000	CS 134	0.0000	0.0000	0.0000
FE 59	0.0000	0.0000	0.0000	CS 137	0.0000	0.0000	0.0000
CO 57	0.0000	0.0010	0.0000	BA 133	0.0000	0.0000	0.0000
CO 58	0.0000	0.0000	0.0000	BA 140	0.0000	0.0000	0.0000
CO 60	0.0000	0.0000	0.0000	LA 140	0.0000	0.0000	0.0000
NI 63	0.0000	0.0000	0.0000	CE 141	0.0010	0.0000	0.0000
CU 64	0.0000	0.0000	0.0000	PM 147	0.0000	0.0000	0.0000
ZN 65	0.0000	0.0000	0.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0000	0.0000	0.0000	HF 181	0.0300	0.0500	0.0100
AS 73	0.0000	0.0000	0.0000	IR 192	0.0000	0.0000	0.0000
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0000	0.0000	0.0000
KR 85	0.0000	0.0000	0.0000	TL 204	0.0000	0.0000	0.0000
RB 81	0.0000	0.0000	0.0000	PB 210	0.0000	0.0000	0.0000
RB 83	0.0000	0.0000	0.0000	RA 226	0.0000	0.0000	0.0000
RB 86	0.0000	0.0000	0.0000	TH 232	0.0000	0.0000	0.0000
SR 85	0.0000	0.0000	0.0000	U 235	0.0000	0.0000	0.0000
SR 90	0.0002	0.0000	0.0000	U 238	0.0000	0.0000	0.0000
MO 99 M	0.0000	0.0000	0.0000	AM 241	0.0000	0.0000	0.0000
TC 99 M	0.0000	0.0000	0.0000	TH MIX	0.0000	0.0000	0.0000
RH 100	0.0000	0.0000	0.0000	U MIX	0.0000	0.0000	0.0000
RH 107	0.0000	0.0000	0.0000	PU MIX	0.0000	0.0000	0.0000
CD 109	0.0000	0.0000	0.0000	MISC.MIX	1.0920	0.3270	0.0000
				TOTAL	7.9332	4.8033	2.0234

TABLE 9-10. RADIONUCLIDES IN SHIPPED WASTE - INDUSTRIAL

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	13.3941	13.3931	13191.4160	IN 111	0.0000	0.0000	0.0000
C 14	3.8011	4.2170	4.1029	SN 119	0.0000	0.0000	0.0000
NA 22	0.0000	0.0000	0.0000	SB 125	0.0000	0.0000	0.0000
P 32	0.1000	0.0950	0.1780	TE 123	0.0000	0.0000	0.0000
P 33	0.0000	0.0000	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.0450	0.0500	0.0260	TE 129	0.0000	0.0000	0.0000
CL 36	0.0000	0.0000	0.0000	I 123	0.0000	0.0000	0.0000
K 40	0.0000	0.0000	0.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0000	0.0000	0.0040	I 125	1.2200	1.5970	1.6200
SC 46	0.0000	0.0000	0.0000	I 131	0.0000	0.0000	0.0000
CR 51	0.0140	0.0150	0.0070	I 133	0.0000	0.0000	0.0000
MN 54	0.0000	0.0000	0.0000	XE 131	0.0000	0.0000	0.0000
FE 55	0.0000	0.0000	0.0000	CS 134	0.0000	0.0000	0.0000
FE 59	0.0100	0.0100	0.0100	CS 137	9.2500	2.5500	5.0500
CO 57	0.0010	0.0010	0.0010	BA 133	0.0000	0.0000	0.0000
CO 58	0.0500	0.0500	0.0500	BA 140	0.0000	0.0000	0.0000
CO 60	159.0500	0.1500	733.0499	LA 140	0.0000	0.0000	0.0000
NI 63	0.0420	0.0250	0.0080	CE 141	0.0000	0.0000	0.0010
CU 64	0.0000	0.0000	0.0000	PM 147	0.1000	0.1000	0.1000
ZN 65	0.0000	0.0000	0.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0000	0.0000	0.0000	HF 181	0.0000	0.0000	0.0000
AS 73	0.0000	0.0000	0.0000	IR 192	0.1100	0.1070	0.0600
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0000	0.0000	0.0000
KR 85	0.0000	0.0000	0.8025	TL 204	0.0000	0.0000	0.0032
RB 81	0.0000	0.0000	0.0000	PB 210	0.0000	0.0000	1.0000
RB 83	0.0000	0.0000	0.0000	RA 226	2.0000	2.0000	2.0055
RB 86	0.0000	0.0000	0.0050	TH 232	0.0000	0.0000	0.0002
SR 85	0.0010	0.0000	0.0010	U 235	0.0000	0.0000	0.0000
SR 90	0.0000	0.0000	0.0160	U 238	0.0002	0.0008	0.0002
MO 99 M	0.0000	0.0000	0.0000	AM 241	0.1230	0.1310	0.7760
TC 99 M	0.0000	0.0000	0.0000	TH MIX	0.3690	0.3930	0.3280
RH 100	0.0000	0.0000	0.0000	U MIX	3.3210	3.5370	20.8500
RH 107	0.0000	0.0000	0.0000	PU MIX	8.4870	9.0390	53.5400
CD 109	0.0000	0.0000	0.0000	MISC MIX	0.1379	0.2096	1.2998
				TOTAL	201.6261	37.6705	14016.2969

TABLE 9-11. RADIONUCLIDES IN SHIPPED WASTE - POWER REACTOR

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	0.0000	0.0000	0.0000	IN 111	0.0000	0.0000	0.0000
C 14	0.0000	0.0000	0.0000	SN 119	0.0000	0.0000	0.0000
NA 22	0.0000	0.0000	0.0000	SB 125	0.0000	0.0000	0.0000
P 32	0.0000	0.0000	0.0000	TE 123	0.0000	0.0000	0.0000
P 33	0.0000	0.0000	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.0000	0.0000	0.0000	TE 129	0.0000	0.0000	0.0000
CL 36	0.0000	0.0000	0.0000	I 123	0.0000	0.0000	0.0000
K 40	25.0000	40.0000	41.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0000	0.0000	0.0000	I 125	0.0000	0.0000	0.0000
SC 46	0.0000	0.0000	0.0000	I 131	130.0000	210.0000	210.0000
CR 51	520.0000	840.0000	860.0000	I 133	0.0000	0.0000	0.0000
MN 54	6.0000	24.0000	25.0000	XE 131	0.0000	0.0000	0.0000
FE 55	0.0000	0.0000	0.0000	CS 134	320.0000	520.0000	540.0000
FE 59	0.0000	0.0000	0.0000	CS 137	560.0000	870.0000	915.0000
CO 57	0.0000	0.0000	0.0000	BA 133	0.0000	0.0000	0.0000
CO 58	293.0000	341.0000	263.0000	BA 140	60.0000	96.0000	99.0000
CO 60	1090.0000	1846.0000	1927.0000	LA 140	50.0000	88.0000	91.0000
NI 63	0.0000	0.0000	0.0000	CE 141	0.0000	0.0000	0.0000
CU 64	0.0000	0.0000	0.0000	PH 147	0.0000	0.0000	0.0000
ZN 65	2100.0000	3400.0000	3500.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0000	0.0000	0.0000	HF 181	0.0000	0.0000	0.0000
AS 73	0.0000	0.0000	0.0000	IR 192	0.0000	0.0000	0.0000
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0000	0.0000	0.0000
KR 85	0.0000	0.0000	0.0000	TL 204	0.0000	0.0000	0.0000
RB 81	0.0000	0.0000	0.0000	PB 210	0.0000	0.0000	0.0000
RB 83	0.0000	0.0000	0.0000	RA 226	0.0000	0.0000	0.0000
RB 86	0.0000	0.0000	0.0000	TH 232	0.0000	0.0000	0.0000
SR 85	0.0000	0.0000	0.0000	U 235	0.0000	0.0000	0.0000
SR 90	0.0000	0.0000	0.0000	U 238	0.0000	0.0000	0.0000
MO 99 M	0.0000	0.0000	0.0000	AM 241	0.0000	0.0000	0.0000
TC 99 M	0.0000	0.0000	0.0000	TH MIX	0.0000	0.0000	0.0000
RH 100	0.0000	0.0000	0.0000	U MIX	0.0000	0.0000	0.0000
RH 107	0.0000	0.0000	0.0000	PU MIX	0.0000	0.0000	0.0000
CD 109	0.0000	0.0000	0.0000	MISC.MIX	0.0000	0.0000	0.0000
				TOTAL	5154.0000	8275.0000	8471.0000

TABLE 9-12. RADIONUCLIDES IN SHIPPED WASTE - GOVERNMENTAL

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	0.0000	0.0000	0.0000	IN 111	0.0000	0.0000	0.0000
C 14	0.0000	0.0000	0.0000	SN 119	0.0000	0.0000	0.0000
NA 22	0.0000	0.0000	0.0000	SB 125	0.0000	0.0000	0.0000
P 32	0.0000	0.0000	0.0000	TE 123	0.0000	0.0000	0.0000
P 33	0.0000	0.0000	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.0000	0.0000	0.0000	TE 129	0.0000	0.0000	0.0000
CL 36	0.0000	0.0000	0.0000	I 123	0.0000	0.0000	0.0000
K 40	0.0000	0.0000	0.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0000	0.0000	0.0000	I 125	0.0000	0.0000	0.0000
SC 46	0.0000	0.0000	0.0000	I 131	0.0000	0.0000	0.0000
CR 51	0.0000	0.0000	0.0000	I 133	0.0000	0.0000	0.0000
MN 54	0.0000	0.0000	0.0000	XE 131	0.0000	0.0000	0.0000
FE 55	0.0000	0.0000	0.0000	CS 134	0.0000	0.0000	0.0000
FE 59	0.0000	0.0000	0.0000	CS 137	0.0000	0.0000	0.0070
CO 57	0.0000	0.0000	0.0000	BA 133	0.0000	0.0000	0.0000
CO 58	0.0000	0.0000	0.0000	BA 140	0.0000	0.0000	0.0000
CO 60	0.0000	0.0000	0.0000	LA 140	0.0000	0.0000	0.0000
NI 63	0.0000	0.0000	0.0000	CE 141	0.0000	0.0000	0.0000
CU 64	0.0000	0.0000	0.0000	PM 147	0.0000	0.0000	0.0000
ZN 65	0.0000	0.0000	0.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0000	0.0000	0.0000	HF 181	0.0000	0.0000	0.0000
AS 73	0.0000	0.0000	0.0000	IR 192	0.0000	0.0000	0.0000
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0000	0.0000	0.0000
KR 85	0.0000	0.0000	0.0000	TL 204	0.0000	0.0000	0.0000
RB 81	0.0000	0.0000	0.0000	PB 210	0.0000	0.0000	0.0000
RB 83	0.0000	0.0000	0.0000	RA 226	0.0000	0.0000	0.0000
RB 86	0.0000	0.0000	0.0000	TH 232	0.0000	0.0000	0.0000
SR 85	0.0000	0.0000	0.0000	U 235	0.0000	0.0000	0.0000
SR 90	0.0000	0.0000	0.0000	U 238	0.0000	0.0000	0.0000
MO 99 M	0.0000	0.0000	0.0000	AM 241	0.0000	0.0000	0.0000
TC 99 M	0.0000	0.0000	0.0000	TH MIX	0.0000	0.0000	0.0000
RH 100	0.0000	0.0000	0.0000	U MIX	0.0000	0.0000	0.0000
RH 107	0.0000	0.0000	0.0000	PU MIX	0.0000	0.0000	0.0000
CB 109	0.0000	0.0000	0.0000	MISC.MIX	0.0000	0.0000	0.0000
				TOTAL	0.0000	0.0000	0.0070

TABLE 9-13. RADIONUCLIDES IN SHIPPED WASTE - TOTAL

ISOTOPE	1978	1979	1980	ISOTOPE	1978	1979	1980
H 3	28.3963	25.8853	13195.8828	IN 111	0.0000	0.0000	0.0000
C 14	6.9196	6.1098	5.3059	SN 119	0.0005	0.0050	0.0000
NA 22	0.0000	0.0000	0.0003	SB 125	0.0000	0.0000	0.0000
P 32	0.2836	0.3943	0.2570	TE 123	0.0000	0.0000	0.0000
P 33	0.0010	0.0050	0.0000	TE 125	0.0000	0.0000	0.0000
S 35	0.5839	0.1589	0.0547	TE 129	0.0000	0.0000	0.0000
CL 36	0.0030	0.0000	0.0000	I 123	0.0013	0.0000	0.0000
K 40	25.0000	40.0000	41.0000	I 124	0.0000	0.0000	0.0000
CA 45	0.0492	0.0313	0.0165	I 125	2.5481	2.5232	2.0110
SC 46	0.0000	0.0000	0.0000	I 131	130.3192	210.3841	210.0381
CR 51	520.2159	840.1986	860.0576	I 133	0.0000	0.0000	0.0000
NM 54	6.0000	24.0000	25.0008	XE 131	0.7000	1.1870	0.1901
FE 55	0.0001	0.0000	0.0000	CS 134	320.0000	520.0000	540.0000
FE 59	7.0234	0.0239	0.0218	CS 137	569.2500	872.5499	920.0569
CO 57	0.0082	0.0091	0.0032	BA 133	0.0000	0.0000	0.0000
CO 58	293.0500	341.0500	263.0500	BA 140	60.0000	96.0000	99.0000
CO 60	1249.0498	1846.1499	2660.0498	LA 140	50.0000	88.0000	91.0000
NI 63	0.0420	0.0250	0.0080	CE 141	0.0010	0.0000	0.0010
CU 64	0.1500	0.3360	0.1855	PM 147	0.1000	0.1000	0.1000
ZN 65	2100.0000	3400.0000	3500.0000	EU 152	0.0000	0.0000	0.0000
GA 67	0.0137	0.0135	0.0807	HF 181	0.0300	0.0500	0.0100
AS 73	0.0000	0.0000	0.0000	IR 192	0.1970	0.1070	0.0600
SE 75	0.0000	0.0000	0.0000	HG 203	0.0000	0.0000	0.0000
KR 81	0.0000	0.0000	0.0000	TL 201	0.0005	0.0198	0.0087
KR 85	0.0000	0.0000	0.8622	TL 204	0.0003	0.0000	0.0032
RB 81	0.0010	0.0001	0.0000	PB 210	0.0000	0.0000	1.0000
RB 83	0.0000	0.0000	0.0000	RA 226	2.0009	2.0000	2.0055
RB 86	0.0000	0.0000	0.0050	TH 232	0.0000	0.0000	0.0002
SR 85	0.0010	0.0000	0.0010	U 235	0.0000	0.0000	0.0000
SR 90	0.0003	0.0138	0.0160	U 238	0.0002	0.0008	0.0002
MO 99 M	0.0005	0.0000	0.0000	AM 241	0.1230	0.1310	0.7760
TC 99 M	0.5134	0.8732	0.0810	TH MIX	0.3690	0.3930	0.3280
RH 100	0.0000	0.0000	0.0000	U MIX	3.3210	3.5370	20.8500
RH 107	0.0000	0.0000	0.0000	PU MIX	8.4870	9.0390	53.5400
CD 109	0.0000	0.0000	0.0000	MISC.MIX	1.5609	1.0307	1.4539
				TOTAL	5386.3145	8332.3340	22494.3555

It should also be noted that the year-to-year levels of the largest shippers vary significantly.

9.5 Physical Characteristics of Shipped Wastes

Low-level radioactive waste may be processed on-site by either reducing the volume of the waste (e.g., compaction, incineration), or by removing free liquid (e.g., solidification, absorption). Table 9-14 shows the number of facilities using these methods. The most common type of on-site processing of shipped wastes is absorption (46 percent), closely followed by solidification/evaporation (44 percent). Thirty-seven percent of the respondents reported using no on-site processing of low-level radioactive waste. Only eight of the 52 respondents answering the question indicated that they used incineration for on-site processing.

Table 9-15 provides data on the type of shipping container used to package waste for transport to disposal facilities. Most facilities indicated that they used either 30 gallon or 55 gallon steel drums. The facilities that indicated "other" shipping containers generally used cardboard boxes.

In the survey, shipped waste was categorized as either dry, moist, biological, sealed or other. Table 9-16 presents the number of facilities reporting the shipping of waste in any of these categories. Ninety percent of the respondents indicated that the physical form of the shipped waste was dry. "Moist/potential free liquid" and "biological waste" was mentioned next with 38 percent of the respondents each mentioning these two types of waste forms.

TABLE 9-14. DATA PROCESSING OF WASTE

Type Of Facility	Number Of Respondents	None		Mechanical Compaction		Incineration		Solidification/ Evaporation		Absorption		Other	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Medical	20	8	40.00	2	10.00	4	20.00	7	35.00	9	45.00	5	25.00
Educational	9	3	33.33	3	33.33	1	11.11	3	33.33	3	33.33	1	11.11
Industrial	19	6	31.58	4	21.05	3	15.79	10	52.63	11	57.89	2	10.53
Power Reactor	3	1	33.33	3	100.00	0	0.00	3	100.00	1	33.33	1	33.33
Governmental	1	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	52	19	36.54	12	23.08	8	15.38	23	44.23	24	46.15	9	17.31

TABLE 9-15. SHIPPING CONTAINER USED

<u>Type Of Facility</u>	<u>Number Of Respondents</u>	<u>55 Gallon Drum</u>		<u>30 Gallon Drum</u>		<u>Other</u>	
		<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Medical	33	24	72.73	16	48.48	1	3.03
Educational	9	8	88.89	3	33.33	1	11.11
Industrial	19	18	94.74	10	52.63	7	36.84
Power Reactor	3	2	66.67	0	0.00	3	100.00
Government	1	0	0.00	0	0.00	1	100.00
TOTAL	65	52	80.00	29	44.62	13	20.00

TABLE 9-16. PHYSICAL FORM OF SHIPPED WASTE

Type Of Facility	Number Of Respondents	Dry		Moist/Potential Free Liquid		Biological Waste		Sealed Sources		Other	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Medical	20	17	85.00	6	30.00	11	55.00	5	25.00	7	35.00
Educational	9	8	88.89	5	55.56	4	44.44	2	22.22	3	33.33
Industrial	19	19	100.00	6	31.58	5	26.32	5	26.32	6	31.58
Power Reactor	3	2	66.67	2	66.67	0	0.00	1	33.33	0	0.00
Government	1	1	100.00	1	100.00	0	0.00	0	0.00	0	0.00
TOTAL	52	47	90.38	20	38.46	20	38.46	13	25.00	16	30.77

APPENDIX A

LIST OF NRC LICENSEES

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Flichbaugh Products Inc. Red Loin, Pennsylvania 17356	Y	1	I	N	No waste generated.
Franklin Institute Research Laboratories Benjamin Franklin Parkway Philadelphia, Pennsylvania 19103	Y	1	I	Y	R & D Center.
General Electric Company 3198 Chestnut Street Philadelphia, Pennsylvania 19101		C	I		
General Electric Company P. O. Box 8555 Philadelphia, Pennsylvania 19101	Y	1	I	Y	R & D.
General Medical Harrisburg 330 East Park Drive P. O. Box Harrisburg, Pennsylvania 17105			M		
GTE Products Corporation Towanda, Pennsylvania 18848			I		
GTE Sylvania, Inc. 3101 Pleasant Valley Boulevard Altoona, Pennsylvania 16603	Y	1	I	N	Incorporates into products.
GTE Sylvania, Inc. Hawes Street Towanda, Pennsylvania 18848			I		
Gulf Research & Development Corporation P. O. Drawer 2038 Pittsburgh, Pennsylvania 15230	Y	1	I	Y	R & D.
Hamilton Watch Company, Inc. 901 Wheatland Avenue Lancaster, Pennsylvania 17604			I		
Hershey Foods Corporate Technical Center 1025 Reese Avenue Hershey, Pennsylvania 17033	Y	2	I	N	Lab Research.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Hewlett-Packard Company Route 41 and Starr Road Avondale, Pennsylvania 19311			I		
ICI America Inc. Valley Forge Industrial Park Valley Forge, Pennsylvania 19481	Y	1 T	I	N	Leak detection.
Institute for Cancer Research (The) 7701 Burholme Avenue Philadelphia, Pennsylvania 19111			M		
International Petroleum Service Com. Box 547 Sheffield, Pennsylvania 16347			I		
Interstate Uniform Rental Service 1150 Second Avenue New Kensington, Pennsylvania 15068	Y	1	I	N	Laundry decontamination.
K-F Industries, Inc. 230 West Dauphin Street Philadelphia, Pennsylvania 19133			I		
Kawecki Berylco Industries Incorporated County Line Road Boyertown, Pennsylvania 19512			I		
Kennedy Van Saun Corporation Railroad Street Danville, Pennsylvania 17821	Y	1	I	N	Tracer Applications. Decay.
Lord Corporation 2000 West Grandview Boulevard Erie, Pennsylvania 16512	Y	C	I	N	Sealed sources only.
Louden Properties Company P. O. Box 235 Yatesboro, Pennsylvania 16263	Y	1	I	N	Gas well logging.
Lukens Steel Company South 1st Avenue Coatesville, Pennsylvania 19320	Y	1	I	N	Process Control.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
McNeil Laboratories, Inc. Camp Hill Road Fort Washington, Pennsylvania 19846	Y	1	I	Y	Research.
Merck and Company Incorporated West Point, Pennsylvania 19486	Y	1	I	Y	Pharmaceuticals.
Micromedic Systems, Inc. 102 Witmer Road Horsham, Pennsylvania 19044	Y	1	I	Y	Incorporates into products.
Milton Roy Company Laboratory Group 139 North Gill Street State College, Pennsylvania 16801	Y	1	I	Y	Partly Building Rubble.
Mine Safety Appliances Company 201 North Braddock Avenue Pittsburgh, Pennsylvania 15208	Y	C	I	N	Sealed sources only.
MSA Research Corporation Evans City, Pennsylvania 16033	Y	1	I	N	Decay of I 131.
Navy, Department of The Johnsville, Pennsylvania 18974			G		
Navy, Department of The Warminster, Pennsylvania 18974	-	C	G	-	Sent but not received.
Nuclear Research Corporation 1105 Industrial Highway Southampton, Pennsylvania 18966	Y	C	I	N	Sealed sources only.
Nuclear Research Corporation Street Road and Second Street Southampton, Pennsylvania 18966	Y	C	I		
Nuclide Corporation 642 East College Avenue State College, Pennsylvania 16801 ^o			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Panel Technology Incorporated (Pantek) Mifflin County Industrial Park Route 2 Lewistown, Pennsylvania 17044			I		
Penn-Well Logging Incorporated 276 Looker Mountain Trail Bradford, Pennsylvania 16701	Y	1 T C	I	N	Wire-line Service Company.
Pennsylvania Power & Light Company Two North Ninth Street Allentown, Pennsylvania 18101	Y	2	P	Y	Susquehanna Power Reactor (On-line 1982).
Pennsylvania, Commonwealth of Transportation and Safety Building Harrisburg, Pennsylvania 17120	Y	1	G	N	Emergency Management Agency.
Pennwalt Corporation 900 First Avenue King of Prussia, Pennsylvania 19406	Y	1	I	N	Analytical instruments.
Pharmaco Nuclear Incorporated 3402 Butler Street Pittsburgh, Pennsylvania 15201	Y	1	M	Y	Radiopharmacy.
Pittsburgh, University of Pittsburgh, Pennsylvania 15261			E		
Radiation Management Corporation 3508 Market Street Philadelphia, Pennsylvania 19104			I		
RIL Electronics Corporation 1105 Industrial Highway Southampton, Pennsylvania 18966	Y	C	I	N	Sealed sources only.
Rohm and Haas Company Norristown and McKean Roads Spring House, Pennsylvania 19477	Y	1	I	Y	Research.
Sangamo Weston, Inc. Kennedy Drive Archbald, Pennsylvania 18403			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Smith Kline and French Laboratories 1500 Spring Garden Street Philadelphia, Pennsylvania 19101	Y	1	I	Y	Pharmaceuticals.
Solid State Scientific, Inc. Commerce Drive Montgomeryville, Pennsylvania 18936	Y	1	I	N	Process Control. Vent to Atmosphere.
State Council of Civil Defense Transportation and Safety Boulevard Harrisburg, Pennsylvania 17120	Y	C	G	N	Use no nuclear material.
Sun Company, Inc. 100 Matsonford Road Radnor, Pennsylvania 19087			I		
Theodore S. Schwalm, Inc. 510 Second Street Lancaster, Pennsylvania 17603			I		
Union Carbide Agricultural Products Brookside Avenue Ambler, Pennsylvania 19002			I		
United States Steel Corporation 600 Grant Street Pittsburgh, Pennsylvania 15230	Y	C	I	N	Sealed sources only.
United States Radium Corporation 4150 Old Berwick Road Bloomsburg, Pennsylvania 17815	Y	1	I	Y	Now: Safety Light Corp. Discharge to Waterway.
University City Science Center 3624 Science Center Philadelphia, Pennsylvania 19104			I		
Upjohn Company (The) 1075 First Avenue King of Prussia, Pennsylvania 19406			I		
Western Electric Company, Inc. 2525 North 11th Street Reading, Pennsylvania 19604	Y	1	I	N	

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Western Electric Company 555 Union Boulevard Allentown, Pennsylvania 18103	Y	1	I	N	Process Control. Vent to Atmosphere.
William H. Rorer Incorporated 500 Virginia Drive Fort Washington, Pennsylvania 19034	Y	1	I	Y	Pharmaceuticals.
Wyeth Laboratories Incorporated P. O. Box 8299 Philadelphia, Pennsylvania 19101	Y	1	I	Y	Pharmaceuticals.
General Electric Company 3198 Chestnut Street Philadelphia, Pennsylvania 19104	Y	1	I	N	Small amounts collected by Disposal Company.
Medical College of Pennsylvania (The) 3300 Henry Avenue Philadelphia, Pennsylvania 19129	Y	T	M		
Abington Memorial Hospital 1200 York Road Abington, Pennsylvania 19001	Y	T	M	Y	Unsealed material.
Albert Einstein Medical Center York and Tabor Roads Philadelphia, Pennsylvania 19141	Y	1	M	Y	
Aliquippa Hospital 2500 Hospital Drive Aliquippa, Pennsylvania 15001			M		
Allegheny General Hospital 320 East North Avenue Pittsburgh, Pennsylvania 15212	Y	1	M	Y	Unsealed material.
Allegheny Valley Hospital 1301 Carlisle Street Natrona Heights, Pennsylvania 15065	Y	1	M	N	Sealed sources.
Allentown and Sacred Heart Hospital 1200 South Cedar Crest Boulevard Allentown, Pennsylvania 18105	Y	1	M	N	Decayed.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Allentown Hospital Association 17th and Chew Streets Allentown, Pennsylvania 18102	Y	2	M	Y	Shipped until 1980, now return to vendor.
Allentown Osteopathic Hospital 1736 Hamilton Street Allentown, Pennsylvania 18104			M		
Allentown Sacred Heart Hospital Center 1200 Cedar Crest Boulevard South Allentown, Pennsylvania 18105			M		
Altoona Hospital Howard Avenue and Seventh Street Altoona, Pennsylvania 16603	Y	T	M	N	Decay.
American Oncologic Hospital Central and Shelmire Avenues Philadelphia, Pennsylvania 19111			M		
Andrew Kaul Memorial Hospital Johnsonburg Road St. Marys, Pennsylvania 15857	Y	T	M	N	Decay.
Annie Warner Hospital South Washington Street Gettysburg, Pennsylvania 17325			M		
Armstrong County Memorial Hospital McKean and Mulberry Streets Kittanning, Pennsylvania 16201			M		
Ashland State General Hospital Route 61 R.D. Ashland, Pennsylvania 17921	Y	1 T C	M	N	Burn on site.
Berwick Hospital 701 East 16th Street Berwick, Pennsylvania 18603	Y	1	M	N	Burn on site.
Bloomsburg Hospital Bloomsburg, Pennsylvania 17815	Y	1 T	M	N	Decayed.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Braddock General Hospital 400-412 Holland Avenue Braddock, Pennsylvania 15104	Y	1 T	M	N	Returned to Pharmaco Nuclear.
Broad Street Hospital 739 South Broad Street Philadelphia, Pennsylvania 19147			M		
Bryn Mawr Hospital (The) Bryn Mawr Avenue Bryn Mawr, Pennsylvania 19010	Y	2	M	N	Return to vendor.
Butler County Memorial Hospital East Brady Street Butler, Pennsylvania 16001			M		
Bux-Mont Radiology Group 285 East Street Road Warminster, Pennsylvania 18974			M		
Canonsburg General Hospital Barr Street Canonsburg, Pennsylvania 15317			M		
Carbondale General Hospital 185 Fallbrook Street Carbondale, Pennsylvania 18407			M		
Cardiac Rehabilities Institute 5438 Centre Avenue Pittsburgh, Pennsylvania 15232	Y	1	M	N	Outpatient Diagnostic Lab.
Carlisle Hospital 244 Parker Street Carlisle, Pennsylvania 17013	Y	T	M	-	Would not comment.
Central Medical Health Services Inc. 1400 Centre Avenue Pittsburgh, Pennsylvania 15219			M		
Chambersburg Hospital Seventh and King Streets Chambersburg, Pennsylvania 17201	Y	T	M	N	Return to vendor.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Charles Cole Memorial Hospital Route 6 Coudersport, Pennsylvania 16915			M		
Chester County Hospital (The) 701 East Marshall Street West Chester, Pennsylvania 19380			M		
Chestnut Hill Hospital 8835 Germantown Avenue Philadelphia, Pennsylvania 19118			M		
Citizens General Hospital New Kensington, Pennsylvania 15068	Y	T	M	N	Release to sewer.
Clarion Osteopathic Community Hospital 214 South 7th Avenue Clarion, Pennsylvania 16214			M		
Joseph Clark, M.D. 711 South 8th Street Lebanon, Pennsylvania 17042			M		
Clearfield Hospital 809 Turnpike Avenue Clearfield, Pennsylvania 16830	Y	T	M	N	Decay.
Coaldale State General Hospital Seventh Street Coaldale, Pennsylvania 18218			M		
Coatesville Hospital 300 Strode Avenue Coatesville, Pennsylvania 19320			M		
Columbia Hospital, Columbia Health Center Penn X Avenue and West Street Winkinsburg, Pennsylvania 15221			M		
Community General Hospital 145 North 6th Street Reading, Pennsylvania 19601	Y	1	M	N	By product materials.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Community General Osteopathic Hospital 4300 Londonderry Road Harrisburg, Pennsylvania 17109	Y	1	M	N	Decay.
Community Medical Center 1822 Mulberry Street Scranton, Pennsylvania 18510			M		
Conemaugh Valley Memorial Hospital 1086 Franklin Street Johnstown, Pennsylvania 15905	Y	1 T	M	N	Decay.
Crozer-Chester Medical Center Fifteenth and Upland Streets Chester, Pennsylvania 19013	Y	1	M	Y	Decay.
Delaware County Memorial Hospital Lansdowne and Keystone Avenues Drexel Hill, Pennsylvania 19026	Y	1	M	N	Incorporated with Pharmaceutical Company.
Delaware Valley Medical Center Wilson Avenue and Pond Street Bristol, Pennsylvania 19007	Y	1 T	M	N	Decayed.
Divine Providence Hospital 1004 Arch Street Pittsburgh, Pennsylvania 15215			M		
Divine Providence Hospital 1100 Grampian Boulevard Williamsport, Pennsylvania 17701	Y	T	M	N	Decay.
Doctors Osteopathic Hospital 252 West 11th Street Erie, Pennsylvania 16501	Y	T	M	N	Decay.
Doylestown Hospital 595 West State Street Doylestown Township, Pennsylvania 18901	Y	1	M	N	Release to sewer.
Du Bois Hospital 100 Hospital Avenue Du Bois, Pennsylvania 15801			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
East Suburban Health Center 2750 Haymaker Road Monroeville, Pennsylvania 15146			M		
Easton Hospital 21st and Lehigh Streets Easton, Pennsylvania 18042	Y	T	M	Y	Ship only small amount.
Ephrata Community Hospital Martin Avenue Ephrata, Pennsylvania 17522	Y	1	M	N	Decay.
Episcopal Hospital Front and Lehigh Avenues Philadelphia, Pennsylvania 19125	Y	T	M	Y	Some material disposed on-site.
Erie Osteopathic Hospital Association 5515 Peach Street Erie, Pennsylvania 16509			M		
Evangelical Community Hospital Lewisburg, Pennsylvania 17837			M		
Fairless Hills Diagnostic Labs, Inc. 515 South Olds Boulevard Fairless Hills, Pennsylvania 19030			M		
Stephen N. Fisher, M.D. 1312 Federal Street Pittsburgh, Pennsylvania 15212			M		
Frankford Hospital Frankford Avenue and Wakeling Street Philadelphia, Pennsylvania 19124			M		
Frankford Mayfair Diagnostic Service 6200 Frankford Avenue Philadelphia, Pennsylvania 19149	Y	1	M	N	Private office.
Franklin Hospital One Spruce Street Franklin, Pennsylvania 16323	Y	C	M	-	Survey sent but not received.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Paul S. Friedman, M.D. 1422 Chestnut Street Philadelphia, Pennsylvania 19102			M		
Geisinger Medical Center Danville, Pennsylvania 17821			M		
Gnaden Huetten Memorial Hospital 11th and Hamilton Streets Lehigh, Pennsylvania 18235			M		
Good Samaritan Hospital East Norwegian and Tremont Streets Pottsville, Pennsylvania 17901	Y	C	M	N	Sealed sources only.
Good Samaritan Hospital (The) Fourth and Walnut Streets Lebanon, Pennsylvania 17042	Y	T	M	N	Decay.
Grand View Hospital Lawn Avenue Sellersville, Pennsylvania 18960	Y	2	M	N	Decay.
Greene County Memorial Hospital Bonar Avenue Waynesburg, Pennsylvania 15370			M		
Greenville Hospital 110 North Main Street Greenville, Pennsylvania 16125	Y	1	M	N	Burn on-site.
Roger B. Haglund, M.D. Physicians Office Building R.D. Punxsutawney, Pennsylvania 15767			M		
Hahnemann Medical College and Hospital 230 North Broad Street Philadelphia, Pennsylvania 19102	Y	1 T C	M	Y	Unsealed material.
Hamot Medical Center 201 State Street Erie, Pennsylvania 16512	Y	T	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Hanover General Hospital 300 Highland Avenue Hanover, Pennsylvania 17331	Y	T	M	N	Decay.
Harrisburg Polyclinic Hospital Harrisburg, Pennsylvania 17105	Y	T	M	Y	Shipments will probably decrease.
Haverford Community Hospital 2000 Old West Chester Pike Havertown, Pennsylvania 19083			M		
Hazleton State General Hospital Hazleton, Pennsylvania 18201			M		
Henry Clay Frick Community Hospital Church Street Mount Pleasant, Pennsylvania 15666	Y	I	M	N	Decay.
Holy Redeemer Hospital 1648 Huntingdon Pike Meadowbrook, Pennsylvania 19046			M		
Holy Spirit Hospital North 21st Street Camp Hill, Pennsylvania 17011	Y	I	M	N	Decay.
Hospital of the Philadelphia College of Osteopathic Medicine 4150 City Line Avenue Philadelphia, Pennsylvania 19131	Y	T	M	N	Decay.
Hospital of the Medical College of Pennsylvania 3300 Henry Avenue Philadelphia, Pennsylvania 19129	Y	I T	M	Y	Unsealed material.
Jerrold D. Hydovitz, M.D. 532 South Aiken Avenue Pittsburgh, Pennsylvania 15232			M		
Indiana Hospital Indiana, Pennsylvania 15701	Y	T	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
J.C. Blair Memorial Hospital Warm Springs Avenue Huntington, Pennsylvania 16652	Y	1	M	N	Decay.
J.F. Kennedy Memorial Hospital Cheltenham and Langdon Streets Philadelphia, Pennsylvania 19124		C	M		
James C. Giuffre Medical Center 8th and Girard Avenue Philadelphia, Pennsylvania 19122	Y	T	M	N	Return to vendor.
Jameson Memorial Hospital 222 West Leasure Avenue New Castle, Pennsylvania 16101	Y	T	M	N	Return to vendor.
Jeanes Hospital 7600 Central Avenue Philadelphia, Pennsylvania 19111			M		
Jeannette District Memorial Hospital 600 Jefferson Avenue Jeannette, Pennsylvania 15644	Y	1	M	N	Return to vendor.
Jersey Shore Hospital Thompson Street Jersey Shore, Pennsylvania 17740			M		
K&A X-Ray Associates 1826 East Allegheny Avenue Philadelphia, Pennsylvania 19134	Y	C	M	N	Sealed sources only.
Richard L. Kalla, M.D. 3471 Fifth Avenue Pittsburgh, Pennsylvania 15213			M		
Chester Kay, M.D. 9102 Babcock Boulevard Pittsburgh, Pennsylvania 15237			M		
Lancaster General Hospital 555 North Duke Street Lancaster, Pennsylvania 17604	Y	1	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Lancaster Osteopathic Hospital 1100 East Orange Street Lancaster, Pennsylvania 17602	Y	2	M	N	Decay.
Lankenau Hospital City Line and Lancaster Avenues Philadelphia, Pennsylvania 19151	Y	T	M		51.5 ft. ³ /Yr. Constant.
Latrobe Area Hospital Latrobe, Pennsylvania 15650	Y	T	M	N	Return to vendor.
Lebanon Valley General Hospital Fourth and Willow Streest Lebanon, Pennsylvania 17042	Y	1	M	N	Decay.
Lee Hospital 320 Main Street Johnstown, Pennsylvania 15901	Y	T	M	N	Return to vendor.
Lewistown Hospital Highland Avenue Lewistown, Pennsylvania 17044	Y	1	M	N	Technitium generator.
Lock Haven Hospital Fourth and Nelson Streets Lock Haven, Pennsylvania 17745	Y	1	M	N	Diagnostic exams.
Lower Bucks Hospital (The) Bath Road and Orchard Avenue Bristol, Pennsylvania 19007	Y	T	M	N	Return to vendor.
McKeesport Hospital 1500 Fifth Avenue McKeesport, Pennsylvania 15132	Y	1	M	N	Decay.
Medical Center of Beaver County, Inc. Beaver Falls, Pennsylvania 15010	Y	T	M	N	Decay.
Medical Center of Beaver County, Inc. 1000 Dutch Ridge Road Beaver, Pennsylvania 15009	Y	T	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Medical College of Pennsylvania (The) 3300 Henry Avenue Philadelphia, Pennsylvania 19129			M		
Memorial Hospital, Roxborough 5800 Ridge Avenue Philadelphia, Pennsylvania 19128			M		
Memorial Hospital, Inc. R.D. #1 Towanda, Pennsylvania 18848			M		
Memorial Hospital of Bedford County Route 1 Everett, Pennsylvania 15537			M		
Memorial Osteopathic Hospital 325 South Belmont Street York, Pennsylvania 17403	Y	1	M	N	Decay.
Mercy Catholic Medical Center 5301 Cedar Avenue Philadelphia, Pennsylvania 19143	Y	T	M	Y	Now ship very infrequently.
Mercy Hospital 196 Hanover Street Wilkes-Barre, Pennsylvania 18703			M		
Mercy Hospital 746 Jefferson Avenue Scranton, Pennsylvania 18501			M		
Mercy Hospital 2500 7th Avenue Altoona, Pennsylvania 16603	Y	T	M	Y	Ship very infrequently.
Mercy Hospital of Johnstown 1020 Franklin Street Johnstown, Pennsylvania 15905			M		
Methodist Hospital 2301 South Broad Street Philadelphia, Pennsylvania 19148	Y	1	M	N	Return to vendor.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Metropolitan Hospital 201 North Eighth Street Philadelphia, Pennsylvania 19106			M		
Monongahela Valley Hospital, Inc. Country Club Road Carroll Township, Pennsylvania 15063	Y	I	M	N	Decay.
Monsour Hospital and Clinic Lincoln Way East Jeannette, Pennsylvania 15644			M		
Montgomery Hospital Powell and Fornance Streets Norristown, Pennsylvania 19401	Y	T	M	N	Return to vendor.
Moses Taylor Hospital 700 Quincey Avenue Scranton, Pennsylvania 18510	Y	I T	M	N	Decay.
Muhlenberg Medical Center Schenersville Road Bethlehem, Pennsylvania 18017	Y	T	M	N	Decay.
Muncy Valley Hospital East Water Street Box 340 Muncy, Pennsylvania 17756			M		
Nanticoke State Hospital West Washington Street Nanticoke, Pennsylvania 18634			M		
Nazareth Hospital 2601 Holme Avenue Philadelphia, Pennsylvania 19152	Y	T	M	Y	29.5 ft. ³ /Yr..
Nesbitt Memorial Hospital 562 Wyoming Avenue Kingston, Pennsylvania 18704			M		
Norristown State Hospital Building #52 Norristown, Pennsylvania 19401			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
North Hills Passavant Hospital 9100 Babcock Boulevard Pittsburgh, Pennsylvania 15237			M		
North Penn Hospital 100 Medical Campus Drive Lansdale, Pennsylvania 19446	Y	1	M	Y	Unsealed material.
Northeastern Hospital 2301 West Allegheny Avenue Philadelphia, Pennsylvania 19134	Y	2	M	N	Indicates 150 ft. ³ /Yr. returned to vendor.
NPW Medical Center of North East Penn. 1000 East Mountain Drive Wilkes-Barre, Pennsylvania 18711			M		
Ohio Valley General Hospital Heckell Road McKees Rocks, Pennsylvania 15136			M		
Oil City Hospital 174 East Bissell Avenue Oil City, Pennsylvania 16301	Y	T	M	Y	Stopped shipping 1980. Handle on-site.
Palmerton Hospital 135 Lafayette Avenue Palmerton, Pennsylvania 18071	Y	1 T	M	N	Decay.
Paoli Memorial Hospital Paoli, Pennsylvania 19301			M		
Parkview Hospital 1331-45 East Wyoming Avenue Philadelphia, Pennsylvania 19124			M		
Philadelphia College of Osteopathic Medicine 4150 City Line Avenue Philadelphia, Pennsylvania 19131			M		
Philipsburg State General Hopsital Philipsburg, Pennsylvania 16866			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Phoenixville Hospital 140 Hutt Road Phoenixville, Pennsylvania 19460	Y	T	M	N	Decay.
Pocono Hospital (The) 206 East Brown Street East Stroudsburg, Pennsylvania 18301			M		
Pocono Radiology Consultants 175 East Brown Street East Stroudsburg, Pennsylvania 18301	Y	C	M	N	Use no nuclear material.
Pottstown Memorial Medical Center Firestone Boulevard and High Street Pottstown, Pennsylvania 19466	Y	1	M	N	Decay.
Pottsville Hospital and Warne Clinic Mauch Chunk and Jackson Streets Pottsville, Pennsylvania 17901	Y	1	M	N	Unsealed material.
Presbyterian University of Pennsylvania 51 North 39th Street Philadelphia, Pennsylvania 19104			M		
Punxsutawney Area Hospital R.D. #5 Route 36 North Punxsutawney, Pennsylvania 15767			M		
Quakertown Community Hospital 11th and Park Avenue Quakertown, Pennsylvania 18951	Y	1	M	N	Burn on-site.
Reading Hospital and Medical Center Sixth and Spruce Streets Reading, Pennsylvania 19602	Y	T	M	N	Discontinued shipping (1979).
Pesara Pushpamala Reddy, M.D. 5 Foxwood Drive Pittsburgh, Pennsylvania 15238	Y	1	M	N	Private office. Decay.
Riddle Memorial Hospital Media, Pennsylvania 19063			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Robert Packer Hospital Guthrie Square Sayre, Pennsylvania 18840	-	T	M	-	Would not answer questions.
Rolling Hill Hospital and Diagnostic 60 East Township Line Elkins Park, Pennsylvania 19117			M		
Sacred Heart General Hospital Ninth and Wilson Streets Chester, Pennsylvania 19013	Y	1	M	N	Decay.
Sacred Heart Hospital Fourth and Chew Streets Allentown, Pennsylvania 18102			M		
Sacred Heart Hospital 1430 DeKalb Street Norristown, Pennsylvania 19401	Y	1	M	N	Decay.
Saint Vincent Health Center 232 West 25th Street Erie, Pennsylvania 16544	Y	T	M	N	Decay.
Scranton State General Hospital Scranton, Pennsylvania 18501	Y	2	M	N	Vent to atmosphere.
Sewickley Valley Hospital Sewickley, Pennsylvania 15143			M		
Shadyside Hospital 5230 Centre Avenue Pittsburgh, Pennsylvania 15232			M		
Sharon General Hospital 740 East State Street Sharon, Pennsylvania 16146			M		
Shenango Valley Osteopathic Hospital 2200 Memorial Drive Extended Farrell, Pennsylvania 16121		C	M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Soldiers and Sailors Hospital Wellsboro, Pennsylvania 16901		C	M		
Somerset Community Hospital 225 South Center Avenue Somerset, Pennsylvania 15501			M		
South Hills Health System Coal Valley Road Box 18119 Pittsburgh, Pennsylvania 15236	Y	T	M	Y	176 ft. ³ /Yr. may begin storage.
South Side Hospital South Twentieth and Jane Streets Pittsburgh, Pennsylvania 15203			M		
Southern Chester County Medical Center Route 1 West Grove, Pennsylvania 19390			M		
Southwestern Health Center 500 Lewis Run Road Pittsburgh, Pennsylvania 15236			M		
Spencer Hospital 1034 Grove Street Meadville, Pennsylvania 16335	Y	1	M	N	Unsealed material.
Spitz Clinic (The) 32 South Morton Avenue Morton, Pennsylvania 19070	Y	1 T	M	N	Return to vendor.
St. Agnes Medical Center 1900 South Broad Street Philadelphia, Pennsylvania 19145			M		
St. Clair Memorial Hospital 1000 Bower Hill Road Pittsburgh, Pennsylvania 15234			M		
St. Francis General Hospital 45th and Penn Avenues Pittsburgh, Pennsylvania 15201	Y	1	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
St. John's General Hospital 3339 McClure Avenue Pittsburgh, Pennsylvania 15212	Y	1	M	N	Return to vendor.
St. Joseph Hospital 250 College Avenue Lancaster, Pennsylvania 17604	Y	2	M	N	Release to sewer.
St. Joseph Hospital Hazleton, Pennsylvania 18201	Y	1	M	N	Decay.
St. Joseph Hospital and Health Center 250 College Avenue Lancaster, Pennsylvania 17604			M		
St. Luke's Hospital Bethlehem, Pennsylvania 18015	Y	2 T	M	Y	Intend to discontinue shipping.
St. Margaret Memorial Hospital 815 Freeport Road Pittsburgh, Pennsylvania 15215	Y	1	M	N	Unsealed.
St. Mary Hospital Frankford Avenue and Palmer Street Philadelphia, Pennsylvania 19125			M		
St. Mary Hospital Langhorne, Pennsylvania 19047			M		
Suburban General Hospital South Jackson Avenue Pittsburgh, Pennsylvania 15202			M		
Suburban General Hospital 2701 DeKalb Pike Norristown, Pennsylvania 19401			M		
Sunbury Community Hospital 350 North Eleventh Street Sunbury, Pennsylvania 17801			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Taylor Hospital Ridley Park, Pennsylvania 19078	Y	T	M	N	Decay.
Tri-County Hospital Sproul and Thomson Roads Springfield, Pennsylvania 19064			M		
Tyler Memorial Hospital Route 6 Tunkhannock, Pennsylvania 18657	Y	1	M	N	Decay.
Uniontown Hospital Uniontown, Pennsylvania 15401			H		
United Community Hospital Grove City, Pennsylvania 16127	Y	1	M	N	Decay.
Valley Radiology Associates, Inc. 451 Third Avenue Kingston, Pennsylvania 18704			H		
Veterans Administration Medical Center Coatesville, Pennsylvania 19320			M		
Veterans Administration Medical Center 1111 East End Boulevard Wilkes-Barre, Pennsylvania 18711			M		
Veterans Administration Medical Center New Castle Road Butler, Pennsylvania 16001			M		
Warminster General Hospital 225 Newtown Road Warminster, Pennsylvania 18974	Y	1	M	N	Approx. 36 ft. ³ /Yr. returned to vendor.
Warren General Hospital 2 to 12 Crecent Park West Warren, Pennsylvania 16365	Y	T	M	N	Decay.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Warren Hospital 185 Roseberry Street Phillipsburg, Pennsylvania 18865			M		
Washington Hospital (The) 155 Wilson Avenue Washington, Pennsylvania 15301	Y	1 T	M	N	Decay.
Wayne County Memorial Hospital Park and West Streets Honesdale, Pennsylvania 18431			M		
Waynesboro Hospital East Main Street Waynesboro, Pennsylvania 17268	Y	1	M	N	Decay.
West Allegheny Osteopathic Hospital 7777 Steubenville Pike Oakdale, Pennsylvania 15071	Y	2	M	N	Return to vonder.
West Park Hospital Ford Road and Fairmount Park Philadelphia, Pennsylvania 19131	Y	1	M	N	Unsealed material.
Western Pennsylvania Hospital 4800 Friendship Avenue Pittsburgh, Pennsylvania 15224	Y	1 T	M	Y	Unsealed material.
Westmoreland Hospital Association Greensburg, Pennsylvania 15601	Y	1 T	M	N	Decay.
Williamsport Hospital 777 Rural Avenue Williamsport, Pennsylvania 17701	Y	1	M	N	Sealed source and unsealed material.
Wills Eye Hospital 9th and Walnut Streets Philadelphia, Pennsylvania 19107			M		
Wyoming Valley Hospital 149 Dana Street Wilkes-Barre, Pennsylvania 18702		C	M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
York Hospital 1001 South George Street York, Pennsylvania 17405	Y	T	M	Y	Decreasing shipments. Using more storage to decay.
611 Radiology Associates 611 University Drive State College, Pennsylvania 16801			H		
Allegheny Health Education and Research 320 East North Avenue Pittsburgh, Pennsylvania 15212	Y	1	M	Y	Unsealed material.
Allegheny Valley Hospital 1300 Carlisle Street Natrona Heights, Pennsylvania 15065	Y	1	M	N	Sealed sources.
Mercy Hospital 1400 Locust Street Pittsburgh, Pennsylvania 18219	Y	1	M	Y	Teletherapy.
St. Joseph Hospital Twelfth and Walnut Streets Reading, Pennsylvania 19603			M		
Veterans Administration Hospital University and Woodland Avenue Philadelphia, Pennsylvania 19104	Y	1	M	Y	Teletherapy.
Western Pennsylvania Hospital 4800 Friendship Avenue Pittsburgh, Pennsylvania 15224	Y	1	M	Y	Unsealed material.
Peoples Natural Gas Company (The) R.D. #3 Old Airport Road Leechburg, Pennsylvania 15656	Y	1	I	N	Well drilling.
Milton S. Hershey Medical Center 500 University Drive Hershey, Pennsylvania 17033	Y	1	M	Y	Unsealed material.
Montefiore Hospital, Association of 1459 Fifth Avenue Pittsburgh, Pennsylvania 15213			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Navy, Department of The 17th Street and Pattison Avenue Philadelphia, Pennsylvania 19145	Y	1	G	N	Naval Regional Medical Center.
Franco M. Michini, M.D. 30 South Valley Road Paoli, Pennsylvania 19301	Y	2	M	N	Use no isotopes.
Pennsylvania Hospital 8th and Spruce Streets Philadelphia, Pennsylvania 19107			M		
University of Pittsburgh A-550 Crabtree Hall Pittsburgh, Pennsylvania 15261			E		
Polyclinic Medical Center North Third Street and Polyclinic Avenue Harrisburg, Pennsylvania 17105	Y	1	M	N	Sealed source.
Radiology Associates of Erie 104 East Second Street Erie, Pennsylvania 16507			M		
St. Francis Hospital of New Castle 1000 South Mercer Street New Castle, Pennsylvania 16101			M		
Thomas Jefferson University and Hospital 920 Chancellor Street Philadelphia, Pennsylvania 19107	Y	1	M	Y	
Pennsylvania, Commonwealth of P. O. Box 80 Harrisburg, Pennsylvania 17120					
Biomarine Industries, Inc. 45 Great Valley Corporate Center Malvern, Pennsylvania 19355	Y	1	M	N	No waste generated.
Boeing Company P. O. Box 16858 Philadelphia, Pennsylvania 19142			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Budd Company (The) 2450 Hunting Park Avenue Philadelphia, Pennsylvania 19132			I		
Freeport Brick Company Cotton Road Meadville, Pennsylvania 16335			I		
Med-Chek Laboratories, Inc. 1386 Old Freeport Road Pittsburgh, Pennsylvania 15238			M		
Penn-Del Instrument Sales, Inc. 709 Bethlehem Pike Philadelphia, Pennsylvania 19118			I		
Philadelphia, City of 500 South Broad Street Philadelphia, Pennsylvania 19146			G		
Smith Kline Clinical Laboratories 20th and Race Streets Philadelphia, Pennsylvania 19103			M		
Albright College Reading, Pennsylvania 19604	Y	I	E	N	Neutron generator.
Allegheny College North Main Street Meadville, Pennsylvania 16335			E		
Bloomsburg State College Bloomsburg, Pennsylvania 17815			E		
Bryn Mawr College Bryn Mawr, Pennsylvania 19010			E		
Bucknell University Lewisburg, Pennsylvania 17837	Y	I	E	Y	Includes Medical Education.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
California State College California, Pennsylvania 15419	Y	1 T	E	N	Less than 100 mCi/Yr.
Carnegie Mellon University 500 Forbes Avenue Pittsburgh, Pennsylvania 15213	Y	1	E	Y	Academic nuclear reactor.
Cedar Crest College Allentown, Pennsylvania 18104	Y	1	E	N	Decay.
Chestnut Hill College Chestnut Hill Philadelphia, Pennsylvania 19118	Y	1	E	N	Neutron generator.
Clarion State Clarion, Pennsylvania 16214	Y	1 T	E	N	Decay.
Dickinson College Carlisle, Pennsylvania 17013	Y	1	E	N	May ship in future.
East Stroudsburg State College East Stroudsburg, Pennsylvania 18301	Y	C	E	N	Sealed sources only.
Edinboro State College Edinboro, Pennsylvania 16412			E		
Elizabethtown College Elizabethtown, Pennsylvania 17022	Y	1 T	E	N	Decay.
Franklin and Marshall College College Avenue Lancaster, Pennsylvania 17604			E		
Gannon College Perry Square Erie, Pennsylvania 17325			E		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Gettysburg College Gettysburg, Pennsylvania 17325	Y	C	E	N	Sealed sources only.
Grove City College Grove City, Pennsylvania 16127	Y	1	E	N	No waste generated.
Haverford College Haverford, Pennsylvania 19041	Y	1	E	Y	Decayed.
Juniata College 1700 Moore Street Huntingdon, Pennsylvania 16652			E		
Kutztown State College Kutztown, Pennsylvania 19530			E		
Lafayette College Easton, Pennsylvania 18042	Y	1	E	N	Unsealed material.
Lebanon Valley College Annville, Pennsylvania 17003	Y	1	E	N	Four Pu-Be Sources received January, 1962. No waste.
Lehigh University Bethlehem, Pennsylvania 18015	Y	2	E	Y	Isotopes unspecified.
Lincoln University of the Commonwealth Lincon University, Pennsylvania 19352			E		
Lock Haven State College North Fairview Street Lock Haven, Pennsylvania 17745			E		
Marywood College Scranton, Pennsylvania 18509	Y	1	E	N	Sealed Pu-Be neutron source. Longer half- lived are reused.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Mercyhurst College Glenwood Hills Erie, Pennsylvania 16501	Y	C	E	N	Sealed sources only.
Messiah College Grantham, Pennsylvania 17027	Y	1	E	N	Sealed source and unsealed material.
Millersville State College East Frederick Street Millersville, Pennsylvania 17551	-	-	E	-	Returned - R.S.O. deceased.
Northampton County Area Community College 3835 Green Pond Road Bethlehem, Pennsylvania 18017	Y	1	E	N	Radiologic Technology Program.
Pennsylvania College of Podiatric Medicine 810 Race Street Philadelphia, Pennsylvania 19107	Y	2	M	Y	Shipments to remain constant.
Pennsylvania State University (The) 107 Old Main University Park, Pennsylvania 16802			E		
Pennsylvania, Commonwealth of Indiana, Pennsylvania 15701	Y	1	E	N	Indiana University of Pennsylvania.
University of Pennsylvania Philadelphia, Pennsylvania 19104			E		
Philadelphia College of Pharmacy 43rd Street and Kingsessing Avenue Philadelphia, Pennsylvania 19104	Y	1	E	Y	Decayed.
University of Scranton Scranton, Pennsylvania 18510	Y	C	E	N	Sealed sources only.
Slippery Rock State College Slippery Rock, Pennsylvania 16057			E		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
St. Francis College Loretto, Pennsylvania 15940			E		
St. Joseph's College City Line Avenue at 54th Street Philadelphia, Pennsylvania 19131			E		
St. Vincent College Latrobe, Pennsylvania 15650			E		
Swarthmore College Swarthmore, Pennsylvania 19081	Y	1	E	N	Sealed source.
Thiel College Greenville, Pennsylvania 16125			E		
Trustees of the University of Pennsylvania Philadelphia, Pennsylvania 19104	Y	2	E	Y	May include Medical & Academic together.
Villanova University Villanova, Pennsylvania 19085			E		
Washington and Jefferson College Washington, Pennsylvania 15301			E		
West Chester State College West Chester, Pennsylvania 19013			E		
Widener College 14th and Chestnut Street Chester, Pennsylvania 19013			E		
Duquesne University 913 Bluff Street Pittsburgh, Pennsylvania 15219			E		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Allegheny County, Community College 808 Ridge Avenue Pittsburgh, Pennsylvania 15212			F		
Allegheny General Hospital 320 East North Avenue Pittsburgh, Pennsylvania 15212	Y	1	M	Y	Unsealed material.
American Red Cross 307 Vine Street Johnstown, Pennsylvania 15901			M		
American Red Cross 23rd and Chestnut Streets Philadelphia, Pennsylvania 19103			M		
American Red Cross Hanover Ind. Estates P. O. Box Wilkes-Barre, Pennsylvania 18703			M		
Clinical Pathology Facility of West Bingham at South 8th Streets Pittsburgh, Pennsylvania 15203			M		
Commonwealth of Pennsylvania Warren, Pennsylvania 16365			G		
Easton Hospital 21st and Lehigh Streets Easton, Pennsylvania 18042			M		
Herbert Fellerman, M.D. 35 West Linden Street Wilkes-Barre, Pennsylvania 18702	Y	1	M	N	Private office.
Good Samaritan Hospital East Norwegian and Tremont Streets Pottsville, Pennsylvania 17901	Y	C	M	N	Sealed sources only.
Interstate Blood Bank, Inc. 2503 North Broad Street Philadelphia, Pennsylvania 19132			M		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Ian A. Kellman, M.D. 10101 Academy Road Philadelphia, Pennsylvania 19114	Y	I	M	N	Private office.
Lee Hospital 320 Main Street Johnstown, Pennsylvania 15901	Y	T	M	N	Return to vendor.
Oxford Hospital 623 East Unruh Avenue Philadelphia, Pennsylvania 19111			M		
Jack V. Rozwadowski, M.D. 154 West 9th Street Erie, Pennsylvania 16501	Y	I T	M	N	Medical lab.
Veterinary Associates R.D. #1 Clarion, Pennsylvania 16214	Y	I T	M	N	Veterinary Hospital.
A. Barletta and Sons P. O. Box 40 Hazleton, Pennsylvania 18201			I		
Ackenheil and Associates Geo Systems 1000 Banksville Road Pittsburgh, Pennsylvania 15216			I		
Acme-Hardesty Company, Inc. 910 Fox Pavilion Jenkintown, Pennsylvania 19046			I		
Ages Laboratories 1200 East High Street Pottstown, Pennsylvania 19464			I		
Agway, Inc. 978 Loucks Mill Road York, Pennsylvania 17402			I		
Air Products and Chemicals, Inc. Box 351 R.D. #1 Tamaqua, Pennsylvania 18252			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Air Products and Chemicals, Inc. P. O. Box 427 Marcus Hook, Pennsylvania 19061			I		
Air Products and Chemicals, Inc. 50 Snowdrift Road North Fogelsville, Pennsylvania 18051			I		
Allegheny County Coroner's Office 542 Fourth Avenue Pittsburgh, Pennsylvania 15219	Y	1	I	N	Forensic X-ray.
Allegheny Ludlum Steel Corporation Alabama and Pacific Avenues Brackenridge, Pennsylvania 15014	Y	1	I	N	Process Control.
Allegheny Power System Cabin Hill Greensburg, Pennsylvania 15601	Y	1	I	N	Analytical Testing.
Allen Products Company, Inc. P. O. Box 2187 Allentown, Pennsylvania 18001			I		
City of Allentown 112 Union Street Allentown, Pennsylvania 18102			G		
Allied Chemical Corporation Baker and Adamson Works Marcus Hook, Pennsylvania 19061	Y	1	I	N	Gas Chromatograph.
Allied Chemical Corporation Westwood Road Pottsville, Pennsylvania 17901			I		
Allis-Chalmers Corporation P. O. Box M-101 York, Pennsylvania 17405			I		
Alpha Portland Cement Company 15 South Third Street Easton, Pennsylvania 18043			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Aluminum Company of America Alcoa Technical Center Alcoa Center, Pennsylvania 15069	Y	C	I	N	Use no nuclear material.
American Asphalt Paving Company, Inc. R.D. #7 Shavertown, Pennsylvania 18708			I		
American Biltrite, Inc. 9401 Blue Grass Road Philadelphia, Pennsylvania 19114			I		
American Home Foods, Inc. Marr Street Milton, Pennsylvania 17847			I		
American Testing Laboratories, Inc. 784 Flory Mill Road Lancaster, Pennsylvania 17604			I		
AMP Incorporated P. O. Box 3608 Harrisburg, Pennsylvania 17105	Y	1	I	N	Return to vendor.
Amstar Corporation Foot of Reed Street Philadelphia, Pennsylvania 19147	Y	1	I	N	Sealed source.
Andrew S. McCreath & Son, Inc. P. O. Box 1453 Harrisburg, Pennsylvania 17105			I		
Angeline Elizabeth Kirby Memorial Hosp. 71 North Franklin Street Wilkes-Barre, Pennsylvania 18701			M		
Antigen & Antibody Manufacturing 258 Main Street Tullytown, Pennsylvania 19007			I		
Appleton Papers, Inc. Roaring Spring, Pennsylvania 16673			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Arco/Polymers, Inc. Frankfort Road Monaca, Pennsylvania 15061			I		
Army, Department of The Chambersburg, Pennsylvania 17201			G		
Arthur H. Thomas Company Vine Street at Third Philadelphia, Pennsylvania 19106			I		
ATEC Associates, Inc., of Pennsylvania 75 Acco Drive York, Pennsylvania 17402	Y	1	I	N	Foundation Engineering.
Atlantic Richfield Company 3144 Passyunk Avenue Philadelphia, Pennsylvania 19145			I		
Atomic Energy of Canada Limited 420 Babylon Road Horsham, Pennsylvania 19044			I		
Automation Industries, Inc. P. O. Box 245 Phoenixville, Pennsylvania 19460			I		
Avtex Fibers, Inc. Dunham Road Meadville, Pennsylvania 16335	Y	1	I	N	Return to vendor.
Basic Alloys, Inc. One Recycling Way Monaca, Pennsylvania 15061			I		
Berks County Emergency Management R.D. #1 Leesport, Pennsylvania 19533	Y	1	I	N	Training monitors. Scaled source.
Bessemer Cement Company Bessemer, Pennsylvania 16112			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Bethlelem Steel Corporation B-252 Martin Tower Bethlehem, Pennsylvania 18016	Y	1	I	Y	Natural ores.
Betz Environmental Engineers, Inc. One Plymouth Meeting Mall Plymouth Meeting, Pennsylvania 19462			I		
Betz Laboratories, Inc. 4636 Somerton Road Trevose, Pennsylvania 19047			I		
Bituminous Applicators, Inc. Rohrerstown and Flory Mill Roads Lancaster, Pennsylvania 17604			I		
Blair County - Civic Council of Altoona Court House Hollidaysburg, Pennsylvania 16648			G		
Blaw-Knox Foundry and Mill Machinery One Oliver Plaza Pittsburgh, Pennsylvania 15222			I		
BP Oil Corporation P. O. Box 428 Marcus Hook, Pennsylvania 19061			I		
Bracken Construction Company P. O. Box 186 Slingo Laverne, Pennsylvania 16255	Y	1 T	I	N	Process Control.
Brady Contracting Company, Inc. 3609 Hartzdale Drive Camp Hill, Pennsylvania 17011	Y	1	I	N	Return to vendor.
Brandt Associates, Inc. Route 611 Martins Creek, Pennsylvania 18063	Y	1	I	N	Gas Chromatography.
Brockway Glass Company, Inc. McCullough Avenue Brockway, Pennsylvania 15824	Y	2	I	N	No waste generated.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Bucks County Council of Civil Defense Bucks County Administration Building Doylestown, Pennsylvania 18901	Y	1	G	N	Training for radio- logical defense.
Budd Company Technical Center (The) 375 Commerce Drive Fort Washington, Pennsylvania 19034			I		
Burrell Construction and Supply Company One Fifth Street New Kensington, Pennsylvania 15068	Y	1	I	N	Sealed source.
Calgon Corporation Campbells Run Road at Route 60 Robinson Township, Pennsylvania 15230	Y	2	I	N	Gas Chromatograph.
Caloric Corporation Washington and Heffner Streets Topton, Pennsylvania 19562			I		
Cambria County Emergency Management Cambria County Court House Ebensburg, Pennsylvania 15931			G		
Cameron Construction Company 1425 Beaver Avenue Pittsburgh, Pennsylvania 15235	Y	1	I	N	Quality Control testing.
Cametco Inc. Box 266 Duquesne, Pennsylvania 15110			I		
Carbon County Civil Defense Jim Thorpe, Pennsylvania 18229	Y	1	G	N	Sealed source.
Carbon Equipment Company, Inc. 203 Pottsville Street Port Carbon, Pennsylvania 17965	Y	NA	I	N	Did not buy gauge, thus use no materials.
Carpenter Steel Company 101 West Bern Street Reading, Pennsylvania 19603			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Catalytic, Inc. 1500 Market Street Centre Square Philadelphia, Pennsylvania 19102			I		
Cedar Grove Laboratories 1314 West Chester Pike West Chester, Pennsylvania 19380			I		
Certainteed Corporation Crestwood Industrial Pike P. O. Box Mountaintop, Pennsylvania 18707	Y	1 T	I	N	Sealed source.
Charles Bluestone Company, Inc. P. O. Box 326 Elizabeth, Pennsylvania 15037	Y	1	I	N	Return to vendor.
Chem Clear, Inc. 997 Old Eagle School Road Wayne, Pennsylvania 19087	Y	1	I	N	Industrial waste water treatment.
Chester Engineers, Inc. (The) 845 Fourth Avenue Corapolis, Pennsylvania 15108	Y	1	I	N	Consulting engineers.
Church Water Purification Laboratory Box 83 49 East Chestnut Street Fairview, Pennsylvania 16415			I		
Clearfield County Civil Defense Clear Haven Clearfield, Pennsylvania 16830			G		
Colonial School District Germantown Pike Plymouth Meeting, Pennsylvania 19462	Y	1	E	N	Sealed source.
Combustion Engineering, Inc. Narvon Mine Narvon, Pennsylvania 17555	Y	1	I	N	Clay Process.
Commonwealth of Pennsylvania 2301 North Cameron Street Harrisburg, Pennsylvania 17110			G		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Commonwealth of Pennsylvania P. O. Box 1430 Harrisburg, Pennsylvania 17185			G		
Commonwealth of Pennsylvania The Fulton Building 3rd and Locust Streets Harrisburg, Pennsylvania 17120	Y	I	G	Y	Bureau of Radiation
Congoleum Corporation Marcus Hook, Pennsylvania 19061	Y	I T	I	N	Return to vendor.
Consolidation Coal Company 1800 Washington Road Pittsburgh, Pennsylvania 15241			I		
Consolidation Coal Company 200 Hidden Valley Road McMurray, Pennsylvania 15317			I		
Consolidation Coal Company 924 North Washington Road McMurray, Pennsylvania 15317			I		
Construction Engineering Consultant Box 241 Laughlintown, Pennsylvania 15655	Y	I	I	N	Industrial radiography.
Container Corporation of America 5000 Flat Rock Road Philadelphia, Pennsylvania 19127			I		
Container Corporation of America Longford Road Oaks, Pennsylvania 19456	Y	I	I	N	Test instrumentation.
Coplay Cement Manufacturing Company Easton Road Nazareth, Pennsylvania 18064			I		
Corning Glass Works State College, Pennsylvania 16801			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Corning Glass Works 1 Jackson Street Wellsboro, Pennsylvania 16901	Y	1	I	N	Return to vendor.
Corning Glass Works Charleroi, Pennsylvania 15022	Y	1	I	N	Sealed source.
Crucible, Inc. 850 Midland Avenue P. O. Box 226 Midland, Pennsylvania 15959	Y	2	I	N	Return to vendor.
D.E. Smith, Inc. R.D. #2 Box 105 Mifflintown, Pennsylvania 17059	Y	1	I	N	Nuclear density medicine.
D'Appolonia Consulting Engineers, Inc. 10 Duff Road Pittsburgh, Pennsylvania 15235			I		
Dalare Associates 217 South 24th Street Philadelphia, Pennsylvania 19103			I		
Dauphin County Civil Defense Court House Harrisburg, Pennsylvania 17101			G		
David M. Burkholder, Inc. R.D. #3 Ephrata, Pennsylvania 17522	Y	1	I	N	Compaction density testing.
Defense Logistics Agency 2800 South 20th Street Philadelphia, Pennsylvania 19101			G		
Defense Supply Agency 2800 South 20th Street Philadelphia, Pennsylvania 19101			G		
Dentsply International, Inc. P. O. Box 872 570 West College York, Pennsylvania 17405			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Devalut Contracting Company, Inc. Box 158 Kimberton, Pennsylvania 19442	Y	I	I	N	Construction testing equipment.
Dick/Trumbell Corporation P. O. Box 10896 Pittsburgh, Pennsylvania 15236			I		
Dodge Foundry and Machine Company 6501 State Road Philadelphia, Pennsylvania 19135			I		
Dresser Industries, Inc. 2 Gateway Center Pittsburgh, Pennsylvania 15222			I		
Duncan, Lagnese and Associates, Inc. 9951 Old Perry Highway Wexford, Pennsylvania 15090			I		
E. D'Appolonia Consulting Engineers 10 Duff Road Pittsburgh, Pennsylvania 15235			I		
E.D. Plummer Sons, Inc. 961 South Main Street Chambersburg, Pennsylvania 17201			I		
E.L. Conwell & Comapny 2024 Arch Street Philadelphia, Pennsylvania 19103			I		
Eanco, Inc. 539 Jacksonville Road Warminster, Pennsylvania 18974	Y	I T	I	N	Install and handle sealed sources.
Eaton-Dikeman Company Mt. Holly Springs, Pennsylvania 17065			I		
Emergency Management Services Easton, Pennsylvania 18042			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Empire Steel Castings, Inc. P. O. Box 139 Reading, Pennsylvania 19603			I		
City of Erir Foot of Wallace Street Erie, Pennsylvania 16501			G		
Exton Materials, Inc. Warren Avenue and Spring Road Malvern, Pennsylvania 19355			I		
F&M Schaefer Brewing Company P. O. Box 2568 Allentown, Pennsylvania 18001			I		
Falls Township Civil Defense 285 Yardley Avenue Fallsington, Pennsylvania 19054			G		
Faylor-Middlecreek, Inc. P. O. Box 135 Winfield, Pennsylvania 17889	Y	1	I	N	Return to vendor.
Firestone Tire and Rubber Company Firestone Drive Pottstown, Pennsylvania 19464			I		
Fischer and Porter Company County Line Road Warminster, Pennsylvania 18974			I		
Fulton County Civil Defense Court House Annex No. 1 McConnellsburg, Pennsylvania 17233			G		
GAF Corporation. Box 0 Blue Ridge Summit, Pennsylvania 17214			I		
GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146	Y	1	I	N	Moisture density gauge for soil.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
General Crushed Stone Company P. O. Box 231 Easton, Pennsylvania 18042			I		
General Electric Company P. O. Box 8555 Philadelphia, Pennsylvania 19101	Y	1	I	Y	R & D.
George E. Logue, Inc. 321 Winters Lane Montoursville, Pennsylvania 17754	Y	2	I	N	Quality control testing. No waste.
Geo-Mechanics, Inc. 1580 Broad Avenue P. O. Box 23 Belle Vernon, Pennsylvania 15012			I		
Gilbert Associates, Inc.. P. O. Box 1498 Reading, Pennsylvania 19630	Y	1	I	N	Instruments.
GPU Service Corporation Route 183 North of Reading Air Reading, Pennsylvania 19603			I		
Great Lakes Laboratories, Inc. P. O. Box 326 Erie, Pennsylvania 16512			M		
Green International, Inc. 504 Beaver Street Sewickley, Pennsylvania 15143			I		
Greenwood Laboratories P. O. Box 187 R.D. #2 Kennett Square, Pennsylvania 19348			M		
Grocery Store Products Company Kennett Square, Pennsylvania 19348			I		
GTE Sylvania Towanda, Pennsylvania 18848			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Gulf Oil Corporation P. O. Box 7408 Philadelphia, Pennsylvania 19101			I		
H.J. Heinz Company 1062 Progress Street Pittsburgh, Pennsylvania 15212			I		
H.F. Lenz Company 1732 Lyter Drive Johnstown, Pennsylvania 15905			I		
H.J. Williams Company, Inc. P. O. Box 269 York, Pennsylvania 17405			I		
Hammermill Paper Company P. O. Box 1440 Erie, Pennsylvania 16533	Y	1	I	N	Process Control.
Hammermill Paper Company 1453 East Lake Road Erie, Pennsylvania 16512			I		
Hatfield Township Municipal Authority Advance Lane Colmar, Pennsylvania 18915			G		
Department of Health, Education and Welfare 900 U.S. Custom House Philadelphia, Pennsylvania 19106			E		
George C. Menny, M.D. 3420 North Broad Street Philadelphia, Pennsylvania 19140	Y	NA	M		Doctor retired.
Hershey Foods Corporation 19 East Chocolate Avenue Hershey, Pennsylvania 17033			I		
Highway Materials, Inc. 234 East DeKalb Pike King of Prussia, Pennsylvania 19406			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Hofmann Industries, Inc. James Street Sinking Spring, Pennsylvania 19608			I		
Howmet Aluminum Corporation Box 3167 Lancaster, Pennsylvania 17604	Y	I	I	N	Process Control.
Ingersoll-Rand Company P. O. Box 247 Kutztown, Pennsylvania 19530			I		
Department of the Interior 4th Floor Federal Building - 228 Wa. Harrisburg, Pennsylvania 17108			G		
International Mill Service, Inc. 1500 Walnut Street Philadelphia, Pennsylvania 19102			I		
Iselin Preparation Company P. O. Box 729 Indiana, Pennsylvania 15701			I		
IU Conversion Systems, Inc. 115 Gibraltar Road Horsham, Pennsylvania 18914			I		
J.E. Baker Company P. O. Box 1189 232 East Market York, Pennsylvania 17405			I		
J.P. Ward Foundries, Inc. 115 Gullick Street Blossburg, Pennsylvania 16912			I		
Jack McCormick and Associates, Inc. 860 Waterloo Road Devon, Pennsylvania 19333			I		
Jeannette Corporation Bullitt Avenue Jeannette, Pennsylvania 15644			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Jessop Steel Company 500 Green Street Washington, Pennsylvania 15301			I		
John H. Roberson Testing, Inc. 3405 State Street Erie, Pennsylvania 16508			I		
Jones and Laughlin Steel Corporation 990 Agnew Road Pittsburgh, Pennsylvania 15230			I		
Jones and Laughlin Steel Corporation Aliquippa Works Aliquippa, Pennsylvania 15001			I		
Jones and Laughlin Steel Corporation 2709 East Carson Street Pittsburgh, Pennsylvania 15203			I		
Joseph Ciccone & Sons, Inc. P. O. Box 98 R.D. #3 Bath, Pennsylvania 18014			I		
Juniata College Huntingdon, Pennsylvania 16652			E		
Juniata County Civil Defense Court House Bridge and Main Street Mifflintown, Pennsylvania 17059			G		
Kawecki Berylco Industries P. O. Box 429 Hazleton, Pennsylvania 18201			I		
Kawecki Berylco Industries, Inc. County Line Road Reading, Pennsylvania 19603	Y	1	I	N	Sealed source.
Keystone Mutual Shoemaker Company 3000 East Ontario Street Philadelphia, Pennsylvania 19134	Y	2	I	N	Process Control.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Keystone Portland Cement Company Bath, Pennsylvania 18014			I		
Kimbob, Inc. P. O. Box 2255 Harrisburg, Pennsylvania 17105			I		
Knouse Foods Corp. Peach Glenn, Pennsylvania 17306			I		
Koppers Company, Inc. Millers Run Road Bridgeville, Pennsylvania 15017			I		
Koppers Company, Inc. 440 College Park Drive Monroeville, Pennsylvania 15146	Y	1	I	N	Analytical instruments.
Koppers Company, Inc. 2312 Koppers Building Pittsburgh, Pennsylvania 15219	Y	1	I	N	Process Control.
Koppers Company, Inc. Rouseville Road Oil City, Pennsylvania 16301			I		
La Salle College 20th Street and Olney Avenue Philadelphia, Pennsylvania 19141			E		
Department of Labor 4800 Forbes Avenue Pittsburgh, Pennsylvania 15213	Y	1	G	N	Mine safety and Health Administration.
Lancaster County Civil Defense 50 North Duke Street Lancaster, Pennsylvania 17602	Y	1	G	N	Return to vendor.
Lancaster Laboratories, Inc. 2425 New Holland Pike Lancaster, Pennsylvania 17601	Y	1	I	N	Gas Chromatograph.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
City of Lancaster 120 North Duke Street Lancaster, Pennsylvania 17604	Y	1	G	N	Conestoga Filtration Plant - (water quality).
Lebanon Steel Foundry 1st Avenue and East Lehman Street Lebanon, Pennsylvania 17042			I		
Lee Tire and Rubber Company East Hector Street Conshohocken, Pennsylvania 19428			I		
Lehigh Asphalt Paving and Construction P. O. Box 217 Tuscarora, Pennsylvania 17982	Y	1	I	N	Sealed source.
Lehigh County Civil Defense 455 Hamilton Street Allentown, Pennsylvania 18101			G		
Lycoming County Civil Defense Court House 48 West Third Street Williamsport, Pennsylvania 17701	Y	1	G	N	Training source.
Management Engineering Corporation 98 Vanadium Road Bridgeville, Pennsylvania 15017			I		
Masonite Corporation P. O. Box 311 Towanda, Pennsylvania 18848			I		
McKeesport Hospital 1500 Fifth Avenue McKeesport, Pennsylvania 15132	Y	1 C	M	N	Decay.
Mercer County Commissioners Mercer Court House Mercer, Pennsylvania 16137	Y	2	G	N	No waste.
Mercer Lime and Stone Company Legislative Route 10068 P. O. Box Branchton, Pennsylvania 16021			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Merck and Company, Inc. Riverside, Pennsylvania 17868	Y	1	I	Y	Pharmaceuticals.
Mercy Hospital Pride and Locust Streets Pittsburgh, Pennsylvania 15219	Y	1	M	Y	Teletherapy.
Metropolitan Edison Company P. O. Box 542 Reading, Pennsylvania 19603			I		
Wayne A. Myers 8306 Stenton Avenue Philadelphia, Pennsylvania 19118			I		
Micro Display Systems, Inc. 950 Rittenhouse Road Norristown, Pennsylvania 19403			I		
Raymond C. Miller 4767 Route 8 Allison Park, Pennsylvania 15101			I		
Mobay Chemical Corporation Penn-Lincoln Parkway West Pittsburgh, Pennsylvania 15205			I		
Monroe County Civil Defense Monroe County Court House Stroudsburg, Pennsylvania 18360	Y	1 T	G	N	Sealed source.
Montgomery County Council of Civil Defense 400 Markley Street Norristown, Pennsylvania 19401			G		
National Medical Services, Inc. 2300 Stratford Avenue Willow Grove, Pennsylvania 19090	Y	1	M	N	Sealed source.
Department of the Navy Philadelphia Division Building 619 - Naval Base Philadelphia, Pennsylvania 19112			G		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Commonwealth of Pennsylvania P. O. Box 3043 West Chester, Pennsylvania 19380			G		
Philadelphia Department of Public Health 321 University Avenue Philadelphia, Pennsylvania 19104			G		
Philadelphia Electric Company 2301 Market Street Philadelphia, Pennsylvania 19101	Y	1	P	Y	Peach Bottom Power Reactor. Discharge to waterway.
Philadelphia Fire Department 3rd and Spring Garden Streets Philadelphia, Pennsylvania 19123	Y	1	G	N	Office of Emergency Preparedness.
Philadelphia Geriatric Center 5301 Old York Road Philadelphia, Pennsylvania 19141			G		
Philadelphia Suburban Water Company 762 Lancaster Avenue Bryn Mawr, Pennsylvania 19010	Y	1	I	N	Water surveyor.
City of Philadelphia Water Department 9001 State Road Philadelphia, Pennsylvania 19136	Y	1	G	N	Return to vendor.
City of Philadelphia 3900 Richmond Street Philadelphia, Pennsylvania 19137			G		
City of Philadelphia 7th Street and Lehigh Avenue Philadelphia, Pennsylvania 19133	Y	1	G	N	Philadelphia Water Department Materials Testing Lab.
City of Philadelphia Philadelphia International Airport Philadelphia, Pennsylvania 19153	Y	1 T	G	N	Department of Commerce/ Division of Aviation.
City of Philadelphia 4290 Ford Road Philadelphia, Pennsylvania 19131			G		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Pike County Civil Defense Council Court House Annex Milford, Pennsylvania 18337			G		
Pittsburgh Alloys, Inc. P. O. Box 239 West Mifflin, Pennsylvania 15122	Y	2	I	N	KeveX analyst 6600.
Pittsburgh Testing Laboratory 850 Poplar Street Pittsburgh, Pennsylvania 15122			I		
City of Pittsburgh City County Building Pittsburgh, Pennsylvania 15219			G		
City of Pittsburgh 4501 Centre Avenue Pittsburgh, Pennsylvania 15213			G		
Power Maintenance Corporation P. O. Box 18107 Pittsburgh, Pennsylvania 15236			I		
Power Piping Company 829 Beaver Avenue Pittsburgh, Pennsylvania 15233	Y	1 T	I	N	Process Control.
PPG Industries, Inc. One Gateway Center Pittsburgh, Pennsylvania 15222			I		
PPG Industries, Inc. 301 Zeta Drive Blawnox, Pennsylvania 15238	Y	1	I	N	Process Control.
PPG Industries, Inc. Ford City, Pennsylvania 16226			I		
PPG Industries, Inc. Box 800 Kebert Industrial Park Meadville, Pennsylvania 16335			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Procter and Gamble Paper Products Company P. O. Box 32 Mehoopany, Pennsylvania 18629			I		
Q.C., Inc. Industrial Highway Southampton, Pennsylvania 18966	Y	2	I	N	Commercial testing laboratory.
Quaker Alloy Casting Company Myerstown, Pennsylvania 17067			I		
Quemahoning Coal Processing Company P. O. Box 488 Somerset, Pennsylvania 15501			I		
Radiation Management Corporation 3508 Market Street Suite 400 Philadelphia, Pennsylvania 19104			I		
RCA Corporation New Holland Avenue Lancaster, Pennsylvania 17604			I		
City of Reading City Hall Reading, Pennsylvania 19603	Y	1	G	N	No waste.
Reginald B. Adams Laboratory 618 Swissvale Avenue Pittsburgh, Pennsylvania 15221	Y	1	I	N	Analytical lab.
Richardson Gordon and Associates Three Gateway Center Pittsburgh, Pennsylvania 15222			I		
Rockwell International Corporation 400 North Lexington Avenue Pittsburgh, Pennsylvania 15208			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Roy F. Weston, Inc. One Weston Way West Chester, Pennsylvania 19380			I		
Schott Optical Glass, Inc. 400 York Avenue Duryea, Pennsylvania 18642			I		
Scott Research Laboratories, Inc. U.S. Route 611 Plumsteadville, Pennsylvania 18949			I		
Senate Environmental Testing Laboratories 1406 Pittsburgh Street Cheswick, Pennsylvania 15024	Y	1	I	N	Sealed source.
Sharon Steel Corporation P. O. Box 291 Sharon, Pennsylvania 16146	Y	1	I	N	Return to vendor.
Somerset County Council of Civil Defense Box 415 Courthouse Somerset, Pennsylvania 15501	Y	1	G	N	Sealed source.
Sonoco Products Company 300 South Brandywine Avenue Downingtown, Pennsylvania 19335			I		
Spang and Company Brugh Avenue Butler, Pennsylvania 16001	Y	1	I	N	Inspection.
Specialty Coating P. O. Box 350 Route 23 Phoenixville, Pennsylvania 19460			I		
SRW Associates, Inc. 631 Idlewood Avenue Carnegie, Pennsylvania 15106	Y	1	I	N	Density gauge.
St. Regis Paper Company Jaycee Drive West Hazleton, Pennsylvania 18201	Y	1	I	N	Process Control.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Stabler Companies, Inc. 635 Lucknow Road Harrisburg, Pennsylvania 17110			I		
Stauffer Chemical Company P. O. Box 572 Monongahela, Pennsylvania 15063			I		
Stearns-Rogers Incorporated Glenn Road Mike Wide Industrial Park Homer City, Pennsylvania 15748			I		
Steelmet, Inc. P. O. Box 369 McKeesport, Pennsylvania 15134			I		
Strand Laboratories 110 Kinzey Street Johnstown, Pennsylvania 15904			I		
Sun Company Marcus Hook, Pennsylvania 19061			I		
Supelco Incorporated Supelco Park Bellefonte, Pennsylvania 16823	Y	2	I	N	Q.A. and R & D.
Susquehanna University Selingsgrove, Pennsylvania 17870			E		
Teleflex Incorporated North Wales, Pennsylvania 19454			I		
The Municipal Authority of the City 100 Atlantic Avenue McKeesport, Pennsylvania 15132	Y	1	G	N	Sealed source.
Theodore Sall, Inc. 2335 East Butler Street Philadelphia, Pennsylvania 19137			I		

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Department of the Treasury 2nd and Chestnut Streets Philadelphia, Pennsylvania 19106			G		
Tri-State Toxicology Laboratory R.D. #1 Box 124-T Burgettstown, Pennsylvania 15021			G		
Trumbull Corporation P. O. Box 18177 Pittsburgh, Pennsylvania 15236	Y	1	I	N	Density testing.
U.S. Steel Corporation 525 William Penn Place Pittsburgh, Pennsylvania 15230			I		
Union Equipment, Inc. Box 31 Warfordsburg, Pennsylvania 17267			I		
Union Paving Company 1 East Wynnewood Road Wynnewood, Pennsylvania 19096			I		
United States Steel Corporation Northampton, Pennsylvania 18067	Y	2	I	N	Process Control.
United States Steel Corporation 1 Library Place Duquesne, Pennsylvania 15110			I		
Universal Technical, Inc. 1234 East College Avenue State College, Pennsylvania 16801	Y	1	I	N	Testing Laboratory.
Urick Foundry Company 15th and Cherry Streets Erie, Pennsylvania 16501			I		
Valley Forge Sewer Authority Pawling Road at Schuylkil River Phoenixville, Pennsylvania 19460	Y	1	G	N	Liquid slurry density meters.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Vaporformed Products P. O. Box 636 New Kensington, Pennsylvania 15068			I		
Warren County Civil Defense Fourth and Market Streets Warren, Pennsylvania 16365			G		
Wastex Industries, Inc. 23 South Hanover Street Pottstown, Pennsylvania 19464	Y	1	I	N	Commercial laboratory.
Weiler Brush Company, Inc. #1 Lake Street Cresco, Pennsylvania 18326			I		
West Company West Bridge Street Phoenixville, Pennsylvania 19460			I		
West Penn Testing Laboratories, Inc. 482 West Eighth Avenue West Homestead, Pennsylvania 15120	Y	1	I	N	Testing Laboratory.
Westinghouse Electric Corporation Youngwood, Pennsylvania 15697	-	-	I	-	May or may not be included in response from other sites.
Westinghouse Electric Corporation 469 Sharpsville Avenue Sharon, Pennsylvania 16146	-	-	I	-	May or may not be included in response from other sites.
Westinghouse Electric Corporation 875 Greentree Road Building 8, 4th Floor Pittsburgh, Pennsylvania 15220	-	-	I	-	May or may not be included in response from other sites.
Westinghouse Electric Corporation Lester, Pennsylvania 19113	-	-	I	-	May or may not be included in response from other sites.
Westinghouse Electric Corporation Pittsburgh, Pennsylvania 15230	-	-	I	-	May or may not be included in response from other sites.

LICENSEE NAME AND ADDRESS	SURVEY		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	RECEIVED	RESPONSE			
Westvaco Corporation Pennsylvania Avenue Tyrone, Pennsylvania 16686			I		
Windsor Service, Inc. P. O. Box 3206 Hampden Station Reading, Pennsylvania 19604	Y	1	I	N	Construction.
Wyoming Sand and Stone Company R.D. #2 Tunkhannock, Pennsylvania 18657	Y	1	I	N	Return to vendor.
Xienta, Inc. R.D. #1 Bernville, Pennsylvania 19506			I		
Westinghouse Electric Corporation P. O. Box 1918 Pittsburgh, Pennsylvania 15230	-	-	I	-	May be included in other responses.
Westinghouse Electric Corporation - PSPD 875 Greentree Road Pittsburgh, Pennsylvania 15220	Y	NA	I	N	Division H.Q. Use no materials.
Bradford Hospital 116-156 Interstate Parkway Bradford, Pennsylvania 16701	Y	1	M	N	Decayed.

APPENDIX B

PENNSYLVANIA LEGISLATION AND REGULATION

LEGISLATURE

OVERVIEW

The Pennsylvania General Assembly consists of the Senate and the House of Representatives. They meet annually, convening on the first Tuesday of January.

SENATE

Membership

Democrats: 28

Republicans: 22

Leadership

President: The Pennsylvania Constitution designates the Lieutenant Governor of the Commonwealth as the President of the Senate. Under the Rules of the Senate, he has the power to refer all legislation to the appropriate standing committee.

President Pro Tempore: The President Pro Tempore of the Senate is elected by the membership at the beginning of each regular session. The President Pro Tempore appoints the Chairman, Vice-Chairman and members of the standing committees of the Senate.

Officers

President: Lt. Governor William W. Scranton III

President Pro Tempore: Martin L. Murray
(D - Wilkes-Barre)

Majority Floor Leader: Edward P. Zemprelli
(D - Clairton)

Majority Policy Committee Chairman: Henry C. Messinger
(D - Allentown)

Minority Floor Leader: Henry G. Hager
(R - Williamsport)

Minority Policy
Committee Chairman:

R. Budd Dwyer (R - Meadville)

Committee Structure

There are twenty-two standing committees of the Senate. The Environmental Resources Committee will be most concerned with the mill tailings program. The Chairman of the Environmental Resources Committee is Robert J. Mellow, a third-term Democrat from Scranton.

Other Senate Committees that may be involved with the mill tailings program, with their chairmen, are:

	<u>Terms Expire</u>
o Appropriations - Joseph F. Smith (D - Philadelphia)	1982
o Public Health and Welfare - W. Louis Coppersmith (D - Johnstown)	1980
o Transportation - Francis J. Lynch (D - Philadelphia)	1982

Senator J. Barry Stout represents the district in which the Canonsburg site is located, District 46 (Washington County). He is a first-term Democrat, and his term expires in 1982. Stout served in the Pennsylvania House from 1971 to 1976.

HOUSE OF REPRESENTATIVES

Membership

Democrats: 100

Republicans: 103

Leadership

Speaker: The Speaker of the House is elected by the membership when the House convenes at the beginning of the Session. The Speaker presides over the business of the House, sets the order of business, recognizes members to speak, assigns bills to committees, and appoints the chairmen of the standing committees.

Officers

Speaker of the House:	H. Jack Seltzer (R - Palmyra)
Majority Floor Leader:	Matthew J. Ryan (R - Media)
Majority Policy Committee Chairman:	Richard J. Cessar (R - Pittsburgh)
Minority Floor Leader:	K. Leroy Irvis (D - Pittsburgh)
Minority Policy Committee Chairman:	James A. Goodman (D - Mahanoy City)

Committee Structure

The House has twenty-two standing committees, the members of which are appointed by the Committee on Committees. The House Committee within whose jurisdiction the mill tailings program probably falls is the Mines and Energy Management Committee.

The Standing Committees of the House that may be relevant to the mill tailings program, with their chairmen, are:

- o Health & Welfare - Joseph V. Zord
(R - Whitehall)
- o Subcommittee on Health - William K. Klingaman
(R Tamaqua)
- o Appropriations - Richard A. McClatchy
(R - Rosemont)
- o Federal - State Relations - David S. Hayes
(R - Fairview)
- o Mines and Energy - James L. Wright
(R - Levittown)
- o Transportation - Rudolph Dininni
(R - Harrisburg)

Representative David W. Sweet represents District 48 (Washington County), the House district in which the Canonsburg site is located. Representative Sweet is a second-term Democrat.

DEPARTMENT OF ENVIRONMENTAL RESOURCES

SECRETARY

ENVIRONMENTAL HEARING BOARD

COMPTROLLER

**OFFICE OF PUBLIC
INFORMATION**

**DEPUTY FOR
LEGISLATION AND BOARDS**

BOARDS AND COMMISSIONS

- CITIZENS ADVISORY COUNCIL
- ENVIRONMENTAL QUALITY BOARD
- COAL AND CLAY MINE SUBSIDENCE INSURANCE BOARD
- STATE BOARD FOR CERTIFICATION OF SEWAGE TREATMENT PLANT AND WATERWORKS OPERATORS
- STATE BOARD FOR CERTIFICATION OF SEWAGE ENFORCEMENT OFFICERS
- STATE CONSERVATION COMMISSION
- ADVISORY COMMITTEE ON ATOMIC ENERGY DEVELOPMENT AND RADIATION CONTROL

DEPUTY FOR ADMINISTRATION

**AFFIRMATIVE ACTION PROGRAM
BUREAU OF
HUMAN RESOURCE MANAGEMENT**

DIVISION OF

- EMPLOYEE RELATIONS
- MANPOWER MANAGEMENT
- HUMAN RESOURCES DEVELOPMENT

BUREAU OF FISCAL MANAGEMENT

DIVISION OF

- BUDGET ANALYSIS
- PROGRAM PLANNING AND EVALUATION

BUREAU OF INFORMATION SYSTEMS

DIVISION OF

- SYSTEMS PLANNING
- SYSTEMS DEVELOPMENT
- OPERATIONS

BUREAU OF OFFICE SERVICES

DIVISION OF

- PURCHASING & SUPPLIES SERVICES
- BUILDING SERVICES MANAGEMENT

OFFICE OF CHIEF COUNSEL

**BUREAU OF
REGULATORY COUNSEL
BUREAU OF LEGAL SERVICES
BUREAU OF LITIGATION**

DIVISION OF THE

- EASTERN REGION
- CENTRAL REGION
- WESTERN REGION

**DEPUTY SECRETARY FOR
ENVIRONMENTAL PROTECTION**

BUREAU OF

WATER QUALITY MANAGEMENT

DIVISION OF

- WATER QUALITY
- DAMS AND EMBANKMENTS
- WATER SUPPLY AND SEWERAGE
- INDUSTRIAL WASTES AND EROSION REGULATION
- MANAGEMENT SERVICES

BUREAU OF

AIR QUALITY CONTROL

DIVISION OF

- AIR RESOURCES MANAGEMENT AND RESEARCH
- TECHNICAL SERVICES AND MONITORING
- ABATEMENT AND COMPLIANCE

BUREAU OF

COMMUNITY ENVIRONMENTAL CONTROL

DIVISION OF

- SEWAGE FACILITIES ACT ADMINISTRATION
- FOOD AND WATER PROTECTION
- FACILITY SANITATION AND VECTOR CONTROL

BUREAU OF LAND PROTECTION

DIVISION OF

- SOLID WASTE MANAGEMENT
- OIL AND GAS
- MINE SUBSIDENCE REGULATION
- MINE SUBSIDENCE INSURANCE

BUREAU OF

SURFACE MINE RECLAMATION

DIVISION OF

- MINE DRAINAGE CONTROL AND RECLAMATION
- LICENSING AND BONDING
- EXPLOSIVES

BUREAU OF OCCUPATIONAL HEALTH

BUREAU OF

RADIATION PROTECTION

DIVISION OF

- RADIATION CONTROL
- ENVIRONMENTAL RADIATION

DEPUTY FOR RESOURCES MANAGEMENT

BUREAU OF RESOURCES PROGRAMMING

DIVISION OF

- COMPREHENSIVE RESOURCES PROGRAMMING
- MINE AREA RESTORATION
- OUTDOOR RECREATION
- WATER RESOURCES PROJECTS

BUREAU OF DESIGN

DIVISION OF

- MINE RECLAMATION
- RECREATIONAL FACILITIES
- WATER CONTROL STRUCTURES

BUREAU OF OPERATIONS

DIVISION OF

- OFFICE ENGINEERING
- RESIDENT SUPERVISION
- COMPLETED PROJECTS
- STREAM IMPROVEMENTS

BUREAU OF FORESTRY

DIVISION OF

- STATE FOREST MANAGEMENT
- FOREST ADVISORY SERVICES
- FOREST FIRE PROTECTION
- FOREST PEST MANAGEMENT

BUREAU OF STATE PARKS

DIVISION OF

- PROGRAM SERVICES AND OPERATIONS
- MAINTENANCE AND ENVIRONMENTAL MANAGEMENT
- MANAGEMENT SERVICES

BUREAU OF

SOIL AND WATER CONSERVATION

DIVISION OF

- CONSERVATION DISTRICTS
- SOIL RESOURCES AND EROSION CONTROL

OFFICE OF PLANNING AND RESEARCH

BUREAU OF

TOPOGRAPHIC AND GEOLOGIC SURVEY

DIVISION OF

- GEOLOGIC MAPPING
- MINERAL RESOURCES
- OIL AND GAS GEOLOGY
- ENVIRONMENTAL GEOLOGY

BUREAU OF

ENVIRONMENTAL MASTER PLANNING

DIVISION OF

- PLANNING AND EVALUATION
- SPECIAL PROJECTS

OFFICE OF DEEP MINE SAFETY

BUREAU OF

ANTHRACITE DEEP MINE SAFETY

BUREAU OF

BITUMINOUS DEEP MINE SAFETY

APPROVED
MAY 18, 1973
REV. 8/74
REV. 10/74
REV. 6/76
REV. 7/78

DEPARTMENT OF ENVIRONMENTAL RESOURCES

Revised September, 1978

Act 275, of December 30, 1970, effective January 19, 1971, established the Department by abolishing the Departments of Forest and Waters, Mines and Mineral Industries and transferred specific powers from the Departments of Agriculture, Health, Labor and Industry and the State Planning Board.

BOARDS, COUNCILS AND COMMISSIONS

Citizens Advisory Council - Reviews environmental laws, makes suggestions for revision and reviews the work of the Department.

Environmental Quality Board - Establishes rules and regulations, reviews reports, provides advice on policy matters, prepares regulations for the control, management, protection, utilization, development, occupancy and use of lands and resources for State parks and forests.

Environmental Hearing Board - Hears appeals and issues adjudication on any order, permit, license or decision of the Department.

State Board for Certification of Sewage Treatment and Waterworks Operators - Approves the standards, methods and procedures for certification of operators of sewage treatment and waterworks operations.

State Board for Certification of Sewage Enforcement Officers - Reviews and passes upon applications, administers examinations, holds hearings and issues adjudications necessary for the certification of Sewage Enforcement Officers.

State Conservation Commission - Assists local conservation districts with financial aid to employ professional help, provides financial assistance for the support of small watershed, and supports local districts in soil and water conservation efforts.

Coal and Clay Mine Subsidence Insurance Board - Administers the coal and clay mine subsidence insurance fund, insuring owners of structures against damage from mine subsidence.

Advisory Committee on Atomic Energy Development and Radiation Control - Advise DER and Commerce in matters relating to radiation protection and atomic energy development.

THE SECRETARY

The Department is headed by a Secretary, who is responsible for directing the overall efforts of the Department in carrying out its functions, assisted by a staff of Deputy Secretaries; each liable for specific areas of responsibility within the organization.

DEPUTY FOR LEGISLATION AND BOARDS

Coordinates legislative activities of the Department and provides administrative support.

DEPUTY FOR ADMINISTRATION

Affirmative Action Program - Develops and conducts programs to insure equality of opportunity in all aspects of employment in order to comply with federal and state laws, rules and regulations. Designs programs to ensure that all persons doing business with the Department of Environmental Resources, where public funds are involved, will take affirmative action to insure equality of opportunity in employment.

Contract and Compliance - Insures that all contractors performing services for the Department meet the requirements of the Civil Rights Act of 1964 (11246 and Title 6). This means that their hiring practices do not discriminate because of race, color, creed, national origin, religion, etc.

Bureau of Human Resource Management - Recruits employees, arranges examinations, Manpower and Training Programs, analyzes classification positions, resolves grievances, evaluates management-union relationships, administers the salary and wage program.

Bureau of Fiscal Management - Examines budget proposals and expenditures, requests for Fiscal Plan amendments, revenue estimates and receipts, compiles the Program Plan, prepares and assists in finalization of Legislative Budget Defense, executes indirect cost rate plan.

Bureau of Information Systems - Provides a central agency within the Department of Environmental Resources for coordination, integration and monitoring of all active systems, systems development, data processing applications, electronic data processing equipment acquisitions, telecommunications, records, microfilm and management science applications.

Bureau of Office Services - Performs the assigned duties of providing equipment management, procurement, distribution and space management for the Department. Coordinates insurance claims with Department programs and the Department of General Services. Interprets and coordinates Commonwealth Energy Policy. Provides duplicating service to all Department programs. Provides composition typing services including photo ready composer copies, as well as transcribing services for all programs having compatible equipment. Also provides mail labeling services.

OFFICE OF CHIEF COUNSEL

Directs, supervises and advises those Bureaus under the Office of Chief Counsel.

Coordinates Bureau activities to insure total achievement of Departmental goals.

Evaluates legal and enforcement effectiveness of Department's regulatory mechanisms in meeting the overall objectives of the Department.

Consults with and advises the Secretary and deputy secretaries regarding legal and regulatory implications of Department policies.

Advises and makes recommendation to the Secretary concerning the legal and policy implications of specific cases and general enforcement and resource management policy.

Provides a liaison between the Department and the Attorney General relating to all legal actions of the Department.

Recommends enforcement policy for the Department.

Bureau of Regulatory Counsel - The Bureau has major responsibilities in the following areas:

Reviews and comments upon proposed legislation affecting the Department.
Reviews and comments upon proposed additions and revisions to the regulations of the Department.

Initiates on behalf of the Department or defends against legal actions which involve senior Department officials or unusual questions of law and policy.

Serves as counsel to the Office of Environmental Protection.

The following tasks are shared with the Bureau of Litigation:

The development of the overall enforcement strategy.

The review of the enforcement mechanisms.

Cooperate with local governmental agencies on environmental policies and enforcement actions.

Bureau of Litigation - This Bureau also has three major responsibilities: Primary responsibility for the initiation of all enforcement actions. Primary responsibility for supervising Department personnel when conducting investigations and tests for use in enforcement actions. Primary responsibility for the providing of counsel to the Regional Offices of the Department on enforcement, inspection and legal interpretation questions to assure statewide uniformity of action.

The following tasks are shared with the Bureau of Regulatory Counsel:

The development of the overall enforcement strategy.

The review of the enforcement mechanisms.

Cooperate with local governmental agencies on environmental policies and enforcement actions.

Bureau of Legal Services - The Bureau of Legal Services has a wide variety of responsibilities on behalf of the Department of Environmental Resources, the nature of which is akin to that of a general law firm with the exception that this Bureau does not enforce statutes and regulations, within the Department's jurisdiction, directed to the alleviation of nuisances, pollution and other damage to the environment, which enforcement responsibilities are those of the Bureau of Litigation and the Bureau of Regulatory Counsel.

DEPUTY FOR ENVIRONMENTAL PROTECTION

Bureau of Land Protection - Administers and enforces the Bituminous Mine Subsidence and Land Conservation Act and issues surface support permits to active bituminous coal mines; approves permits for solid waste processing and disposal; administers the development of local solid waste management plans; develops and maintains a state-wide solid waste management plan and solid waste management regulations for the Commonwealth; regulates the drilling, plugging, abandonment of oil and gas wells, the conservation of oil and gas resources, and the underground storage of natural gas; and

administers the Mine Subsidence Insurance Fund, and the Act providing assistance to homeowners who suffer damage from mine subsidence.

Bureau of Surface Mine Reclamation - Issues surface mining operator's licenses; reviews mine drainage control and reclamation plans supporting the applications for all surface mining operations; issues permits; conducts environmental and safety inspections of surface mines. Regulates the storage, handling and use of explosives; approves permits for all the purchase and sale of explosives, licenses for the storage of explosives and blasters licenses.

Bureau of Occupational Health - Administers programs to protect the health and welfare of state and local government and non-coal mining workers in Pennsylvania by evaluating environmental conditions; making recommendations for control of health hazards; enforcing occupational health standards and regulations; and investigating occupational disease sources to determine causes and recommended control measures.

Bureau of Water Quality Management - Establishes and regulates water quality standards, develops a statewide Water Quality and Waste Water Management Plan, sets technical standards, reviews applications and issues permits for water works, waste water collection systems, sewage and industrial waste treatment systems, mine drainage and erosion control and bathing places; assists communities in financing construction of sewage treatment plants; reviews plans for construction or repair of dams and encroachments, inspects treatment facilities, investigates fish kills and pollution incidents, makes water quality studies and investigations, and coordinates Water Quality Research and Development programs.

Bureau of Air Quality Control - Develops air quality control regulations and air resource management techniques designed to attain and maintain the ambient air quality standards promulgated by the Federal government for the protection of public health, establishes air quality monitoring systems, acts on permits, issues orders for the control of air pollution, and assists in local air pollution control efforts.

Bureau of Community Environmental Control - Inspects, reviews plans and enforces regulations on sanitation in institutions, schools, recreational areas and facilities, mobile home parks, food service establishments, migrant labor camps; approves permits for on-lot sewage systems, assists local governments in housing code enforcement; administers the Sewage Facilities Act, administers a statewide insect and rodent control program; administers grants to municipalities for sewerage planning, local on-lot sewage system enforcement and insect and rat control.

Bureau of Radiation Protection - Carries out responsibilities assigned by Atomic Energy Development and Radiation Control Act. Regulates and inspects users of ionizing radiation. Licenses users of radium sources. Monitors environment to determine the levels of radioactivity, possible sources of radioactivity and population exposure. Reviews and evaluates applications for nuclear reactors and other major facilities.

DEPUTY FOR RESOURCES MANAGEMENT

Bureau of Resources Programming - Conducts long-range planning, considering

inter-relationship of all resources on a state-wide basis; conducts investigations, surveys, studies, and research to determine state-wide needs and project future demands for multi-purpose water and other resources uses and controls, recreational facilities, programs for acid mine pollution abatement, and mine area reclamation. Prepares environmental impact statements for resources management projects and reviews environmental impact statements from others affecting resources management programs. Provides for the representation of the Commonwealth in comprehensive water and other resource studies, river basin commissions, and operational planning of Federal and other agencies in areas affecting Pennsylvania.

Bureau of Design - Designs recreational facilities, mine pollution abatement and mine area reclamation projects and water control structures which planning studies have indicated must be constructed by the Department. Conducts value engineering services. Enters into agreements with and coordinates the activities of professional consultants for the design of projects which cannot be designed in-house. Performs liaison services with other federal and state agencies, professional societies, contractors, organizations, regulatory agencies, and all other parties affected by the design of Department projects. Participates in initial start-up of projects.

Bureau of Operations - Inspects the construction of water control structures, water pollution abatement projects, recreational facilities and the elimination of mine and refuse bank fires. Operates and maintains completed Departmental projects for a limited time after construction and specific Departmental projects on a permanent basis. Periodically inspects and reports on the condition of completed projects. Investigates, designs, administers, and constructs Departmental stream clearance and channel improvement projects; does minor construction as required on land reclamation, mine subsidence, State forests and parks, using rented equipment and local labor; provides advisory services to other agencies and local governments on remedial construction and operation methods.

Bureau of State Parks - Administers the operation, maintenance and protection of the State Park System. Maintains a comprehensive outdoor recreational program, cooperates with other agencies (Federal, State and local) associated with outdoor recreational development or grants-in-aid; encourages private enterprise to provide related services. Participates in nature interpretation and environmental education activities.

Bureau of Forestry - Manages the nearly two million acres of State forest lands, prevents and controls forest fires on all forested land throughout the State; conducts annual programs to protect forest lands from insect damage; produces tree seedlings for reforestation of idle land and provides technical forest management assistance to owners of forest land.

Bureau of Soil and Water Conservation - Carries out the mandated responsibilities in the Soil Conservation Law. Approves all applications for P.L. 566 projects in the Commonwealth. Establishes priorities for watershed project installations. Implements the Environmental Quality Board rules and regulations for erosion and sediment control. Provides administrative, advisory and financial assistance to the 66 conservation districts within the State. Supervises flood prevention and watershed protection programs on small watersheds approved under P.L. 566 projects.

OFFICE OF PLANNING AND RESEARCH

Bureau of Environmental Master Planning - Prepares Environmental Master Plan for Commonwealth and recommends actions for Plan implementation. Coordinates departmental reviews of Federally funded projects as defined by Circular A-95 and the National Environmental Policy Act. Provides technical assistance on environmental planning matters to the Department, planning agencies, and local and county governments. Responsible for preparation and update of Pennsylvania's Recreation Plan.

Bureau of Topographic and Geologic Survey - Plans, administers, conducts and maintains thorough studies and surveys of the Commonwealth's geology, mineral resources, topography and groundwater resources; makes the results available to government, industry and the public through publications and services. Coordinates and cooperates with Federal, State and Local government and planning agencies on topographic and geologic matters.

OFFICE OF DEEP MINE SAFETY

Enforces the anthracite and bituminous deep coal mining laws of the Commonwealth which provide for the health and safety of persons employed in and about the deep mines, and for the protection and preservation of property connected therewith; and maintains an index of abandoned mine maps on record in the Commonwealth.

Bureau of Anthracite Deep Mine Safety and Bureau of Bituminous Deep Mine Safety - Conducts safety inspections of all deep coal mines, cleaning and preparation plants, breakers, washeries and all metal and non-metallic deep mines; issues various permits relative to underground coal mining; develops qualification examinations for the certification of miners, machine runners, shot-firers, and mine officials together with the assisting in the development of qualification examinations for the certification of mine inspectors and electricians; coordinates program to provide for training in mine rescue and first aid; maintains statistics on all fatal and non-fatal accidents, natural deaths, roof fall accidents, and accidents which occur in or around coal mines resulting in serious injuries; investigates complaints submitted by the general public on hazardous mining conditions caused by deep mining.

OFFICE OF PUBLIC INFORMATION

Provides staff support services to the Secretary and Department program areas in carrying out an effective program of public information.

Maintains liaison with news media and issues news releases to them, creates exhibits, issues brochures, maintains a film library and publishes a monthly newspaper, Pennsylvania *ECONOTES*.

GENERAL REGULATIONS

Governing the Highway Transportation

Hazardous Substances

HAZARDOUS SUBSTANCES TRANSPORTATION

BOARD

Harrisburg, Pennsylvania

Telephone Area Code (717) 787-7445

Issued: September 11, 1972

Effective: December 1, 1972

**PENNSYLVANIA HAZARDOUS SUBSTANCES
TRANSPORTATION BOARD**

GENERAL REGULATIONS

Promulgated Under the Authority of Act #323
Approved November 9, 1965 P. L. 657, as amended.

**GOVERNING THE HIGHWAY TRANSPORTATION
OF HAZARDOUS SUBSTANCES**

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**GENERAL REGULATIONS
for
HAZARDOUS SUBSTANCES**

I. GENERAL INFORMATION

A. Scope

1. These regulations are promulgated to promote the uniform enforcement of law and to minimize the dangers to life and property incident to the transportation of hazardous substances by motor carriers over the highways and toll roads of the Commonwealth of Pennsylvania.

2. The regulations herein are prescribed to define the articles for transportation purposes and to state the precautions that must be observed by the shipper and the carrier in preparation and shipment.

3. Hazardous Substances may be offered to carriers for transportation provided they are in the proper condition for transportation, are as defined, packed, marked, labeled, and described as provided in accordance with these regulations.

4. Shipments that do not comply with these regulations shall not be transported or offered for transportation.

5. Articles which are loaded and unloaded, manufactured, packaged, transported and stored insofar as they affect safety in transportation shall be open to inspection by a duly authorized representative of the initial carrier or of the Secretary of the Hazardous Substances Transportation Board or his duly authorized representative.

6. The Board may, upon application therefor or upon its own initiative, grant exemptions or exceptions from the requirements of these regulations when it determines they are authorized by law and the results will not constitute a significant risk to the health and safety of the public.

B. Application of General and Specific Regulations

1. These General Regulations shall apply equally to all hazardous substances. In addition, the separate Specific Regulations re-

GENERAL INFORMATION

lating to Explosives, Chapter 12; Flammable Liquids and Flammable Solids, Chapter 13; Oxidizing Materials, Poisons, and Corrosive Liquids, Chapter 14; Radioactive Materials, Chapter 15; Compressed Gas-Cryogenics, Chapter 16; and any additional Chapters adopted by the Board shall also be applicable.

C. Compliance Required

1. Every shipper and carrier of hazardous substances shall comply with the requirements of these regulations, shall instruct its officers, agents, representatives and drivers with respect thereto, and shall take such measures as are necessary to insure compliance therewith. All officers, agents, representatives, drivers, and employees of shippers and carriers directly concerned with the management, maintenance, operation or driving of vehicles, shall comply with and be conversant with the requirements of these regulations.

2. Any person who knowingly offers to any carrier for transportation by highway or any person who knowingly carries on or in any vehicle of any description operated in transportation of passenger or property by any carrier engaged in transportation by highway, any hazardous substance as covered in this regulation, under any false or deceptive marking, description, invoice, shipping order, or other declaration, or any person who so delivers any such article without informing such carrier in writing of the true character thereof, at the time such delivery is made, or without plainly marking on the outside of every package containing hazardous substances in accordance with the markings required in these regulations, shall be in violation of Act #323, 1965, P.L. 657, as amended.

II. DEFINITIONS

1. Board—The Hazardous Substances Transportation Board created by Act #323, approved November, 1965, P.L. 657, as amended.

2. Bureau of Explosives—Testing laboratory for hazardous substances, located in American Railroads Building, 1920 "L" Street, N.W., Washington, D. C. 20036.

3. Business District—The territory contiguous to a highway, where fifty (50) percent or more of the frontage thereon for a distance of three hundred (300) feet or more is occupied by buildings in use for business.

4. Cargo Tank—Any tank designed to be permanently attached to any motor vehicle or any container not permanently attached to any motor vehicle which by reason of its size, construction, or attach-

DEFINITIONS

ment to any motor vehicle must be loaded and/or unloaded without being removed from the motor vehicle.

5. Carrier—Any person, who, or which, as owner, lessee or other possessor of one or more vehicles, directs and controls the transportation of hazardous substances either for his or its own account or for hire.

6. Commonwealth—Shall mean Commonwealth of Pennsylvania.

7. Container—For this definition, see "Specific Regulations".

8. D.O.T.—Shall mean the United States Department of Transportation.

9. Driver—A person who drives any vehicle laden with hazardous substances or is on duty, as defined in these regulations.

10. Hazardous Substance—A flammable liquid, flammable solid, oxidizing substance, corrosive liquid, compressed gas, poisonous substance, radioactive substance, explosive or other substance so defined by the Board.

11. Highway—A highway, street or other public way, or a toll road, including the Pennsylvania Turnpike.

12. Must or Shall—Where these words are used, the provisions are mandatory.

13. N.O.S.—Shall mean "not otherwise specified".

14. Package—For this definition, see "Specific Regulations".

15. PennDOT—Shall mean the Pennsylvania Department of Transportation.

16. Person—Any natural person, firm, association, co-partnership, joint venture or corporation.

17. Semitrailer—Any vehicle other than a "pole trailer", without motive power, designed to be drawn by another motor vehicle and so constructed that some part of its weight rests upon the towing vehicle.

18. Shipper—Any person who ships hazardous substances over the highways of the Commonwealth, either on his own equipment or through a carrier, as herein defined.

19. Shipping Paper—Any shipping order, bill of lading, manifest or other shipping document serving a similar purpose.

20. Should—Where this word is used, the provisions are recommended.

21. Similar Substance—Any substance, which the Board, by procedure prescribed in Act #323, P.L. 657, as amended, shall declare a hazardous substance.

DEFINITIONS

22. The Act—Shall mean the "Hazardous Substances Transportation Act"—Act #323, P.L. 657, approved November 9, 1965, as supplemented and amended.

23. Transportation—Carriage by vehicle upon a highway.

24. Truck—Any self-propelled motor vehicle except a truck tractor, designed and used, or exclusively used whether or not so designed, for the transportation of property.

25. Truck Tractor—A self-propelled motor vehicle designed and used primarily for drawing other vehicles and not so constructed as to carry a load other than a part of the weight of the vehicle and load so drawn.

26. Vehicle—Any rolling stock or equipment, whether self-propelled or otherwise, used for the transportation of freight or passengers over highways and shall include all trailers.

III. SHIPPER RULES AND REGULATIONS

A. General Requirements for Containers

1. All containers, including cargo tanks, used in transportation of hazardous substances shall be built and tested in compliance with the provisions of the Code of Federal Regulations, Title #49, Sections 173, 177, 178 and 179 as they apply.

(a) Where containers are supplied by the shipper, the shipper shall be responsible to determine that shipments of hazardous substances are made in containers which are in compliance with the above specifications.

(b) Where containers are supplied by the carrier, the shipper shall determine that the containers in which hazardous substances are to be loaded are proper containers for the transportation of such commodities by examining the manufacturer's identification plate, specification marking, or certification by the carrier.

2. Special Testing Required by the Board: The Board or its agents may, at its discretion, cause any container and/or cargo tank to be retested at any time.

3. Hazardous substances shipped under special permits of, and in containers specified by the D.O.T. are permitted for transportation within the Commonwealth.

4. Where use of containers (other than those proposed for in these regulations) is proposed for highway transportation within the Commonwealth, the shipper shall submit complete specifications

SHIPPER RULES AND REGULATIONS

covering the proposal, including supporting information from the Bureau of Explosives, Underwriters' Laboratories, or any other fully accredited technical source acceptable to the Board. The Board will review the data and advise the shipper of acceptance or rejection of the proposal for use within the Commonwealth.

B. Outage—(See Specific Regulations)

C. Exemptions

1. A hazardous substance, except one for which no exemption is provided, as indicated by the "no exemption" statement in Appendix "A" (Commodity List) may be exempt from packing, marking, and labeling requirements when packed and transported in accordance with the applicable provisions of the specific regulations for exemptions for that type of hazardous substance.

D. Hazardous Substances Not Specifically Provided For (For these regulations, see "Specific Regulations")

E. Marking and Labeling

1. Hazardous substances shall be marked and labeled in accordance with the provisions of the Code of Federal Regulations, Title #49, Sections 173 and 177 applicable to that substance and as specifically provided in the regulations for that substance.

2. Where use of packing, marking, and labeling (other than those proposed for in these regulations) is proposed for highway transportation within the Commonwealth, the shipper shall submit complete specifications covering the proposal, including supporting information from the Bureau of Explosives, Underwriters' Laboratories, or any other fully accredited technical source acceptable to the Board. The Board will review the data and advise the shipper of acceptance or rejection of the proposal for use within the Commonwealth.

F. Shipping Order and Bill of Lading Description

1. The shipper when offering for transportation by carrier by highway any hazardous substance must describe such article in the shipping order by the shipping name and the classification used in Appendix "A". A further description not inconsistent therewith may also be added. Abbreviations and/or trade names alone must not be used. The total quantity by weight, volume, or as otherwise appropriate, must be shown. Where the regulations exempt the packages

SHIPPER RULES AND REGULATIONS

from labeling, the exemption must be indicated by the words "NO LABEL REQUIRED" immediately following the description on the shipping order. Such shipping order shall be in the possession of the driver during the course of highway transportation.

G. Certificate

1. Each shipper offering for highway transportation any hazardous substance must show on the shipping order the following certificate over the written or stamped facsimile signature of the shipper or his duly authorized agent:

This is to certify that the above named articles are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation, according to the applicable regulations of the D.O.T. or the Hazardous Substances Transportation Board.

No carrier shall accept for highway transportation any material described as or known to be a hazardous substance not so labeled or certified as required in this section.

H. Closing and Cushioning

1. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed in the regulations for the Specific Hazardous Substance, or in any case when necessary to prevent breakage or leakage.

IV. CARRIER RULES AND REGULATIONS

A. Transportation of Hazardous Substances by Vehicle

1. It shall be unlawful to transport, by vehicle, over the highways within the Commonwealth, any hazardous substance in such manner or conditions as will unreasonably endanger the person or property of others.

2. Transportation shall also comply with the Specific Regulations for each class of hazardous substance.

B. Carrier Registration Required

1. Within thirty (30) days of initiating carriage, and within thirty (30) days after the close of each calendar year, all carriers transporting hazardous substances in quantities requiring placarding, (Section V-A-7 of these regulations) over the highways of the Commonwealth, shall report in writing to the Board. This report shall

CARRIER RULES AND REGULATIONS

include the name and address of the carrier and the class or classes of hazardous substances transported.

C. General Requirements for Containers

1. All containers, including cargo tanks, used in transportation of hazardous substances shall be built and tested in compliance with the provisions of the Code of Federal Regulations, Title #49, Sections 173, 177, 178 and 179, as they apply.

2. Special testing required by the Board: The Board or its agents may, at its discretion, cause any container and/or cargo tank to be retested at any time.

3. Hazardous substances carried under special permits of, and in containers specified by the D.O.T. are permitted for transportation within the Commonwealth.

D. Vehicle Specifications and Requirements

1. All vehicles transporting hazardous substances in quantities requiring placarding (Section V-A-7 of these regulations) shall be equipped as follows:

(a) Power units must be equipped with a fire extinguisher having an Underwriters' Laboratories rating of 10 BC or more. (See the Board's Specific Regulations, Chapters 12, 13, 14, 15 and 16 for additional requirements).

(1) A fire extinguisher must be properly filled and readily accessible for use. When a vehicle is equipped with more than one fire extinguisher they shall be mounted on opposite sides of the vehicle.

(2) The fire extinguisher must be securely mounted on the vehicle.

(3) The fire extinguisher must be designed to permit visual determination of whether it is fully charged.

(4) The fire extinguisher must have an extinguishing agent that does not need protection from freezing.

(b) Snow tires or tire chains for one wheel on each side of single axle drive vehicles, during the time when likely to encounter conditions requiring them.

(c) A check valve between the source of compressed air or vacuum and the reservoir, for air or vacuum braking systems.

(d) A front end limiting valve on vehicles equipped with front wheel brakes.

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(c) An audible or visual low air pressure or low vacuum warning device on air or vacuum braking systems.

(f) A "break-away" system on tractor trailer units equipped with air or vacuum brakes.

* (g) Warning devices for stopped vehicles shall consist of one of the following combinations:

(1) Three flares (liquid-burning pot torches) and three fuseses and two red flags; or

(2) Three red electric lanterns and two red flags; or

(3) Three red emergency reflectors and two red flags; or

(4) Three triangular reflectors (as defined in Part 393.95 (h), Federal Motor Carrier Safety Regulations).

(5) Flares (pot torches), fuseses, oil lanterns, or any signal produced by a flame shall not be carried on any vehicle transporting explosives, Class A or Class B; any cargo tank vehicle used for the transportation of flammable liquids or flammable compressed gas whether loaded or empty; or any vehicle using compressed gas as a motor fuel; but in lieu of such flares or fuseses, three electric lanterns or three red emergency reflectors shall be carried.

(h) Heaters. (See "Specific Regulations")

(i) Fuel tanks shall conform to the specifications established in Parts 393.65 and 393.66 Motor Carrier Safety Regulations, Title #49, C.F.R.

(j) No vehicle transporting hazardous substances shall be operated on any tire that has fabric exposed through the tread or sidewall or any other defects likely to cause tire failure. Any tire on the front wheels shall have a minimum tread depth of 4/32 of an inch and on any other wheel, a tread depth of 2/32 of an inch. No vehicle shall be operated with recapped or re-treaded tires on the front wheels. Use of tires which have been regrooved below the original tread depth is prohibited.

E. Shipping Papers

1. Carriers must not accept for transportation nor transport any hazardous substance subject to these regulations unless the hazardous

*Note 1: During an emergency vehicle stop, these devices shall be placed as follows: One at a distance of approximately 100 feet from the disabled vehicle in the center of the traffic lane occupied by such vehicle and toward the traffic approaching in that lane and; one at a distance of approximately 100 feet in the opposite direction from the disabled vehicle in the center of the traffic lane occupied by such vehicle and; one at the traffic side of the disabled vehicle, not less than 30 feet to the front or rear thereof.

CARRIER RULES AND REGULATIONS

substance is described on the shipping paper by the shipping name and class of hazardous substance as prescribed in Appendix "A" of these regulations. A further description not inconsistent therewith may be included. Abbreviations and/or trade names alone may not be used. The total quantity by weight, volume, or as otherwise appropriate, must be shown.

2. Where the regulations exempt the packages from labeling, the exemption must be indicated by the words "*No Label Required*" immediately following the description on the shipping paper.

3. The driver of each vehicle transporting hazardous substances must have in his possession a copy of the shipping paper showing the information required in paragraphs (1) and (2) of this section.

4. Each carrier offering or delivering for rail transportation any loaded vehicle or container containing hazardous substances must show on the shipping paper the information required in paragraphs (1) and (2) of this section, the description of the vehicle or container, and the kind of placard applied.

F. Waybills, Manifests, etc.

1. The waybill, manifest, dispatch memorandum receipt, bill of lading, transfer sheet, or interchange record, when prepared for shipments and used for transferring such shipments to a connecting carrier, must properly describe the articles by name and classification.

G. Markings on Containers

1. Each package or container of hazardous substances must show the name and address of the consignee. When the transportation of any hazardous substance is to be exclusively by vehicle between points when the articles are not to be transferred from one carrier to another, in either truckload or less than truckload lots, the individual packages need not be marked with the consignee's name and address.

H. Labels

1. Labels prescribed in these regulations or in the Specific Regulations for each commodity, must have been applied to packages by the shipper, unless exempted from the labeling requirements, the exemption being noted on the shipping paper. However, labels are not required for packages transported by the shipper as a private carrier *except* for packages which are to be reshipped or transferred from one carrier to another.

CARRIER RULES AND REGULATIONS

2. Carriers must keep on hand an adequate supply of labels. Lost or detached labels must be replaced from information given on waybill, manifest, or shipping paper.

(NOTE: Samples will be furnished on request by the Bureau of Explosives.)

3. The carrier's name and stationery form number may be printed on the label, in type not larger than 10 point, if placed within the lined border and in the upper or lower corner of the diamond-shaped label.

4. Additional shipping information not inconsistent with these regulations may be shown by the shipper on a container of hazardous substances if so desired, but no label or marking may be of a design, form, or size, as may be confused with the label or marking required by these regulations.

1. Certificate

1. Carriers must not accept for transportation nor transport any hazardous substance subject to these regulations unless it has been certified by the shipper, using the following certificate which must be signed by the shipper:

This is to certify that the above named articles are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the D.O.T. or the Hazardous Substances Transportation Board.

2. Shipper certification is not required for shipments to be transported by the shipper as a private carrier except for shipments which are to be reshipped or transferred from one carrier to another, or for bulk shipments in cargo tanks supplied by the carrier.

3. For the relief of shippers from multiplicity of certifications required for packages which may move by various means of transportation, shipments may be certified for a vehicle by adding to the certificate required on the shipping document.

V. VEHICLE OPERATION, INSPECTION AND MAINTENANCE

A. General Requirements

1. All general regulations pertaining to the operation of vehicles as provided in the Pennsylvania Motor Vehicle Code, not inconsistent with these regulations, shall apply to the transportation of hazardous substances.

VEHICLE OPERATION, INSPECTION AND MAINTENANCE

2. In addition to the following General Regulations, operation, inspection and maintenance of vehicles shall be carried out as required in the Specific Regulations for the hazardous substance being transported.

3. Nothing contained in these regulations shall be construed as prohibiting any carrier from enforcing additional rules and regulations relating to safety of operation, not inconsistent with these regulations, tending to a greater degree of precaution against accidents.

4. No carrier shall schedule a run nor permit nor require the operation of any vehicle between points in such period of time as would necessitate the vehicle being operated at speeds greater than those prescribed by the jurisdictions in or through which the vehicle is being operated.

5. No vehicle shall be driven unless the driver thereof shall have determined that the following parts and accessories are in good working order; nor shall any driver fail to use or make use of such parts and accessories when and as needed:

Service brakes, including trailer brake connections
Rear-vision mirror or mirrors
Parking brake
Coupling devices
Horn
Steering mechanism
Lighting devices & reflectors
Windshield wiper or wipers
Tires

6. No vehicle shall be driven unless the driver thereof shall have determined that the emergency equipment required in these regulations, and the Specific Regulations for the hazardous substance being transported, are in place and ready for use; nor shall any driver fail to use or make use of such equipment when and as needed.

7. Marking and Placarding on Vehicles and Combinations

(a) Every carrier operating, hauling, or in any manner using any vehicle or trailer containing any hazardous substance as specified in this part shall cause every vehicle, at all times while containing such hazardous substance, to display clearly discernible markings or placards in accordance with the following requirements:

VEHICLE OPERATION, INSPECTION AND MAINTENANCE

(1) The marking or placards required to be displayed on any vehicle or trailer shall be as follows:

COMMODITY & QUANTITY	TYPE OF MARKING ON PLACARD
Explosives, Class A, any quantity or a combination of Class A and Class B explosives.	EXPLOSIVES A (Red letters on white background)
Explosives, Class B, any quantity.	EXPLOSIVES B (Red letters on white background)
Poison, Class A, any quantity; Poison, Class B, 1000 pounds or more gross weight.	POISON (Blue letters on white background)
Flammable Liquid, 1000 pounds or more gross weight; Flammable Solid, 1000 pounds or more gross weight.	FLAMMABLE (Red letters on white background)
Oxidizing Material—1000 pounds or more gross weight.	OXIDIZERS (Yellow letters on black background)
Nonflammable Compressed Gas—1000 pounds or more gross weight.	COMPRESSED GAS (Green letters on white background)
Corrosive Liquid—1000 pounds or more gross weight.	CORROSIVES (Blue letters on white background)
Flammable Compressed Gas—1000 pounds or more gross weight.	FLAMMABLE GAS (Red letters on white background)
Radioactive Material requiring radioactive Yellow-III label, any quantity.	RADIOACTIVE (Black letters on yellow background)
Mixed loadings—see subparagraph (a) (4) of this section.	DANGEROUS (Red letters on white background)

(2) Each marking or placard shall consist of letters not less than four inches high, in the color specified, using approximately a $\frac{5}{8}$ inch stroke. The placard must be larger than the lettering required thereon by at least one inch at the top and bottom sides. Such marking or placard described in subparagraph (a) (1) shall be contained in an area on the vehicle which has no other marking, lettering, or graphic display, for at least three inches in each direction, except as specified in subparagraph (a) (4) and paragraph (c) of this section.

(3) Such markings or placards shall be displayed at the front, rear, and on each side of the motor vehicle or trailer, or other cargo carrying body while it contains hazardous substances of such type and in such quantity as specified in subparagraph (a) (1) and paragraphs (b) and (c) of this section. The front marking or placard may be displayed on the front of either the truck, truck body, truck tractor or the trailer.

VEHICLE OPERATION, INSPECTION AND MAINTENANCE

(4) Each vehicle, trailer or other cargo carrying body containing more than one kind of explosives or other hazardous substances requiring different placards under the provisions of subparagraph (a) (1) of this section, the aggregate gross weight of which totals 1,000 pounds or more, shall be marked or placarded "DANGEROUS" instead of being marked or placarded as required by that subparagraph. Any such vehicle which contains any quantity of explosives Class A, explosives Class B, poison Class A, or radioactive materials requiring yellow-III label as prescribed herein shall display the marking or placard "EXPLOSIVES A", "EXPLOSIVES B", "POISON", OR "RADIOACTIVE", as appropriate, in addition to the marking or placard "DANGEROUS". If explosives Class A and explosives Class B are loaded on the same vehicle, the "EXPLOSIVES B" marking or placarding need not be displayed.

(5) In any combination of two or more vehicles containing explosives or other hazardous substance each vehicle shall be marked or placarded as to its contents and in accordance with paragraphs (a) (1) and (a) (4) of this section.

(b) Tank Motor Vehicles.

(1) Every tank motor vehicle or tank trailer used for the transportation of any hazardous substance, regardless of quantity or whether loaded or empty, shall be marked or placarded in accordance with the requirements of paragraph (a) of this section except as otherwise provided in subparagraphs (2), (3) and (4) of this paragraph; provided, however, that no such marking or placard shall be displayed during such time as such vehicle or trailer is laden only with a commodity not classified as a hazardous substance.

(2) Tank motor vehicles transporting gasoline may be marked or placarded "GASOLINE" in lieu of the required "FLAMMABLE" marking or placard and in the same size and color as required for the "FLAMMABLE" marking or placard.

(3) Tank motor vehicles transporting any flammable compressed gas shall be marked in letters at least four inches high with the words "FLAMMABLE GAS" or "FLAMMABLE COMPRESSED GAS". In addition, the common name of the contents shall be marked on the tank in letters at least two inches high using approximately a $\frac{1}{4}$ inch stroke, in colors specified in subparagraph (a) (1) of this paragraph.

(4) Tank motor vehicles transporting any nonflammable compressed gas shall be marked in letters not less than four

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inches high with the words, "COMPRESSED GAS". In addition, the common name of the contents shall be marked on the tank in letters at least two inches high using approximately a 1/4 inch stroke, in the colors specified in subparagraphs (a) (1) of this part.

(c) In addition to displaying the marking or placards required by paragraphs (a) and (b) of this part, a carrier shall display markings or placards reading "CARGO FIRE-AVOID WATER" or words of similar meaning that denote the incompatibility of water with the lading, in letters at least two inches high, when such wording is specified or requested by the shipper on the shipping papers, or when such warning is appropriate. Such wording shall be displayed immediately adjacent to all required marking or placards on the truck, trailer or trailers containing the commodity involved.

(d) The marking or placarding required by this section shall be removed from or covered on any vehicle to which it is attached when such vehicle does not contain the article for which the marking is required, except in the case of tank motor vehicles used exclusively for transportation of the article for which such marking is required. All placards must be clearly discernible when required.

8. Safe Loading

(a) Prohibited Loading Combinations: In any single driven vehicle or in any single unit of a combination of vehicles, hazardous substances shall not be loaded together if prohibited by the Loading Chart in Appendix "B". This section shall not be so construed as to forbid the carrying of material essential to safe operation of vehicles.

(b) Distribution and securing of load: No vehicle shall be driven nor shall any carrier permit or require any vehicle to be driven if it is so loaded, or if the load thereon is so improperly distributed or so inadequately secured, as to prevent its safe operation.

(c) Doors, tarpaulins, tailgates and other equipment: No vehicle shall be driven unless the tailgate, tailboard, tarpaulins, doors, all equipment and rigging used in the operation of said vehicle, and all means of fastening the load, are securely in place.

(d) Interference with driver: No vehicle shall be driven when the lading or any other object obscures his view ahead, or to the right or left sides, or interferes with the free movement of his

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arms or legs, or prevents his free and ready access to the accessories required for emergencies, or prevents the free and ready exit of any person from the cab or driver's compartment.

9. Transportation and Delivery of Shipments

(a) All shipments of hazardous substances shall be transported without delay, from and including the time of commencement of the loading of the cargo until its final discharge at destination.

(b) Shipments of hazardous substances which are refused by the consignees, or which cannot be delivered within forty-eight (48) hours after arrival at destination, must be promptly disposed of as follows:

- (1) By return to the shipper, if in proper shipping condition.
- (2) By storage, provided a suitable place for such articles is available.
- (3) By sale, or,
- (4) By destruction, when necessary to safety.

10. Improperly Packed Shipments and/or Astray Shipments

(a) Instances of packages of hazardous substances offered for transportation or discovered in transit not properly prepared for transportation in accordance with these regulations, shall be reported by carrier in writing within five (5) days to the Hazardous Substances Transportation Board, Department of Transportation, Harrisburg, Pennsylvania.

(b) Any astray shipments of hazardous substances must be forwarded promptly to destination, if known, provided a careful inspection shows the package to be in proper condition for safe transportation. If the package is not labeled and the exact nature of the contents is unknown, the red label must be applied.

(c) This section shall in no respect excuse either shipper or carrier for failure to exercise due care to prevent any departure from any regulation prescribed herein.

B. Vehicle Operation

1. Every vehicle shall be driven in accordance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated, unless such laws, ordinances and regulations are at variance with Specific Regulations of this Board which impose a greater obligation or restraint.

VEHICLE OPERATION, INSPECTION AND MAINTENANCE

2. A driver shall not drive or be required or permitted to drive while his ability or alertness is so impaired through fatigue, illness, or any other cause as to make driving unsafe.

3. Extreme caution in the operation of a vehicle carrying hazardous substances shall be exercised when hazardous conditions, such as those caused by snow, ice, sleet, fog, mist, rain, dust or smoke, adversely affect visibility or traction. Speed shall be reduced when such conditions exist. If conditions become sufficiently dangerous, the operation of the vehicle shall be discontinued and shall not be resumed until the vehicle can be safely operated.

4. Except in case of emergency, a driver shall not permit a vehicle to which he is assigned to be driven by any person not authorized to drive such vehicle by the carrier in control thereof.

5. Unless authorized to do so by the carrier under whose authority the vehicle is being operated, a driver shall not transport any person or permit any person to be transported on any vehicle transporting hazardous substances.

6. Railroad grade crossings; stopping required:

(a) Except as provided in paragraph (b) of this Section, the driver of any vehicle transporting hazardous substances in quantities requiring placarding (Section V-A-7 of these regulations) before crossing at grade any track or tracks of a railroad, shall stop such vehicle within 50 ft., but not less than 15 ft., from the nearest rail of such railroad and while so stopped, shall listen and look in both directions along the tracks for any approaching train, and for signals indicating the approach of a train, and shall not proceed until he has ascertained that the course is clear. When it is safe to do so, the driver may drive the vehicle across the tracks in a gear that permits the vehicle to complete the crossing without a change of gears. The driver must not shift gears while crossing the tracks.

(b) A stop need not be made at:

(1) A street car crossing, or railroad tracks used exclusively for industrial switching purposes, within a business or industrial district.

(2) A railroad grade crossing when a police officer or crossing flagman directs traffic to proceed.

(3) A railroad grade crossing where a stop and go traffic light controls movement of traffic.

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(4) An abandoned railroad grade crossing which is marked with a sign indicating that the rail line is abandoned.

(5) An industrial or spur line railroad crossing marked with a sign reading "Exempt Crossing". Such "Exempt Crossing" signs shall be erected only by or with the consent of the appropriate state or local authority.

7. Drawbridges; slowing down of vehicles:

(a) Any vehicle transporting hazardous substances, shall, upon approaching a drawbridge, be driven at a rate of speed which will permit said vehicle to be stopped before reaching the lip of the draw and shall proceed only when the draw is completely closed.

8. Vehicular Routing:

(a) Vehicles transporting hazardous substances shall be so driven as to avoid — so far as practicable, and where feasible, by pre-arrangement of routes — congested thoroughfares and places where crowds are assembled.

9. Stopped Vehicles not to Interfere with Other Traffic:

(a) No vehicle shall be stopped, parked, or left standing, whether attended or unattended, upon a traveled portion of any highway outside a business or residential district, when it is practicable to stop, park or leave such vehicle off the traveled portion of the highway. In the event that conditions make it impracticable to move such motor vehicle from the traveled portion of the highway the driver shall make every effort to leave all possible width of the highway opposite the standing vehicle for the free passage of other vehicles and he shall take care to provide a clear view of the standing vehicle as far as possible to the front and rear.

10. Emergency Signals; Disabled Vehicles:

(a) Whenever a vehicle is disabled upon the traveled portion of any highway or shoulder thereof, the four-way flashers (turn signals) shall immediately be activated. Steps shall then be taken to place the warning devices specified in Section IV-D-1 (g) of these regulations in the proper place.

(b) After activating the four-way flashers of a disabled vehicle, the driver shall place on the traveled portion of the highway at the traffic side of such vehicle, a lighted fusee, a lighted red electric lantern, a red emergency reflector or a triangular reflector.

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- (d) Fuel tank and feed line shall be secure and have no leaks.
 - (e) Brakes, lights, horn, windshield wipers and steering apparatus shall function properly.
 - (f) Tires shall be properly inflated and without defects.
3. Tires shall be visibly checked for proper inflation and general condition at every rest stop or, during continuous traveling, at intervals not to exceed two (2) hours.
4. Flat tires and hot tires shall be removed immediately from the vehicle. After removal, the hot tire shall be placed sufficiently far from the vehicle so that a spontaneous ignition of the tire will not endanger the vehicle. The tire shall not be transported on the vehicle until it has been cooled below the ignition temperature.

VI. DRIVER QUALIFICATIONS

A. General

1. The rules in this part establish minimum qualifications for persons who drive motor vehicles as, for, or on behalf of motor carriers. The rules in this part also establish minimum duties of motor carriers with respect to the qualifications of their drivers.
2. The rules in this part do not prevent a motor carrier from imposing more stringent or additional qualifications or examinations than are imposed by these rules.
3. A motor carrier who employs himself as a driver must comply with both the rules in this part that apply to motor carriers and the rules in this part that apply to drivers.
4. Each motor carrier and each driver shall know, and be familiar with, the rules in this part.
5. No person shall aid, abet, encourage, or require a motor carrier or a driver to violate the rules in this part.
6. The rules of this part apply only to drivers of vehicles requiring placarding (Section V-A-7, General Regulations, Chapter 11).

B. Qualifications and Disqualifications of Drivers

1. Qualifications of Drivers

- (a) Except as provided in C-2 of this part, a motor carrier shall not require or permit a person to drive a motor vehicle unless that person is qualified to drive a motor vehicle.
- (b) Except as provided in C-1 of this part, a person is qualified to drive a motor vehicle if he:

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- (1) Is at least 21 years old;
- (2) Can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and to make entries on reports and records;
- (3) Can, by reason of experience, training, or both, safely operate the type of motor vehicle he drives;
- (4) Can, by reason of experience, training, or both, determine whether the cargo he transports has been properly located, distributed, and secured;
- (5) Is familiar with methods and procedures for securing cargo in or on the motor vehicle he drives;
- (6) Is physically qualified to drive a motor vehicle in accordance with E-1 of this part;
- (7) Has been issued a currently valid motor vehicle operator's license;
- (8) Has furnished the motor carrier that employs him with the list of violations or the certificate as required by C-4 of this part;
- (9) Is not disqualified to drive a motor vehicle under the rules of B-2 of this part;
- (10) Has successfully completed the driver's road test and has been issued the certificate as prescribed in D-1 (f) of this part, or has presented an operator's license or a certificate of road test which the carrier that employs him has accepted as equivalent to a road test in accordance with D-2 (a) of this part;
- (11) Has taken a written examination and has been issued a certificate of written examination in accordance with D-3 of this part or has presented a certificate of written examination which the motor carrier that employs him has accepted as equivalent to a written examination in accordance with D-4 (a) of this part; and
- (12) Has furnished the motor carrier that employs him with an application for employment in accordance with C-1 of this part.

2. Disqualifications of Drivers

- (a) A driver who is disqualified shall not drive a vehicle laden with hazardous materials. A carrier shall neither require nor permit a driver who is disqualified to drive a vehicle laden with hazardous materials.

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(b) A driver is disqualified for one (1) year on his first offense; two (2) years on his second offense; and three (3) years on his third offense and every subsequent offense after he has been convicted of or forfeited bond or collateral upon a charge of committing any of the following criminal offenses after the effective date of these regulations:

(1) A felony involving the use of a motor vehicle; or

(2) A crime involving the manufacture, knowing transportation, knowing possession, sale or use of any narcotic drug or dangerous drug as defined in Act #64, known as the Controlled Substance, Drug, Device and Cosmetic Act, effective June 14, 1972.

(3) Operating a motor vehicle while under the influence of alcohol, narcotic drug, or dangerous drug as defined in Act #64, known as the Controlled Substance, Drug, Device, and Cosmetic Act, effective June 14, 1972.

(4) Leaving the scene of an accident if it resulted in personal injury or death;

(c) For the duration of the driver's loss of his privilege to operate a vehicle on the highways of the Commonwealth of Pennsylvania.

C. Background and Character

1. Application for employment.

(a) The application for employment form shall be furnished by the carrier and must be completed by the applicant. It shall contain the following information:

(1) The name and address of the employing motor carrier;

(2) The applicant's name, address, date of birth, and social security number;

(3) The addresses at which the applicant has resided during the 3 years preceding the date of this application;

(4) The date on which the application is submitted;

(5) The issuing state, number, and expiration date of each unexpired motor vehicle operator's license or permit that has been issued to the applicant;

(6) The nature and extent of the applicant's experience in the operation of motor vehicles, including the type of equipment he has operated;

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(7) A list of all motor vehicle accidents in which the applicant was involved during the 3 years preceding the date the application is submitted specifying the date and nature of each accident and any fatalities or personal injuries it caused;

(8) A list of all violations of motor vehicle laws or ordinances (other than parking violations) of which the applicant was convicted or forfeited bond or collateral during the 3 years preceding the date the application is submitted;

(9) A statement setting forth in detail the facts and circumstances of any denial, revocation or suspension of any license, permit, or privilege to operate a motor vehicle that has been issued to the applicant, or a statement that no such denial, revocation, or suspension has occurred;

(10) A list of the names and addresses of the applicant's employers during the 3 years preceding the date the application is submitted, together with the dates he was employed by and the reason for leaving the employ of each;

(11) The following certification and signature line must appear at the end of the application form and be signed by the applicant:

This certifies that this application was completed by me, and that all entries on it are true and complete to the best of my knowledge.

Date

Applicant's Signature

(b) Before an application is submitted, the motor carrier shall inform the applicant that the information he provides under 1-(a)-(10) of this section may be used, and the applicant's prior employers may be contacted, for the purpose of investigating the applicant's background.

2. Investigation and Inquiries

(a) Except as provided in "G" of this part, each motor carrier shall make the following investigations and inquiries with respect to each driver it employs on or after the effective date of these regulations.

(1) An inquiry into the driver's driving record during the preceding 3 years to the appropriate agency of every state in

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which the driver held a motor vehicle operator's license or permit during those 3 years;

(2) An investigation of the driver's employment during the preceding 3 years.

(b) The inquiry to state agencies required in (a) (1) above shall be made in the form those agencies prescribe. A copy of each response, showing the driver's driving record or certifying that no record exists for that driver, shall be retained in the carrier's files as a part of the driver's qualification file.

(c) The investigation of the driver's employment record required in (a) (2) above must be made within 30 days of the date his employment begins. The investigation may be made by any method of obtaining information the motor carrier deems appropriate. Each motor carrier shall keep a written record of each past employer contacted showing the information received from each and shall retain same in the driver's qualification file.

3. Annual Review of Driving Record

(a) Except as provided in "G" of this part, a motor carrier shall review once every 12 months the driving record of each driver it employs to determine whether that driver meets minimum requirements for safe driving or is disqualified to drive a motor vehicle in accordance with B-2 of this part. In reviewing a driver's record, the motor carrier must consider any evidence that the driver has violated applicable regulations of the Board. The motor carrier must also consider the driver's accident record and must give great weight to violations such as speed, reckless driving or any other violation that indicates that the driver has exhibited a disregard for the safety of the public.

(A note shall be included in the driver's qualification file, setting forth the date upon which this review was performed and the name of the person who reviewed the record.)

4. Record of Violations

(a) At least once every 12 months, each motor carrier shall require of each regular driver it employs a list of all violations of motor vehicle traffic laws and ordinances (other than for parking) of which the driver has been convicted or on account of which he has forfeited bond or collateral during the preceding 12 months.

(b) The form prescribed for the driver's compliance with 4 (a) above is as follows:

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MOTOR VEHICLE DRIVER'S CERTIFICATION

I certify that the following is a true and complete list of traffic violations (other than parking violations) for which I have been convicted or forfeited bond or collateral during the past 12 months.

Date of Conviction	Offense	Location	Type of Vehicle Operated
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

If no violations are listed above, I certify that I have not been convicted or forfeited bond or collateral on account of any violation required to be listed during the past 12 months.

_____ (Date of Certification)	_____ (Motor Carrier's Address)
_____ (Motor Carrier's Name)	_____ (Driver's Signature)
_____ (Reviewed by: Signature)	_____ (Title)

(c) The motor carrier shall retain a copy of the above certification in the driver's qualification file.

D. Examinations and Tests

1. Road Test

(a) Except as provided in part 2 (a) and part G-1, a person shall not drive a motor vehicle laden with hazardous substances unless he has first successfully completed a road test and has been issued a certificate confirming same. Drivers qualifying under section 2 (a) of this part are exempt from this requirement.

(b) The road test shall be given by the motor carrier or a person designated by it. A driver who is a carrier must be given the test by other than himself. The test shall be given by a person who is competent to evaluate and determine whether the person who takes the test is capable of operating the vehicle, and associated equipment to be assigned to him.

(c) The road test must be of sufficient duration to enable the person who gives it to evaluate the person who takes it.

(d) The motor carrier shall provide a road test form on which the person who gives the test shall rate the performance of the applicant on each of the following operations:

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- (1) The pretrip inspection required by HSTB General Regulations, Chapter II, Section V-F.
 - (2) Coupling and uncoupling of combination units if applicable.
 - (3) Placing the vehicle in operation.
 - (4) Use of the vehicle's controls and emergency equipment.
 - (5) Operating the vehicle in traffic and while passing other vehicles.
 - (6) Turning the vehicle.
 - (7) Braking and slowing the vehicle by means other than braking.
 - (8) Backing and parking the vehicle.
- (e) After he completes the road test form, the person who gave the test shall sign it.
- (f) If the road test is successfully completed, the person who gave it shall complete a certificate of driver's road test on the prescribed form which is as follows:

Certificate of Road Test

Driver's Name _____
Social Security No. _____
Operator's License No. _____
State _____
Type of power unit _____
Type of trailer(s) _____

This is to certify that the above-named driver was given a road test under my supervision on _____ 19____, consisting of approximately _____ miles of driving.

It is my considered opinion that this driver possesses sufficient driving skill to operate safely the type of commercial motor vehicle listed above.

(Signature of Examiner)

(Title)

(Organization and address of examiner)

- (g) A copy of the certificate referred to immediately above shall be given to the person who was examined. The motor carrier shall retain in the driver's qualification file (1) the original of the signed road test form and (2) the original or a copy of the certificate required by this paragraph.

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2. Equivalent of Road Test

- (a) In place of the road test required under D-1 above, the carrier may accept one of the following:

(1) A valid operator's license which has been issued by a state that licenses drivers to operate specific categories of vehicles based upon the successful completion of a road test in a motor vehicle of the type the motor carrier intends to assign to him.

(2) A copy of a valid certificate of driver's road test issued by another carrier within the preceding 3-year period qualifying the driver to operate the type of vehicle to be assigned to him.

(b) If a driver presents, and a motor carrier accepts, a license or certificate as equivalent to the road test, the motor carrier shall retain a legible copy of the license or certificate in its files as part of the driver's qualification file.

(c) A motor carrier may require any person who presents a license or certificate as equivalent to the road test to take a road test or any other test of his driving skill as a condition to his employment as a driver.

3. Written Examination

(a) A person shall not drive a vehicle laden with hazardous substances unless he has first completed a written examination and has been issued a certificate of written examination in accordance with this section.

(b) The objective of the written examination is to instruct prospective drivers in the rules and regulations established by the Federal Highway Administration pertaining to commercial vehicle safety. It is an instructional tool only, and a person's qualifications to drive a motor vehicle under the rules in this part are not affected by his performance on the examination.

(c) The written examination shall be given by the motor carrier or a person designated by it, on a form prescribed by the motor carrier.

(d) Prior to, and during, the examination, the person who takes it shall be permitted to examine and consult a copy of the Motor Carrier Safety Regulations in addition to any other material explaining the provisions of those regulations that the motor carrier may provide. There is no time limit for completing

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the examination, and persons taking it shall be so advised in advance.

(e) The examination shall consist of at least 30 questions covering the examinee's knowledge of Motor Carrier's Safety Regulations and the Hazardous Materials Regulations.

(f) After the examinee completes the examination, the person who administered it shall advise him of the correct answers to any questions he failed to answer correctly. The motor carrier may also provide the examinee with such additional instruction in the pertinent regulations as appears to be warranted on the basis of his performance on the examination.

(g) The motor carrier, or the person who administered the examination on the motor carrier's behalf, shall provide every person who completes the examination with a certificate substantially in the following form:

Certificate of Written Examination

This is to certify that the person whose signature appears below, has completed the written examination under my supervision in accordance with the provisions of Section VI-D-3, General Regulations of the Hazardous Substances Transportation Board.

(Signature of person taking exam)	(Date of examination)
(Location of Examination)	
(Signature of examiner)	(Title)
(Organization and address of examiner)	

(h) A copy of this certificate shall be given to the person examined. The original of this certificate shall be filed by the carrier in the driver's qualification file. A record of the questions asked and the answers given shall also be filed in the driver's qualification file.

4. Equivalent of Written Examination

(a) In place of the written examination required under 3 (c) above the carrier may accept a valid certificate of written examination issued by another carrier during the preceding 3-year period. A copy of such certificate shall be filed by the carrier in the driver's qualification file.

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E. Physical Qualifications and Examinations

1. Physical Qualifications for Drivers

(a) A person shall not drive a motor vehicle laden with hazardous substances requiring placarding (Section V-A-7, General Regulations, Chapter II) unless he is physically qualified to do so and has on his person a medical examiner's certificate stating that he is so qualified.

(b) A person is physically qualified to drive a motor vehicle if he—

(1) Has no loss of a foot, a leg, a hand, or an arm.

(2) Has no impairment of the use of a foot, a leg, a hand, fingers, or an arm, and no other structural defect or limitation which is likely to interfere with his ability to control and safely drive a motor vehicle.

(3) Has no established medical history or clinical diagnosis of diabetes mellitus currently requiring insulin for control.

(4) Has no clinical diagnosis of heart condition.

(5) Has no clinical diagnosis of respiratory dysfunction, high blood pressure, muscular or other vascular disease, epilepsy, mental, nervous, organic or functional disease or psychiatric disorder likely to interfere with his ability to control and drive a motor vehicle.

(6) Has distant visual acuity of at least 20/40 (Snellen) in each eye without corrective lenses or visual acuity separately corrected to 20/40 (Snellen) or better with corrective lenses, distant binocular acuity of at least 20/40 (Snellen) in both eyes with or without corrective lenses, field of vision of at least 70° in the horizontal meridian in each eye, and the ability to recognize the colors of traffic signals and devices showing standard red, green, and amber.

(7) First perceives a forced whispered voice in the better ear at not less than 5 ft. with or without the use of a hearing aid or, if tested by use of an audiometric device, does not have an average hearing loss in the better ear greater than 40 decibels at 500 Hz, 1,000 Hz, and 2,000 Hz with or without a hearing aid when the audiometric device is calibrated to American National Standard (formerly ASA Standard) Z24.5-1951.

(8) Does not use an amphetamine, narcotic or any habit-forming drug and has no current clinical diagnosis of alcoholism.

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2. Medical Examination; Certificate of Physical Examination

(a) Except as provided in paragraph (b) of this section, the medical examination shall be performed by a licensed doctor of medicine or osteopathy.

(b) A licensed optometrist may perform so much of the examination as pertains to visual acuity, field of vision and the ability to recognize colors red, green, and yellow.

(c) The medical examination shall be performed in accordance with instructions referred to in Appendix "C", H.S.T.B., General Regulations, Chapter 11.

3. Persons Who Must be Medically Examined and Certified

(a) A person must be medically examined and certified in accordance with Appendix "C", General Regulations, Chapter 11, before he may drive a motor vehicle laden with hazardous substances requiring placarding in accordance with Part V-A-7, General Regulations, Chapter 11.

(b) Drivers referred to in (a) above, must be re-examined every 24 months.

(c) Any driver whose ability to perform his normal duties has been impaired by physical or mental injury or disease shall be physically examined and certified before operating vehicles described in (a) above.

F. Files and Records

1. Driver Qualification Files

(a) The carrier shall maintain a driver qualification file for each driver regularly employed prior to the effective date of these regulations. The file shall include the following:

(1) A legible medical examiner's certificate declaring him qualified to drive.

(2) A list or certificate relating to violations of motor vehicle laws and ordinances as required by C-3 (a) of this section.

(b) The carrier's qualification file for a regularly employed driver, who has not been regularly employed by the carrier for a continuous period starting prior to the effective date of these regulations, shall include the following:

(1) A legible medical examiner's certificate declaring him qualified to drive.

(2) A list or certificate relating to violations of motor vehicle laws or ordinances as required by C-3 (a) of this section.

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(3) The completed driver's application for employment.

(4) Responses of state agencies to the Motor Carrier's inquiries concerning the driver's driving record.

(5) The certificate of driver's road test or a copy of the license or certificate which the carrier accepted as equivalent thereto.

(6) The questions asked and answers given by the driver on written examination and copy of certificate issued by the carrier, or a copy of a certificate which the motor carrier accepted as equivalent thereto.

(c) The carrier's driver qualification file of a casual or occasional driver must include:

(1) A legible medical examiner's certificate qualifying the driver to drive.

(2) A certificate of driver's road test or a copy of the license or certificate which the carrier accepted as equivalent thereto.

(3) Questions asked, answers given, and the certificate of written examination given, or a copy of a certificate which the carrier accepted as equivalent thereto.

(4) Driver's name, social security number and the identification number, type and issuing state of his motor vehicle operator's license.

(d) The qualification file for a driver furnished by another motor carrier shall include:

(1) A legible copy of medical examiner's certificate.

(2) A copy of a certificate from the motor carrier that regularly employs the driver stating that the driver is fully qualified to drive the type of motor vehicle to be assigned.

G. Exemptions

1. Regularly Employed Drivers

(a) The provisions of C-1 (Application for Employment), C-3 (Investigation and Inquiries), D-1 (Road Test), and D-3 (Written Examination) do not apply to a driver who has been regularly employed by the carrier on the effective date of these regulations.

2. Intermittent, Casual or Occasional Drivers

(a) If a motor carrier employs a person who is not a regularly employed driver to drive a motor vehicle for a single trip or on

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an intermittent, casual or occasional basis, the motor carrier shall comply with all requirements of this part except he need not—

- (1) Furnish an application for employment.
- (2) Make the investigations and inquiries specified in C-3 of this part.
- (3) Perform the annual review of the person's driving record as required by C-4 of this part.
- (4) Require the driver to furnish a record of violations as required in C-5 of this part.

3. Drivers Furnished by Other Motor Carriers

(a) A motor carrier may employ a driver who is not a regularly employed driver of that motor carrier without complying with the rules of this part if:

- (1) The driver is regularly employed by another motor carrier, transporting hazardous substances.
- (2) The motor carrier that regularly employs the driver furnishes a certificate that the driver is fully qualified to drive a motor vehicle under the rules of this part.
- (3) The motor carrier that uses the driver has in its files a copy of the driver's medical examiner's certificate.
- (b) The certificates required in (a) (2) and (a) (3) above shall be retained by the carrier for a period of three (3) years.

4. Board's Right to Require Examination

(a) At any time that the Board suspects that there might be a change in the physical condition of a driver since the last examination for which a doctor's certificate has been issued, which change might be expected to be detrimental to the safe operation of a vehicle transporting any hazardous substance, the Board may require a re-examination for the issuance of a new doctor's certificate. The Board will be required to give prior advice to the examining doctor that the examination is a re-examination ordered by the Board.

5. Carrier's Right to Require Additional Qualifications

(a) Nothing contained in the above shall be so construed as to prevent a carrier from requiring additional or more stringent physical, mental, or intellectual qualifications or age requirements than have been prescribed in this part, notwithstanding that a driver may have in his possession a doctor's certificate as herein required.

VII. HOURS OF SERVICE AND DRIVER'S DAILY LOG

A. Compliance with and Knowledge of Regulations Required

1. Every carrier and its officers, drivers, agents, employees, and representatives shall comply with the following regulations, and every carrier shall require that its officers, drivers, agents, employees and representatives be conversant with this part.

2. On Duty Time. The term "On Duty Time" shall include: All time from the time a driver begins to work or is required to be in readiness to work, until the time he is relieved from work and all responsibility for performing work.

(a) All time at a carrier or shipper plant, terminal, facility, or other property, or on any public property, waiting to be dispatched, unless the driver has been relieved from duty by the carrier;

(b) All time inspecting equipment or otherwise inspecting, servicing, or conditioning any vehicle at any time;

(c) All driving time;

(d) All time, other than driving time, in or upon any vehicle except time spent resting in a sleeper berth;

(e) All time loading or unloading a vehicle, supervising, or assisting in the loading or unloading, attending a vehicle being loaded or unloaded, remaining in readiness to operate the vehicle, or in giving or receiving receipts for shipments loaded or unloaded;

(f) All time spent performing the driver's requirements relating to any accident;

(g) All time repairing, obtaining assistance, or remaining in attendance upon a disabled vehicle;

(h) Performing any other work in the capacity of, or in the employ or service of, a common, contract or private carrier.

3. Driving Time. The term "drive" and "driving time" shall include all time spent at the driving controls of a vehicle in operation.

4. 7 Consecutive Days. Shall mean a period of seven (7) consecutive days beginning at 12:01 A.M. on any day.

5. 8 Consecutive Days. Shall mean the period of eight (8) consecutive days beginning at 12:01 A.M. of any day.

6. 24 Consecutive Hours. Shall mean any such period starting at the time the driver reports for duty.

7. Regularly Employed Driver. Shall mean a driver who in any period of seven (7) consecutive days is employed or used as a driver by a single carrier.

HOURS OF SERVICE AND DRIVER'S DAILY LOG

B. Maximum Driving and On-Duty Time

1. No carrier shall permit or require any driver used by it to drive nor shall any driver drive more than ten (10) hours following eight (8) consecutive hours off-duty, or drive for any period after having been on duty fifteen (15) hours following eight (8) consecutive hours off-duty; provided, however, that drivers using sleeper berth equipment (approved by the D.O.T. or the Board) may cumulate the aforementioned total of at least eight (8) hours off-duty in two periods of at least two hours each resting in a sleeper berth.

2. No carrier shall permit or require any driver used by it to be on duty, nor shall any such driver be on duty, more than sixty (60) hours in any seven (7) consecutive days; provided, however, that carriers operating vehicles every day in the week may permit drivers to be on duty for a total of seventy (70) hours in any period of eight (8) consecutive days.

3. In case of hazardous road or adverse weather conditions, a driver may be permitted or required to drive in order to complete his run, for not more than twelve (12) hours in the aggregate following eight (8) consecutive hours off duty; provided, however, that no driving shall be permitted or performed after the driver has been on duty fifteen (15) hours following eight (8) consecutive hours off duty.

C. Driver's Daily Log

1. Every carrier shall require that a driver's daily log shall be made in duplicate by every driver used by him or it, and every driver who operates a vehicle shall make such a log. Failure to make logs, failure to make required entries therein, falsification of entries, or failure to preserve logs, shall make both the driver and carrier liable for prosecution. Driver's logs shall be prepared and retained in accordance with the provisions of these regulations.

2. Entries to be Current. Drivers shall keep the log current to the time of the last change of duty.

3. Entries Made by Driver Only. Except that the name and principal place of business address may be printed, all entries shall be made by the driver in his own handwriting.

4. Date. Enter month, day, and year for each calendar day on or off duty.

5. Total Mileage. Total mileage entered shall be that mileage traveled while on duty during the day covered by the log.

HOURS OF SERVICE AND DRIVER'S DAILY LOG

6. Vehicle Identification. The carrier's vehicle number or numbers of the Commonwealth and license number of each vehicle operated during the calendar day, shall be entered.

7. Name of Carrier. The name or names of the carrier or carriers shall be that of those for which duty is performed.

8. Driver's Signature. The driver shall certify to the correctness of the log by signing his first name and last name in full.

9. Home Terminal. The driver's home terminal shown shall be that at which he normally reports for duty.

10. Origin and Destination. The name of the place where the trip begins and the final destination of the farthest turn-around point shall be shown at the bottom of the log. If the trip lasts more than one (1) calendar day, the log for each day shall show the origin and final destination.

11. Preservation of Driver's Log. The driver shall retain and keep in his possession while on duty the duplicate copies of his daily log for the preceding thirty (30) days. The carrier shall retain all driver's daily logs for a period of one (1) year and keep same on file at its principal place of business within the Commonwealth.

12. Driver's Log—When Not Required. The requirements of Section VII (C) herein, shall not apply to any Regularly Employed Driver (as defined under Section VII (A)-7 herein) who drives within a radius of fifty (50) miles of the garage or terminal at which he reports for work: Provided that the carrier employing such driver maintains and retains for a period of one (1) year accurate and true records showing the total number of hours the driver is on duty per day and the time at which the driver reports for and is released from duty each day.

VIII. RECORDING AND REPORTING OF ACCIDENTS

A. Accident Register

1. Every carrier shall have in its files at its principal place of business—or at such regional office or offices as the Board may approve—a register, maintained currently and containing at least the following items of information with respect to each reportable accident:

- (a) Accident claim number, or carrier's file number;
- (b) Date and hour of accident;
- (c) Location of accident;
- (d) Name of driver;

RECORDING AND REPORTING OF ACCIDENTS

- (c) Number of deaths and non-fatal injuries, and amount of damage to property in dollars;
- (f) Nature of accident such as collision, over turn, fire, cargo damage, etc.;
- (g) Local or intercity operation. (Did the run extend beyond municipal or commercial zone?)

B. Accident Report

1. The driver of any vehicle, transporting required placarded hazardous substances (whether loaded or empty), involved in an accident resulting in personal injury and/or total property damage of \$200.00 or more, shall furnish a report to the Hazardous Substances Transportation Board within fifteen (15) days. If the accident results in fire, explosion, release of product, necessitating transfer of cargo to another vehicle, or damage to containers to such a degree as to necessitate repacking of articles, it shall additionally be reported by the carrier by phone at the earliest possible time and shall be followed by a written report within fifteen (15) days to the Hazardous Substances Transportation Board, Department of Transportation, Harrisburg, Pennsylvania, 17120.

2. A copy of the D.O.T. form BMC-50-T, in lieu thereof, (submitted by the carrier) will be acceptable to the Board.

3. The Board may require carriers involved in such accidents to file supplemental reports of accidents whenever the original report is insufficient.

4. Accident reports made by carriers in compliance with the regulations of this part shall be for the information of the Board and shall not be open to public inspection.

IX. PENALTIES (As defined by Act #323—1965)

A. Any person who, as operator of a vehicle, shall knowingly or willfully violate any regulation of the Board pertaining to routing, parking or other act in the actual operation of a vehicle, shall be guilty of a misdemeanor, and, upon conviction thereof in the court of quarter sessions of the county in which the offense occurred, shall be sentenced to pay a fine of not less than twenty-five dollars (\$25) nor more than five hundred dollars (\$500), or to undergo imprisonment in the county jail for not more than thirty (30) days, or both. Any such person, having been convicted of a first offense under this subsection, who shall at a later time commit a second or subsequent

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offense and be convicted thereof, shall be sentenced to pay a fine as aforesaid, or to undergo imprisonment in the county jail for not less than sixty (60) days nor more than one (1) year, or both.

B. Any person who, as shipper, carrier, consignee or user of a hazardous substance, shall knowingly or willfully violate any regulation of the Board, shall be guilty of a misdemeanor, and, upon conviction thereof in the court of quarter sessions of the county in which the offense occurred, shall be sentenced to pay a fine of not less than one hundred dollars (\$100) nor more than five thousand dollars (\$5000), or to undergo imprisonment in the county jail for not more than sixty (60) days, or both. Any person, having been convicted of a first offense under this subsection, who shall at a later time commit a second or subsequent offense and be convicted thereof, shall be sentenced to pay a fine as aforesaid, or to undergo imprisonment in the county jail for not less than sixty (60) days nor more than one (1) year, or both. If such person be a firm, partnership, joint venture or association, then the member thereof responsible for the violation, or if such person be a corporation, then the officer, agent or employee thereof responsible for the violation, shall have the sentence of imprisonment, herein prescribed, imposed upon him.

LIST OF HAZARDOUS MATERIALS

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Acetaldehyde (ethyl aldehyde)	F. I.	173.118, 173.119	Red
Acetone	F. I.	173.118, 173.119	Red
Acetone cyanhydride	Pole. B.	173.345, 173.348	Poison
Acetone oils	F. I.	173.118, 173.119	Red
Acetonitrile	F. I.	173.118, 173.119	Red
Acetyl benzoyl peroxide, solid	Not accepted		
Acetyl benzoyl peroxide, solution	Oxy. M.	No exemption, 173.222	Yellow
Acetyl chloride	Cor.	173.244, 173.247	Corrosive
Acetyl peroxide, solid	Not accepted		
Acetyl peroxide, solution	Oxy. M.	173.153 (b), 173.222	Yellow
Acetylene	F. I.	173.306, 173.309	Red Gas
Acid carbonyls, empty	See § 173.29 (c)		
Acids, liquid, n. o. a.	Cor.	173.244, 173.245	Corrosive
Acid peric. See Picric acid.			
Acid sludge. See "Sludge acid."			
Acrolein, inhibited	F. I.	No exemption, 173.123	Red
Acrylonitrile	F. I.	173.118, 173.119	Red
Actuating cartridges, explosive, fire extinguisher or valve	Expl. C.	173.114	
*Adhesives, n.o.a. See Cement, liquid, n.o.a.			
Aeroplane flares. See Special fireworks.			
Aerosol products. See Compressed gases, n.o.a.			
Air, compressed	Nonf. G.	173.306, 173.307	Green
Aircraft rocket engines (commercial)	F. B.	No exemption, 173.238	Yellow
Aircraft rocket engine igniters (commercial)	F. B.	No exemption, 173.238	Yellow
*Alcohol, n. o. a.	F. I.	173.118, 173.119	Red
Alcohol, allyl	Pole. B.	173.345, 173.348	Poison
Alclrin	Pole. B.	173.344, 173.376	Poison
*Alclrin, cast solid	See § 173.376 (b)		
*Alclrin mixtures, liquid, with 60 percent or less alclrin	See § 173.381 (b)		
Alclrin mixtures, liquid, with more than 60 percent alclrin	Pole. B.	173.345, 173.381	Poison
Alclrin mixtures, dry, with more than 65 percent alclrin	Pole. B.	173.384, 173.376	Poison
*Alclrin mixtures, dry, with 65 percent or less alclrin	See § 173.376 (b)		
*Alkaline caustic liquids, n. o. a.	Cor.	173.244, 173.248	Corrosive
Alkaline corrosive battery fluid	Cor.	173.244, 173.248, 173.257	Corrosive
Alkaline corrosive battery fluid with storage battery	Cor.	No exemption, 173.258	Corrosive
Alkaline corrosive liquids, n. o. a.	Cor.	173.244, 173.249	Corrosive
Allyl alcohol. See Alcohol, allyl.			
Allyl aluminum halides. See Pyroforic liquids, n.o.a.			
Allyl bromide	F. I.	173.118, 173.119	Red
Allyl chlorocarbonate. See Allyl chloroformate.			
Allyl chloroformate	Cor.	No exemption, 173.288	Corrosive
Allyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Aluminum alkyls. See Pyroforic liquids, n.o.a.			
Aluminum dross	See § 173.173		
*Aluminum liquid (or paint). See "Paint, enamel, lacquer, stain, shellac, varnish, etc."			
Aluminum nitrate	Oxy. M.	173.153, 173.182	Yellow
Aluminum triethyl	F. I.	No exemption, 173.134	Red
Aluminum trimethyl	F. I.	No exemption, 173.134	Red
Anatol. See High explosives.			
Ammonia, anhydrous. See Anhydrous ammonia.			
Ammonium arsenate, solid	Pole. B.	173.364, 173.365	Poison
Ammonium bichromate (ammonium dichromate)	F. B.	173.153, 173.154, 173.235	Yellow
Ammonium nitrate	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate (organic coating)	Oxy. M.	173.153, 173.182	Yellow
*Ammonium nitrate-phosphate	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate-carbamate mixtures	Oxy. M.	173.153, 173.182	Yellow
*Ammonium nitrate mixed fertilizer	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate fertilizer, containing 90 percent or more ammonium nitrate with no organic coating	Oxy. M.	173.153, 173.182	Yellow
Ammonium perchlorate	Oxy. M.	173.153, 173.154, 173.230a	Yellow
Ammonium permanganate	Oxy. M.	173.153, 173.154	Yellow
Ammonium picrate. See High explosives.			
Ammonium picrate, wet (not to exceed 16 ounces)	See § 173.192		
Ammunition, chemical (containing class A poisons, liquids, or gases). See Chemical ammunition.			
Ammunition, chemical (containing class B poisons, liquids, or gases). See Chemical ammunition.			
Ammunition, chemical (containing class C poisons, liquids, or solids). See Chemical ammunition.			

LIST OF HAZARDOUS MATERIALS-Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Ammunition, chemical, explosive	See § 173.69		
Ammunition material	See § 173.68		
Ammunition non-explosive	See § 173.68		
Ammunition for cannon with empty projectiles	Expl. U.	No exemption, 173.89	
Ammunition for cannon with explosive projectiles	Expl. A.	No exemption, 173.84	
Ammunition for cannon with gas projectiles	Expl. A.	No exemption, 173.84	
Ammunition for cannon with illuminating projectiles	Expl. A.	No exemption, 173.84	
Ammunition for cannon with incendiary projectiles	Expl. A.	No exemption, 173.84	
Ammunition for cannon with inert-loaded projectiles	Expl. U.	No exemption, 173.89	
Ammunition for cannon with smoke projectiles	Expl. A.	No exemption, 173.84	
Ammunition for cannon with solid projectiles	Expl. B.	No exemption, 173.89	
Ammunition for cannon without projectiles	Expl. B.	No exemption, 173.89	
Ammunition, rocket. See Rocket ammunition.			
Ammunition, small-arms. See Small-arms ammunition.			
Ammunition for small-arms with explosive projectiles	Expl. A.	No exemption, 173.88	
Ammunition for small-arms with incendiary projectiles	Expl. A.	No exemption, 173.88	
*Amyl acetate	F. I.	173.118, 173.119	Red
Amyl chloride	F. I.	173.118, 173.119	Red
Amyl mercaptan	F. I.	173.118, 173.119	Red
Amyl nitrite	F. I.	173.118, 173.119	Red
Amyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Anhydrous ammonia	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Anhydrous hydrazine. See Hydrazine, anhydrous.			
Anhydrous hydrofluoric acid. See Hydrofluoric acid, anhydrous.			
Aniline oil drums, empty	See § 173.347 (d)		
Aniline oil, liquid	Pole. B.	No exemption, 173.347	Poison
Anisyl chloride	Cor.	173.244, 173.278	Corrosive
*Anti-freeze compounds, liquid	F. I.	173.118, 173.119	Red
*Anti-freeze preparations, proprietary, liquid	F. I.	173.118, 173.119	Red
Antimony pentachloride	Cor.	173.244, 173.247	Corrosive
Antimony pentachloride solution	Cor.	173.244, 173.248	Corrosive
Antimony pentasulfide	Cor.	No exemption, 173.246	Corrosive
Apparatus. See Refrigerating machines, comp. gas or flammable liquid.			
*Aqua ammonia solution containing anhydrous ammonia	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Argon	Nonf. G.	173.306, 173.307, 173.314	Green
Argon, pressurized liquid	Nonf. G.	No exemption, 173.304	Green
Arsonate of lead. See Lead arsonate.			
Arsenic acid, liquid	Pole. B.	173.345, 173.348	Poison
Arsenic acid, solid	Pole. B.	173.344, 173.365	Poison
Arsenic bromide, solid	Pole. B.	173.345, 173.348	Poison
Arsenic chloride (arsenous), liquid	Pole. B.	173.344, 173.365	Poison
Arsenic iodide, solid	Pole. B.	173.344, 173.365	Poison
Arsenic pentoxide, solid	Pole. B.	173.344, 173.365	Poison
Arsenic solid	Pole. D.	173.364, 173.368	Poison
Arsenic sulfide (powder), solid	Pole. D.	173.361, 173.365	Poison
Arsenic trichloride, liquid	Pole. B.	173.345, 173.348	Poison
Arsenic trioxide, solid (arsenic, white, solid, arsenous acid, solid)	Pole. B.	173.364, 173.366, 173.368	Poison
Arsenic, white, solid	Pole. B.	173.364, 173.368	Poison
Arsenical compounds or mixtures, n.o.a., liquid	Pole. D.	173.345, 173.348	Poison
Arsenical compounds or mixtures, n.o.a., solid	Pole. D.	173.364, 173.367	Poison
Arsenical dip, liquid (sheep dip)	Pole. B.	173.345, 173.348	Poison
Arsenical dust	Pole. D.	173.361, 173.368	Poison
Arsenical flue dust	Pole. D.	173.361, 173.368	Poison
Arsenous acid, solid	Pole. B.	173.364, 173.365	Poison
Arsenous and mercuric iodide solution, liquid	Pole. B.	173.345, 173.348	Poison
*Asphalt, cut-back. See "Road asphalt, or tar, liquid."			
Automobiles, motorcycles, tractors or other self-propelled vehicles	See § 173.120, 173.316		
Automobiles, motorcycles, tractors or other self-propelled vehicles, engines or other mechanical apparatus, with charged electric storage batteries, wet	See § 173.250		
1-Azidobenzene phosphine oxide (trn). See Tetra (1-azidobenzyl) phosphine oxide.			
Bage, nitrate of soda, empty and unwashed	F. B.	No exemption, 173.155 (a)	Yellow
Barium azide—50 percent or more water wet	F. B.	No exemption, 173.239	Yellow

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Barium chlorate.	Oxy. M.	173.153, 173.153.	Yellow
Barium chlorate, wet.	Oxy. M.	173.153, 173.153 (a) (6).	Yellow
Barium cyanide, solid.	Pols. D.	173.370.	Poison
Barium nitrate.	Oxy. M.	173.153, 173.153.	Yellow
Barium perchlorate.	Oxy. M.	173.153, 173.153.	Yellow
Barium permanganate.	Oxy. M.	173.153, 173.153.	Yellow
Barium peroxide (binoxide, dioxide).	Oxy. M.	173.153, 173.153.	Yellow
Barrels, empty. See Drums, empty.			
Batteries, dry.	Not regulated.		
Batteries, electric storage, wet.	Cor.	173.200.	Corrosive
Batteries, electric storage, wet, with automobiles, auto parts, engines or other mechanical apparatus.	Cor.	173.250, 173.200.	Corrosive
Batteries, electric storage, wet, with containers of corrosive battery fluid.	Cor.	No exemption, 173.258.	Corrosive
Battery charger with electrolyte (acid) or battery fluid.	See § 173.259.		
Battery fluid. See Electrolyte (acid) or Alkaline corrosive battery fluid.			
Benzene (benzol).	F. L.	173.118, 173.119.	Red.
Benzene phosphorus dichloride.	Cor.	173.244, 173.244.	Corrosive
Benzene phosphorus trichloride.	Cor.	173.244, 173.244.	Corrosive
Benzine.	F. L.	173.118, 173.119.	Red.
Benzol (benzene).	F. L.	173.118, 173.119.	Red.
Benzoyl chloride.	Cor.	173.244, 173.244.	Corrosive
Benzoyl peroxide.	Oxy. M.	No exemption, 173.157, 173.158.	Yellow
Benzyl bromide (bromotoluene, alpha).	Cor.	No exemption, 173.281.	Corrosive
Benzyl chloride.	Cor.	173.244, 173.244.	Corrosive
Benzyl chlorocarbonate. See Benzyl chlorofornate.			
Benzyl chlorofornate.	Cor.	No exemption, 173.288.	Corrosive
Beryllium compounds, n. o. s.	Pols. D.	173.304, 173.305.	Poison
Black blasting powder. See Black powder.			
Black pellet powder. See Black powder.			
Black powder.	Expl. A.	No exemption, 173.60.	
Black powder igniters with empty cartridge bags.	Expl. C.	No exemption, 173.100.	
Black rifle powder. See Black powder.			
Blasting caps—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps—more than 1,000.	Expl. A.	No exemption, 173.60.	
Blasting caps with metal clad mild detonating fuse—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps with metal clad mild detonating fuse—more than 1,000.	Expl. A.	No exemption, 173.60(c), 173.67.	
Blasting caps with safety fuse—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps with safety fuse—more than 1,000.	Expl. A.	No exemption, 173.60(c), 173.67.	
Blasting caps, electric. See Electric blasting caps.			
Blasting gelatin. See High explosives.			
Blasting powder. See Black powder.			
Boiler compound, liquid.	Cor.	173.244, 173.249.	Corrosive
Bombs, explosive. See Explosive bomb.			
Bombs, explosive, with gas, smoke, or incendiary material. See Explosive bomb.			
Bombs, explosive, incendiary. See Explosive bomb.			
Bombs, fireworks. See Special fireworks.			
Bombs, gas, smoke or incendiary, non-explosive. See Chemical ammunition.			
Bombs, incendiary or smoke without bursting charges. See Special fireworks.			
Bombs, practice, with electric primers or electric squibs.	See § 173.55.		
Bombs, sand-loaded or empty.	See § 173.55.		
Boron (explosive).	Expl. A.	No exemption, 173.60.	
Borodens arsenite, liquid.	Pols. D.	173.345, 173.346.	Poison
Borodens arsenite, solid.	Pols. B.	173.304, 173.305.	Poison
Boron trichloride.	Cor.	No exemption, 173.261.	Corrosive
Boron trifluoride.	Nonf. O.	173.300, 173.302.	Green
Bottles, acid or other corrosive liquids, empty.	See § 173.29.		
Box ton gum.	F. L.	173.118, 173.119.	Red.
Breze, resin.	See § 173.29.		
Bromaceton, liquid.	Pols. A.	No exemption, 173.329 (a).	Poison Gas
Bromobenzyl cyanide, liquid.	Pols. C.	No exemption, 173.382.	Teat Gas
Bromine.	Cor.	No exemption, 173.252.	Corrosive
Bromine pentafluoride.	Cor.	No exemption, 173.284.	Corrosive
Bromine trifluoride.	Cor.	No exemption, 173.283.	Corrosive
Bromotoluene, alpha. See Benzyl bromide.			
Bronze liquid (or paint). See "Paint, enamel, lacquer, stain, shellac, varnish, etc.			

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Brucine, solid (dimethoxy strychnine).	Pols. B.	173.304, 173.305.	Poison
Burnt cotton (not repicked).	F. B.	No exemption, 173.159.	Yellow
Burnt fiber.	F. B.	No exemption, 173.159.	Yellow
Bursters (explosive).	Expl. A.	No exemption, 173.60.	
Butadiene, inhibited.	F. L.	173.308, 173.309, 173.314, 173.315.	Red Gas
Butane or Liquefied petroleum gas. See Liquefied Petroleum gas.			
*Butyl acetate.	F. L.	173.118, 173.119.	Red.
*Butyl alcohol. See Alcohol, n. o. s.			
Butyl mercaptan.	F. L.	No exemption, 173.141.	Red.
Butyl trichlorosilane.	Cor.	No exemption, 173.280.	Corrosive
Butyraldehyde.	F. L.	173.118, 173.119.	Red.
Carbonyl acid, solid (dimethylarsenic).	Pols. B.	173.301, 173.305.	Poison
Calcium arsenate, solid.	Pols. B.	173.301, 173.307, 173.308.	Poison
Calcium arsenite, solid.	Pols. B.	173.301, 173.305.	Poison
Calcium chlorate.	Oxy. M.	173.153, 173.153.	Yellow
Calcium chloride.	Oxy. M.	No exemption, 173.100.	Yellow
Calcium cyanide. See Cyanide of calcium.			
Calcium hypochlorite mixtures (dry, containing more than 35 percent available chlorine).	Oxy. M.	173.153, 173.217.	Yellow
Calcium metallic.	F. B.	173.153, 173.154.	Yellow
Calcium metallic, crystalline.	F. B.	No exemption, 173.231.	Yellow
Calcium nitrate.	Oxy. M.	173.153, 173.153.	Yellow
Calcium peroxide.	Oxy. M.	173.153, 173.153.	Yellow
Calcium permanganate.	Oxy. M.	173.153, 173.153.	Yellow
Calcium phosphide.	F. B.	No exemption, 173.161.	Yellow
Calcium sesquioxide.	F. B.	No exemption, 173.168.	Yellow
Calcium sesquioxide, fused.	F. B.	No exemption, 173.168.	Yellow
Calcium sesquioxide, fused.	Expl. C.	No exemption, 173.107.	
Cannon primers.			
Caps, blasting. See Blasting caps.			
Caps, toy. See Toy caps.			
Caprylyl peroxide solution.	Oxy. M.	173.153 (b), 173.221.	Yellow
Carbolic acid, fused solid. See Carbolic acid (phenol), solid.			
Carbolic acid (phenol), liquid, (liquid tar acid containing over 50 percent benzene-phenol).	Pols. B.	173.345, 173.349.	Poison
Carbolic acid (phenol), solid.	Pols. B.	173.349.	Poison
Carbon disulfide (disulfide), solid.	F. L.	No exemption, 173.121.	Red
Carbon disulfide, liquid.	Nonf. O.	173.304 (a) (2) Table Note 4.	Green
Carbon disulfide, liquid, liquefied ("mixing device").	Nonf. O.	173.306, 173.304, 173.314, 173.315.	Green
Carbon disulfide, liquefied.	Nonf. O.	173.306, 173.304.	Green
Carbon dioxide—nitrous oxide mixture.	Nonf. O.	173.300, 173.304.	Green
Carbon dioxide—oxygen mixture.	Nonf. O.	173.300, 173.304.	Green
Carbon monoxide.	F. L.	173.306, 173.302(f).	Red Gas
Carbon monoxide.	F. L.	173.118, 173.119.	Red
Carbon remover, liquid.			
Carbonyl chloride. See Phosgene.			
Carboys, acid, empty.	See § 173.29 (c).		
Carboys, empty. See Acid carboys, empty.			
Cartridge bags, empty, with black powder igniters.	Expl. C.	No exemption, 173.100.	
Cartridge cases, empty, primed.	Expl. C.	No exemption, 173.107.	
Cartridges, practice ammunition.	Expl. C.	No exemption, 173.101a.	
Case oil. See Gasoline, "Naphtha."			
Casinghead gasoline. See Gasoline.			
Casks, empty. See Drums, empty.			
Caulate potash, liquid.	Cor.	173.244, 173.249.	Corrosive
Caulate soda, liquid.	Cor.	173.244, 173.249.	Corrosive
*Cement, additive, n.o.s. See Cement, liquid, n.o.s.			
*Cement, leather.	F. L.	173.118, 173.119.	Red.
*Cement, linoleum, tile, wallboard, or container, liquid.	F. L.	173.118, 173.132.	Red
*Cement, liquid, n.o.s.	F. L.	173.118, 173.119, 173.132.	Red
*Cement, pyroxylin.	F. L.	173.118, 173.132.	Red
*Cement, roofing, liquid.	F. L.	173.118, 173.119.	Red
*Cement, rubber.	F. L.	173.118, 173.132.	Red
*Charcoal, activated.	F. B.	173.162.	Yellow #
Charcoal, briquettes.	F. B.	173.162.	Yellow #
Charcoal, shell.	F. B.	173.162.	Yellow #
Charcoal, wood, ground, crushed, granulated or pulverized.	F. B.	173.162.	Yellow
Charcoal, wood, lump.	F. B.	173.162.	Yellow
Charcoal screenings, made from "pinon" wood.	F. B.	173.162.	Yellow #
Charcoal, wood screenings other than "Pinon" wood screenings.	F. B.	No exemption, 173.162.	Yellow
Charcoal screenings, wet.	Not accepted.		
Charcoal, wet.	Not accepted.		

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Charged oil well jet perforating guns (total explosive contents in guns exceeding 50 pounds per motor vehicle)	Expl. A.	No exemption, 173.53 (u), 173.80	
Charged oil well jet perforating guns (total explosive contents in guns not exceeding 50 pounds per motor vehicle)	Expl. C.	No exemption 173.53 (u), 173.110	
*Chemicals, n. o. s. See *Drugs, chemicals, medicines or cosmetics, n. o. s.			
Chemical ammunition (containing class A poisons, liquids, or gases)	Pols. A.	No exemption, 173.330	Poison gas
Chemical ammunition (containing class B poisons, liquids, or gases)	Pols. B.	173.345, 173.350	Poison
Chemical ammunition (containing class C poisons, liquids, or solids)	Pols. C.	No exemption, 173.383	Tear Gas
Chemical ammunition, explosive	See § 173.59		
*Chemical kits	See § 173.266		
(Chloroacetylene, gas, liquid, or solid)	Pols. C.	No exemption, 173.383	Tear Gas
Chloroacetyl chloride	Cor.	No exemption, 173.253	Corrosive
*Chlorate and borate mixtures	Oxy. M.	173.153, 173.226	Yellow
*Chlorate and magnesium chloride mixture	Oxy. M.	173.153, 173.226	Yellow
*Chlorates, n. o. s.	Oxy. M.	173.153, 173.163	Yellow
*Chlorates, n. o. s., wet	Oxy. M.	173.153, 173.163 (a) (6)	Yellow
Chlorate explosives, dry. See High explosives.			
Chlorate of potash	Oxy. M.	173.153, 173.163	Yellow
Chlorate of soda	Oxy. M.	173.153, 173.163	Yellow
Chlorate powders. See High explosives.			
Chloride of phosphorus. See Phosphorus trichloride.			
Chloride of sulfur. See Sulfur chloride.			
*Chlorine	Nonl. G.	173.300, 173.304, 173.314, 173.313	Green
Chlorine dioxide hydrate, frozen	Oxy. M.	No exemption, 173.237	Yellow
Chlorine trifluoride	Cor.	No exemption, 173.285	Corrosive
Chlorobenzyl peroxide (para)	Oxy. M.	No exemption, 173.157, 173.158	Yellow
Chlorodinitrobenzol. See Dinitrochlorobenzol, solid			
4-Chloro-o-toluidine hydrochloride	Pols. B.	No exemption, 173.382	Poison
Chlorosulfonic acid	Cor.	173.244, 173.254	Corrosive
Chlorosulfonic acid-sulfur trioxide mixture	Cor.	173.244, 173.254	Corrosive
Chlorpicrin and nonflammable, nonliquefied compressed gas mixtures	Pols. A.	No exemption, 173.329 (c)	Poison Gas
Chlorpicrin, liquid	Pols. B.	No exemption, 173.357	Poison
Chlorpicrin, absorbed	Pols. B.	No exemption, 173.357	Poison
Chlorpicrin mixtures (containing no compressed gas or poisonous liquid, class A)	Pols. B.	No exemption, 173.357	Poison
Chlorpicrin and methyl chloride mixtures	Pols. A.	No exemption, 173.329 (b)	Poison Gas
Chromic acid	Oxy. M.	173.153, 173.164	Yellow
Chromic acid solution	Cor.	173.244, 173.246, 173.287	Corrosive
Chromic anhydride. See Chromic acid.			
Chromium trioxide. See Chromic acid.			
Chromyl chloride	Cor.	No exemption, 173.247	Corrosive
Cigar and cigarette lighter fluid	F. L.	173.118, 173.119	Red
Cigarette lighter charged with fuel	See § 173.21 (d)		
Cigarette loads	Expl. C.	No exemption, 173.111	
*Cleaning fluid or liquid	F. L.	173.118, 173.119	Red
Cloud gas cylinders. See Chemical ammunition.			
Coal briquettes, hot	Not accepted		
Coal gas. See Hydrocarbon gas, non-liquefied.			
Coal, ground bituminous, sea coal, coal facings, etc.	See § 173.165		
*Coal tar distillate	F. L.	173.118, 173.119	Red
*Coal tar light oil	F. L.	173.118, 173.119	Red
*Coal tar naphtha	F. L.	173.118, 173.119	Red
*Coal tar oil	F. L.	173.118, 173.119	Red
*Coating solution	F. L.	173.118, 173.132	Red
Cobalt resinates, precipitated	F. B.	No exemption, 173.160	Yellow
Cocculus, solid (fish berry)	Pols. B.	173.364, 173.365	Poison
Coke, hot	Not accepted		
Collodion	F. L.	173.118, 173.119	Red
Collodion cotton, wet. See Wet ultracellulose.			
Colony spirits (alcohol)	F. L.	173.118, 173.119	Red
Colored fire. See Count on fireworks.			
Columbian spirits (wood alcohol)	F. L.	173.118, 173.119	Red
Combination fuses	Expl. C.	No exemption, 173.105	

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Combination primers	Expl. C.	No exemption, 173.107	
Commercial shaped charges. See High explosives.	See § 173.65 (h)		
Common fireworks	Expl. C.	No exemption, 173.100 (r), 173.108	
*Compounds, cleaning, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, cleaning, liquid (containing hydrochloric (muriatic) acid)	Cor.	173.244, 173.203	Corrosive
*Compounds, cleaning, liquid	F. L.	173.118, 173.119	Red
*Compounds, cleaning, liquid (containing hydrofluoric acid)	Cor.	173.244, 173.256	Corrosive
*Compounds, enamel	F. L.	173.118, 173.128	Red
*Compounds, iron or steel rust preventing or removing	Cor.	173.244, 173.245	Corrosive
*Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid	F. L.	173.118, 173.128	Red
*Compounds, lacquer, paint, or varnish removing, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, polishing, liquid	F. L.	173.118, 173.129	Red
*Compounds, tree or weed killing, liquid	F. L.	173.118, 173.119	Red
*Compounds, tree or weed killing, liquid	Pols. B.	173.345, 173.346	Poison
*Compounds, tree or weed killing, solid	Oxy. M.	173.153, 173.154, 173.229	Yellow
*Compounds, type-cleaning, liquid	F. L.	173.118, 173.119	Red
*Compounds, vulcanizing, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, vulcanizing, liquid	F. L.	173.118, 173.119	Red
Compressed gases, n.o.s.	Nonl. G.	173.300, 173.305, 173.304, 173.302	Green
Compressed gases, n.o.s.	F. G.	173.308, 173.305, 173.304, 173.302	Red Gas
Containers, empty. See Acid carboys, empty; bottles empty, drums empty, cylinders empty.			
Containers, reused	See § 173.29		
Copper acetarsenite, solid (emerald green, imperial green, Kings green, moss green, meadow green, midis green, parrot green, Vienna green)	Pols. B.	173.364, 173.367	Poison
Copper arsenite, solid (Scheele's green, cupric green, copper orthoarsenite, Sverdsk green)	Pols. B.	173.364, 173.365	Poison
Copper cyanide	See § 173.370		
Corleau detonant fuse	Expl. C.	No exemption, 173.104	
Corrosive battery fluid. See Electrolyte (acid), or Alkaline corrosive battery fluid.			
Corrosive acid, n.o.s.	Corrosive	173.244, 173.245	Corrosive
Cotton, burnt. See burnt cotton.			
Cotton waste, oily with more than 5 percent of animal or vegetable oil	F. B.	No exemption, 173.167	Yellow
Crotonaldehyde	F. L.	173.118, 173.119	Red
*Crude nitrogen fertilizer solution	Nonl. G.	173.306, 173.304, 173.314	Green
*Crude oil, petroleum	F. L.	173.118, 173.119	Red
Cumene hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Cupriethylenediamine solution	Cor.	173.244, 173.249	Corrosive
Cyanide of calcium or cyanide of calcium mixtures, solid	Pols. B.	173.370 (c) and (d)	Poison
Cyanides of copper, zinc, lead, and silver	See § 173.370		
Cyanides or cyanide mixtures, dry	Pols. B.	173.364, 173.370	Poison
Cyanide of potassium, liquid	Pols. B.	173.345, 173.352	Poison
Cyanide of potassium, solid	Pols. B.	173.370	Poison
Cyanide of sodium, liquid	Pols. B.	173.345, 173.352	Poison
Cyanide of sodium, solid	Pols. B.	173.370	Poison
Cyanogen bromide	Pols. B.	No exemption, 173.379	Poison
Cyanogen chloride containing less than 0.9 percent water	Pols. A.	No exemption, 173.328	Poison Gas
Cyanogen gas	Pols. A.	No exemption, 173.328	Poison Gas
Cyclohexane	F. L.	173.118, 173.119	Red
Cyclohexanone peroxide not over 50 percent concentration	Oxy. M.	173.153, 173.154	Yellow
Cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration	Oxy. M.	No exemption, 173.157, 173.158	Yellow
Cyclohexenyl trichlorosilane	Cor.	No exemption, 173.290	Corrosive
Cyclohexyltrichlorosilane	Cor.	No exemption, 173.290	Corrosive
Cyclopentane	F. L.	173.118, 173.119	Red
Cyclopentane, methyl	F. L.	173.118, 173.119	Red
Cyclopropane	F. G.	173.300, 173.304	Red Gas
Cyclotrimethylendinitramine, desensitized. See High Explosives.			
Cyclotrimethylendinitramine, wet with not less than 10 percent of water. See High explosives.			
Cylinders, empty	See § 173.29		

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Decaborane	F. S.	No exemption, 173.236	Yellow
Delay electric igniters	Expl. C.	No exemption, 173.106	
Denatured alcohol. See Alcohol, n. o. s.			
Depth bombs. See Explosive bomb.			
Detonating fuses, class A explosives	Expl. A.	No exemption, 173.69	
Detonating fuses, class A explosives, radioactive	Expl. A.	No exemption, 173.69	
Detonating fuses, class C explosives	Expl. C.	No exemption, 173.113	
Detonating primers	Expl. A.	No exemption, 173.68	
Diazodinitrophenol. See Initiating explosive.			
Dichloroethylene	F. L.	173.118, 173.119	Red
Dichlorodifluoromethane	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichlorodifluoromethane-dichlorotetrafluoroethane mixture	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichlorodifluoromethane-mono-chlorodifluoromethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-trichloromono-fluoromethane-mono-chlorodifluoromethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-trichlorotrifluoromethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-mono-fluorotrifluoromethane mixture	Nonf. G.	173.306, 173.314, 173.315	Green
Dichlorofluoromethane and difluoroethane mixture (constant boiling mixture)	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichloroisocyanuric acid, dry, containing more than 30% available chlorine	Oxy. M.	173.153, 173.217	Yellow
Dicumyl peroxide, solid	Oxy. M.	173.153, 173.154	Yellow
Dicumyl peroxide, 50% solution	Oxy. M.	173.153 (b), 173.224	Yellow
Diethyl aluminum chloride	F. L.	No exemption, 173.134	Red
Diethyl dichlorosilane	Cor.	No exemption, 173.280	Corrosive
Diethylamine	F. L.	173.118, 173.119	Red
Diethylene glycol dinitrate	See § 173.51 (d)		
1,1 difluoro 1-chloroethane. See Difluoromono-chloroethane			
Difluoroethane	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Difluoromono-chloroethane (1,1 difluoro 1-chloroethane)	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Difluorophosphoric acid, anhydrous	Cor.	No exemption, 173.276	Corrosive
Diisooctyl acid phosphate	Cor.	173.244, 173.296	Corrosive
Diisopropylbenzene hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Dimethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Dimethylamine, aqueous solution	F. L.	173.118, 173.119	Red
Dimethyldichlorosilane	F. L.	No exemption, 173.135	Red
Dimethyl ether	F. G.	173.306, 173.304, 173.314	Red Gas
Dimethylhexane dihydroperoxide, dry	Not accepted		
Dimethylhexane dihydroperoxide, wet	Oxy. M.	No exemption, 173.157	Do
Dimethylhydrazine, unsymmetrical	F. L.	No exemption, 173.145	Red
Dimethyl sulfate	Cor.	No exemption, 173.255	Corrosive
Dimethyl sulfide	F. L.	173.118, 173.119	Red
Dinitrobenzol, solid	Pois. B.	173.364, 173.371	Poison
Dinitrobenzol, liquid	Pois. B.	173.345, 173.346	Poison
Dinitrochlorobenzol, solid (dinitrochlorobenzene, chlorodinitrobenzol)	Pois. B.	173.364, 173.365	Poison
Dinitrophenol solutions	Pois. B.	173.345, 173.362A	Poison
Diphenyl dichlorosilane	Cor.	No exemption, 173.280	Corrosive
Diphenylaminochlorarsine, gas, liquid, or solid	Pois. C.	No exemption, 173.382	Tear Gas
Diphenylchlorarsine, solid	Pois. C.	No exemption, 173.382	Tear Gas
Diphosgene. See Phosgene.			
Dispersant gas, n. o. s.	See § 173.314 (c) Table Note 13, 173.315 (a) Table Note 9		
Distillate	F. L.	173.118, 173.119	Red
Dodecyltrichlorosilane	Cor.	No exemption, 173.280	Corrosive
Dressing, leather	F. L.	173.118, 173.119	Red
Driers, paint, varnish, enamel, etc. See *Paint driers, liquid.			
Drill cartridges	See § 173.55		
Drugs, chemicals, medicines or cosmetics, n. o. s.	F. L.	173.118, 173.119	Red
Drugs, chemicals, medicines or cosmetics, n. o. s.	F. S.	173.153, 173.154	Yellow
Drugs, chemicals, medicines or cosmetics, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Drugs, chemicals, medicines or cosmetics, n. o. s.	Cor.	173.244, 173.245	Corrosive
Drugs, chemicals, medicines or cosmetics, n. o. s. (liquid)	Pois. B.	173.345, 173.346	Poison
Drugs, chemicals, medicines or cosmetics, n. o. s. (solid)	Pois. B.	173.364, 173.365	Poison
Drums, empty	See § 173.29		
Dummy cartridges	See § 173.55		
Dusta, by-product, poisonous. See Arsenical dust.			
Dynamite. See High explosives.			
Electric blasting caps—more than 1,000	Expl. A.	No exemption, 173.66	

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Electric blasting caps—1,000 or less	Expl. C.	No exemption, 173.103	
Electric squibs	Expl. C.	No exemption, 173.100	
Electric storage batteries, wet. See Batteries, electric storage, wet.			
Electrolyte (acid), battery fluid	Cor.	173.244, 173.257	Corrosive
Electrolyte (acid) or alkaline corrosive battery fluid packed with storage batteries	Cor.	No exemption, 173.256	Corrosive
Electrolyte (alkali) or alkaline corrosive battery fluid packed with battery charger, radio current supply device, or electronic equipment and actuating devices	Cor.	No exemption, 173.259	Corrosive
Empty cartridge bags with black powder igniters	Expl. C.	No exemption, 173.106	
Empty cartridge cases, primed	Expl. C.	No exemption, 173.107	
*Enamel. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Engines, internal combustion	See § 173.120		
Engine starting fluid	F. G.	No exemption, 173.304	Red Gas
*Eradicators, paint or grease, liquid	F. L.	173.118, 173.119	Red
Etching acid liquid, n. o. s.	Cor.	No exemption, 173.299	Corrosive
Ethane	F. G.	173.306, 173.304	Red Gas
Ether	F. L.	173.118, 173.119	Red
Ether, ethyl (sulphuric). See Ether.			
Ethyl acetate	F. L.	173.118, 173.119	Red
Ethyl alcohol. See Alcohol, n. o. s.			
Ethyl aldehyde. See Acetaldehyde.			
Ethyl aluminum dichloride	F. L.	No exemption, 173.131	Red
Ethyl aluminum sesquichloride	F. L.	No exemption, 173.134	Red
Ethyl chloride	F. L.	No exemption, 173.123	Red
Ethyl chlorocarbonate. See Ethyl chloroformate.			
Ethyl chloroformate	Cor.	No exemption, 173.288	Corrosive
Ethyl chloroethoxyformate. See Corrosive liquid n. o. s.			
Ethyl dichlorosilane	Pois. A.	No exemption, 173.328	Poison Gas
Ethyl dichlorosilane	F. L.	No exemption, 173.135	Red
Ethylene	F. G.	173.306, 173.304	Red Gas
Ethylene dichloride	F. L.	173.118, 173.119	Red
Ethyleneimine, inhibited	F. L.	No exemption, 173.139	Red
Ethylene oxide	F. L.	No exemption, 173.124	Red
Ethyl formate	F. L.	173.118, 173.119	Red
Ethyl mercaptan	F. L.	No exemption, 173.141	Red
Ethyl methyl ether	F. L.	173.118, 173.119	Red
Ethyl methyl ketone	F. L.	173.118, 173.119	Red
Ethyl nitrate (nitric ether)	F. L.	173.118, 173.119	Red
Ethyl nitrite (nitrous ether)	F. L.	173.118, 173.119	Red
Ethyl phenyl dichlorosilane	Cor.	No exemption, 173.280	Corrosive
Ethyl phosphonothioic dichloride, anhydrous. See Corrosive liquid, n. o. s.			
Ethyl phosphorus dichloride, anhydrous. See Corrosive liquid, n. o. s.			
Ethyl phosphorodichloridate. See Corrosive liquid n. o. s.			
Ethyl trichlorosilane	F. L.	No exemption, 173.135	Red
Explosive auto alarms	Expl. C.	No exemption, 173.111	
Explosive bomb	Expl. A.	No exemption, 173.56	
Explosive cable cutters	Expl. C.	No exemption, 173.102	
Explosives, class A	See § 173.53		
Explosives, class B	See § 173.68		
Explosives, class C	See § 173.100		
Explosive compositions	Expl. A or B	No exemption, 173.63, 173.61 to 173.93	
Explosive mine	Expl. A.	No exemption, 173.56	
Explosive power device, class B	Expl. B.	No exemption, 173.94	Red
Explosive power device, class C	Expl. C.	No exemption, 173.102	
Explosive projectile	Expl. A.	No exemption, 173.56	
Explosive treacle device	Expl. C.	No exemption, 173.102	
Explosive rivets	Expl. C.	No exemption, 173.100 (q)	
Explosive samples for laboratory examination	See § 173.86		
Explosive torpedo	Expl. A.	No exemption, 173.56	
Extracts, liquid, flavoring	F. L.	173.118, 173.119	Red
Fabrics or fibers with animal or vegetable oil. See Fibers or fabrics with animal or vegetable oil.			

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Felt waste, wet. See Waste wool, wet.			
Ferric arsenate, solid	Pois. B.	173.364, 173.365	Poison
Ferric arsenite, solid	Pois. B.	173.364, 173.365	Poison
Ferrous arsenate (iron arsenate), solid	Pois. B.	173.364, 173.365	Poison
*Fertilizer ammoniating solution containing free ammonia	Nonf. G.	173.306, 173.304, 173.314	Green
Fertilizer, tankage. See Garbage, tankage.			
Fiber, burnt	F. B.	No exemption, 173.100	Yellow
Fibers or fabrics, with animal or vegetable oil	F. B.	No exemption, 173.170	Yellow
Film, motion-picture and toy pieces of. See Motion-picture film, toy and motion-picture film scrap.			
Firecrackers. See Common fireworks or Special fireworks.			
Firecracker, salutes. See Common fireworks or Special fireworks.			
Fire extinguisher charges	Cor.	173.261	Corrosive
Fire extinguisher charges containing not to exceed 50 grains of propellant explosives per unit.	See § 173.88 (f) Note 1.		
Fire extinguishers	Nonf. G.	173.306	Green
Fireworks, common	Expl. C.	No exemption, 173.100 (r), 173.108	
Fireworks, exhibition display pieces. See Special fireworks.			
Fireworks, special	Expl. B.	No exemption, 173.88(d), 173.91	Special Fireworks (f).
Fish meal. See Fish scrap or fish meal.			
Fish scrap or fish meal containing less than 6 percent or more than 18 percent moisture	F. B.	No exemption, 173.171	Yellow
Fissile radioactive materials	R.A.M.	173.393, 173.394	Radioactive
*Flame retardant compound, liquid	Cor.	173.244, 173.291	Corrosive
Flammable liquids, n. o. s.	F. L.	173.118, 173.119	Red
Flammable solids, n. o. s.	F. B.	173.163, 173.164	Yellow
Flares. See Common fireworks.			
Flares, aeroplans. See Special fireworks.			
Flash cartridges. See Special fireworks and Low explosives.			
Flash crackers. See Common fireworks or Special fireworks.			
Flash powder. See Special fireworks and Low explosives.			
Flash sheets. See Special fireworks and Low explosives.			
Flexible linear shaped charges, metal clad	Expl. C.	No exemption, 173.104	
Flue dust, poisonous	Pois. B.	173.364, 173.368	Poison
Fluorine	F. G.	173.306, 173.302	Red Gas
Fluorosulfonic acid	Cor.	No exemption, 173.274	Corrosive
Formic acid	Cor.	173.244, 173.245, 173.289	Corrosive
Formic acid, solution	Cor.	173.244, 173.245, 173.289	Corrosive
Fulminate of mercury, dry	Forbidden explosive.		
Fulminate of mercury, wet. See Initiating explosive.			
*Fumigants	See § 173.152 (a) Note 1.		
*Furniture polish. See *Polishes, metal, stove, furniture, and wood, liquid.			
*Furniture or wood stains, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Fuse lighters	Expl. C.	No exemption, 173.106	
Fuse, instantaneous. See Instantaneous fuse.			
Fuse lighters	Expl. C.	No exemption, 173.106	
Fuse, mild detonating, metal clad. See Mild detonating fuse, metal clad.			
Fuse, safety. See Safety fuse.			
Fuses (railway and highway)	F. B.	No exemption, 173.154a	Yellow
Fuses, combination	Expl. C.	No exemption, 173.105	
Fuses, detonating, class A explosives	Expl. A.	No exemption, 173.69	
Fuses, detonating, class A explosives, radioactive	Expl. A.	No exemption, 173.69	
Fuses, detonating, class C explosives	Expl. C.	No exemption, 173.113	
Fuses, percussion	Expl. C.	No exemption, 173.105	
Fuses, time	Expl. C.	No exemption, 173.105	
Fuses, tracer	Expl. C.	No exemption, 173.105	
Garbage tankage containing less than 8 percent of moisture	F. B.	No exemption, 173.209	Yellow
Gas cylinders, empty	See § 173.29		
*Gas drips, hydrocarbon	F. L.	173.118, 173.119	Red
Gas identification sets	Pois. A. and C.	No exemption, 173.331	Poison Gas
Gas mine. See Explosive mine	See § 173.56 (d)		

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Gasoline	F. L.	173.118, 173.119	Red
Gelatin dynamite. See High explosives.			
*Gold paint. See *Paint, enamel, lacquer, etale, shellac, varnish, etc.			
Grenades, empty, primed	Expl. C.	No exemption, 173.107	
Grenades, hand. See Hand grenades.			
Grenades, hand or rifle, explosive, with gas, smoke or incendiary material. See Hand or Rifle grenades			
Grenades, hand or rifle, with gas, smoke or incendiary material but without burning charges	See § 173.88 (d), 173.108, 173.238, 173.350		
Grenades, police. See Police grenades, poison gas, class A.			
Grenades, rifle. See Rifle grenades.			
Grenades, tear gas. See Tear gas grenades.			
Guanidine nitrate	Oxy. M.	173.163, 173.162	Yellow
Guanyl nitroamino guanidyl tetrazene. See Initiating explosive.			
Guanyl nitroamino guanidyl tetrazene. See Initiating explosive.			
Guided missiles, with warheads. See Rocket ammunition with explosive, illuminating, gas, incendiary or smoke projectiles.			
Guided missiles without warheads. See Rocket motors, class A explosives or Rocket motors, class B explosives.			
Guncotton. See High explosives.			
Hafnium metal, dry, chemically produced, finer than 80 mesh particle size	F. B.	No exemption, 173.214	Yellow
Hafnium metal, dry, mechanically produced, finer than 870 mesh particle size	F. B.	No exemption, 173.214	Yellow
Hafnium metal, wet, chemically produced, finer than 80 mesh particle size	F. B.	No exemption, 173.214	Yellow
Hafnium metal, wet, mechanically produced, finer than 870 mesh particle size	F. B.	No exemption, 173.214	Yellow
Hair, wet	F. B.	No exemption, 173.172	Yellow
Hand grenades	Expl. A.	No exemption, 173.66	
Hand signal devices	Expl. C.	No exemption, 173.106	
Heaters for refrigerator cars, liquid fuel type	F. L.	173.148	
Helium	Nonf. G.	173.306, 173.302, 173.314	Green
Helium-oxygen mixture	Nonf. G.	173.306, 173.302	Green
Heptane	F. L.	173.118, 173.119	Red
Hexadecyltrichlorosilane	Cor.	No exemption, 173.280	Corrosive
Hexaethyl tetraphosphate and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Hexaethyl tetraphosphate, liquid	Pois. B.	No exemption, 173.338	Poison
Hexaethyl tetraphosphate mixture, dry	Pois. B.	173.377	Poison
Hexaethyl tetraphosphate mixture, liquid	Pois. B.	173.359	Poison
Hexafluorophosphoric acid	Cor.	No exemption, 173.278	Corrosive
Hexafluoropropylene	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Hexamethylene diamine solution	Cor.	173.244, 173.249, 173.292	Corrosive
Hexane	F. L.	173.118, 173.119	Red
Hexyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
High explosives	Expl. A.	No exemption, 173.61 to 173.67	
High explosives, liquid	Expl. A.	No exemption, 173.62	
High wines. See Alcohol or alcohol, n. o. s.			
Hydraulic accumulators (pressurized with non-flammable, nonliquefied compressed gas)	See § 173.308 (e) (2)		
Hydrazine, anhydrous	Cor.	No exemption, 173.278	Corrosive
Hydrochloric acid	Cor.	173.244, 173.245	Corrosive
Hydrobromic acid	Cor.	173.244, 173.283	Corrosive
Hydrobromic acid, anhydrous. See Hydrogen bromide.			
Hydrocarbon gas, liquefied	F. G.	173.308, 173.304, 173.314	Red Gas
Hydrocarbon gas, nonliquefied	F. G.	173.306, 173.302	Red Gas
Hydrochloric (muriatic) acid	Cor.	173.244, 173.283	Corrosive
Hydrochloric acid, anhydrous. See Hydrogen chloride.			
Hydrochloric acid mixtures	Cor.	173.244, 173.288	Corrosive
Hydrochloric acid solution, inhibited	Cor.	173.244, 173.283	Corrosive
Hydrocyanic acid, liquefied	Pois. A.	No exemption, 173.332	Poison Gas
Hydrocyanic acid (prussic), liquid	Pois. A.	No exemption, 173.332	Poison Gas
Hydrocyanic acid (prussic), unstabilized	Not accepted.		
Hydrocyanic acid solutions	Pois. B.	No exemption, 173.331	Poison

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Hydrofluoric acid	Cor.	173.244, 173.264 (a)	Corrosive
Hydrofluoric acid, anhydrous	Cor.	No exemption, 173.264 (b)	Corrosive
Hydrofluoric and sulfuric acids, mixtures	Cor.	No exemption, 173.290	Corrosive
Hydrofluosulfuric acid	Cor.	173.244, 173.265	Corrosive
*Hydrogen	F. G.	170.306, 173.302, 173.314	Red Gas
Hydrogen bromide	Nonf. G.	173.306, 173.304	Green
Hydrogen chloride	Nonf. G.	173.306, 173.304	Green
Hydrogen, liquefied	F. G.	No exemption, 173.310	Red Gas
Hydrogen peroxide (hydrogen dioxide) solution in water containing over 8 percent hydrogen peroxide by weight	Cor.	173.244, 173.266	Corrosive
Hydrogen sulfide	F. G.	173.306, 173.304, 173.314	Red Gas
Hypochlorite solutions containing more than 7 percent available chlorine by weight	Cor.	173.277	Corrosive
Igniter cord	Expl. C.	No exemption, 173.100 (a)	
Igniter fuse-metal clad	Expl. C.	No exemption, 173.100	
Igniters	Expl. C.	No exemption, 173.100	
Igniters, jet thrust (jet), class A explosives	Expl. A.	No exemption, 173.79	None
Igniters, jet thrust (jet), class B explosives	Expl. B.	No exemption, 173.92	Red #
Igniters, rocket motor, class A explosives	Expl. A.	No exemption, 173.79	
Igniters, rocket motor, class B explosives	Expl. B.	No exemption, 173.92	Red #
Illuminating projectiles fused or not fused, with exploding charges. See Special fireworks.			
Inflammable liquids, n. o. s. See Flammable liquids, n. o. s.			
Inflammable solids, n. o. s. See Flammable solids, n. o. s.			
Initiating explosive	Expl. A.	No exemption, 173.70 to 173.78, incl.	
Diazodinitrophenol		No exemption, 173.70	
Fulminate of mercury		No exemption, 173.71	
Guanyl nitroamine guanyldiene hydrazine		No exemption, 173.72	
Lead azide, dextrinated type only		No exemption, 173.73	
Lead mononitrosarsenate		No exemption, 173.70	
Lead styphnate (lead trinitrosarsenate)		No exemption, 173.74	
Nitro mannite		No exemption, 173.75	
Nitroguanidine		No exemption, 173.76	
Pentacythrid tetranitrate		No exemption, 173.77	
Tetrazene (guanyl nitroamine guanyld tetrazene)		No exemption, 173.78	
*Ink	F. L.	173.118, 173.144	Red
*Insecticide, dry	Pole. B.	173.304, 173.365	Poison
*Insecticide, liquid	Pole. B.	173.345, 173.346	Poison
Insecticide, liquefied gas	Nonf. G.	173.305, 173.304	Green
*Insecticide, liquid (vermin exterminator)	F. L.	173.118, 173.119	Red
Instantaneous fuse	Expl. C.	No exemption, 173.100 (a)	
Iodine monochloride	Cor.	No exemption, 173.203	Corrosive
Iron mass, spent	F. S.	No exemption, 173.174	Yellow
Iron sponge not properly oxidized	F. S.	No exemption, 173.174	Yellow
Iron sponge, spent	F. S.	No exemption, 173.174	Yellow
Isobutane or liquefied petroleum gas. See Liquefied petroleum gas.			
Isobutylene or liquefied petroleum gas. See Liquefied petroleum gas.			
Isocane	F. L.	173.118, 173.119	Red
Isocetene	F. L.	173.118, 173.119	Red
Isopentane	F. L.	173.118, 173.119	Red
Isoprene	F. L.	173.118, 173.119	Red
*Isopropanol	F. L.	173.118, 173.119	Red
Isopropyl acetate	F. L.	173.118, 173.119	Red
Isopropyl mercaptan	F. L.	No exemption, 173.141	Red
Isopropyl percarbonate, stabilized	Cor.	No exemption, 173.282	Corrosive
Isopropyl percarbonate, unstabilized	F. S.	No exemption, 173.218	Yellow
Jet thrust igniters. See Igniters, jet thrust.			
Jet thrust unit (jet) class A explosives	Expl. A.	No exemption, 173.79	
Jet thrust unit (jet) class B explosives	Expl. B.	No exemption, 173.92	Red #
Keps, reused	See § 173.28		
*Lacquer. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Lacquer base, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Lacquer base or lacquer chips, dry	F. S.	173.163, 173.175	Yellow

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
*Lacquer, base or lacquer chips, plastic (not with alcohol or solvent)	F. L.	173.118, 173.137	Red
*Lacquer removing, reducing and thinning compounds. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
Lauroyl peroxide	Oxy. M.	173.163 (b), 173.167, 173.168	Yellow
Lead arsenate, solid	Pole. B.	173.364, 173.367	Poison
Lead arsenite, solid	Pole. B.	173.364, 173.365	Poison
Lead azide. See Initiating explosive.			
Lead cyanide	See § 173.270		
Lead mononitrosarsenate. See Initiating explosive.			
Lead nitrate	Oxy. M.	173.163, 173.162	Yellow
Lead styphnate (lead trinitrosarsenate). See Initiating explosive.			
*Leather bleach	F. L.	173.118, 173.119	Red
*Leather dressing	F. L.	173.118, 173.119	Red
Levitate	Pole. A.	No exemption, 173.328	Poison Gas
Lighter fluid. See Cigar and cigarette lighter fluid.			
*Liquefied carbon dioxide. See Carbon dioxide, liquefied.			
Liquefied carbon dioxide gas (mining device). See carbon dioxide gas, liquefied (mining device).			
Liquefied hydrocarbon gas	F. G.	173.306, 173.304, 173.314	Red Gas
Liquefied nonflammable gases charged with nitrogen, carbon dioxide, or air	Nonf. G.	173.306, 173.304	Green
*Liquefied petroleum gas	F. G.	173.306, 173.304, 173.314, 173.316	Red Gas
Liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon dioxide or air. See Compressed gases, n. o. s.			
Lithium aluminum hydride	F. S.	No exemption, 173.308	Yellow
Lithium aluminum hydride, ethereal	F. L.	No exemption, 173.137	Red
Lithium azide, powdered	F. S.	173.163, 173.168	Yellow
Lithium ferro silico	F. S.	No exemption, 173.208	Yellow
Lithium hydride	F. S.	No exemption, 173.308	Yellow
Lithium hydride in solid form	F. S.	No exemption, 173.208	Yellow
Lithium hypochlorite compounds, dry, containing more than 30 percent available chlorine	Oxy. M.	173.163, 173.217	Yellow
Lithium metal	F. S.	No exemption, 173.208	Yellow
Lithium metal, in cartridges	See § 173.208		
Lithium peroxide	Oxy. M.	173.163 (a), 173.154	Yellow
Lithium silico	F. S.	No exemption, 173.208	Yellow
London purple, solid	Pole. B.	173.364, 173.365	Poison
Low explosives. See Low explosives.			
Low blasting explosives. See Low explosives.			
Machines or apparatus	See §§ 173.130, 173.308		
Magnesium arsenate, solid	Pole. B.	173.364, 173.367	Poison
Magnesium dust	See § 173.173		
*Magnesium, metallic, powdered, pellets, turnings, or ribbons	F. S.	173.163, 173.220	Yellow
Magnesium nitrate	Oxy. M.	173.163, 173.162	Yellow
Magnesium perchlorate	Oxy. M.	173.163, 173.164	Yellow
Magnesium peroxide, solid	Oxy. M.	173.163, 173.164	Yellow
Magnesium scrap (borings, chippings, shavings, shochs, turnings or scalings)	F. S.	173.163, 173.220	Yellow
Matches, book, card, or strike-on-box, with other articles	See § 173.170 (a)		
Matches, book, card, or strike-on-box	See § 173.170 (b)		
Matches, strike-anywhere	F. S.	No exemption, 173.170	Yellow
*Medicines, n. o. s. See *Drugs, chemicals, medical, or cosmetic, n. o. s.			
Mentetridylo phthalic anhydride	Cor.	No exemption, 173.208	Corrosive
*Mercaptan mixtures, aliphatic	F. L.	No exemption, 173.141	Red
*Mercuric liquid, n. o. s.	Pole. B.	173.345, 173.346	Poison
Mercuric acetate	Pole. B.	173.364, 173.365	Poison
Mercuric ammonium chloride, solid	Pole. B.	173.364, 173.365	Poison
Mercuric borosulfate, solid	Pole. B.	173.364, 173.365	Poison

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Mercuric bromide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric chloride. <i>See</i> Mercury bichloride, solid.			
Mercuric cyanide, solid	Pois. B.	173.370	Poison
Mercuric iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric iodide solution	Pois. B.	173.345, 173.346	Poison
Mercuric oleate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxide (red), solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxide (yellow), solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxycyanide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric-potassium cyanide, solid	Pois. B.	173.364, 173.365, 173.370	Poison
Mercuric-potassium iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric salicylate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric subsulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric sulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric sulfo cyanate, solid (mercuric thiocyanate)	Pois. B.	173.364, 173.365	Poison
Mercuriol (mercury nucleate), solid	Pois. B.	173.364, 173.365	Poison
Mercurous bromide, solid	Pois. B.	173.364, 173.365	Poison
Mercurous gluconate, solid	Pois. B.	173.364, 173.365	Poison
Mercurous iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercurous nitrate, solid	Pois. B.	173.364, 173.365	Poison
Mercurous oxide, black, solid	Pois. B.	173.364, 173.365	Poison
Mercurous sulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercury acetate, solid	Pois. B.	173.364, 173.365	Poison
Mercury bichloride, solid (mercuric chloride)	Pois. B.	173.364, 173.372	Poison
Mercury bisulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercury compounds, n. o. s. (solid)	Pois. B.	173.364, 173.365	Poison
Mercury cyanide, solid	Pois. B.	173.370	Poison
Mercury fulminate. <i>See</i> Initiating explosive.			
Metal kegs, reused.			
*Metal polish. <i>See</i> *Polishes, metal, stove, furniture and wood, liquid.			
Metallic sodium or potassium. <i>See</i> Sodium or potassium, metallic.			
Methanol (methyl alcohol). <i>See</i> Wood alcohol.			
Methane	F. G.	173.306, 173.304	Red Gas
Methyl acetate	F. L.	173.118, 173.119	Red
Methyl acetone	F. L.	173.118, 173.119	Red
Methyl alcohol (methanol). <i>See</i> Wood alcohol.			
Methylacetylene-propadiene, stabilized	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl aluminum sesquichloride	F. L.	No exemption, 173.134	Red
Methyl aluminum sesquichloride	F. L.	No exemption, 173.134	Red
Methyl bromide and chlorpicrin mixture, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide and ethylene dibromide mixture, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide and nonflammable, nonliquefied compressed gas mixtures, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide, liquid (bromomethane)	Pois. B.	No exemption, 173.353	Poison
*Methyl chloride	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl chloroformate	F. L.	No exemption, 173.128	Corrosive
Methylchloromethyl ether, anhydrous	F. L.	No exemption, 173.143	Red
Methyldichloramine	Pois. A.	No exemption, 173.328	Poison Gas
Methyl dichlorosilane	F. L.	No exemption, 173.136	Red
Methyl ethyl ketone	F. L.	173.118, 173.119	Red
Methyl formate	F. L.	173.118, 173.119	Red
Methyl hydrate. <i>See</i> Alcohol or alcohol, n. o. s.			
Methylhydrazine	F. L.	No exemption, 173.145	Red
Methyl isopropenyl ketone, inhibited	F. L.	173.118, 173.119	Red
Methyl magnesium bromide in ethyl ether in concentrations not over 40 percent	F. L.	No exemption, 173.149	Red
Methyl mercaptan	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl methacrylate monomer	F. L.	173.118, 173.119	Red
Methyl parathion, liquid	Pois. B.	No exemption, 173.358	Poison
Methyl parathion mixture, dry	Pois. B.	173.377	Poison
Methyl parathion mixture, liquid	Pois. B.	173.359	Poison
Methyl phosphomothione dichloride, anhydrous. <i>See</i> Corrosive liquid, n. o. s.			
Methyl phosphorous dichloride. <i>See</i> Corrosive liquid, n. o. s.			
Methyltrichlorosilane	F. L.	No exemption, 173.135	Red
Methyl vinyl ketone, inhibited	F. L.	173.147	Red
Mild detonating fuse, metal clad	Expl. C.	No exemption, 173.104	
Mine rescue equipment	See §§ 173.306 (a) (2) and 173.703 (d)		
Mines, empty	See § 173.65		

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Mines, explosive, with gas material. <i>See</i> Explosive mines.			
Mixed acid. <i>See</i> Nitrating (mixed) acid.			
Mixtures of hydrofluoric and sulfuric acids. <i>See</i> Hydrofluoric and sulfuric acids, mixtures.			
Mixtures or solutions of liquefied nonflammable gases and liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon dioxide, or air. <i>See</i> Compressed gases, n. o. s.			
Monochlorotrifluoromethane	Nonf. G.	173.306, 173.304, 173.314	Green
Monochloroacetone, stabilized	Pois. C.	No exemption, 173.361	Tear Gas
Monochloroacetone (unstabilized)	Not accepted.		
Monochloroacetic acid, liquid	Cor.	173.344, 173.394	Corrosive
Monochlorodifluoromethane	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Monochloroethylene. <i>See</i> Vinyl chloride.			
Monochloropentafluoroethane	Nonf. G.	173.306, 173.304	Green
Monochlorotetrafluoroethane	Nonf. G.	173.306, 173.304, 173.314	Green
Monochlorotrifluoromethane	Nonf. G.	173.306, 173.304	Green
Monocetylamine	F. L.	173.118, 173.148	Red
Monofluorophosphoric acid, anhydrous	Cor.	No exemption, 173.275	Corrosive
Monomethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Monomethylamine, aqueous solution	F. L.	173.118, 173.119	Red
*Mortar stain, liquid	F. L.	173.118, 173.126	Red
*Motion-picture film, nitrocellulose base, including mixed shipments with nonflammable film	F. B.	No exemption, 173.177	Yellow
Motion-picture film, old and wornout (nitrocellulose)	F. B.	No exemption, 173.178	Yellow
Motion-picture film, old and wornout (slow-burning)	See § 173.181 (a) (1)		
*Motion-picture outfit, toy	See § 173.181 (a) (4)		
*Motion-picture film (processed, positive or negative, nitrocellulose)	F. B.	No exemption, 173.177	Yellow
*Motion-picture film (processed, positive or negative, slow-burning)	See § 173.181 (a) (1)		
Motion-picture film scrap (nitrocellulose), samples of	F. B.	No exemption, 173.186	Yellow
Motion-picture film scrap (nitrocellulose), other than samples	F. B.	No exemption, 173.185	Yellow
Motion-picture film scrap (slow-burning)	See § 173.181 (a) (2)		
*Motion-picture film, toy (nitrocellulose)	F. B.	No exemption, 173.178	Yellow
*Motion-picture film, toy (slow-burning)	See § 173.181 (a) (1)		
*Motion-picture film, toy pieces (nitrocellulose)	See § 173.181 (a) (3)		
Motion-picture film, unexposed (nitrocellulose base)	F. B.	173.180	Yellow
Motion-picture film, unexposed (slow-burning)	See § 173.181 (a) (1)		
Motorcycles	See § 173.120		
Motor fuel antiknock compound	Pois. B.	No exemption, 173.354	Poison
*Motor fuel, n. o. s.	F. L.	173.118, 173.119	Red
Motors, internal combustion	See § 173.120		
Muriatic acid. <i>See</i> Hydrochloric acid.			
Mustard gas	Pois. A.	No exemption, 173.328	Poison Gas
*Naphtha	F. L.	173.118, 173.119	Red
*Naphtha distillate	F. L.	173.118, 173.119	Red
*Naphtha, petroleum. <i>See</i> *Petroleum naphtha.			
*Naphtha, solvent	F. L.	173.118, 173.119	Red
Natural gasoline. <i>See</i> Gasoline.			
Neobutane	F. L.	173.118, 173.119	Red
Neon gas	Nonf. G.	173.306, 173.305	Green
New explosives or explosive devices	See §§ 173.61 (a), 173.66, and 173.502 (a) (8)		
Nickel carbonyl	F. L.	No exemption, 173.129	Red
*Nickel catalyst, finely divided, activated or spent	F. B.	No exemption, 173.223	Yellow
Nickel cyanide, solid	Pois. B.	173.370	Poison
Nicotine hydrochloride	Pois. B.	173.345, 173.348	Poison
Nicotine, liquid	Pois. B.	173.345, 173.346	Poison

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Nicotine salicylate	Pois. B.	173.364, 173.365	Poison
Nicotine sulfate, liquid	Pois. B.	173.345, 173.346	Poison
Nicotine sulfate, solid	Pois. B.	173.364, 173.365	Poison
Nicotine tartrate	Pois. B.	173.364, 173.365	Poison
Nitrate of aluminum. See Aluminum nitrate.			
Nitrate of ammonia. See Ammonium nitrate.			
Nitrate of ammonia explosives. See High explosives.			
Nitrate of ammonia fertilizer. See Ammonium nitrate fertilizer, containing 90 percent or more ammonium nitrate with no organic coating.			
Nitrate of barium. See Barium nitrate.			
Nitrate of lead. See Lead nitrate.			
Nitrate of potash. See Potassium nitrate.			
Nitrate of soda. See Sodium nitrate.			
Nitrate of soda and potash	Oxy. M.	173.153, 173.152	Yellow
Nitrate of soda bags, empty, unwashed. See Bags, nitrate of soda, empty and unwashed.			
Nitrate of strontium. See Strontium nitrate.			
Nitrates, n. o. s.	Oxy. M.	173.153, 173.152	Yellow
Nitrating (mixed) acid	Cor.	No exemption, 173.287	Corrosive
Nitric acid	Cor.	No exemption, 173.258	Corrosive
Nitric ether. See Ethyl nitrate.			
Nitric oxide	Pois. A.	No exemption, 173.337	Poison Gas
Nitrite of soda. See Sodium nitrite.			
Nitrobenzol, liquid (oil of mirbane)	Pois. B.	173.345, 173.346	Poison
Nitro carbo nitrate	Oxy. M.	173.153, 173.152	Yellow
Nitrocellulose, colloidal, granular, flake or block, wet with alcohol or solvent. See Wet nitrocellulose colloidal, granular or flake—20 percent alcohol or solvent; or block—25 percent alcohol.			
Nitrocellulose, colloidal, granular, or flake, wet with 80 percent water. See Wet nitrocellulose, colloidal, granular or flake—20 percent water.			
Nitrocellulose (collodion cotton), wet with water. See Wet nitrocellulose—20 percent water.			
Nitrocellulose (collodion cotton), wet with alcohol or solvent. See Wet nitrocellulose—30 percent alcohol or solvent.			
Nitrocellulose, dry. See High explosives.			
Nitrocellulose flakes, wet with alcohol or solvent. See Wet nitrocellulose flakes—20 percent alcohol or solvent.			
Nitrochlorobenzene, ortho, liquid	Pois. B.	173.345, 173.346	Poison
Nitrochlorobenzene, meta or para, solid	Pois. B.	173.364, 173.374	Poison
Nitrogen	Nonf. G.	173.306, 173.303, 173.314	Green
Nitrogen dioxide, liquid	Pois. A.	No exemption, 173.336	Poison Gas
Nitrogen fertilizer solution	Nonf. G.	173.306, 173.304, 173.314	Green
Nitrogen peroxide, liquid	Pois. A.	No exemption, 173.338	Poison Gas
Nitrogen, pressurized liquid	Nonf. G.	No exemption, 173.304	Green
Nitrogen tetroxide, liquid	Pois. A.	No exemption, 173.336	Poison Gas
Nitrogen tetroxide-nitric oxide mixtures containing up to 33.2 percent weight nitric oxide	Pois. A.	No exemption, 173.338	Poison Gas
Nitroglycerin, liquid	See § 173.51 (d)		
Nitroglycerin liquid, desensitized. See High Explosive, liquid.			
Nitroglycerin, spirits of. See Spirits of nitroglycerin.			
Nitrohydrochloric acid	Cor.	No exemption, 173.278	Corrosive
Nitrohydrochloric acid, diluted	Cor.	No exemption, 173.278	Corrosive
Nitro manite. See Initiating explosive.			
Nitroguanidine, dry. See High explosives.			
Nitroguanidine, wet with water. See Wet nitroguanidine—20 percent water.			
Nitrosoguanidine. See Initiating explosive.			
Nitrosalarch, dry. See High explosives.			
Nitrosalarch, wet with alcohol or solvent. See Wet nitrosalarch—30 percent alcohol or solvent.			
Nitrosalarch, wet with water. See Wet nitrosalarch—20 percent water.			
Nitrosylchloride	Nonf. G.	173.306, 173.304, 173.314	Green
Nitrourea. See High explosives.			
Nitrous oxide	Nonf. G.	173.306, 173.304, 173.316	Green
Nitroxylol	Pois. B.	173.345, 173.346	Poison
Nonliquefied gases. See Compressed gases, n. o. s.			

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Nonliquefied hydrocarbon gas	F. G.	173.306, 173.302	Red Gas
Nonyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Octadecyltrichlorosilane	Cor.	No exemption, 173.280	Corrosive
Octyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
*Oil, described as oil, n. o. s., petroleum oil, or petroleum oil, n. o. s.	F. I.	173.118, 173.119	Red
Oil of mirbane. See Nitrobenzol, liquid.			
Oil of nitric. See Nitric acid.			
Oil well cartridges	Expl. C.	No exemption, 173.112	
Oleum	Cor.	173.244, 173.272	Corrosive
*Organic phosphate compound, liquid, n. o. s.	Pois. B.	No exemption, 173.358	Poison
*Organic phosphate compound mixtures, liquid, n. o. s.	Pois. B.	173.359	Poison
*Organic phosphate compound, mixtures, dry, n. o. s.	Pois. B.	173.377	Poison
*Organic phosphates, n. o. s. mixed with compressed gas	Pois. A.	No exemption, 173.334	Poison Gas
Ortho-nitroaniline	Pois. B.	173.364, 173.373	Poison
Oxide, spent. See Spent oxide.			
Oxidizing material, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Oxidizing materials with other articles—fumigants.	See § 173.152 (c)		
Oxygen	Nonf. G.	173.306, 173.302, 173.314	Green
Oxygen, pressurized liquid	Nonf. G.	No exemption, 173.304	Green
*Paint driers, liquid	F. I.	173.118, 173.128	Red
*Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid	F. I.	173.118, 173.128	Red
*Paint, lacquer and varnish removing, reducing or thinning compounds. See *Compounds, lacquer, paint or varnish, reducing or thinning liquid, etc.			
Paper cap ammunition for toy pistols. See Toy caps.			
Paper caps. See Toy caps.			
Paper stock, wet	F. B.	No exemption, 173.185	Yellow
Paper waste, wet. See Waste paper, wet.			
Para chlorobenzoyl peroxide. See Chlorobenzoyl peroxide, (para).			
Paramenthane hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Paranitraniline (paranitroaniline), solid	Pois. B.	173.364, 173.373	Poison
Parathion and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Parathion, liquid	Pois. B.	No exemption, 173.358	Poison
Parathion, mixture, dry	Pois. B.	173.377	Poison
Parathion mixture, liquid	Pois. B.	173.359	Poison
Paris green, solid	Pois. B.	173.364, 173.367	Poison
Pentaborane	F. I.	No exemption, 173.138	Red
Pentane	F. L.	173.118, 173.119	Red
Pentane, methyl	F. L.	173.118, 173.119	Red
Pentacythrite tetranitrate. See Initiating explosive.			
Pentacythrite tetranitrate, desensitized, wet. See High explosives.			
Pentoxide, dry. See High explosives.			
Peracetic acid	Oxy. M.	173.223	Yellow
Perchlorate of ammonia. See Ammonium perchlorate.			
Perchlorate of potash. See Potassium perchlorate.			
Perchlorates, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Perchloric acid in excess of 72 percent	See § 173.269		
Perchloric acid not in excess of 72 percent	Cor.	173.244, 173.269	Corrosive
Perchloro-methyl-mercaptan	Pois. B.	173.345, 173.360	Poison
Percussion caps	Expl. C.	No exemption, 173.107	
Percussion fuses	Expl. C.	No exemption, 173.105	
Potassium permanganate	Oxy. M.	173.153, 173.154, 173.194	Yellow
Potassium permanganate of soda	Oxy. M.	173.153, 173.154	Yellow
Potassium permanganate, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Peroxide of sodium. See Sodium peroxide.			
Peroxides, organic, liquids or solutions, n. o. s.	F. I.	No exemption, 173.119 (m)	Red
Peroxides, organic, liquids, n. o. s.	Oxy. M.	173.153, 173.221	Yellow
Peroxides, organic, solution, liquid, n. o. s.	Oxy. M.	173.153, 173.221	Yellow
Petroleum, crude. See Crude oil.			
*Petroleum distillate	F. I.	173.118, 173.119	Red
Petroleum ether	F. L.	173.118, 173.119	Red

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Petroleum gas, liquefied. See Liquefied petroleum gas.			
*Petroleum naphtha.	F. L.	173.118, 173.119	Red
Phenol. See Carbolic acid.			
Phenylacetylene chloride.	Pois. A.	No exemption, 173.328	Poison Gas
Phenylchlorarsine, liquid.	Pois. B.	No exemption, 173.355	Poison
Phenyl trichlorosilane.	Cor.	No exemption, 173.280	Corrosive
Phenyl trichlorosilane.	Pois. A.	No exemption, 173.333	Poison Gas
Phosgene (diphosgene).	F. S.	No exemption, 173.188	Yellow
Phosphoric anhydride.	F. S.	No exemption, 173.189	Yellow
Phosphorus, amorphous, red.	F. S.	No exemption, 173.271	Corrosive
Phosphorus oxybromide.	Cor.	No exemption, 173.271	Corrosive
Phosphorus oxychloride.	F. S.	No exemption, 173.191	Yellow
Phosphorus pentachloride.	F. S.	No exemption, 173.225	Yellow
Phosphorus sesquioxide.	Cor.	No exemption, 173.270	Corrosive
Phosphorus tribromide.	Cor.	No exemption, 173.271	Corrosive
Phosphorus trichloride.	F. S.	No exemption, 173.190(d) & (e)	Yellow
Phosphorus, white or yellow, dry.	F. S.	No exemption, 173.190(b) & (c)	Yellow
Phosphorus, white or yellow, in water.	F. S.	No exemption, 173.195	Yellow
Photographic film scrap, X-ray film scrap.	F. S.	No exemption, 173.195	Yellow
Photographic flash powder. See Special fireworks or low explosives.			
Picrates dry. See High explosives.			
Picrate of ammonia. See High explosives.			
Picric acid, dry. See High explosives.			
Picric acid, wet, not exceeding 16 ounces.	See § 173.192		
Picric acid, wet, with not less than 10 percent water, over 26 pounds. See High explosives.			
Picric acid, wet, with not less than 10 percent water, in excess of 16 ounces but not exceeding 25 pounds.	F. S.	No exemption, 173.193	Yellow
Pinechols. See Common fireworks.			
*Plastic solvent, n. o. s.	F. L.	173.118, 173.119	Red
Poisonous liquid or gas, n. o. s.	Pois. A.	No exemption, 173.328	Poison Gas
Poisonous liquids, n. o. s.	Pois. B.	173.345, 173.346	Poison
Poisonous liquids, n. o. s.	Pois. C.	No exemption, 173.382	Tear Gas
Poisonous solids, n. o. s.	Pois. B.	173.361, 173.365	Poison
Poisonous solids, n. o. s.	Pois. C.	No exemption, 173.382	Tear Gas
Poisonous solids, n. o. s.	Pois. A.	No exemption, 173.335	Poison Gas
*Polishes, metal, stove, furniture and wood, liquid.	E. L.	173.118, 173.129	Red
Polymerizable materials.	See § 173.21 (b)		
Potash, caustic, solution. See Caustic potash, liquid.			
Potassium arsenate, solid.	Pois. B.	173.361, 173.365	Poison
Potassium arsenite, solid.	Pois. B.	173.361, 173.365	Poison
Potassium bromate.	Day. M.	173.153, 173.154	Yellow
Potassium chlorate (potash chlorate). See Chlorate of potash.			
Potassium cyanide. See Cyanide of potassium.			
Potassium dichloroisocyanurate, dry, containing more than 30% available chlorine.	Day. M.	173.153, 173.217	Yellow
Potassium hydroxide solution. See Caustic potash, liquid.			
Potassium, metallic.	F. S.	No exemption, 173.206	Yellow
Potassium, metallic liquid alloy.	F. S.	No exemption, 173.202	Yellow
Potassium nitrate.	Day. M.	173.153, 173.182	Yellow
Potassium nitrate mixed (fused) with sodium nitrite.	Day. M.	173.153, 173.183	Yellow
Potassium nitrite.	Day. M.	173.153, 173.154	Yellow
Potassium perchlorate.	Day. M.	173.153, 173.219	Yellow
Potassium permanganate. See Permanganate of potash.			
Potassium peroxide.	Day. M.	No exemption, 173.154	Yellow
Potassium sulfide.	F. S.	173.153, 173.207	Yellow
Potato spray (arsenical), liquid. See *Insecticide, liquid.			
Pressurized products. See Compressed gases, n. o. s.			
Primers. See Cannon, combination, or small-arm primers.			
Primers, detonating. See Detonating primers.			
Projectiles, explosive. See Explosive projectile.			
Projectiles, gas, nonexplosive. See Chemical.			
*Ammunition, class A, B, or C.			
*Projectiles, gas, smoke, or incendiary, with burst or booster with or without detonating fuse. See Explosive projectile.			
*Projectiles, illuminating, incendiary or smoke with expelling charge but without bursting charge. See Special fireworks.			
*Projectiles, sand-lod' empty, or solid.	See § 173.55		

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Propane or Liquefied petroleum gas.			
See Liquefied petroleum gas.			
Propellant explosives, class A.	Expl. A.	No exemption, 173.04 (d)	Red
Propellant explosives (liquid), class B.	Expl. B.	No exemption, 173.03	Red
Propellant explosives (solid), class B.	Expl. B.	No exemption, 173.03	Red
Propellant explosives in water (smokeless powder for cannon or small arms).	Expl. B.	No exemption, 173.03	Red
Propellant explosives in water unstable, condemned or deteriorated (smokeless powder for cannon or small arms).	Expl. B.	No exemption, 173.03	Red
Propellant explosives (solid), class B, and small-arm primers. See Propellant explosives, class B.			
Propylene oxide, inhibited.	F. L.	No exemption, 173.129	Red
Propylene oxide.	F. L.	173.118, 173.119	Red
*Propyl alcohol. See Alcohol, n. o. s.			
Propyl mercaptan.	F. L.	No exemption, 173.141	Red
Propyl trichlorosilane.	Cor.	No exemption, 173.280	Corrosive
Propane or Liquefied petroleum gas.			
See Liquefied petroleum gas.			
Prussic acid. See Hydrocyanic acid.			
*Pyridine.	F. L.	173.118, 173.119	Red
Pyroforic liquids, n. o. s.	F. L.	No exemption, 173.134	Red
Pyro sulfur chloride.	Cor.	173.244, 173.247	Corrosive
*Pyroxilin cement. See Cement, pyroxilin.			
Pyroxilin plastic scrap.	F. S.	No exemption, 173.186, 173.190	Yellow
Pyroxilin plastics, rods, sheets, rolls, tubes.	F. S.	173.197	Yellow
*Pyroxilin solution.	F. L.	173.118, 173.119	Red
*Pyroxilin solvent, n. o. s.	F. L.	173.118, 173.119	Red
Radio current supply device with electrolyte (acid) or battery fluid.	See § 173.259		
Radioactive devices.	H. A. M.	173.391 (b)	None
Radioactive materials, low specific activity (LSA).	H. A. M.	173.392, 173.393	Radioactive
Radioactive materials, n. o. s.	H. A. M.	173.393, 173.395	Radioactive
Radioactive materials, special form.	H. A. M.	173.393, 173.394	Radioactive
Radioactive materials, small quantities.	H. A. M.	173.391 (a)	None
Rags, oily.	F. S.	No exemption, 173.199	Yellow
Rags, wet.	F. S.	No exemption, 173.200	Yellow
Railway torpedoes.	Expl. B.	No exemption, 173.01	Special Fireworks
*Reducing compounds, paint, varnish, lacquer, etc. See *Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid.			
Refrigerant gas, n. o. s.	See §§ 173.214 (c) table Note 13, 173.315 (a) table Note 9		
Refrigerating machines.	See §§ 173.130, 173.306		
*Removing compounds, paint, varnish, lacquer, etc. See *Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid.			
*Resin solution (resin compound, liquid).	F. L.	173.118, 173.119	Red
Resinate of cobalt, precipitated. See Cobalt resinate, precipitated.			
Rifle grenades.	Expl. A.	No exemption, 173.06	Red
Rifle powder. See Propellant explosives, class A.			
Propellant explosives, class B, or Black powder.			
*Road asphalt or tar, liquid.	F. L.	173.118, 173.131	Red
Rocket bodies, with electric primers or electric squibs.	See § 173.66		
Rocket ammunition with empty projectiles.	Expl. B.	No exemption, 173.00	Red
Rocket ammunition with explosive projectiles.	Expl. A.	No exemption, 173.57	Red
Rocket ammunition with illuminating projectiles.	Expl. A.	No exemption, 173.57	Red
Rocket ammunition with gas projectiles.	Expl. A.	No exemption, 173.57	Red
Rocket ammunition with incendiary projectiles.	Expl. A.	No exemption, 173.57	Red
Rocket ammunition with inert-loaded projectiles.	Expl. B.	No exemption, 173.00	Red
Rocket ammunition with smoke projectiles.	Expl. A.	No exemption, 173.57	Red
Rocket ammunition with solid projectiles.	Expl. B.	No exemption, 173.00	Red
Rocket engines (liquid), class B explosives.	Expl. B.	No exemption, 173.03	Red
Rocket fireworks. See Common fireworks.			
Rocket heads. See Explosive projectiles.			
Rocket motors, class A explosives.	Expl. A.	No exemption, 173.79	Red
Rocket motors, class B explosives.	Expl. B.	No exemption, 173.03	Red
Roman candles. See Common fireworks.			
*Rough ammunition tankages.	F. S.	No exemption, 173.210	Yellow

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
*Rubber cement. See Cement, rubber.			
*Rubber scrap or rubber buffings.	F. B.	173.153, 173.201	Yellow
*Rubber, shoddy, regenerated rubber, or reclaimed rubber.	F. B.	173.153, 173.201	Yellow
*Rum, denatured.	F. L.	173.110, 173.119	Red
Safety fuse.	See § 173.100 (c)		
Safety squibs.	Expl. C.	No exemption, 173.108	
Saltpeter. See Potassium nitrate.			
Saltpeter, Chile. See Sodium nitrate.			
Salutes. See Common fireworks and Special fireworks.			
Samples of explosives.	See § 173.86		
Samples, New explosives.	See § 173.86		
Samples of explosives and explosive articles.	See § 173.86		
Scheele's green. See Copper arsenite.			
Self-lighting cigarettes.	See § 173.21 (d)		
Self-propelled vehicles.	See § 173.120, 173.257, 173.304		
Shaped charges, commercial. See High explosives.			
*Shellac. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Shellac, liquid.	F. L.	173.110, 173.128	Red
Shells, fireworks. See Common fireworks or Special fireworks.			
Ship distress signals. See Special fireworks.			
Signal flares.	Expl. C.	No exemption, 173.108	
Silicon chloride (tetrachloride).	Cor.	173.244, 173.247	Corrosive
Silicon tetrafluoride.	Nonf. G.	173.306, 173.302	Green
Silver cyanide.	See § 173.270		
Silver nitrate.	Oxy. M.	173.153, 173.182	Yellow
*Sludge acid.	Cor.	No exemption, 173.248	Corrosive
Small-arms ammunition.	Expl. C.	No exemption, 173.101	
Small-arms ammunition, tear gas cartridges.	Expl. C.	No exemption, 173.101	Tear gas
Small-arms primers.	Expl. C.	No exemption, 173.107	
Smoke candles.	Expl. C.	No exemption, 173.108	
Smoke generators. See Chemical ammunition, class B or C.			
Smoke grenades.	Expl. C.	No exemption, 173.108	
Smoke pots.	Expl. C.	No exemption, 173.108	
Smoke signals.	Expl. C.	No exemption, 173.108	
Smokeless powder for cannon or small arms. See Propellant explosives, class A, or propellant explosives, class B.			
Smokeless powder for small arms (100 pounds or less).	See § 173.85 (f), 173.107a		
Smoke projectiles with burning charges. See Explosive projectile.			
Smoke projectiles with expelling charge but without burning charge. See Special fireworks.			
Soda amato. See High explosives.			
Soda, caustic solution. See Caustic soda, liquid.			
Sodium aluminum hydride.	F. B.	No exemption, 173.208	Yellow
Sodium aluminate, liquid.	Cor.	173.244, 173.249	Corrosive
Sodium amide.	F. B.	No exemption, 173.208	Yellow
Sodium arsenate, solid.	Pols. B.	173.304, 173.385, 173.388	Poison
Sodium arsenite (solution), liquid.	Pols. B.	173.345, 173.348	Poison
Sodium azide.	Pols. B.	173.304, 173.275	Poison
Sodium bromate.	Oxy. M.	173.153, 173.154	Yellow
Sodium cacodylate, solid (sodium dimethyl arsenate).	Pols. B.	173.384, 173.385	Poison
Sodium chlorate (soda chlorate).	Oxy. M.	173.163, 173.163	Yellow
Sodium chlorite.	Oxy. M.	No exemption, 173.160	Yellow
Sodium chlorite solution (not exceeding 42 percent sodium chlorite).	Cor.	173.244, 173.263	Corrosive
Sodium cyanide. See Cyanide of sodium.			
Sodium dichloroisocyanurate, dry, containing more than 39% available chlorine.	Oxy. M.	173.163, 173.217	Yellow
Sodium hydride.	F. B.	No exemption, 173.199	Yellow
Sodium hydrosulfite.	F. B.	173.163, 173.204	Yellow
Sodium hydroxide solution. See Caustic soda, liquid.			
Sodium, metallic.	F. B.	No exemption, 173.208	Yellow
Sodium, metallic, dispersion in organic solvent.	F. B.	No exemption, 173.230	Yellow
Sodium, metallic liquid alloy.	F. B.	No exemption, 173.202	Yellow
Sodium methylate, dry.	F. B.	173.158, 173.154	Yellow
*Sodium methylate, alcohol mixture.	F. L.	173.110, 173.119	Red
Sodium nitrate.	Oxy. M.	173.153, 173.182	Yellow
Sodium nitrite.	Oxy. M.	173.153, 173.184, 173.234	Yellow

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Sodium nitrite mixed (fused) with potassium nitrate.	Oxy. M.	173.153, 173.183	Yellow
Sodium nitrite mixtures (sodium nitrate, sodium nitrite, and potassium nitrate).	Oxy. M.	173.153, 173.234	Yellow
Sodium permanganate.	Oxy. M.	173.153, 173.164	Yellow
Sodium peroxide.	Oxy. M.	No exemption, 173.187	Yellow
Sodium picramate wet with 20 percent of water.	F. B.	No exemption, 173.205	Yellow
Sodium potassium alloys.	F. B.	No exemption, 173.208	Yellow
*Sodium sulfide.	F. B.	173.153, 173.207	Yellow
Solvents, n. o. s.	F. L.	173.110, 173.119	Red
*Sparklers. See Common fireworks.			
Special fireworks.	Expl. B.	No exemption, 173.88(d), 173.91	Special Fireworks //
Spent iron mass. See Iron mass, spent.			
Spent iron sponge. See Iron sponge, spent.			
Spent mixed acid.	Cor.	No exemption, 173.248	Corrosive
Spent oxide.	F. B.	No exemption, 173.174	Corrosive
Spent sulfuric acid.	Cor.	No exemption, 173.248	Corrosive
Spirits of nitroglycerin.	F. L.	No exemption, 173.133	Red
Spirits of nitroglycerin not exceeding 1 percent nitroglycerin by weight.			
Spotting powder. See Black powder or Propellant explosives, class B explosives.			
Spray starting fluid. See Engine starting fluid.			
Spreader cartridges. See Special fireworks.			
Squibs, electric or safety. See Electric squibs or Safety squibs.			
*Stain. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Starter cartridges, jet engine, class B explosives.	Expl. B.	No exemption, 173.92	Red //
Starter cartridges, jet engine, class C explosives.	Expl. C.	No exemption, 173.102	
Storage batteries, wet. See Batteries, electric storage, wet.			
Stores, ship or aircraft.	See § 171.9		
*Stove polish. See *Polishes, metal, stove, furniture and wood, liquid.			
Strike-anywhere matches. See Matches, strike-anywhere.			
Strike-on-box matches. See Matches, strike-on-box.			
Strontium arsenite, solid.	Pols. B.	173.304, 173.368	Poison
Strontium chlorate.	Oxy. M.	173.153, 173.163	Yellow
Strontium chlorate, wet.	Oxy. M.	173.153, 173.163 (a) (6)	Yellow
Strontium nitrate.	Oxy. M.	173.153, 173.182	Yellow
Strontium peroxide.	Oxy. M.	173.153 (a), 173.154	Yellow
Styrene and salts thereof, solid.	Pols. B.	173.304, 173.365	Poison
Sulfonate of lead. See Initiating explosive.			
Sulfuric acid peroxide.	Oxy. M.	173.153 (b), 173.157, 173.158	Yellow
Sulfide of sodium. See Sodium sulfide.			
Sulfide of potassium. See Potassium sulfide.			
Sulfur chloride (mono and di).	Cor.	No exemption, 173.247	Corrosive
*Sulfur dioxide.	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Sulfur hexafluoride.	Nonf. G.	173.306, 173.304	Green
Sulfur trioxide, stabilized.	Cor.	173.244, 173.272	Corrosive
Sulfuric acid (oil of nitric).	Cor.	173.244, 173.272	Corrosive
Sulfuric acid, fuming (oleum) (Nordhausen). See Sulfuric acid.			
Sulfuric acid.	Cor.	173.244, 173.247	Corrosive
Sulfuryl chloride.	Nonf. G.	173.306, 173.304, 173.314	Green
Sulfuryl fluoride.	Expl. A.	No exemption, 173.60	
Supplementary charges (explosive).			
Tankage. See Garbage tankage.			
*Tankage fertilizers.	F. B.	No exemption, 173.209	Yellow
*Tankages, rough ammoniate.	F. B.	No exemption, 173.210	Yellow
Tank car, containing residual phosphorus and filled with water or inert gas.	See § 173.233		
Tank cars, empty (last contents poisons, class A).	See § 174.562 (d) and (e)		
Tank cars, gas (must not contain gases that combine chemically).	See § 173.301 (a)		
Tank truck, empty.	See § 173.29		
Tanks, empty.	See § 173.29		
*Tar, liquid.	F. L.	173.110, 173.131	Red
Tear gas candles.	Pols. C.	No exemption, 173.385	Tear Gas
Tear gas cartridges. See Small-arms ammunition.			
Tear gas cartridges.	Pols. C.	No exemption, 173.385	Tear Gas
Tear gas grenades.	Pols. C.	No exemption, 173.382	Tear Gas
Tear gas material, liquid or solid, n. o. s.			

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Tertiary alcohol. See Alcohol, n. o. s.			
Tertiary butylisopropyl benzene hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Tetraethyl dithio pyrophosphate and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Tetraethyl dithio pyrophosphate, liquid	Pois. B.	No exemption, 173.358	Poison
Tetraethyl dithio pyrophosphate mixture, dry	Pois. B.	173.377	Poison
Tetraethyl dithio pyrophosphate mixture, liquid	Pois. B.	173.359	Poison
Tetraethyl lead, liquid	Pois. B.	No exemption, 173.354	Poison
Tetraethyl pyrophosphate and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Tetraethyl pyrophosphate, liquid	Pois. B.	No exemption, 173.358	Poison
Tetraethyl pyrophosphate mixture, dry	Pois. B.	173.377	Poison
Tetraethyl pyrophosphate mixture, liquid	Pois. B.	173.359	Poison
Tetrafluoroethylene, inhibited	F. G.	173.306, 173.314	Red Gas
Tetranitromethane	Oxy. M.	No exemption, 173.203	Yellow
Tetrazene (guanyl nitrosamino guanyl tetrazene). See Initiating explosive.			
Tetryl. See High explosives.			
Textile waste, wet	F. S.	No exemption, 173.211	Yellow
Thallium salts, solid	Pois. D.	173.364, 173.365	Poison
Thallium sulfate, solid	Pois. D.	173.364, 173.365	Poison
Thinning compounds, paint, varnish, lacquer, etc. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Thiocarbonyl-chloride. See Thiophosgene.			
Thionyl chloride	Cor.	No exemption, 173.247	Corrosive
Thiophosgene (Thiocarbonyl-chloride)	Pois. B.	No exemption, 173.356	Poison
Thiophosphoryl chloride	Cor.	No exemption, 173.271	Corrosive
Thorium metal, powdered	F. S.	173.226	Yellow
Thorium nitrate, solid	R.A.M.Oxy.M.	173.392	Radioactive and yellow
Time fuses	Expl. C.	No exemption, 173.105	
Tin tetrachloride, anhydrous	Cor.	173.244, 173.247	Corrosive
Titanium metal powder, dry	F. S.	No exemption, 173.208	Yellow
Titanium metal powder, wet, with not less than 20 percent water	F. S.	No exemption, 173.208	Yellow
Titanium sulfate solution containing not more than 45 percent sulfuric acid	Cor.	173.244, 173.267	Corrosive
Titanium tetrachloride	Cor.	173.244, 173.247	Corrosive
Toluol (Toluene)	F. L.	173.118, 173.119	Red
Torches. See Common fireworks.			
Torpedoes, cap. See Special fireworks.			
Torpedoes, empty	See § 173.55.		
Torpedoes, explosives. See Explosive torpedoes.			
Torpedoes, railway or track. See Railway torpedoes.			
Toy propellant devices	Expl. C.	No exemption, 173.111	
Toy smoke devices	Expl. C.	No exemption, 173.111	
Toy torpedoes. See Special fireworks.			
Toy caps	Expl. C.	No exemption, 173.100 (p), 173.109	
Tracers	Expl. C.	No exemption, 173.105	
Tracer fuses	Expl. C.	No exemption, 173.105	
Tractors	See § 173.120		
Trailer or truck body with refrigerating or heating equipment on flat cars	See §§ 173.120 (c), 173.306		
Trichloroacetic acid, dry, containing more than 30% available chlorine	Oxy. M.	173.153, 173.217	Yellow
Trichlorosilane	F. L.	No exemption, 173.130	Red
Trick matches	Expl. C.	No exemption, 173.111	
Trick noise makers, explosive	Expl. C.	No exemption, 173.111	
Trifluorochloroethylene	F. G.	173.306, 173.304, 173.314	Red Gas
Trimethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Trimethylamine, aqueous solution	F. L.	173.118, 173.119	Red
Trimethylchlorosilane	F. L.	No exemption, 173.135	Red
Trinitrobenzene. See High explosives.			
Trinitrobenzene, wet (not to exceed 16 ounces)	F. S.	173.212	
Trinitrobenzene acid, dry. See High explosives.			
Trinitrobenzoic acid, wet, not exceeding 16 ounces	See § 173.192		
Trinitrobenzole acid, wet with not less than 10 percent water, in excess of 16 ounces but not exceeding 25 pounds	F. S.	No exemption 173.103	Yellow
Trinitrobenzoic acid, wet, with not less than 10 percent water, over 25 pounds. See High explosives			
Trinitroresorcinol. See High explosives.			
Trinitrotoluene. See High explosives			

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Trinitrotoluene, wet (not to exceed 16 ounces)	F. S.	173.212	
Tris-(1-aziridinyl) phosphine oxide	Cor.	173.244, 173.260 (a)	Corrosive
*Turpentine substitutes	F. L.	173.118, 173.119	Red
Uranyl nitrate, solid	R.A.M.Oxy.M.	173.392, 173.396	Radioactive and yellow
Urea nitrate wet with not less than 10 percent of water, over 25 pounds. See High explosives.			
Urea nitrate wet with not less than 10 percent of water, in excess of 16 ounces but not exceeding 25 pounds	F. S.	No exemption, 173.193	Yellow
Urea nitrate, dry. See High explosives.			
Urea nitrate, wet with not less than 10 percent of water, not exceeding 16 ounces	See § 173.192		
*Urea peroxide	Oxy. M.	173.153 (b), 173.227	Yellow
Vanadium oxytrichloride	Cor.	173.244, 173.247a	Corrosive
Vanadium tetrachloride	Cor.	173.244, 173.247a	Corrosive
*Varnish. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Varnish driers. See *Paint driers, liquid.			
*Varnish remover or reducer. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
*Varnish thinning compounds. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
Very signal cartridges	Expl. C.	No exemption, 173.106	
Vinyl acetate	F. L.	173.118, 173.119	Red
Vinyl chloride	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Vinylidene chloride, inhibited	F. L.	173.118, 173.119	Red
Vinyl fluoride inhibited	F. G.	173.306, 173.304	Red Gas
Vinyl methyl ether, inhibited	F. G.	173.306, 173.304, 173.314	Red Gas
Vinyl trichloroacetate	F. L.	No exemption, 173.135	Red
War heads. See Explosive projectiles.			
Waste paper, wet	F. S.	No exemption, 173.186	Yellow
Waste textile, wet	F. S.	No exemption, 173.211	Yellow
Waste wool, wet	F. S.	No exemption, 173.213	Yellow
*Water treatment compound, liquid. See *Compounds, tree or weed killing, liquid.			
Wet hair. See Hair wet.			
Wet nitrocellulose, colloided, granular or flake—20 percent alcohol or solvent; or block—25 percent alcohol	F. L.	173.118, 173.127	Red
Wet nitrocellulose, colloided, granular or flake—20 percent water	F. S.	173.153, 173.184	Yellow
Wet nitrocellulose—20 percent alcohol or solvent	F. L.	173.118, 173.127	Yellow
Wet nitrocellulose—20 percent water	F. S.	173.153, 173.184	Yellow
Wet nitrocellulose flakes—20 percent alcohol or solvent	F. L.	173.118, 173.127	Red
Wet nitroguanidine—20 percent water	F. S.	173.153, 173.184	Yellow
Wet nitrostarch—20 percent water	F. S.	173.153, 173.184	Yellow
Wet nitrostarch—30 percent alcohol or solvent	F. L.	173.118, 173.127	Red
Wet paper stock. See Paper stock, wet.			
Wet rags. See Rags, wet.			
Wet textile waste. See Waste textile, wet.			
Wet waste paper. See Waste paper, wet.			
Wet waste wool. See Waste wool, wet.			
Wood alcohol (methanol, methyl alcohol)	F. L.	173.118, 173.125	Red
*Wood filler. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Wood polish. See *Polishes, metal, stove, furniture and wood, liquid.			
*Wood stain, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Wool waste, wet. See Waste wool, wet.			
X-ray film (nitrocellulose base)	F. S.	No exemption, 173.177	Yellow
X-ray film (slow-burning)	See § 173.181 (a) (1)		
X-ray film scrap (nitrocellulose base), samples of	F. S.	No exemption, 173.196	Yellow
X-ray film scrap (nitrocellulose base), other than samples	F. S.	No exemption, 173.195	Yellow

LIST OF HAZARDOUS MATERIALS--Concluded

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
X-ray film scrap (slow-burning).....	See § 173.181 (a) (2)		
X-ray film, unexposed (nitrocellulose base).....	F. S.	173.180	Yellow #1
Xylol (Xylene).....	F. L.	173.118, 173.119	Red
Xylol bromide.....	Pois. C.	No exemption, 173.382	Tear Gas
Zinc ammonium nitrite.....	Oxy. M.	No exemption, 173.228	Yellow
Zinc arsenate.....	Pois. B.	173.364, 173.365	Poison
Zinc arsenite, solid.....	Pois. B.	173.364, 173.365	Poison
Zinc chlorate.....	Oxy. M.	173.153, 173.163	Yellow
Zinc cyanide.....	See § 173.370		
Zinc dthyl. See Pyrophoric liquids, n. o. s.			
Zinc nitrate. See Nitrates, n. o. s.			
Zinc permanganate.....	Oxy. M.	173.153, 173.164	Yellow
Zinc peroxide.....	Oxy. M.	173.153, 173.164	Yellow
Zirconium metal, dry, mechanically produced, finer than 870 mesh particle size.....	F. S.	No exemption, 173.214	Yellow
Zirconium metal, dry, chemically produced, finer than 80 mesh particle size.....	F. S.	No exemption, 173.214	Yellow
Zirconium metal, wet, mechanically produced, finer than 870 mesh particle size.....	F. S.	No exemption, 173.214	Yellow
Zirconium metal, wet, chemically produced, finer than 80 mesh particle size.....	F. S.	No exemption, 173.214	Yellow
Zirconium, metallic, solutions or mixtures thereof, liquid.....	F. L.	No exemption, 173.140	Red
Zirconium picramate, wet with 80 percent of water.....	Oxy. M.	No exemption, 173.216	Yellow
Zirconium scrap (borings, clippings, shavings, sheets, or turnings).....	F. S.	173.153, 173.220	Yellow

APPENDIX "B"

LOADING CHART

for

HAZARDOUS SUBSTANCES

LOADING CHART OF HAZARDOUS SUBSTANCES

The following table shows the explosives and other dangerous articles which must not be loaded or stored together.

The "X" intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuses, class A, with or without radioactive components & horizontal column must not be loaded or stored with high explosives, or propellant explosives, class A, & vertical column.

[illegible]

The following table shows the explosives and other dangerous articles which must not be loaded or stored together. The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuses, class A, with or without radioactive components; horizontal column must not be loaded or stored with high explosives, or propellant explosives, class A, a vertical column.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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	a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLASS C EXPLOSIVES																						
Small arms ammunition	4			X																		
Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, com- bination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	5			X																		
Percussion fuses, tracer fuses or tracers	6			X																		
Time, combination or detoning fuses, class C . .	7			X																		
Cordeau detonant fuse, safety quibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs, instantaneous fuse or igniter cord . . .	8			X																		
Fireworks, common, highway fuses or railway fuses	9	X	X	X	AX	X	X														X	
HAZARDOUS MATERIALS																						
Flammable liquids or compressed flammable gases, red label	10	X	X	X	AX	X	X														X	
Flammable solids or oxidizing materials, yellow label	11	X	X	X	AX	X	X														X	
Acids or corrosive liquids, white label	12	X	X	X	AX	X	X	AX	AX												X	
Compressed nonflammable gases, green label . .	13	X	X	X	AX	X	X														X	
Poisonous gases or liquids in tank car tanks, cylinders, projectiles or bombs, poison gas labels	14	X	X	X	X	X	X	X	X	X	X						X	X	X	X		
Radioactive materials	15	FX	FX	FX	FX	FX	FX															

A-Blasting caps or electric blasting caps in quantities not exceeding 1,000 caps may also be loaded and transported with articles named in vertical and horizontal columns 3, 9, 10, 11, 12 and 13. Loading and transportation of blasting caps or electric blasting caps, except as provided in 17.833, in any quantity with articles named in vertical or horizontal columns b, c, e or f is prohibited.

B-Acid or other corrosive liquids, white label, must not be loaded above or adjacent to flammable solids or oxidizing materials, yellow label. Ammunitions for cannon with or without projectiles, or propellant explosives, except that shippers loading truckload shipments of white label and yellow label packages and who have obtained prior approval from the Bureau of Explosives may load such articles together when it is known that the mixture of contents would not cause a dangerous evolution of heat or gas.

C-Explosives, class A and explosives, class B must not be loaded or stored with chemical ammunition containing incendiary charges or white phosphorous either with or without bursting charges.

D-Bursting (explosive), boosters (explosive), or supplementary charges (explosive) without detonators when shipped by, is or for the Departments of the Army, Navy, and Air Force of the United States Government, may be loaded with any of the articles named, except those in columns e, d, 3, 9, 10, 11, 12, 13, 14 and 15.

E-Does not include nitro carbo nitrate or ammonium nitrate, fertilizer grade, which may be loaded, transported or stored with high explosives or with blasting caps or electric blasting caps, and detoning primers.

F-Normal uranium, depleted uranium, and thorium metal in solid form may also be loaded and transported with articles named in vertical and horizontal columns a, b, c, d, e, f, and g.

Note 1-Charged electric storage batteries must not be loaded in the same vehicle with explosives, class A.

Note 2-Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

Note 3-One identification sets may be loaded and transported with all articles named except those in column a.

Note 4-Nitric acid, when loaded in the same motor vehicle with other acids or other corrosive liquids in carboys, must be separated from the other carboys. A 2 by 6 inch plank, set on edge, should be nailed across the motor vehicle floor at least 12 inches from the nitric acid carboys, and the space between the plank and the carboys of nitric acid should be filled with sand, siliceous ash, or other uncompressible absorbent material.

Note 5-Sensitized powder for small arms in quantities not exceeding 100 pounds net weight in one motor vehicle shall be stowed as a flammable solid for purposes of transportation.

HIGHWAY TRANSPORTATION OF HAZARDOUS SUBSTANCES

EXAMINING PHYSICIAN

TO DETERMINE PHYSICAL FITNESS OF

DRIVERS ENGAGED IN THE

and

PRESCRIBED FORMS FOR RECORDING FINDINGS

The above forms may be obtained from the Hazardous Substances Transportation Board, 1004 Transportation and Safety Building, Harrisburg, Pa. 17120.

APPENDIX "C"

INSTRUCTIONS

for

APPENDIX "D"

QUESTIONS AND ANSWERS

for

WRITTEN EXAMINATIONS

Copies of Questions and Answers for written examinations may be obtained from the Hazardous Substances Transportation Board, 1001 Transportation and Safety Building, Harrisburg, Pa. 17120.

SPECIFIC REGULATIONS

Governing the Highway Transportation

of

Radioactive Materials

HAZARDOUS SUBSTANCES TRANSPORTATION BOARD

Harrisburg, Pennsylvania

Telephone: Area Code (717) 787-7443
For Radiation Emergency Assistance—(717) 787-2180
Off Duty—(717) 787-4343

Issued: September 14, 1972

Effective: December 1, 1972

Chapter 15

Regulation 1

PENNSYLVANIA HAZARDOUS SUBSTANCES

TRANSPORTATION BOARD

Specific Regulations

Promulgated Under Authority of Act #323
Approved 11/9/65, as Amended

GOVERNING THE HIGHWAY TRANSPORTATION

OF

RADIOACTIVE MATERIALS

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SPECIFIC REGULATIONS

for

RADIOACTIVE MATERIALS

I. GENERAL INFORMATION

A. Scope

1. The regulations contained herein apply to the intrastate transportation of radioactive materials on the highways and toll roads of the Commonwealth of Pennsylvania. Such intrastate transportation of radioactive materials shall be either in full compliance with the U.S. Department of Transportation Regulations or with the regulations contained herein.

2. These regulations are in addition to the General Regulations of the Hazardous Substances Transportation Board found in Chapter 11.

3. Interstate shipments of radioactive materials, while being transported on the highways and toll roads of the Commonwealth, are governed by the Safety Regulations of the Department of Transportation (DOT) found in the Code of Federal Regulations, Title 49, Parts 170 through 179 and Parts 290 through 297, Motor Carrier Safety Regulations.

4. The Hazardous Substances Transportation Board shall grant exceptions from the requirements of these regulations, provided a request for such exception has been made in accordance with provisions of Sections III B-2 or IV B-6, and it can be established that such exception may be granted without undue hazard to the health and safety of the public.

B. General Exemptions

The following are exempt from these regulations:

1. The highway transportation of radioactive materials under the jurisdiction of and in conformity with the requirements of the U.S. Department of Defense and/or the U.S. Atomic Energy Commission.

2. The transportation of Radioactive Materials in the normal

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GENERAL INFORMATION

and emergency operations of federal agencies such as the Armed Forces, the Federal Bureau of Investigation, the Secret Service; the transportation by fire and police departments, providing they are acting in proper performance of their duties; the transportation by an agency of the Commonwealth when existing emergency conditions make it necessary.

II. DEFINITIONS

1. Radioactive Material—Any substance or material, or combination of materials, which spontaneously emits ionizing radiation. Materials in which the estimated specific activity is not greater than 0.002 microcuries per gram of material and in which the radioactivity is essentially uniformly distributed are not considered to be radioactive materials.

2. Low Specific Activity Radioactive Material—

(a) Uranium or thorium ores and physical or chemical concentrates of these ores;

(b) Unirradiated natural or depleted uranium or unirradiated natural thorium;

(c) Tritium oxide in aqueous solutions provided the concentration does not exceed 5 millicuries per milliliter;

(d) Material in which the activity is uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

(1) 0.0001 millicuries of Group I (See Transport Group) radionuclides; or

(2) 0.005 millicuries of Group II radionuclides; or

(3) 0.3 millicuries of Groups III or IV radionuclides.

Note: This includes, but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper and cardboard; solid or liquid plant waste; sludges and ashes.

(e) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material, is not readily dispersible and the surface contamination

DEFINITIONS

when averaged over an area of one square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,220,000 disintegrations per minute) per square centimeter of other radionuclides.

3. Small Quantities of Radioactive Materials—Radioactive materials in normal form, not exceeding 0.01 millicurie of Group I radionuclides, 0.1 millicurie of Group II radionuclides, 1 millicurie of Group III, IV, V, or VI radionuclides, 25 curies of Group VII radionuclides; tritium oxide in aqueous solution with a concentration not exceeding 0.5 millicuries per milliliter and with a total activity per package of not more than 3 curies; or 1 millicurie of radioactive material in special form containing not more than 15 grams of uranium-235.

4. Large Quantity of Radioactive Materials—A quantity of radioactive materials, the aggregate activity of which exceeds that specified as follows:

(a) Groups I or II radionuclides: 20 curies.

(b) Groups III or IV radionuclides: 200 curies.

(c) Group V radionuclides: 5,000 curies.

(d) Group VI or VII radionuclides: 50,000 curies.

(e) Special form material: 5,000 curies.

5. Type "A" Quantity and Type "B" Quantity Radioactive Materials—A quantity the aggregate radioactivity of which does not exceed that specified as follows:

Transport group (see definition #10)	Type A quantity (in curies)	Type B quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VII	1,000	50,000
Special form	20	5,000

DEFINITIONS

6. **Radioactive Devices**—Manufactured articles such as instruments, clocks, electronic tubes or apparatus, or other similar devices, having radioactive materials (other than liquids) in a non-dispersible form as a component part.

7. **Fissile Radioactive Material**—Radioactive material which has the additional property that it affords a possibility of a self-sustaining nuclear fission reaction. Fissile material includes plutonium-238, plutonium-239, plutonium-241, uranium-233, and uranium-235 as elements, compounds or mixtures. (See note #3). Packages of fissile material are classified according to the controls needed to provide nuclear criticality safety during transportation as follows:

(a) **Fissile Class I**.—Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(b) **Fissile Class II**.—Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(c) **Fissile Class III**.—Shipments of packages which do not meet the requirements of Fissile Class I or II and which are controlled to provide nuclear criticality safety in transportation by special arrangements between the shipper and the carrier.

Note 1: Uranium-235 exists only in combination with various percentages of uranium-234 and uranium-238. "Fissile radioactive material" as applied to uranium-235 refers to the amount of uranium-235 actually contained in the total quantity of uranium being transported.

Note 2: Radioactive material may consist of mixtures of fissile and nonfissile radionuclides. "Fissile radioactive material" refers to the amount of plutonium-238,

DEFINITIONS

plutonium-239, plutonium-241, uranium-233, or uranium-235 or any combination thereof actually contained in the mixture. The "radioactivity" of the mixture consists of the total activity of both the fissile and non-fissile radionuclides. All mixtures containing "fissile material" shall be subject to Appendix 15-A-X.

Note 3: The following materials are not classified as fissile radioactive materials:

- (1) Not more than 15 grams of fissile material;
- (2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material;
- (3) Uranium compounds other than metal (e.g., UF_4 , UF_6 , or uranium oxide in bulk form, not pelleted or fabricated into shapes), and aqueous solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0 percent by weight of the uranium-235 content, and the total fissile content does not exceed 1 percent by weight of the total uranium content;
- (4) Homogenous hydrogenous solutions or mixtures containing not more than:
 - (i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or
 - (ii) 800 grams of uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1.0 (one) percent by weight of the total uranium-235 content; or
 - (iii) 500 grams of uranium-233 and uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium

DEFINITIONS

is not more than 1.0 (one) percent by weight of the total uranium-233 and uranium-235 content.

- (5) A package containing less than 350 grams of fissile material, if there is not more than 5 grams of fissile material in any cubic foot within the package.

8. Special Form Radioactive Materials—Those radioactive materials which, if released from a package, might present some direct radiation hazard but would present little hazard due to radiotoxicity and little possibility of contamination. This may be the result of inherent properties of the material (such as metals or alloys), or acquired characteristics, as through encapsulation. The criteria for determining whether a material meets the definition of special form are prescribed in Appendix 15-C.

9. Normal Form Radioactive Materials—Radioactive materials which are not special form radioactive materials. Normal form radioactive materials are grouped into Transport Groups. (See Section III-G herein).

10. Transport Group—Any one of seven groups into which normal form radionuclides are classified according to their radiotoxicity and potential hazard in transportation, and as listed in Section III-G herein.

11. Transport Index—The number placed on a package to designate the degree of control to be exercised by the carrier during transportation. The transport index to be assigned to a package of radioactive materials shall be determined by either subparagraph (a) or (b) of this paragraph, whichever is larger. The number expressing the transport index shall be rounded up to the next highest tenth; e. g., 1.01 becomes 1.1.

(a) The highest radiation dose rate, in millirem per hour at 3 feet from any accessible external surface of the package; or

(b) For Fissile Class II packages only, the transport index number calculated by dividing the number fifty (50) by the number of similar packages which may be transported together, as determined by the procedures prescribed in the regulations of the

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DEFINITIONS

11. U. S. Atomic Energy Commission, Title 10, Code of Federal Regulations, Part 71.

12. Specific Permit—A written authorization by the Hazardous Substances Transportation Board which allows shipments not otherwise provided for in these regulations.

13. Package—The packaging plus its content of hazardous substances, as presented for transportation.

14. Packaging—The assembly of the containers and any other components necessary to assure compliance with the prescribed packaging requirements.

15. Specification Container—Any packaging approved for use in the transportation of hazardous substances and described in Part 178 of the regulations of the U. S. Department of Transportation.

16. Approved Container—Any packaging not a specification container, but otherwise specifically approved for use in the transportation of specified hazardous substances by the Hazardous Substances Transportation Board, as provided for in Chapter 11, Section III-A, General Regulations.

17. Type "A" Packaging—Packaging which is designed in accordance with the general packaging requirements of Appendix 15-A-I and 15-A-II, and which is adequate to prevent the loss or dispersal of the radioactive contents and to retain the efficiency of its radiation shielding properties if the package is subject to the tests prescribed in Appendix 15-A-V.

18. Type "B" Packaging—Packaging which meets the standards for Type A packaging, and, in addition, meets the standards for hypothetical accident conditions of transportation as prescribed in Appendix 15-A-VI.

19. Removable Radioactive Contamination—Radioactive contamination which can be readily removed in measurable quantities by wiping the contaminated surface with an absorbent material. The measurable quantities as measured on the wiping material shall be

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considered as being not significant if they do not exceed:

- (a) 10^{-11} curie per square centimeter beta-gamma (2,200 disintegrations/min. per 100 square centimeters) and 10^{-12} curie per square centimeter alpha (220 disintegrations/min. per 100 square centimeters) for all contaminants except natural or depleted uranium and natural thorium; or
- (b) 10^{-10} curie per square centimeter beta-gamma (22,000 disintegrations/min. per 100 square centimeters) and 10^{-11} curie per square centimeter alpha (2,200 disintegrations/min. per 100 square centimeters) where the only contaminant is known to be natural or depleted uranium or natural thorium.

20. Transport Vehicle—The conveyance used for the transportation of hazardous substances. Each cargo-carrying body is a separate vehicle.

21. C. F. R.—U. S. Code of Federal Regulations.

22. A. E. C.—Atomic Energy Commission.

23. D. O. T.—U. S. Department of Transportation.

III. SHIPPER RULES AND REGULATIONS

A. General Requirements for Packages

1. All radioactive materials offered for transport shall be packaged to comply with the requirements of Appendix 15-A unless otherwise authorized by the Hazardous Substances Transportation Board.

2. Radioactive materials in special form must also be packaged in accordance with Appendix 15-A-VIII or in an approved container.

3. Radioactive materials in normal form must also be packaged in accordance with Appendix 15-A-IX, or in an approved container. Radioactive materials in normal form also qualifying as a small quantity of radioactive material (Section II-3) or as a manufactured device

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(Section II-6) may be packaged in accordance with requirements of Appendix 15-A-III or IV. (See also Section III-D-Exemptions).

4. Fissile material must also be packaged in accordance with Appendix 15-A-X or in an approved container.

5. Low specific activity materials must also be packaged in accordance with Appendix 15-A-VII.

6. Containers previously used for shipments of radioactive materials may be shipped as EMPTY when securely closed and when free of significant removable contamination (Section II-19) and the radiation dose rate at the external surface of the package does not exceed 0.5 millirem per hour.

7. The exterior surface of containers used to transport radioactive materials shall be cleaned or free of significant contamination. Packages of small quantity radioactive materials and manufactured devices must exhibit no detectable radioactive surface contamination.

B. Acceptable Packages

1. Any package authorized by the U. S. D. O. T. as an approved specification container for the transported commodity.

2. Any package or shipment approved under an existing A. E. C. license authorizing its use for the commodity.

3. Any package or shipment authorized for transport of the commodity by a permit issued by the U. S. D. O. T. or Bureau of Explosives.

4. Any approved package or shipment authorized for transport of the commodity by the International Atomic Energy Agency.

5. Any package or shipment authorized by a specific permit issued by the Hazardous Substances Transportation Board to others for transport of the commodity.

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6. Any package otherwise approved by the Hazardous Substances Transportation Board.

Note: Prior to use of any container other than those of Section B-1 above, a copy of the license, permit, certificate or other authorizing document shall be submitted to the Hazardous Substances Transportation Board.

C. Outage

(Not applicable for Radioactive Materials)

D. Shipper Exemptions

1. Small quantities of radioactive materials are exempt from other packaging, marking and labeling requirements when in compliance with Appendix 15-A-III.

2. Radioactive devices are exempt from packaging, marking, labeling requirements when in compliance with Appendix 15-A-IV.

E. Radioactive Materials Not Specifically Provided For

(Purposely Left Blank)

F. Marking and Labeling

1. Packages of radioactive materials shall be labeled as provided in Appendix 15-B.

2. Labels

(a) Labels for packages of radioactive materials must be of diamond shape, in colors specified in this section, with each side at least four (4) inches long. Printing must be in black inside a black line border measuring at least 3¼ inches on each side and as shown in this section.

(b) "Radioactive White-I" label for radioactive materials. Label must be white in color. The single vertical bar on the

SHIPPER RULES AND REGULATIONS

lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

(c) "Radioactive Yellow-II" label for radioactive materials. The upper half of the label must be bright yellow and the bottom half must be white. The two vertical bars on the lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

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(d) "Radioactive Yellow-III" label for radioactive materials. The upper half of the label must be bright yellow and the bottom half must be white. The three vertical bars on the lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

(e) "Empty Container" label for radioactive materials must be not less than 6 inches on each side, white in color, and printed in letters not less than one (1) inch high in black ink as shown in this section.

(Reduced size)

SHIPPER RULES AND REGULATIONS

3. Labeling as prescribed in Appendix 15-B is required on all packages containing radioactive materials except for Department of Defense shipments exempted by Appendix 15-B-II.

4. Packages containing other hazardous substances in addition to radioactive materials must be labeled as prescribed by Chapters 12, 13, and 14 in addition to the requirements of Appendix 15-B.

Note 1: (Example) Packages containing the solid nitrates of uranium or thorium must bear both a "radioactive" label and a "yellow" oxidizing materials label.

Note 2: (Example) Packages containing nitric acid solutions of radioactive materials must bear both a "radioactive" label and a "white" corrosive acid label.

5. Labels which conform to the model prescribed in the regulations of the International Atomic Energy Agency, and which are similar in appearance to the labels prescribed herein (although the inscriptions on the labels may be in a foreign language) are authorized in place of the labels prescribed herein for import or export shipments only.

G. Transport Groups of Radionuclides

1. List of Radionuclides:

ELEMENT 1	RADIONUCLIDE 2	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
ACTINIUM (89)	AC-227							
	AC-228							
AMERICIUM (95)	AM-241							
	AM-243							
ANTIMONY (51)	SB-122							
	SB-124							
	SB-126							
ARGON (18)	AR-37							
	AR-41							
	AR-41 (UNCOMPRESSED) 2							
ARSENIC (33)	AS-73							
	AS-74							
	AS-76							
	AS-77							
ASTATINE (85)	AT-211							
BARIUM (56)	BA-131							
	BA-133							
	BA-140							
BERKELIUM (97)	BK-249							
BERYLLIUM (4)	BE-7							

See footnotes at end of table

SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
BISMUTH (83)	Bi-206							
	Bi-207							
	Bi-210							
	Bi-212							
BROMINE (35)	BR-82							
CADMIUM (48)	CD-109							
	CD-113M							
	CD-115							
CALCIUM (20)	CA-48							
	CA-47							
CALIFORNIUM (98)	CF-249							
	CF-250							
	CF-252							
CARBON (6)	C-14							
CERIUM (58)	CE-141							
	CE-143							
	CE-144							
CESIUM (55)	CS-131							
	CS-134M							
	CS-134							
	CS-135							
	CS-136							
CHLORINE (17)	CL-36							
	CL-38							
CHROMIUM (24)	CR-51							
COBALT (27)	CO-58							
	CO-57							
	CO-58M							
	CO-59							
	CO-60							
COPPER (29)	CU-64							
CURIUM (96)	CM-242							
	CM-243							
	CM-244							
	CM-246							
	CM-248							
DI SPORIUM (66)	DY-154							
	DY-155							
	DY-166							
ERBIUM (68)	ER-169							
	ER-171							
EUROPIUM (63)	EU-150							
	EU-152M							
	EU-152							
	EU-154							
	EU-155							
FLUORINE (9)	F-18							
GADOLINIUM (64)	GD-153							
	GD-159							
GALLIUM (31)	GA-67							
	GA-72							
GERMANIUM (32)	GE-71							
GOLD (79)	AU-193							
	AU-194							
	AU-195							
	AU-196							
	AU-198							
	AU-199							
HAFNIUM (72)	HF-181							
HOLMIUM (67)	HO-166							
HYDROGEN (1)	H-3 (SEE TRITIUM)							
INDIUM (49)	IN-113M							
	IN-114M							
	IN-115M							
	IN-115							

See footnotes at end of table

SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
IODINE (53)	I-124							
	I-125							
	I-126							
	I-129							
	I-131							
	I-132							
	I-133							
	I-134							
	I-135							
	I-136							
IRIDIUM (77)	IR-190							
	IR-192							
	IR-194							
IRON (26)	FE-55							
KRYPTON (36)	FE-59							
	KR-83M							
	KR-83M (UNCOMPRESSED) ²							
	KR-85							
	KR-86 (UNCOMPRESSED) ²							
LANTHANUM (57)	KR-87							
	KR-87 (UNCOMPRESSED) ²							
LEAD (82)	LA-140							
	PB-203							
	PB-210							
LUTECIUM (71)	PB-212							
	LU-172							
MAGNESIUM (12)	LU-177							
MANGANESE (25)	MG-28							
	MN-52							
	MN-54							
MERCURY (80)	MN-56							
	HG-197M							
	HG-197							
MIXED FISSION PRODUCTS	HG-203							
	MT-P							
MOLYBDENUM (42)	MO-99							
NEODYMIUM (60)	ND-147							
	ND-148							
NEPTUNIUM (93)	NP-237							
	NP-239							
NICKEL (28)	NI-56							
	NI-59							
	NI-63							
NIOBIUM (41)	NI-65							
	NB-93M							
	NB-95							
OSMIUM (76)	NB-97							
	OS-185							
	OS-191M							
	OS-191							
	OS-193							
PALLADIUM (46)	PD-103							
	PD-109							
PHOSPHORUS (15)	P-32							
	PT-191							
PLATINUM (78)	PT-193							
	PT-193M							
	PT-197M							
	PT-197							
PLUTONIUM (94)	PU-238 ⁴							
	PU-239 ⁴							
	PU-240							
	PU-241 ⁴							
	PU-242							
POLONIUM (84)	PO-210							
POTASSIUM (19)	K-42							
	K-43							

See footnotes at end of table

SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
PRASEODYMIUM (89)	PR-142				X			
	PR-143				X			
PROMETHIUM (61)	PM-147				X			
	PM-149				X			
PROTACTINIUM (91)	PA-230		X					
	PA-231		X					
	PA-233		X					
RADIUM (88)	RA-223			X				
	RA-224			X				
	RA-226			X				
	RA-228			X				
RADON (86)	RN-220				X			
	RN-222				X			
RENIUM (75)	RE-183				X			
	RE-186				X			
	RE-187				X			
	RE-188				X			
	RE NATURAL				X			
RHODIUM (45)	RH-103M				X			
	RH-105				X			
ROBIDIUM (37)	RB-86				X			
	RB-87				X			
	RB NATURAL				X			
RUTHENIUM (44)	RU-97				X			
	RU-103				X			
	RU-105				X			
	RU-106				X			
SAMARIUM (62)	SM-145				X			
	SM-147				X			
	SM-151				X			
	SM-153				X			
SCANDIUM (21)	SC-46				X			
	SC-47				X			
	SC-48				X			
SELENIUM (34)	SE-75				X			
SILICON (14)	SI-31				X			
SILVER (47)	AG-105				X			
	AG-110M				X			
	AG-111				X			
SODIUM (11)	NA-22				X			
	NA-24				X			
STRONTIUM (38)	SR-83M				X			
	SR-85				X			
	SR-89				X			
	SR-90				X			
	SR-91				X			
	SR-92				X			
SULPHUR (16)	S-35				X			
TANTALUM (73)	TA-182				X			
TECHNETIUM (43)	TC-98M				X			
	TC-98				X			
	TC-97M				X			
	TC-97				X			
	TC-99M				X			
	TC-99				X			
TELLURIUM (52)	TE-125M				X			
	TE-127M				X			
	TE-127				X			
	TE-129M				X			
	TE-129				X			
	TE-131M				X			
	TE-132				X			
TERBIUM (65)	TB-160				X			
THALLIUM (81)	TL-200				X			
	TL-201				X			
	TL-202				X			
	TL-204				X			

See footnotes at end of table

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1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
THORIUM (90)	TH-227				X			
	TH-228				X			
	TH-230				X			
	TH-231				X			
	TH-232				X			
	TH-234				X			
	TH NATURAL				X			
THULIUM (69)	TM-168				X			
	TM-170				X			
	TM-171				X			
TIN (80)	SN-113				X			
	SN-117A				X			
	SN-121				X			
	SN-125				X			
TRITIUM (1)	H-3				X			
	H-3 (AS A GAS, AS LUMINOUS PAINT, OR ADSORBED ON SOLID MATERIAL)				X			
TUNGSTEN (74)	W-181				X			
	W-186				X			
	W-187				X			
URANIUM (92)	U-230				X			
	U-232 ⁴				X			
	U-233 ⁴				X			
	U-234 ⁴				X			
	U-235 ⁴				X			
	U-238				X			
	U-239				X			
	U NATURAL				X			
	U ENRICHED ⁴				X			
	U DEPLETED				X			
		U-235				X		
VANADIUM (23)	V-48				X			
	V-49				X			
XENON (54)	XE-125				X			
	XE-131M				X			
	XE-131M (UNCOMPRESSED) ²				X			
	XE-133				X			
	XE-133 (UNCOMPRESSED) ²				X			
	XE-135				X			
	XE-135 (UNCOMPRESSED) ²				X			
	YE-175				X			
YTTERBIUM (70)					X			
YTRITIUM (39)	Y-88				X			
	Y-90				X			
	Y-91M				X			
	Y-91				X			
	Y-92				X			
	Y-93				X			
ZINC (30)	ZN-65				X			
	ZN-69M				X			
	ZN-69				X			
	ZN-70				X			
ZIRCONIUM (40)	ZR-93				X			
	ZR-95				X			
	ZR-97				X			
		ZR-98				X		

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2. Any radionuclide not listed in the above table shall be assigned to one of the groups in accordance with the following table:

RADIONUCLIDE	RADIOACTIVE HALF-LIFE		
	0-1,000 days	1,000 days to 10^6 years	Over 10^6 years
Atomic number 1 - 81	Group III	Group II	Group III
Atomic number 82 and over.	Group I	Group I	Group III

Note 1: No unlisted radionuclides shall be assigned to Groups IV, V, VI, or VII.

3. For mixtures of radionuclides the following shall apply:

(a) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(b) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(c) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(d) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except if a radionuclide "x" has a half-life longer than that of the first member and an activity greater than that of any other member including the first at any time during transportation; in that case, the transport group of the nuclide "x" shall be the transport group for the mixture and

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the activity of the mixture shall be the maximum activity of the nuclide "x" during transportation.

II. General Requirements

1. **Radioactive materials handling.** When radioactive materials are loaded into vehicles by the shipper, the shipper shall observe all applicable requirements of C. F. R., Title 49, Part 177 as applicable.

2. **Specific Permits.** The Hazardous Substances Transportation Board shall issue upon application, specific permits to allow persons to package, load, or transport radioactive materials in intrastate commerce when it is established that transportation can be accomplished without undue hazard to the public health and safety. Such permits shall:

- Describe the situation to which the permit applies.
- Authorize such exemptions as may be warranted.
- Establish the period of time in which the permit is effective.
- Impose any new or special conditions which must be observed.
- The decision as to whether or not a specific permit will be issued, is solely that of the Hazardous Substances Transportation Board. An application for a specific permit shall be made to the Hazardous Substances Transportation Board, Department of Transportation, Harrisburg, Pennsylvania, and shall include the following:

- 1 - Name and address of applicant.
- 2 - Business of applicant.
- 3 - Requested exemptions to regulations.
- 4 - Reason a specific permit is required.
- 5 - Points of origin-destination and proposed routes.
- 6 - Evidence to establish that transportation can be accomplished without undue hazard to public health and safety.
- 7 - Period during which permit is to be effective.
- 8 - Additional information as may be required.

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Note: Specific permits for fissile radioactive materials will not be issued unless packaging is approved by the U. S. A. E. C. or U. S. D. O. T.

IV. CARRIER RULES AND REGULATIONS

A. General Requirements for Packages

1. Packaging furnished by a carrier shall comply with the requirements of Section III-A and III-B of these regulations.

B. Transportation of Radioactive Materials

1. Improperly packaged or damaged shipments discovered in transit: For the protection of the public against contamination or other further hazard, the carrier shall immediately report to the shipper and to the Hazardous Substances Transportation Board all instances of improperly packaged or damaged shipments of radioactive materials discovered or occurring in transit.

2. Disposal of vehicle: A carrier shall not sell, junk, abandon or otherwise dispose of any contaminated vehicle used for the transportation of radioactive materials until he has found that the vehicle meets the requirements of decontamination found in paragraph 3-(a) below, except that this requirement shall not prevent disposal of the vehicle as radioactive waste.

3. Contamination of vehicles:

(a) Each vehicle used for transporting low specific activity radioactive materials in bulk or unpackaged truckload lots must be surveyed by the carrier, with radiation detection instruments after each use. If the survey shows that the surface radiation dose rate exceeds 0.5 millirem per hour, or that there is significant removable radioactive surface contamination, the carrier is responsible for cleaning the vehicle so that the radiation dose rates are reduced below 0.5 millirem per hour and the removable contamination meets the limits discussed in Definition #19 of Section II, *Removable Radioactive Contamination*.

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(b) This section does not apply to any vehicle used solely for transporting radioactive material if a survey of the interior surface shows that the radiation dose rate does not exceed 10 millirem per hour at the interior surface or 2 millirem per hour at 3 feet from any interior surface. Such vehicles must be stenciled with the words "FOR RADIOACTIVE MATERIALS USE ONLY" in lettering at least 3 inches high in a conspicuous place, on both sides of the exterior of the vehicle.

(c) In the event that radioactive material leaks from a package as the result of breakage or an accident or other cause, the vehicle, equipment, areas, and buildings must be decontaminated so that at any accessible surface the beta-gamma radiation dose rate is less than 0.5 millirem per hour and there is no significant removable radioactive surface contamination prior to returning such vehicle, equipment, area or building to transportation or public service. The shipper and the Board must be notified immediately upon the discovery of such leakage. In the event that radiological advice or assistance is needed, contact the nearest U.S. Atomic Energy Commission office, or the Office of Radiological Health, Department of Environmental Resources, Harrisburg.

4. Loading and Unloading of Radioactive Materials

(a) Mixing of packages of other types of radioactive materials, including Fissile Class I, with Fissile Class II packages is permitted if the total transport index in any one transport vehicle of storage location does not exceed 50.

(b) For Fissile Class II packages shipped under the exclusive use provisions of Appendix 15-A-II (i) to provide for packages with high radiation dose rates, the transport index number which is calculated for nuclear criticality control purposes must not exceed 10 for any single package or a total of 50 for the full load, unless specifically authorized by the Department for Fissile Class III shipments.

(c) Packages of radioactive material bearing "radioactive yellow-II" or "radioactive yellow-III" labels shall not be placed in vehicles or other places closer than the distances shown in the

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following table to any area which may be continuously occupied by passengers, employees, or shipments of animals, nor closer than the distances shown in the table below to any package containing undeveloped film (if so marked). If more than one of these packages is present, the distance shall be computed from the following table on the basis of the total transport index number (determined by adding together the transport index numbers on the labels of the individual packages) of packages in the vehicle or storeroom.

Total transport index	Minimum separation distances in feet to nearest undeveloped film for various times of transit					Minimum distance in feet to area of persons, or minimum distance in feet from dividing partition of cargo compartments
	Up to 2 hours	2-4 hours	4-8 hours	8-12 hours	Over 12 hours	
NONE.....	0	0	0	0	0	0
0.1 TO 1.0.....	1	2	3	4	5	1
1.1 TO 5.0.....	3	4	6	8	11	2
5.1 TO 10.0.....	4	6	9	11	15	3
10.1 TO 20.0.....	5	8	12	16	22	4
20.1 TO 30.0.....	7	10	15	20	28	5
30.1 TO 40.0.....	8	11	17	22	32	6
40.1 TO 50.0.....	9	12	19	24	35	7

Note: The distance in the table must be measured from the nearest point on the packages of radioactive materials.

5. Controlled Shipments

(a) Fissile Class III shipments may be made only in accordance with subparagraph (1) or (2) of this paragraph, or in accordance with other procedures authorized by the Hazardous Substances Transportation Board. The transport controls must provide nuclear criticality safety and shall be carried out by the shipper or carrier, as appropriate, to protect against loading, transporting, or storing of that shipment together with other fissile material.

(1) Transportation in a transport vehicle assigned for the sole use of that consignor, with a specific restriction for such sole use to be provided in the special arrangements, and with instructions to that effect issued with the shipping papers; or

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(2) Transportation under escort by a person in a separate vehicle, with the escort having the capability, equipment, authority, and instructions to provide administrative controls adequate to assure compliance with this paragraph.

6. Specific Permits

(a) The Hazardous Substances Transportation Board shall issue specific permits to allow carriers to transport radioactive materials in intrastate commerce when it is established that a permit can be granted without undue hazard to the public health and safety. Such permits shall be issued and applications shall be submitted in accordance with Section III-II-2 of this Chapter.

7. Fire Extinguishers

(a) Not less than one fire extinguisher having a rating of at least 10 BC, approved by a nationally recognized fire equipment testing laboratory, and placed on the vehicle where readily accessible when needed; and meeting all the requirements as set forth in Section IV-D-1(a), General Regulations, Chapter 11.

V. VEHICLE OPERATION, INSPECTION AND MAINTENANCE

A. Vehicle Operation

1. Accidents - Radioactive Materials

(a) In the event of an accident involving any vehicle transporting radioactive materials, every available means shall be used to protect all persons. All personnel shall be warned of the hazard of congregating in the vicinity. Care shall also be taken to prevent radioactive materials from contaminating streams or flowing into sewers.

(b) In case of fire, accident, leakage, or unusual delay involving shipments of radioactive materials, the carrier shall immediately notify the shipper and the Hazardous Substances Transportation Board. Vehicles, buildings, areas, or equipment in which radioactive materials have been spilled may not be again placed in

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service or routinely occupied until the radiation dose rate at any accessible surface is less than 0.5 millirem per hour and there is no significant removable radioactive surface contamination.

(c) In the instances outlined in (b) above, the package or materials should be segregated as far as practicable from personnel contact. If radiological advice or assistance is needed, contact the U.S. Atomic Energy Commission or the Office of Radiological Health, Pennsylvania Department of Environmental Resources, Harrisburg, Pennsylvania. In case of obvious leakage, or if it appears likely that the inside container may have been damaged, care should be taken to avoid inhalation, ingestion, or contact with the radioactive material. Any loose radioactive material should be left in a segregated area and held pending disposal instructions from qualified persons.

B. Inspection and Maintenance

1. Sections V-C-2 and V-E, Chapter 11, General Regulations, are not applicable to carriers of radioactive materials.

VI. DRIVER QUALIFICATIONS

A. Minimum Requirements

1. Drivers of vehicles engaged in the transportation of radioactive materials are exempt from the requirements of Sections VI and VII (except Sections VII-A.2 and VII-B) of Chapter 11, General Regulations, when all of the following conditions are met:

(a) The loaded vehicle driven has a gross weight of no more than 21,000 pounds and has no more than two axles.

(b) The driver shall possess an operator's license valid in the Commonwealth of Pennsylvania.

(c) The vehicle is operated in accordance with the Pennsylvania Motor Vehicle Code.

(d) The operation of such vehicle in the transportation of radioactive materials is on a casual basis, or the transportation of radioactive materials is not a significant part of the driver's assigned duties.

(e) Appropriate management of the shipper is notified of the manner in which radioactive materials are to be transported.

RECORDING AND REPORTING OF ACCIDENTS

VII. HOURS OF SERVICE AND DRIVER'S DAILY LOG

Section VII-A and VII-C, Chapter 11, General Regulations are not applicable to intrastate transportation of radioactive Materials.

VIII. RECORDING AND REPORTING OF ACCIDENTS

Section VIII-A, Chapter 11, General Regulations, is not applicable to intrastate transportation of Radioactive Materials by not-for-hire carriers.

APPENDIX 15-A

PACKAGING REQUIREMENTS

for

RADIOACTIVE MATERIALS

PACKAGING REQUIREMENTS - RADIOACTIVE MATERIALS

(Note: Specification containers referenced herein are those described in U. S. D. O. T. regulations, 49 C.F.R., Part 178)

I. STANDARD REQUIREMENTS FOR ALL PACKAGES

(a) Each package used for shipping radioactive materials under this chapter shall be so designed and constructed, and its contents so limited; that under conditions normally incident to transportation:

1. There will be no significant release of the radioactive material to the environment;
2. The effectiveness of the packaging will not be substantially reduced; and
3. There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging.

(b) Materials for which detailed specifications for packaging are not set forth in this part must be securely packaged in strong, tight packages meeting the requirements of this section.

(c) Packaging used for the shipment of radioactive materials under this chapter shall, unless otherwise specified or exempted therein, meet all of the following design and construction criteria:

1. Each specification container shall be marked in an unobstructed area with letters and numerals identifying that specification (e.g., ICC-6J, DOT-6L, DOT MC 306, ICC-105a200-F);

(i) The marking is a certification that the packaging complies with all specification requirements.

(ii) The name and address or the symbol of the manufacturer, or the user, who assumes responsibility for compliance with the specification requirements, shall be included. Symbol letters

STANDARD REQUIREMENTS FOR ALL PACKAGES

must be registered with the Bureau of Explosives. Duplicate symbols are not authorized.

(iii) The markings shall be stamped, embossed, burned, printed, or otherwise marked on the packaging to provide adequate accessibility, permanency, and contrast so as to be readily apparent and understood.

(iv) Unless otherwise specified, letters and numerals shall be at least $\frac{1}{8}$ inch high.

(v) Packaging which does not comply with the applicable specification listed in 49 C.F.R. Parts 178 and 179 must not be marked to indicate such compliance.

2. Steel used shall be low-carbon commercial quality steel. Stainless, open hearth, electric, basic oxygen, or other similar quality steels are acceptable. Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal Thickness (Inches)	Minimum Thickness (Inches)
12	0.1046	0.0946
13	0.0897	0.0817
14	0.0747	0.0677
15	0.0673	0.0603
16	0.0598	0.0533
17	0.0538	0.0478
18	0.0478	0.0428
19	0.0418	0.0378
20	0.0359	0.0324
22	0.0299	0.0269
24	0.0239	0.0209
26	0.0179	0.0159
28	0.0149	0.0129
30	0.0120	0.0110

3. Lumber used shall be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

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STANDARD REQUIREMENTS FOR ALL PACKAGES

4. Welding and brazing shall be performed in a workmanlike manner using suitable and appropriate techniques, materials, and equipment.

5. Packaging materials and contents shall be such that there will be no significant chemical or galvanic reaction among any of the materials in the package.

6. Closures shall be adequate to prevent inadvertent leakage of the contents under normal conditions incident to transportation. Gasketed closures shall be fitted with gaskets of efficient material which will not be deteriorated by the contents of the container.

7. Nails, staples, and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to cause failures.

8. The nature and thickness of the packaging shall be such that friction during transport does not generate any heating likely to decrease the chemical stability of the contents.

(d) For specification containers, compliance with the applicable specifications in 49 C.F.R. Parts 178 and 179 shall be required in all details, except as otherwise provided in this chapter.

II. GENERAL PACKAGING REQUIREMENTS

(a) The outside of each package must incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that the package has not been illicitly opened.

(b) The smallest outside dimension of any package must be 4 inches or greater.

(c) Radioactive materials must be packaged in packagings which have been designed to maintain shielding efficiency and leak tightness, so that, under conditions normally incident to transportation, there will be no release of radioactive material. If necessary, additional suitable inside packaging must be used. Each package must

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GENERAL PACKAGING REQUIREMENTS

be capable of meeting the standards in Appendix 15-C. Specification containers listed as authorized for radioactive materials shipments may be assumed to meet those standards, provided the packages do not exceed the gross weight limits prescribed for those containers in 49 C.F.R. Part 178.

1. Internal bracing or cushioning, where used, must be adequate to assure that, under the conditions normally incident to transportation, the distance from the inner container or radioactive material to the outside wall of the package remains within the limits for which the package design was based, and the radiation dose rate external to the package does not exceed the transport index number shown on the label. Inner shield closures must be positively secured to prevent loss of the contents.

(d) The packaging must be so designed, constructed, and loaded that, when transporting large quantities of radioactive material:

1. The heat generated within the package because of the radioactive materials present will not, at any time during transportation, affect the efficiency of the package under the conditions normally incident to transportation, and

2. The temperature of the accessible external surfaces of the package will not exceed 122°F. in the shade when fully loaded, assuming still air at ambient temperature. If the package is transported in a transport vehicle consigned for the sole use of the consignor, the maximum accessible external surface temperature shall be 180°F.

(e) Pyrophoric materials, in addition to the packaging prescribed in this subpart, must also meet the packaging requirements of Chapter 13, Specific Regulations for Flammable Liquids and Solids.

(f) Liquid radioactive material must be packaged in or within a leak-resistant and corrosion-resistant inner container. In addition:

1. The packaging must either be adequate to prevent loss or dispersal of the radioactive contents from the inner container, if the package were subjected to the 30-foot drop test

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GENERAL PACKAGING REQUIREMENTS

prescribed in Appendix 15-A-VI(b) (I), or

2. Enough absorbent material must be provided to absorb at least twice the volume of the radioactive liquid contents. The absorbent material may be located outside the radiation shield only if it can be shown that if the radioactive liquid contents were taken up by the absorbent material the resultant dose rate at the surface of the package would not exceed 1,000 millirem per hour.

(g) There must be no significant removable radioactive surface contamination on the exterior of the package.

(h) Except for shipments described in paragraph (i) of this section, all radioactive materials must be packaged in suitable packaging (shielded, if necessary) so that at any time during the normal conditions incident to transportation the radiation dose rate does not exceed 200 millirem per hour at any point on the external surface of the package, and the transport index does not exceed 10.

(i) Packages for which the radiation dose rate exceed the limits specified in paragraph (h) of this section, but does not exceed at any time during transportation any of the limits specified in subparagraphs (1) through (4) of this paragraph, may be transported in a transport vehicle assigned for the sole use of that consignor, and unloaded by the consignee from the transport vehicle in which originally loaded.

1. 1,000 millirem per hour at 3 feet from the external surface of the package (closed transport vehicle only);

2. 200 millirem per hour at any point on the external surface of the car or vehicle (closed transport vehicle only).

3. 10 millirem per hour at 6 feet from the external surface of the car or vehicle; and

4. 2 millirem per hour in any normally occupied position in the car or vehicle, except that this provision does not apply to private carriers.

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PACKAGING REQUIREMENTS FOR SMALL QUANTITY RADIOACTIVE MATERIALS

III. PACKAGING REQUIREMENTS FOR SMALL QUANTITY RADIOACTIVE MATERIALS

Note: Small quantities of radioactive materials are exempt from specification packaging, marking and labeling and from the General Package Requirements (Appendix 15-A-II), provided the following conditions are met.

(a) The materials are packaged in strong tight packages such that there will be no leakage of radioactive materials under conditions normally incident to transportation.

(b) The package must be such that the radiation dose rate at any point on the external surface of the package does not exceed 0.5 millirem per hour.

(c) There must be no significant removable radioactive surface contamination on the exterior of the package.

(d) The outside of the inner container must bear the marking "Radioactive."

IV. PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

(a) Manufactured articles such as instruments, clocks, electronic tubes or apparatus, or other similar devices, having radioactive materials (other than liquids) in a nondispersible form as a component part, are exempt from specification packaging, marking, and labeling, and are exempt from the provisions of Appendix 15-A-II if the following conditions are met:

Note: For radioactive gases, the requirement for radioactive material to be in a nondispersible form does not apply.

1. Radioactive materials are securely contained within the devices, or are securely packaged in strong, tight packages, so that there will be no leakage of radioactive materials under conditions normally incident to transportation.

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PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

2. The radiation dose rate at four inches from any unpackaged device does not exceed 10 millirem per hour.

3. The radiation dose rate at any point on the external surface of the outside container does not exceed 0.5 millirem per hour. However, for truckload lots only, the radiation at the external surface of the package or the item may exceed 0.5 millirem per hour, but must not exceed 2 millirem per hour.

4. There must be no significant removable radioactive surface contamination on the exterior of the package.

5. The total radioactivity content of a package containing radioactive devices must not exceed the quantities shown in the following table:

Transport Group	Quantity in Curies	
	Per Device	Per Package
I-----	0.0001	0.001
II-----	0.001	0.05
III-----	0.01	3
IV-----	0.05	3
V or VI-----	1	1
VII-----	25	200
Special Form-----	0.05	20

6. No package may contain more than 15 grams of fissile material.

(b) Manufactured articles, other than reactor fuel elements, in which the sole radioactive material is natural or depleted uranium, are exempt from specification packaging, marking, and labeling and are exempt from the provisions of Appendix 15-A-II if the following conditions are met:

1. The radiation dose rate at any point on the external surface of the outside container does not exceed 0.5 millirem per hr;

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PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

2. There must be no detectable radioactive surface contamination on the exterior of the package;
3. The total radioactivity content of each article must not exceed 3 curies;
4. The outer surface of the uranium is enclosed in an inactive-metallic sheet.

Note: Such articles may be packagings for the transportation of radioactive materials.

V. PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

(a) Type A packaging must be so designed and constructed that, if it were subject to the environmental and test conditions prescribed in this section:

1. There would be no release of radioactive material from the package;
2. The effectiveness of the packaging would not be substantially reduced; and,
3. There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(b) Environmental conditions:

1. Heat. Direct sunlight at an ambient temperature of 130°F. in still air.
2. Cold. An ambient temperature of -40°F. in still air and shade.
3. Reduced pressure. Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 p.s.i.a.).

PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

4. Vibration. Vibration normally incident to transportation.

(c) Test conditions: The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:

1. Water spray. A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combination thereof, are exempt from the water spray test.

2. Free drop. Between 1½ to 2½ hours after the conclusion of the water spray test, a free drop through a distance of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

3. Corner drop. A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

4. Penetration. Impact of the hemispherical end of a vertical steel cylinder 1½ inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

5. Compression. For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of

PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

VI. PACKAGING REQUIREMENTS FOR TYPE "B" PACKAGE

(a) Type B packaging must meet the applicable Type A packaging standards and must be designed and constructed and its contents so limited that, if subjected to the hypothetical accident conditions prescribed in this paragraph, it will meet the following conditions:

1. The reduction of shielding would not be enough to increase the radiation dose rate at three feet from the external surface of the package to more than 1,000 millirem per hour.

2. No radioactive material would be released from packages containing Type B quantities of radioactive material. The allowable release of radioactivity from packages containing large quantities of radioactive material is limited to gases and contaminated coolant containing total radioactivity exceeding neither 0.1 percent of the total radioactivity of the package contents nor 0.01 curie of Group I radionuclides, 0.5 curie of Group II radionuclides, and 10 curies of Groups III and IV radionuclides, except that for inert gases the limit is 1,000 curies.

(b) Test conditions: The conditions which the package must be capable of withstanding must be applied sequentially, to determine their cumulative effect on a package, in the following order:

1. Free drop. A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal target surface, striking the surface in a position for which maximum damage is expected.

2. Puncture. A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface, the bar shall be 6 inches in diameter, with the top horizontal and its edge rounded

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PACKAGING REQUIREMENTS FOR TYPE "B" PACKAGE

to a radius of not more than one-fourth inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface.

3. Thermal. Exposure to a thermal test in which the heat input to the package is no less than that which would result from exposure of the whole package to a radiation environment of 1,475°F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have an absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature of the inside of the package has begun to fall in less than 3 hours.

4. Water immersion (fissile radioactive materials packages only). Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 8 hours.

VII. PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

(a) Low specific activity materials, when transported on transport vehicles other than those assigned for the sole use of the consignor, are exempt from the provisions of Appendix 15-A-II(a) thru (f); however, they must be packaged in accordance with the requirements of Appendix 15-A-IX and must be marked and labeled as required in Appendix 15-B and Section III-F of this Chapter.

(b) Low specific activity materials which are transported in transport vehicles assigned for the sole use of that consignor are exempt from specification packaging, marking, and labeling provided the shipments meet the requirements of paragraph (c) or (d) of this section.

(c) Packaged shipments of low specific activity materials transported in transport vehicles assigned for the sole use of that consignor must comply with the following:

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PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

1. Materials must be packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transportation.

2. Packages must not have any significant removable surface contamination.

3. External radiation levels must comply with Appendix 15-A-II-(i).

4. Shipments must be loaded by consignor and unloaded by consignee from the transport vehicle in which originally loaded.

5. There must be no loose radioactive material in the car or vehicle.

6. Shipment must be braced so as to prevent leakage or shift of lading under conditions normally incident to transportation.

7. Except for shipments of uranium or thorium ores, unconcentrated, the transport vehicle must be placarded with the placards prescribed in accordance with 49 C.F.R. 177.823 (a) and Chapter 11 (General Regulations) Section V-A-7-(a).

8. The outside of each outside package must be stencilled or otherwise marked "Radioactive-L.SA."

(d) Unpackaged (bulk) shipments of low specific activity materials transported in closed transport vehicles assigned for the sole use of that consignor must comply with the following:

1. Authorized materials are limited to the following:

(i) Uranium or thorium ores and physical or chemical concentrates of those ores.

(ii) Uranium metal or natural thorium metal, or alloys of these materials; or

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PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

(iii) Materials of low radioactive concentration, if the average estimated radioactivity concentration does not exceed 0.001 millicurie per gram and the contribution from Group I material does not exceed one percent of the total radioactivity.

(iv) Objects of nonradioactive material externally contaminated with radioactive material, if the radioactive material is not readily dispersible and the surface contamination, when averaged over one square meter, does not exceed 0.0001 millicurie per square centimeter of Group I radionuclides or 0.001 millicurie per square centimeter of other radionuclides. Such objects must be suitably wrapped or enclosed.

2. Bulk liquids must be transported in the following:

(i) Spec. MC 310, MC 311, MC 312, or MC 331 (Parts 178.330, 178.331, 178.337, or 178.343, Title 49, C.F.R.) cargo tanks. Authorized only where the radioactivity concentration does not exceed 10 percent of the specified low specific activity levels. The requirements of Appendix 15-A-II-(f) do not apply to these cargo tanks. Bottom fittings and valves are not authorized. Trailer-on-flat-car service is not authorized.

3. External radiation levels must comply with subparagraphs (2), (3), and (4) of Appendix 15-A-II-(i).

4. Shipments must be loaded by the consignor, and unloaded by the consignee from the transport vehicles in which originally loaded.

5. Except for shipments of uranium or thorium ores, unconcentrated, the transport vehicle must be placarded with the placards prescribed in accordance with 49-C.F.R. 177.828 (a).

6. There must be no leakage of radioactive materials from the vehicle.

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**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
IN SPECIAL FORM**

**VIII. PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS IN
SPECIAL FORM**

A. Type "A" Quantities

1. Type A quantities of special form radioactive materials must be packaged as follows:

(a) Spec. 5B, 5D, 6A, 6B, 6C, 6J, 6K, 6L, 6M, 17C, 17H, 42B, or 42C (Sections 178.82, 178.84, 178.97, 178.98, 178.99, 178.100, 178.101, 178.103, 178.104, 178.107, 178.108, 178.115, and 178.118 of 49 C. F. R.) metal drums.

(b) Spec. 21C (Section 178.224 of 49 C. F. R.) fiber drums.

(c) Spec. 14, 15A, 15B, 15C, 15D, 19A, or 19B (Sections 178.168, 178.169, 178.170, 178.171, 178.190, and 178.191 of 49 C. F. R.) wooden boxes.

(d) Any Spec. 12 series (Sections 178.205 through 178.212 49 C. F. R.) fiberboard boxes, 200-pound test minimum or Spec. 23F or 23H (Sections 178.214 or 178.219, 49, C. F. R.) fiberboard boxes.

(e) Spec. 55 (Section 178.250 of 49, C. F. R.) metal-encased shielded container. Additionally authorized for not more than 300 curies per package, for domestic shipments only.

(f) Spec. 7A (Section 178.350 of 49 C. F. R.) Type A general package.

(g) Foreign-made packagings which bear the symbol "Type A" may be used for transportation of radioactive materials from the point of entry in the United States to their destination in the United States or through the United States en route to a point of destination outside of the United States.

**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS IN
SPECIAL FORM**

B. Type "B" Quantities

1. Type B quantities of special form radioactive materials must be packaged as follows:

(a) Spec. 55 (Section 178.250 of 49 C. F. R.) metal-encased shielded container. Authorized only for not more than 300 curies per package. Authorized for domestic shipments only (See also Section 178.394 (a) (5) of 49 C. F. R.).

(b) Spec. 6M (Section 178.304 of 49 C. F. R.) metal packaging.

(c) Any Type B packaging specifically approved for such use by the Hazardous Substances Transportation Board.

2. Large quantities of radioactive materials in special form must be packaged as follows:

(a) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. Radioactive thermal decay energy must not exceed 10 watts.

(b) Any Type B packaging which meets the standards in the regulations of the U. S. Atomic Energy Commission - (10 C. F. R. Part 71) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R., Part 170. In applying for D. O. T. authorization of packages for large quantities of radioactive materials to be used in shipments by the U. S. Atomic Energy Commission, or one of its contractors of licensees, a copy of the license amendment or other approval issued by that Commission will be accepted in place of the package structural integrity evaluation.

**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

**IX. PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

A. Type "A" Quantities

1. Type A quantities of normal form radioactive materials must be packaged as follows:

(a) Spec. 5B, 5D, 6A, 6B, 6C, 6J, 6K, 6L, 6M, 17C, 17H, 42B, or 42C (Section 178.82, 178.84, 178.97, 178.98, 178.99, 178.100, 178.101, 178.103, 178.104, 178.107, 178.108, 178.115, and 178.118 of 49 C.F.R.) metal drums.

(b) Spec. 21C (Section 178.224 of 49 C.F.R.) fiber drums.

(c) Spec. 14, 15A, 15B, 15C, 15D, 19A, or 19B (Sections 178.165, 178.168, 178.169, 178.170, 178.171, 178.190, and 178.191 of 49 C.F.R.) for wooden boxes.

(d) Any Spec. 12 series (Sections 178.205 through 178.212 of 49 C.F.R.) fiberboard boxes 200-pound test minimum; or Spec. 23F or 23H (Sections 178.214 or 178.219) fiberboard boxes. (49 C.F.R.)

(e) Any Spec. 3 or 4 series (Section 178.36 through 178.44 or 178.47 through 178.58 of 49 C.F.R.) cylinders.

(f) Spec. 55 (Section 178.250 of 49 C.F.R.) metal-encased shielded container.

(g) Spec. 7A (Section 178.350 of 49 C.F.R.) Type A general package.

(h) Foreign-made packagings which bear the symbol "Type A" may be used for transportation of radioactive materials from their point of entry in the United States to their destination in the United States or through the United States en route to a point of destination outside of the United States.

B. Type "B" Quantities

1. Type B quantities of radioactive materials in normal form must be packaged as follows:

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**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

(a) Spec. 6M (Section 178.104 of 49 C.F.R.) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250°F.

(b) Any Type B packaging specifically approved for such use by the D.O.T. or Hazardous Substances Transportation Board.

C. Large Quantities

1. Large quantities of radioactive materials in normal form must be packaged as follows:

(a) Spec. 6M (Section 178.104 of 49 C.F.R.) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250°F. Radioactive thermal decay energy must not exceed 10 watts.

(b) Any Type B packaging which meets the standards prescribed in the regulations of the U. S. Atomic Energy Commission of 10 C. F. R., Part 21) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R. Part 170 of this chapter. In applying for D. O. T. authorization of package for large quantities of radioactive materials to be used in shipments by the U. S. Atomic Energy Commission, or one of its contractors or licensees, a copy of the license amendment or other approval issued by that Commission will be accepted in place of the package structural integrity evaluation.

X. FISSILE RADIOACTIVE MATERIALS

A. Type "A" Quantities - Special and Normal Form

1. Fissile radioactive materials containing not more than Type A quantities of radionuclides, in either normal form or special form, must be packaged as follows:

(a) Spec 6L (Section 178.103 of 49 C. F. R.) metal packaging. Authorized only for enriched uranium, the fissile content

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FISSILE RADIOACTIVE MATERIALS

not to exceed 14 kilograms of uranium-235 as metal or oxide, or as compounds or alloys which will not decompose at temperatures up to 750°F. Each package shipped as Fissile Class II must be assigned a transport index of 1.3 (unless external radiation levels require a higher assignment). The atomic ratio of hydrogen to uranium-235 must not exceed three, all sources of hydrogen within the specification 2R inner containment vessel being considered. The gross weight of the loaded package must not exceed 350 pounds for the 55-gallon size or 480 pounds for sizes up through 110 gallons.

(b) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. See Part B-1-(b) of this section for authorized contents.

(c) Any packaging listed in Appendix 15-A-IX-A-1. Authorized only for not more than the following:

(i) 500 grams of uranium-235 as Fissile Class III, or not more than 40 grams of uranium-235 as Fissile Class II. For Fissile Class II shipments, the transport index to be assigned to each package shall be 0.4 for each gram of uranium-235 above 15 grams up to a maximum of 40 grams (transport index of 10).

(ii) 320 grams of plutonium-239 as plutonium-beryllium neutron sources in special form. Total radioactivity content must not exceed 20 curies. The transport index to be assigned to each package shall be 0.5 for each 20 grams, or fraction thereof, of fissile plutonium.

(d) Any other packaging which meets the standards in the regulations of the U. S. Atomic Energy Commission, (10 CFR Part 71) the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R. part 170 of this chapter.

B. Type "B" Quantities Special and Normal Form

1. Fissile radioactive materials containing Type B quantities of radionuclides, in either normal form or special form, must be packaged as follows:

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FISSILE RADIOACTIVE MATERIALS

(a) Spec. 6L (Section 178.103 of 49 C. F. R.) metal packaging. Authorized only for enriched uranium, the fissile content not to exceed 14 kilograms of uranium-235 as metal or oxide, or as compounds or alloys which will not decompose at temperatures up to 750°F. Each package shipped as Fissile Class II must be assigned a transport index of 1.3 (unless external radiation levels require a higher assignment). The atomic ratio of hydrogen to uranium-235 must not exceed three, all sources of hydrogen within the specification 2R inner containment vessel being considered. The gross weight of the loaded package must not exceed 350 pounds for the 55-gallon size or 480 pounds for sizes up through 110 gallons.

(b) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. Authorized only for solid radioactive materials which will not decompose at temperatures up to 250°F. Radioactive thermal decay energy output shall not exceed 10 watts. Large quantity radioactive materials in normal form must be packaged in one or more sealed and leaktight metal cans or polyethylene bottles within the Spec. 2R containment vessel.

(i) Fissile Class I packages. The following quantities of fissile radioactive material are authorized for Fissile Class I packages: 1.6 kilograms uranium-235; 0.9 kilograms of plutonium (see Note); 0.5 kilograms of uranium-233. The maximum ratio of hydrogen to fissile material must not exceed three, all sources of hydrogen within the Spec. 2R containment vessel being considered.

Note: Because of the 10-watt thermal decay heat limitation, the limit for plutonium-238 is only 0.02 kilograms.

(ii) Fissile Class II and III Packages. Quantities of fissile radioactive material as shown in the following table are authorized for Fissile Class II and Fissile Class III packages. Where a maximum ratio of hydrogen to fissile material is specified in the table, only the hydrogen interspersed with the fissile material need be

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FISSILE RADIOACTIVE MATERIALS

considered. For Fissile Class II packages, the minimum transport index to be assigned is shown in the table. For Fissile Class III packages, the maximum number of similar packages per transport vehicle is shown. Fissile Class III shipments are also subject to paragraph 2(a) and (b) of this section.

TABLE OF AUTHORIZED CONTENTS¹

URANIUM-235 ²			PLUTONIUM ^{3 4}			FISSILE CLASS II	FISSILE CLASS III, MAXIMUM
COMPOUND ³			COMPOUND ³			TRANSPORT INDEX	NUMBER PACKAGES PER TRANSPORT VEHICLE
METAL OR ALLOY			METAL OR ALLOY				
H/E 20	H/E 20	H/E 23	H/E 20	H/E 20	H/E 23		
7.2	7.0	5.2	3.1	4.1	3.4	0.1	1,250
6.7	6.6	6.4	3.4	4.8	4.1	0.2	825
11.2	13.9	8.3	4.2	-----	4.8	0.5	250
13.5	16.0	10.1	4.8	-----	-----	1.0	125
-----	26.0	16.1	-----	-----	-----	2.0	25
-----	32.0	19.9	-----	-----	-----	10.0	12

¹ QUANTITY IN KILOGRAMS.

² MAXIMUM URANIUM-235 ENRICHMENT IS 93 WEIGHT PERCENT.

³ MINIMUM PERCENTAGE OF PLUTONIUM-240 IS 5 WEIGHT PERCENT.

⁴ 4.8 KILOGRAM LIMITATION ON PLUTONIUM DUE TO 10 WATT DECAY HEAT LIMITATION.

(c) Any other packaging which meets the standards prescribed in the regulations of the U.S. Atomic Energy Commission (Title 10, Code of Federal Regulations, Part 71) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T., 49 C. F. R. - Part 170, or the Hazardous Substances Transportation Board.

2. Fissile Class III shipments may be made only in accordance with subparagraph (a) or (b) of this paragraph or in accordance with other procedures authorized by the Department. The transport controls must provide nuclear criticality safety and shall be carried out by the shipper or carrier, as appropriate, to protect against loading, transporting, or storing of that shipment together with other fissile material.

(a) Transportation in a transport vehicle assigned for the sole use of that consignor, with a specific restriction for such sole use to be provided in the special arrangements, and with

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instructions to that effect issued with the shipping papers; or

(b) Transportation under escort by a person in a separate vehicle, with the escort having the capability, equipment, authority, and instructions to provide administrative controls adequate to assure compliance with this paragraph.

XI. REUSE OF CONTAINERS

(a) Containers used more than once (refilled and reshipped after having been previously emptied) must be in such condition, including closure devices and cushioning materials, that they comply in all respects with the prescribed requirements for those containers. Repairs must be made in an efficient manner in accordance with requirements for materials and construction as prescribed in 49 C. F. R. Parts 178 and 179, for new containers, or as otherwise prescribed. Parts that are weak, broken, or otherwise deteriorated must be replaced.

(b) Except as provided in this section, single-trip containers made under specifications prescribed in 49 C.F.R. Part 178, from which contents have once been removed following use for shipment of any commodity, shall not be again used as shipping containers for explosives or other dangerous articles. Single-trip containers may be reused if retested before each reuse in accordance with methods approved by the Bureau of Explosives for service for specific commodities or classes of commodities. Applications for permission for reuse should be made to the Bureau of Explosives, American Railroads Building, 1920 "L" Street, Washington, D.C. 20036.

XII. PREVIOUSLY AUTHORIZED PACKAGING

(a) Where the regulations require Spec. 6D or 37M (Sections 178.102 or 178.134 of 49 C. F. R.) cylindrical steel overpacks; Spec. 5H, 6J, or 37A (single-trip container) (Sections 178.82, 178.100, or 178.131 of 49 C. F. R.) metal drums manufactured before March 18, 1964, having inside Spec. 2S, 2SL, 2T, or 2TL (Sections 178.21, 178.27, 178.35 or 178.35a of 49 C. F. R.)

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PREVIOUSLY AUTHORIZED PACKAGING

polyethylene container, may be continued in use for the commodities and gross weights for which they were previously authorized.

(b) Reusable molded polyethylene containers for use without overpack complying with Spec. 34 (Section 178.19 of 49 C. F. R.), manufactured before September 5, 1966, may be continued in use, if they are plainly marked "ICC-34", and are embossed with the maker's name or symbol, rated capacity, and the month and year of manufacture.

XIII. EMPTY CONTAINERS

(a) All packagings and accessories which have been used for shipments of radioactive materials and which contain residual internal radioactive contamination when shipped as empty, must be securely closed. The external surface must be free of significant removable radioactive contamination, and the radiation at the external surface of the packaging must not exceed 0.5 millirem per hour. The "Empty" label, described in Section III-2(e) of this chapter, must be affixed to the packaging.

APPENDIX 15-B

LABELING

FOR

RADIOACTIVE MATERIALS

LABELING FOR RADIOACTIVE MATERIALS

I. LABELING PACKAGES OF RADIOACTIVE MATERIALS

A. Each package of radioactive materials, unless exempted, shall be labeled as provided in this section. The label to be used shall be determined by the transport index or other considerations as follows:

1. Radioactive White-I Label. Each package not exceeding 0.5 millirem per hour at any point on the external surface of the package, and which does not come within the provisions of subparagraph (2) or (3) below. Not authorized for Fissile Class II packages.

2. Radioactive Yellow-II Label. When the limit in subparagraph (1) of this paragraph is exceeded but the provisions of subparagraph (3) of this section are not met; and --

(a) Each package not exceeding 10 millirem per hour at any point on the external surface of the package and not exceeding 0.5 millirem per hour at 3 feet from the external surface of the package; or

(b) Each package for which the transport index does not exceed 0.5 at any time during transportation.

3. Radioactive Yellow-III Label. When either of the limits in subparagraph (2) above is exceeded. In addition, the following types of packages must also bear this label:

(a) Each Fissile Class III package;

(b) Each package containing a large quantity of radioactive material or;

(c) Each package being transported under a special or specific permit.

B. Each package must be labeled with two such labels, affixed to opposite sides of the package.

EXEMPTIONS FROM LABELING

II. EXEMPTIONS FROM LABELING

A. Labels are not required on truckload lots of shipments of radioactive materials made by, for, or to the Department of Defense if the shipments are loaded by the shipper and unloaded by the consignee from the transport vehicle in which originally loaded and if the shipments are accompanied by qualified personnel supplied with equipment to repair leaks or other container failures which would permit escape of contents. The proper shipping name of the contents must be marked on each package shipped under this exemption.

APPENDIX 15-C

SPECIAL TESTS

FOR

RADIOACTIVE MATERIALS

SPECIAL TESTS FOR RADIOACTIVE MATERIALS

(Note: It is not necessary to actually conduct the tests prescribed in this section if it can be clearly shown, through engineering evaluations or comparative data; that the material or item would be capable of performing satisfactorily under the prescribed test conditions.).

I. SPECIAL FORM MATERIAL

A. To qualify as special form material, the radioactive material must either be in massive solid form or encapsulated. Each item in massive solid form or each capsule must either have no overall dimension less than 0.5 millimeters, or must have at least one dimension greater than 5 millimeters. Each item, or the capsule material, must not dissolve or convert into dispersible form to the extent of more than 0.005 percent, by weight, by immersion for 1 week in water at pH 6-8 and 60°F., and a maximum conductivity of 10 micro-mhos/centimeter, and by immersion in air at 86°F. If in massive solid form, the radioactive material must not break, crumble, or shatter if subjected to the percussion test prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,000°F. If encapsulated, the capsule must retain its contents when subjected to all of the performance tests prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,475°F.

1. Free drop. A free drop through a distance of 30 feet on to a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

2. Percussion. Impact of the flat circular end of a one inch diameter steel rod weighing three pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than one inch thick, supported by a smooth, essentially unyielding surface.

3. Heating. Heating in air to a temperature of 1,475°F. and remaining at that temperature for a period of 10 minutes.

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SPECIAL FORM MATERIAL.

4. Immersion. Immersion for 24 hours in water at room temperature. The water shall be at pH 6-pH 8, with a maximum conductivity of 10 micro-mhos/cm.

II. NORMAL TRANSPORT--TEST CONDITIONS FOR TYPE A PACKAGES.

A. Test conditions for normal transport are given in Appendix 15-A, Section V.

III. HYPOTHETICAL ACCIDENT CONDITIONS FOR TYPE B PACKAGES

A. Test conditions for hypothetical accident conditions applicable to type B packages are given in Appendix 15-A, Section VI.

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APPENDIX "A"

Introduction to Commodity List for Hazardous Substances

The Commodity List which follows should be used to determine those hazardous substances approved and those forbidden for highway transportation in the Commonwealth.

The list gives the commodity classification and supplies the reference in Title 49 of the Code of Federal Regulations (comprising the Commonwealth marking, labeling, packing and container requirements) where any required special packaging and any exemption from said classification may be found.

Where the carrier is not wholly familiar with the commodity and its handling, it is his responsibility to pursue the references in the Code of Federal Regulations.

Special note should be taken of materials "Forbidden" for transportation and commodities which in specified smaller quantities and/or designated packaging are classified less hazardous or non-hazardous, requiring different handling or no special handling.

Explanation of Signs and Abbreviations.

An asterisk indicates that article may or may not be classed as flammable liquids, flammable solids, oxidizing materials, compressed gases, poisons, or corrosive liquids by Parts 171-179. If so classed, such articles are subject to the regulations prescribed for articles within these definitions.

F. L.—Flammable liquid.

F. S.—Flammable solid.

Oxy. M.—Oxidizing material.

Cor. L.—Corrosive liquid.

Nonf. G.—Nonflammable compressed gas.

F. G.—Flammable compressed gas.

Pois. A.—Poison gas or liquid, Class A.

Pois. B.—Poisonous liquid or solid, Class B.

Pois. C.—Toxic gas, Class C.

R. A. M.—Radioactive materials.

Expl. A.—Class A explosives.

Expl. B.—Class B explosives.

Expl. C.—Class C explosives.

Not accepted—Means not to be offered or accepted for transportation.

Forbidden—Means prohibited by law.

N. O. S.—Means not otherwise specified.

N. O. I.—Means not otherwise indexed.

N. O. I. B. N.—Means not otherwise indexed by name.

LIST OF HAZARDOUS MATERIALS

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Acetaldehyde (ethyl aldehyde)	F. L.	173.118, 173.119	Red
Acetone	F. L.	173.118, 173.119	Red
Acetone cyanohydrin	Pols. B.	173.345, 173.346	Poison
Acetone sulfolene	F. L.	173.118, 173.119	Red
Acetonitrile	F. L.	173.118, 173.119	Red
Acetyl benzoyl peroxide, solid	Not accepted.		
Acetyl benzoyl peroxide, solution	Oxy. M.	No exemption, 173.222	Yellow
Acetyl chloride	Cor.	173.244, 173.247	Corrosive
Acetyl peroxide, solid	Not accepted.		
Acetyl peroxide, solution	Oxy. M.	173.153 (b), 173.222	Yellow
Acetylene	F. L.	173.306, 173.303	Red Gas
Acid carbonyl, empty	See § 173.29 (c)		
Acid, liquid, n. o. s.	Cor.	173.244, 173.245	Corrosive
Acid peric. See Picric acid.			
Acid sludge. See Sludge acid.			
Acrolein, inhibited	F. L.	No exemption, 173.123	Red
Acrylonitrile	F. L.	173.118, 173.119	Red
Actuating cartridges, explosive, fire extinguisher or valve	Expl. C.	173.114	
Aethers, n.o.s. See Cement, liquid, n.o.s.			
Aeroplane flares. See Special fireworks.			
Aerosol products. See Compressed gases, n.o.s.			
Air, compressed	Nonf. G.	173.306, 173.302	Green
Aircraft rocket engines (commercial)	F. B.	No exemption, 173.238	Yellow
Aircraft rocket engine igniters (commercial)	F. B.	No exemption, 173.238	Yellow
Alcohol, n. o. s.	F. L.	173.118, 173.119	Red
Alcohol, allyl	Pols. B.	173.343, 173.346	Poison
Aldrin	Pols. B.	173.361, 173.376	Poison
Aldrin, cast solid	See § 173.376 (b)		
Aldrin mixtures, liquid, with 60 percent or less aldrin	See § 173.361 (b)		
Aldrin mixtures, liquid, with more than 60 percent aldrin	Pols. B.	173.345, 173.361	Poison
Aldrin mixtures, dry, with more than 65 percent aldrin	Pols. B.	173.344, 173.376	Poison
Aldrin mixtures, dry, with 65 percent or less aldrin	See § 173.376 (b)		
Alkaline caustic liquids, n. o. s.	Cor.	173.244, 173.246	Corrosive
Alkaline corrosive battery fluid	Cor.	173.244, 173.249, 173.267	Corrosive
Alkaline corrosive battery fluid with storage battery	Cor.	No exemption, 173.268	Corrosive
Alkaline corrosive liquids, n. o. s.	Cor.	173.244, 173.246	Corrosive
Allyl alcohol. See Alcohol, allyl.			
Allyl aluminum halides. See Pyrophoric liquids, n.o.s.			
Allyl bromide	F. L.	173.118, 173.119	Red
Allyl chloroacetate. See Allyl chloroacetate.			
Allyl chloroformate	Cor.	No exemption, 173.288	Corrosive
Allyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Aluminum alkyls. See Pyrophoric liquids, n.o.s.			
Aluminum dross	See § 173.173		
Aluminum liquid (or paint). See Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Aluminum nitrate	Oxy. M.	173.153, 173.182	Yellow
Aluminum triethyl	F. L.	No exemption, 173.134	Red
Amalcol. See High explosives.			
Ammonia, anhydrous. See Anhydrous ammonia.			
Ammonium arsenate, solid	Pols. B.	173.361, 173.365	Poison
Ammonium bichromate (ammonium dichromate)	F. B.	173.153, 173.154, 173.238	Yellow
Ammonium nitrate	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate (organic coating)	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate-phosphate	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate-carbamate mixtures	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate mixed fertilizer	Oxy. M.	173.153, 173.182	Yellow
Ammonium nitrate fertilizer, containing 90 percent or more ammonium nitrate with no organic coating	Oxy. M.	173.153, 173.182	Yellow
Ammonium perchlorate	Oxy. M.	173.153, 173.151, 173.239a	Yellow
Ammonium permanganate	Oxy. M.	173.153, 173.151	Yellow
Ammonium picrate. See High explosives.			
Ammonium picrate, wet (not to exceed 14 ounces)	See § 173.192		
Ammunition, chemical (containing class A poisons, liquids, or gases)			
Ammunition, chemical (containing class B poisons, liquids, or gases)			
Ammunition, chemical (containing class C poisons, liquids, or solids)			

LIST OF HAZARDOUS MATERIALS - Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Ammunition, chemical, explosive	See § 173.69		
Ammunition material	See § 173.65		
Ammunition non-explosive	See § 173.65		
Ammunition for cannon with empty projectiles	Expl. B.	No exemption, 173.69	
Ammunition for cannon with explosive projectiles	Expl. A.	No exemption, 173.64	
Ammunition for cannon with gas projectiles	Expl. A.	No exemption, 173.64	
Ammunition for cannon with illuminating projectiles	Expl. A.	No exemption, 173.64	
Ammunition for cannon with incendiary projectiles	Expl. A.	No exemption, 173.64	
Ammunition for cannon with inert loaded projectiles	Expl. B.	No exemption, 173.69	
Ammunition for cannon with smoke projectiles	Expl. A.	No exemption, 173.64	
Ammunition for cannon with solid projectiles	Expl. B.	No exemption, 173.69	
Ammunition for cannon without projectiles	Expl. B.	No exemption, 173.69	
Ammunition, rocket. See Rocket ammunition.			
Ammunition, small-arms. See Small-arms ammunition.			
Ammunition for small-arms with explosive projectiles	Expl. A.	No exemption, 173.66	
Ammunition for small-arms with incendiary projectiles	Expl. A.	No exemption, 173.66	
Amyl acetate	F. L.	173.118, 173.119	Red
Amyl chloride	F. L.	173.118, 173.119	Red
Amyl mercaptan	F. L.	No exemption, 173.161	Red
Amyl nitrite	F. L.	173.118, 173.119	Red
Amyl trichloroethane	Cor.	No exemption, 173.280	Corrosive
Anhydrous ammonia	Nonf. G.	173.306, 173.304, 173.314, 173.316	Green
Anhydrous hydrazine. See Hydrazine, anhydrous.			
Anhydrous hydrofluoric acid. See Hydrofluoric acid, anhydrous.			
Aniline oil drums, empty	See § 173.347 (d)		
Aniline oil, liquid	Pols. B.	No exemption, 173.347	Poison
Anisyl chloride	Cor.	173.244, 173.279	Corrosive
Anti-freeze compounds, liquid	F. L.	173.118, 173.119	Red
Anti-freeze preparations, proprietary, liquid	F. L.	173.118, 173.119	Red
Antimony pentachloride	Cor.	173.244, 173.247	Corrosive
Antimony pentachloride solution	Cor.	173.244, 173.248	Corrosive
Antimony pentachloride	Cor.	No exemption, 173.246	Corrosive
Apparatus. See Refrigerating machines, compressors or flammable liquid.			
Aqua ammonia solution containing anhydrous ammonia	Nonf. G.	173.306, 173.304, 173.314, 173.316	Green
Argon	Nonf. G.	173.306, 173.302, 173.314	Green
Argon, pressurized liquid	Nonf. G.	No exemption, 173.304	Green
Arsonate of lead. See Lead arsonate.			
Arsenic acid, liquid	Pols. B.	173.345, 173.348	Poison
Arsenic acid, solid	Pols. B.	173.344, 173.346	Poison
Arsenic bromide, solid	Pols. B.	173.344, 173.348	Poison
Arsenic chloride (arsenous), liquid	Pols. B.	173.345, 173.348	Poison
Arsenic iodide, solid	Pols. B.	173.344, 173.345	Poison
Arsenic pentoxide, solid	Pols. B.	173.344, 173.346	Poison
Arsenic solid	Pols. B.	173.344, 173.346	Poison
Arsenic sulfide (powder), solid	Pols. B.	173.345, 173.348	Poison
Arsenic trichloride, liquid	Pols. B.	173.345, 173.348	Poison
Arsenic trioxide, solid (arsenic, white, solid, arsenous acid, solid)	Pols. B.	173.344, 173.346, 173.368	Poison
Arsenic, white, solid	Pols. B.	173.344, 173.346	Poison
Arsenical compounds or mixtures, n.o.s., liquid	Pols. B.	173.345, 173.348	Poison
Arsenical compounds or mixtures, n.o.s., solid	Pols. B.	173.344, 173.347	Poison
Arsenical dip, liquid (sheep dip)	Pols. B.	173.345, 173.348	Poison
Arsenical dust	Pols. B.	173.344, 173.346	Poison
Arsenical flue dust	Pols. B.	173.344, 173.346	Poison
Arsenous acid, solid	Pols. B.	173.344, 173.346	Poison
Arsenous and mercuric iodide solution, liquid	Pols. B.	173.345, 173.348	Poison
Asphalt, cut-back. See Road asphalt, or tar, liquid.			
Automobiles, motorcycles, tractors or other self-propelled vehicles	See § 173.120, 173.246		
Automobiles, motorcycles, tractors or other self-propelled vehicles, engines or other mechanical apparatus, with charged electric storage batteries, wet	See § 173.250		
1-Asiridinyl phosphine oxide (tris). See Tri-(1-asiridinyl) phosphine oxide.			
Blaze, nitrate of soda, empty and unwashed	F. B.	No exemption, 173.155 (a)	Yellow
Barium acid--50 percent or more water wet	F. B.	No exemption, 173.239	Yellow

LIST OF HAZARDOUS MATERIALS - Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Barium chlorate.	Oxy. M.	173.153, 173.153.	Yellow
Barium chlorate, wet.	Oxy. M.	173.153, 173.153 (a) (6)	Yellow
Barium cyanide, solid.	Pols. B.	173.370.	Poison
Barium nitrate.	Oxy. M.	173.153, 173.153.	Yellow
Barium perchlorate.	Oxy. M.	173.153, 173.153.	Yellow
Barium permanganate.	Oxy. M.	173.153, 173.153.	Yellow
Barium peroxide (binoxide, dioxide).	Oxy. M.	173.153, 173.153.	Yellow
Barrels, empty. See Drums, empty.			
Batteries, dry.	Not regulated.		
Batteries, electric storage, wet.	Cor.	173.250.	Corrosive
Batteries, electric storage, wet, with automobiles, auto parts, engines or other mechanical apparatus.	Cor.	173.250, 173.250.	Corrosive
Batteries, electric storage, wet, with containers of corrosive battery fluid.	Cor.	No exemption, 173.250.	Corrosive
Battery charger with electrolyte (acid) or battery fluid.	See § 173.250.		
Battery fluid. See Electrolyte (acid) or Alkaline corrosive battery fluid.			
Benzene (benzol).	F. L.	173.118, 173.119.	Red
Benzene phosphorus dichloride.	Cor.	173.244, 173.250a.	Corrosive
Benzene phosphorus trichloride.	Cor.	173.244, 173.250a.	Corrosive
Benzine.	F. L.	173.118, 173.119.	Red
Benzol (benzene).	F. L.	173.118, 173.119.	Red
Benzoyl chloride.	Cor.	173.244, 173.247.	Corrosive
Benzoyl peroxide.	Oxy. M.	No exemption, 173.157, 173.158.	Yellow
Benzyl bromide (bromotoluene, alpha).	Cor.	No exemption, 173.281.	Corrosive
Benzyl chloride.	Cor.	173.244, 173.295.	Corrosive
Benzyl chloroformate. See Benzyl chloroformate.			
Benzyl chloroformate.	Cor.	No exemption, 173.281.	Corrosive
Beryllium compounds, n. o. s.	Pols. D.	173.304, 173.305.	Poison
Black blasting powder. See Black powder.			
Black pellet powder. See Black powder.			
Black powder.	Expl. A.	No exemption, 173.00.	
Black powder igniters with empty cartridge bags.	Expl. C.	No exemption, 173.100.	
Black rifle powder. See Black powder.			
Blasting caps—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps—more than 1,000.	Expl. A.	No exemption, 173.00.	
Blasting caps with metal clad mild detonating fuse—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps with metal clad mild detonating fuse—more than 1,000.	Expl. A.	No exemption, 173.00(c), 173.07.	
Blasting caps with safety fuse—1,000 or less.	Expl. C.	No exemption, 173.103.	
Blasting caps with safety fuse—more than 1,000.	Expl. A.	No exemption, 173.00(c), 173.07.	
Blasting caps, electric. See Electric blasting caps.			
Blasting gelatin. See High explosives.			
Blasting powder. See Black powder.			
Boiler compound, liquid.	Cor.	173.244, 173.249.	Corrosive
Bombs, explosive. See Explosive bomb.			
Bombs, explosive, with gas, smoke, or incendiary material. See Explosive bomb.			
Bombs, explosive, incendiary. See Explosive bomb.			
Bombs, fireworks. See Special fireworks.			
Bombs, gas, smoke or incendiary, non-explosive. See Chemical ammunition.			
Bombs, incendiary or smoke without bursting charges. See Special fireworks.			
Bombs, practice, with electric primers or electric squibs.	See § 173.55.		
Bombs, sand-lodged or empty.	See § 173.55.		
Boronates (explosive).	Expl. A.	No exemption, 173.00.	
Bordeaux arsenites, liquid.	Pols. D.	173.345, 173.346.	Poison
Bordeaux arsenites, solid.	Pols. B.	173.304, 173.305.	Poison
Boron trichloride.	Cor.	No exemption, 173.251.	Corrosive
Boron trifluoride.	Nonf. O.	173.300, 173.302.	Green
Botulin, acid or other corrosive liquids, empty.	See § 173.29.		
Box ton gum.	F. L.	173.118, 173.119.	Red
Braze, reusé.	See § 173.28.		
Bromaceton, liquid.	Pols. A.	No exemption, 173.329 (a).	Poison Gas
Bromobenzyl cyanide, liquid.	Pols. C.	No exemption, 173.382.	Yellow Gas
Bromine.	Cor.	No exemption, 173.252.	Corrosive
Bromine pentafluoride.	Cor.	No exemption, 173.284.	Corrosive
Bromine trifluoride.	Cor.	No exemption, 173.283.	Corrosive
Bromotoluene, alpha. See Benzyl bromide.			
Bronze liquid (or paint). See "Paint, enamel, lacquer, stain, shellac, varnish, etc."			

LIST OF HAZARDOUS MATERIALS - Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Bromine.	Pols. B.	173.304, 173.305.	Poison
Burnt cotton (not repacked).	F. B.	No exemption, 173.100.	Yellow
Burnt fiber.	F. B.	No exemption, 173.100.	Yellow
Bursters (explosive).	Expl. A.	No exemption, 173.00.	
Butadiene, inhibited.	F. L.	173.300, 173.301, 173.314, 173.315.	Red Gas
Butane or Liquefied petroleum gas. See Liquefied Petroleum gas.			
Butyl acetate.	F. L.	173.118, 173.119.	Red
Butyl alcohol. See Alcohol, n. o. s.			
Butyl mercaptan.	F. L.	No exemption, 173.141.	Red
Butyl trichlorosilane.	Cor.	No exemption, 173.280.	Corrosive
Butyraldehyde.	F. L.	173.118, 173.119.	Red
Carbonyl acid, solid (dimethylarsinic acid).	Pols. D.	173.304, 173.305.	Poison
Calcium arsenate, solid.	Pols. B.	173.301, 173.307, 173.308.	Poison
Calcium arsenite, solid.	Pols. B.	173.301, 173.305.	Poison
Calcium chloride.	Oxy. M.	173.153, 173.153.	Yellow
Calcium chlorite.	Oxy. M.	No exemption, 173.100.	Yellow
Calcium cyanide. See Cyanide of calcium.			
Calcium hypochlorite mixtures (dry, containing more than 50 percent available chlorine).	Oxy. M.	173.153, 173.217.	Yellow
Calcium, metallic.	F. B.	173.153, 173.154.	Yellow
Calcium, metallic, crystalline.	F. B.	No exemption, 173.231.	Yellow
Calcium nitrate.	Oxy. M.	173.153, 173.153.	Yellow
Calcium peroxide.	Oxy. M.	173.153, 173.153.	Yellow
Calcium permanganate.	F. B.	No exemption, 173.161.	Yellow
Calcium phosphide.	F. B.	No exemption, 173.160.	Yellow
Calcium titanate.	F. B.	No exemption, 173.160.	Yellow
Calcium carbonate, fused.	Expl. C.	No exemption, 173.107.	
Cannon primers.			
Caps, blasting. See Blasting caps.			
Caps, toy. See Toy caps.			
Caprylyl peroxide solution.	Oxy. M.	173.153 (b), 173.321.	Yellow
Carbolic acid, fused solid. See Carbolic acid (phenol), solid.			
Carbolic acid (phenol), liquid, (liquid tar acid containing over 50 percent benzophenol).	Pols. B.	173.345, 173.346.	Poison
Carbolic acid (phenol), solid.	Pols. B.	173.309.	Poison
Carbon bisulfide (disulfide).	F. L.	No exemption, 173.121.	Red
Carbon dioxide gas, liquefied ("mining device").	Nonf. O.	173.304 (a) (2) Table Note 4.	Green
Carbon dioxide, liquefied.	Nonf. O.	173.300, 173.301.	Green
Carbon dioxide-nitrous oxide mixture.	Nonf. O.	173.300, 173.301.	Green
Carbon dioxide-oxygen mixture.	Nonf. O.	173.300, 173.301.	Green
Carbon monoxide.	F. L.	173.300, 173.302(f).	Red Gas
Carbon monoxide, liquid.	F. L.	173.118, 173.119.	Red
Carbonyl chloride. See Phosgene.			
Carboys, acid, empty.	See § 173.29 (c).		
Carboys, empty. See Acid carboys, empty.			
Cartridge bags, empty, with black powder igniters.	Expl. C.	No exemption, 173.100.	
Cartridge cases, empty, primed.	Expl. C.	No exemption, 173.107.	
Cartridges, practice ammunition.	Expl. C.	No exemption, 173.101a.	
Case oil. See Gasoline, "Naphtha."			
Casinghead gasoline. See Gasoline.			
Casks, empty. See Drums, empty.			
Caustic potash, liquid.	Cor.	173.244, 173.249.	Corrosive
Caustic soda, liquid.	Cor.	173.244, 173.249.	Corrosive
Cement, adhesive, n.o.s. See Cement, liquid, n.o.s.			
Cement, leather.	F. L.	173.118, 173.119.	Red
Cement, lime, tile, wallboard, or container, liquid.	F. L.	173.118, 173.132.	Red
Cement, liquid, n.o.s.	F. L.	173.118, 173.119, 173.132.	Red
Cement, pyroxylin.	F. L.	173.118, 173.132.	Red
Cement, roofing, liquid.	F. L.	173.118, 173.119.	Red
Cement, rubber.	F. L.	173.118, 173.132.	Red
Charcoal, activated.	F. B.	173.162.	Yellow
Charcoal briquettes.	F. B.	173.162.	Yellow
Charcoal, shell.	F. B.	173.162.	Yellow
Charcoal, wood, ground, crushed, granulated or pulverized.	F. B.	173.162.	Yellow
Charcoal, wood, lump.	F. B.	173.162.	Yellow
Charcoal screenings, made from "pinon" wood.	F. B.	173.162.	Yellow
Charcoal, wood screenings other than "Pinon" wood screenings.	F. B.	No exemption, 173.162.	Yellow
Charcoal screenings, wet.	Not accepted.		
Charcoal, wet.	Not accepted.		

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Charged oil well jet perforating guns (total explosive contents in guns exceeding 50 pounds per motor vehicle)	Expl. A	No exemption, 173.53 (u), 173.80	
Charged oil well jet perforating guns (total explosive contents in guns not exceeding 50 pounds per motor vehicle)	Expl. C	No exemption 173.53 (u), 173.110	
*Chemicals, n. o. s. See *Drugs, chemicals, medicines or cosmetics, n. o. s.			
Chemical ammunition (containing class A poisons, liquids, or gases)	Pois. A	No exemption, 173.330	Poison gas
Chemical ammunition (containing class B poisons, liquids, or gases)	Pois. B	173.345, 173.350	Poison
Chemical ammunition (containing class C poisons, liquids, or solids)	Pois. C	No exemption, 173.383	Tear Gas
Chemical ammunition, explosive	See § 173.59		
*Chemical kits	See § 173.386		
*Chloracetophenone, gas, liquid, or solid	Pois. C	No exemption, 173.392	Tear Gas
*Chloroacetyl chloride	Cor.	No exemption, 173.253	Corrosive
*Chlorate and borate mixtures	Oxy. M	173.153, 173.229	Yellow
*Chlorate and magnesium chloride mixture	Oxy. M	173.153, 173.229	Yellow
Chlorates, n. o. s.	Oxy. M	173.153, 173.163	Yellow
Chlorates, n. o. s., wet	Oxy. M	173.153, 173.163 (a) (6)	Yellow
Chlorate explosives, dry. See High explosives.			
Chlorate of potash	Oxy. M	173.153, 173.163	Yellow
Chlorate of soda	Oxy. M	173.153, 173.163	Yellow
Chlorate powders. See High explosives.			
Chloride of phosphorus. See Phosphorus trichloride.			
Chloride of sulfur. See Sulfur chloride.			
*Chlorine	Uncl. G	173.300, 173.304, 173.314, 173.315	(Green)
Chlorine dioxide hydrate, frozen	Oxy. M	No exemption, 173.237	Yellow
Chlorine trifluoride	Cor.	No exemption, 173.285	Corrosive
Chlorobenzoyl peroxide (para)	Oxy. M	No exemption, 173.157, 173.158	Yellow
*Chlorodinitrobenzol. See Dinitrochlorobenzol, solid.			
*Chloro-o-toluidine hydrochloride	Pois. B	No exemption, 173.362	Poison
Chlorosulfonic acid	Cor.	173.244, 173.251	Corrosive
Chlorosulfonic acid-sulfur trioxide mixture	Cor.	173.244, 173.251	Corrosive
Chloriprin and nonflammable, nonliquefied compressed gas mixtures	Pois. A	No exemption, 173.329 (c)	Poison Gas
Chloriprin, liquid	Pois. B	No exemption, 173.357	Poison
Chloriprin, solid	Pois. B	No exemption, 173.357	Poison
Chloriprin mixtures (containing no compressed gas or poisonous liquid, class A)	Pois. B	No exemption, 173.357	Poison
Chloriprin and methyl chloride mixtures	Pois. A	No exemption, 173.329 (b)	Poison Gas
Chromic acid	Oxy. M	173.153, 173.161	Yellow
Chromic acid solution	Cor.	173.244, 173.245, 173.287	Corrosive
Chromic anhydride. See Chromic acid.			
Chromium trioxide. See Chromic acid.			
Chromyl chloride	Cor.	No exemption, 173.247	Corrosive
Cigar and cigarette lighter fluid	F. L.	173.118, 173.119	Red
Cigarette lighters charged with fuel	See § 173.21 (d)		
Cigarette loads	Expl. C	No exemption, 173.111	
*Cleaning fluid or liquid	F. L.	173.118, 173.119	Red
*Clou gas cylinders. See Chemical ammunition.			
Coal briquettes, hot	Not accepted.		
Coal gas. See Hydrocarbon gas, non-liquefied.			
Coal, ground bituminous, sea coal, coal facings, etc.	See § 173.165		
*Coal tar distillate	F. L.	173.118, 173.119	Red
*Coal tar light oil	F. L.	173.118, 173.119	Red
*Coal tar naphtha	F. L.	173.118, 173.119	Red
*Coal tar oil	F. L.	173.118, 173.119	Red
*Coating solution	F. L.	173.118, 173.132	Red
Cobalt remanite, precipitated	F. 8.	No exemption, 173.166	Yellow
Cocculus, solid (ash berry)	Pois. B	173.364, 173.365	Poison
Coke, hot	Not accepted.		
Collodion	F. L.	173.118, 173.119	Red
Collodion cotton, wet. See Wet ultracellulose.			
Cologne spirits (alcohol)	F. L.	173.118, 173.119	Red
Colored fire. See Common fireworks.			
Colundian spirits (wood alcohol)	F. L.	173.118, 173.119	Red
Combination fuses	Expl. C	No exemption, 173.105	

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Combination primers	Expl. C	No exemption, 173.107	
Commercial shaped charges. See High explosives.	See § 173.65 (b)		
Common fireworks	Expl. C	No exemption, 173.100 (r), 173.106	
*Compounds, etching, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, etching, liquid (containing hydrochloric (muriatic) acid)	Cor.	173.244, 173.263	Corrosive
*Compounds, etching, liquid (containing hydrofluoric acid)	F. L.	173.118, 173.119	Red
*Compounds, etching, liquid (containing hydrofluoric acid)	Cor.	173.244, 173.256	Corrosive
*Compounds, enamel	F. L.	173.118, 173.128	Red
*Compounds, iron or steel rust preventing or removing	Cor.	173.244, 173.245	Corrosive
*Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid	F. L.	173.118, 173.128	Red
*Compounds, lacquer, paint, or varnish removing, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, polishing, liquid	F. L.	173.118, 173.129	Red
*Compounds, tree or weed killing, liquid	F. L.	173.118, 173.119	Red
*Compounds, tree or weed killing, liquid	Pois. B	173.345, 173.346	Poison
*Compounds, tree or weed killing, solid	Oxy. M	173.153, 173.154, 173.229	Yellow
*Compounds, type-cleaning, liquid	F. L.	173.118, 173.119	Red
*Compounds, vulcanizing, liquid	Cor.	173.244, 173.245	Corrosive
*Compounds, vulcanizing, liquid	F. L.	173.118, 173.119	Red
Compressed gases, n.o.s.	Uncl. G	173.300, 173.305, 173.304, 173.302	Green
Compressed gases, n.o.s.	F. L.	173.208, 173.205, 173.304, 173.302	Red Gas
Containers, empty. See Acid cartboys, empty; bottles empty, drums empty, cylinders empty.	See § 173.29		
Containers, reused	See § 173.28		
Copper acetoarsenite, solid (emerald green, imperial green, kings green, moss green, meadow green, milis green, parrot green, Vienna green)	Pois. B	173.364, 173.367	Poison
Copper arsenite, solid (Scheele's green, cupric green, copper orthoarsenite, Verdian green)	Pois. B	173.364, 173.365	Poison
Copper cyanide	See § 173.370		
Cordieu detonant fuse	Expl. C	No exemption, 173.104	
Corrosive battery fluid. See Electrolyte (acid), or Alkaline corrosive battery fluid.			
Corrosive acid, n.o.s.	Corrosive	173.244, 173.245	Corrosive
Cotton, burnt. See flint cotton.			
Cotton waste, oily with more than 6 percent of animal or vegetable oil	F. 8.	No exemption, 173.167	Yellow
Crotonaldehyde	F. L.	173.118, 173.119	Red
*Crude nitrogen fertilizer solution	Uncl. G	173.308, 173.304, 173.314	Green
*Crude oil, petroleum	F. L.	173.118, 173.119	Red
*Cumene hydroperoxide	Oxy. M	173.153 (b), 173.224	Yellow
Cyanoethylene diamine solution	Cor.	173.244, 173.249	Corrosive
Cyanide of calcium or cyanide of calcium mixtures, solid	Pois. B	173.370 (c) and (d)	Poison
Cyanides of copper, zinc, lead, and silver	See § 173.370		
Cyanides or cyanide mixtures, dry	Pois. B	173.364, 173.370	Poison
Cyanide of potassium, liquid	Pois. B	173.345, 173.352	Poison
Cyanide of potassium, solid	Pois. B	173.370	Poison
Cyanide of sodium, liquid	Pois. B	173.345, 173.352	Poison
Cyanide of sodium, solid	Pois. B	173.370	Poison
Cyanogen bromide	Pois. B	No exemption, 173.370	Poison
Cyanogen chloride containing less than 0.9 percent water	Pois. A	No exemption, 173.329	Poison Gas
Cyanogen gas	Pois. A	No exemption, 173.329	Poison Gas
Cyclohexane	F. L.	173.118, 173.119	Red
Cyclohexanone peroxide not over 50 percent concentration	Oxy. M	173.153, 173.154	Yellow
Cyclohexanone peroxide over 50 percent concentration but not exceeding 85 percent concentration	Oxy. M	No exemption, 173.157, 173.158	Yellow
Cyclohexenyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Cyclohexyltrichlorosilane	Cor.	No exemption, 173.280	Corrosive
Cyclopentane	F. L.	173.118, 173.119	Red
Cyclopentane, methyl	F. L.	173.118, 173.119	Red
Cyclopropane	F. G.	173.300, 173.304	Red Gas
Cyclotrimethylene triamine, desensitized. See High Explosives.			
Cyclotrimethylene triamine, wet with not less than 10 percent of water. See High explosives.			
Cylinders, empty	See § 173.29		

LIST OF HAZARDOUS MATERIALS--Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Decaborane	F. S.	No exemption, 173.236	Yellow
Delay electric igniters	Expl. C.	No exemption, 173.106	
Denatured alcohol. See Alcohol, n. o. s.			
Depth bombs. See Explosive bomb.			
Detonating fuses, class A explosives	Expl. A.	No exemption, 173.69	
Detonating fuses, class A explosives, radioactive	Expl. A.	No exemption, 173.69	
Detonating fuses, class C explosives	Expl. C.	No exemption, 173.113	
Detonating primers	Expl. A.	No exemption, 173.68	
Diazodinitrophenol. See Initiating explosive.			
Dichlorethylene	F. L.	173.118, 173.119	Red
Dichlorodifluoromethane	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichlorodifluoromethane-dichlorotetrafluoroethane mixture	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichlorodifluoromethane-monochlorodifluoromethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-trichloromonofluoromethane-monochlorodifluoromethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-trichlorotrifluoroethane mixture	Nonf. G.	173.306, 173.304, 173.314	Green
Dichlorodifluoromethane-monofluorotrifluoromethane mixture	Nonf. G.	173.306, 173.314, 173.315	Green
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture)	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Dichloroacetic acid, dry, containing more than 39% available chlorine	Oxy. M.	173.153, 173.217	Yellow
Dicumyl peroxide, solid	Oxy. M.	173.153, 173.154	Yellow
Dicumyl peroxide, 50% solution	Oxy. M.	173.153 (b), 173.224	Yellow
Diethyl aluminum chloride	F. L.	No exemption, 173.134	Red
Diethyl dichlorosilane	Cor.	No exemption, 173.280	Corrosive
Diethylamine	F. L.	173.118, 173.119	Red
Diethylene glycol dinitrate	See § 173.51 (d)		
1,1 difluoro 1-chloroethane. See Difluoromonochloroethane			
Difluoroethane	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Difluoromonomethylchloroethane (1,1 difluoro 1-chloroethane)	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Difluorophosphoric acid, anhydrous	Cor.	No exemption, 173.275	Corrosive
Diisooctyl acid phosphate	Cor.	173.244, 173.296	Corrosive
Diisopropylbenzene hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Dimethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Dimethylamine, aqueous solution	F. L.	173.118, 173.119	Red
Dimethyldichlorosilane	F. L.	No exemption, 173.135	Red
Dimethyl ether	F. G.	173.306, 173.304, 173.314	Red Gas
Dimethylhexane dihydroperoxide, dry	Not accepted		
Dimethylhexane dihydroperoxide, wet	Oxy. M.	No exemption, 173.157	Do
Dimethylhydrazine, unsymmetrical	F. L.	No exemption, 173.145	Red
Dimethyl sulfate	Cor.	No exemption, 173.255	Corrosive
Dimethyl sulfide	F. L.	173.118, 173.119	Red
Dinitrobenzol, solid	Pois. B.	173.364, 173.371	Poison
Dinitrobenzol, liquid	Pois. B.	173.345, 173.346	Poison
Dinitrochlorobenzol, solid (dinitrochlorobenzene, chlorodinitrobenzol)	Pois. B.	173.364, 173.365	Poison
Dinitrophenol solutions	Pois. B.	173.345, 173.362A	Poison
Diphenyl dichlorosulfate	Cor.	No exemption, 173.280	Corrosive
Diphenylaminochloramine, gas, liquid, or solid	Pois. C.	No exemption, 173.382	Tear Gas
Diphenylchlorarsine, solid	Pois. C.	No exemption, 173.382	Tear Gas
Diphosgene. See Phosgene.			
Dispersant gas, n. o. s.	See § 173.314 (c) Table Note 13, 173.315 (a) Table Note 9.		
*Distillate	F. L.	173.118, 173.119	Red
Dodecyltrichlorosilane	Cor.	No exemption, 173.280	Corrosive
Dressing, leather	F. L.	173.118, 173.119	Red
*Driers, paint, varnish, enamel, etc. See *Paint driers, liquid.			
*Drill cartridges	See § 173.55		
*Drugs, chemicals, medicines or cosmetics, n. o. s.	F. L.	173.118, 173.119	Red
*Drugs, chemicals, medicines or cosmetics, n. o. s.	F. S.	173.153, 173.154	Yellow
*Drugs, chemicals, medicines or cosmetics, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
*Drugs, chemicals, medicines or cosmetics, n. o. s.	Cor.	173.244, 173.245	Corrosive
*Drugs, chemicals, medicines or cosmetics, n. o. s. (liquid)	Pois. B.	173.345, 173.346	Poison
*Drugs, chemicals, medicines or cosmetics, n. o. s. (solid)	Pois. B.	173.364, 173.365	Poison
Drums, empty	See § 173.29		
Dummy cartridges	See § 173.55		
Dusta, by-product, poisonous. See Arsenical dust.			
Dynamite. See High explosives.			
Electric blasting caps—more than 1,000	Expl. A.	No exemption, 173.66	

LIST OF HAZARDOUS MATERIALS Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Electric blasting caps—1,000 or less	Expl. C.	No exemption, 173.103	
Electric squibs	Expl. C.	No exemption, 173.106	
Electric storage batteries, wet. See Batteries, electric storage, wet.			
Electrolyte (acid), battery fluid	Cor.	173.244, 173.257	Corrosive
Electrolyte (acid) or alkaline corrosive battery fluid packed with storage batteries	Cor.	No exemption, 173.256	Corrosive
Electrolyte (acid) or alkaline corrosive battery fluid packed with battery charger, radio current supply device, or electronic equipment and actuating devices	Cor.	No exemption, 173.259	Corrosive
Empty cartridge bags with black powder igniters	Expl. C.	No exemption, 173.106	
Empty cartridge cases, primed	Expl. C.	No exemption, 173.107	
*Enamel. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Engines, internal combustion	See § 173.120		
Engine starting fluid	F. G.	No exemption, 173.304	Red Gas
*Eradicators, paint or grease, liquid	F. L.	173.118, 173.119	Red
Etching acid liquid, n. o. s.	Cor.	No exemption, 173.299	Corrosive
Ethane	F. G.	173.306, 173.304	Red Gas
Ether	F. L.	173.118, 173.119	Red
Ether, ethyl (sulfuric). See Ether.			
Ethyl acetate	F. L.	173.118, 173.119	Red
Ethyl alcohol. See Alcohol, n. o. s.			
Ethyl aldehyde. See Acetaldehyde.			
Ethyl aluminum dichloride	F. L.	No exemption, 173.134	Red
Ethyl aluminum sesquichloride	F. L.	No exemption, 173.134	Red
Ethyl chloride	F. L.	No exemption, 173.123	Red
Ethyl chlorocarbonate. See Ethyl chloroformate.			
Ethyl chloroformate	Cor.	No exemption, 173.288	Corrosive
Ethyl chloroethanolformate. See Corrosive liquid n. o. s.			
Ethylchloroarsine	Pois. A.	No exemption, 173.328	Poison Gas
Ethyl dichlorosilane	F. L.	No exemption, 173.135	Red
*Ethylene	F. G.	173.306, 173.304	Red Gas
Ethylene dichloride	F. L.	173.118, 173.119	Red
Ethyleneimine, inhibited	F. L.	No exemption, 173.139	Red
Ethylene oxide	F. L.	No exemption, 173.124	Red
Ethyl formate	F. L.	173.118, 173.119	Red
Ethyl mercaptan	F. L.	No exemption, 173.141	Red
Ethyl methyl ether	F. L.	173.118, 173.119	Red
Ethyl methyl ketone	F. L.	173.118, 173.119	Red
Ethyl nitrate (nitric ether)	F. L.	173.118, 173.119	Red
Ethyl nitrite (nitrous ether)	F. L.	173.118, 173.119	Red
Ethyl phenyl dichlorosilane	Cor.	No exemption, 173.280	Corrosive
Ethyl phosphonothioic dichloride, anhydrous. See Corrosive liquid, n. o. s.			
Ethyl phosphorus dichloride, anhydrous. See Corrosive liquid, n. o. s.			
Ethyl phosphorodichloridate. See Corrosive liquid n. o. s.			
Ethyl trichlorosilane	F. L.	No exemption, 173.135	Red
Explosive auto alarms	Expl. C.	No exemption, 173.111	
Explosive bomb	Expl. A.	No exemption, 173.56	
Explosive candle cutters	Expl. C.	No exemption, 173.102	
Explosives, class A	See § 173.53		
Explosives, class B	See § 173.58		
Explosives, class C	See § 173.100		
Explosive compositions	Expl. A or B.	No exemption, 173.53, 173.61 to 173.93	
Explosive mine	Expl. A.	No exemption, 173.56	
Explosive power device, class B	Expl. B.	No exemption, 173.94	Red
Explosive power device, class C	Expl. C.	No exemption, 173.102	
Explosive projectile	Expl. A.	No exemption, 173.56	
Explosive release device	Expl. C.	No exemption, 173.102	
Explosive rivets	Expl. C.	No exemption, 173.100 (q)	
Explosive samples for laboratory examination	See § 173.96		
Explosive torpedo	Expl. A.	No exemption, 173.56	
*Extracts, liquid, flavoring	F. L.	173.118, 173.119	Red
Fabrics or fibers with animal or vegetable oil. See Fibers or fabrics with animal or vegetable oil.			

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Felt waste, wet. See Waste wool, wet.			
Ferric arsenate, solid.	Pois. B.	173.364, 173.365.	Poison
Ferric arsenite, solid.	Pois. B.	173.361, 173.365.	Poison
Ferrous arsenate (iron arsenate), solid.	Pois. D.	173.361, 173.365.	Poison
*Fertilizer ammoniating solution containing free ammonia.	Nonf. G.	173.306, 173.304, 173.314.	Green
Fertilizer, tankage. See Garbage, tankage.			
Fiber, burnt.	F. B.	No exemption, 173.169.	Yellow
Fibers or fabrics, with animal or vegetable oil.	F. B.	No exemption, 173.170.	Yellow
Film, motion-picture and toy pieces of. See Motion-picture film, toy and motion-picture film scrap.			
Firecrackers. See Common fireworks or Special fireworks.			
Firecracker salutes. See Common fireworks or Special fireworks.			
Fire extinguisher charges.	Cor.	173.281.	Corrosive
Fire extinguisher charges containing not to exceed 50 grains of propellant explosives per unit.	See § 173.88 (f) Note 1.		
Fire extinguishers.	Nonf. G.	173.306.	Green
Fireworks, common.	Expl. C.	No exemption, 173.100 (r), 173.108.	
Fireworks, exhibition display pieces. See Special fireworks.			
Fireworks, special.	Expl. B.	No exemption, 173.88(d), 173.91.	Special Fireworks ff.
Fish meal. See Fish scrap or fish meal.			
Fish scrap or fish meal containing less than 6 percent or more than 18 percent moisture.	F. B.	No exemption, 173.171.	Yellow
Fissile radioactive materials.	R. A. M.	173.303, 173.306.	Radioactive
Flame retardant compound, liquid.	Cor.	173.244, 173.291.	Corrosive
Flammable liquids, n. o. s.	F. L.	173.116, 173.119.	Red
Flammable solids, n. o. s.	F. B.	173.153, 173.154.	Yellow
Flares. See Common fireworks.			
Flares, aeroplane. See Special fireworks.			
Flash cartridges. See Special fireworks and Low explosives.			
Flash crackers. See Common fireworks or Special fireworks.			
Flash powder. See Special fireworks and Low explosives.			
Flash sheets. See Special fireworks and Low explosives.			
Flexible linear shaped charges, metal clad.	Expl. C.	No exemption, 173.104.	
Flue dust, poisonous.	Pois. B.	173.364, 173.365.	Poison
Fluorine.	F. G.	173.306, 173.307.	Poison
Fluorosulfonic acid.	Cor.	No exemption, 173.274.	Corrosive
Formic acid.	Cor.	173.244, 173.245, 173.289.	Corrosive
Formic acid, solution.	Cor.	173.244, 173.245, 173.289.	Corrosive
Fulminate of mercury, dry.	Forbidden explosive.		
Fulminate of mercury, wet. See Initiating explosive.			
*Fumigants.	See § 173.152 (a) Note 1.		
*Furniture polish. See *Polishes, metal, stove, furniture, and wood, liquid.			
*Furniture or wood stains, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Fuse igniters.	Expl. C.	No exemption, 173.106.	
Fuse, instantaneous. See Instantaneous fuse.			
Fuse lighters.	Expl. C.	No exemption, 173.106.	
Fuse, mild detonating, metal clad. See Mild detonating fuse, metal clad.			
Fuse, safety. See Safety fuse.			
Fuses (railway and highway).	F. B.	No exemption, 173.154a.	Yellow
Fuses, combination.	Expl. C.	No exemption, 173.105.	
Fuses, detonating, class A explosives.	Expl. A.	No exemption, 173.69.	
Fuses, detonating, class A explosives, radioactive.	Expl. A.	No exemption, 173.69.	
Fuses, detonating, class C explosives.	Expl. C.	No exemption, 173.113.	
Fuses, percussion.	Expl. C.	No exemption, 173.105.	
Fuses, time.	Expl. C.	No exemption, 173.105.	
Fuses, tracer.	Expl. C.	No exemption, 173.105.	
Garbage (tankage containing less than 6 percent of moisture).	F. B.	No exemption, 173.200.	Yellow
Gas cylinders, empty.	See § 173.29.		
*Gas drips, hydrocarbon.	F. L.	173.118, 173.119.	Red
Gas identification acts.	Pois. A. and C.	No exemption, 173.331.	Poison Gas
Gas mine. See Explosive mine.	See § 173.56 (d)		

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Gasoline.	F. L.	173.118, 173.119.	Red
Gelatin dynamite. See High explosives.			
*Gold paint. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Grenades, empty, primed.	Expl. C.	No exemption, 173.107.	
Grenades, hand. See Hand grenades.			
Grenades, hand or rifle, explosive, with gas, smoke or incendiary material. See Hand or Rifle grenades.			
Grenades, hand or rifle, with gas, smoke or incendiary material but without bursting charges.	See § 173.88 (d), 173.108, 173.256, 173.250.		
Grenades, police. See Police grenades, poison gas, class A.			
Grenades, rifle. See Rifle grenades.			
Grenades, tear gas. See Tear gas grenades.			
Guandine nitrate.	Oxy. M.	173.162, 173.163.	Yellow
Guanyl nitroamine guanylidene hydrazine. See Initiating explosive.			
Guanyl nitroamine guanyl tetraazene. See Initiating explosive.			
Guided missiles, with warheads. See Rocket ammunition with explosive, illuminating, gas, incendiary or smoke projectiles.			
Guided missiles without warheads. See Rocket motors, class A explosives or Rocket motors, class B explosives.			
Gun cotton. See High explosives.			
Halofium metal, dry, chemically produced, finer than 80 mesh particle size.	F. B.	No exemption, 173.214.	Yellow
Halofium metal, dry, mechanically produced, finer than 870 mesh particle size.	F. B.	No exemption, 173.214.	Yellow
Halofium metal, wet, chemically produced, finer than 80 mesh particle size.	F. B.	No exemption, 173.214.	Yellow
Halofium metal, wet, mechanically produced, finer than 870 mesh particle size.	F. B.	No exemption, 173.214.	Yellow
Hair, wet.	F. B.	No exemption, 173.172.	Yellow
Hand grenades.	Expl. A.	No exemption, 173.68.	
Hand signal devices.	Expl. C.	No exemption, 173.108.	
Heaters for refrigerator cars, liquid fuel type.	F. L.	173.146.	
Helium.	Nonf. G.	173.306, 173.307, 173.314.	Green
Helium-oxygen mixture.	Nonf. G.	173.306, 173.307.	Green
Heptane.	F. L.	173.118, 173.119.	Red
Hexadecyltrichlorosilane.	Cor.	No exemption, 173.280.	Corrosive
Hexethyl tetraphosphate and compressed gas mixture.	Pois. A.	No exemption, 173.234.	Poison Gas
Hexethyl tetraphosphate, liquid.	Pois. B.	No exemption, 173.356.	Poison
Hexethyl tetraphosphate mixture, dry.	Pois. B.	173.377.	Poison
Hexethyl tetraphosphate mixture, liquid.	Pois. B.	173.356.	Poison
Hexafluorophosphoric acid.	Cor.	No exemption, 173.278.	Corrosive
Hexafluoropropylene.	Nonf. G.	173.306, 173.304, 173.314, 173.315.	Green
Hexamethylene diamine solution.	Cor.	173.244, 173.245, 173.283.	Corrosive
Hexane.	F. L.	173.118, 173.119.	Red
Hexyl trichlorosilane.	Cor.	No exemption, 173.280.	Corrosive
High explosives, liquid.	Expl. A.	No exemption, 173.61 to 173.67.	
High explosives, solid.	Expl. A.	No exemption, 173.62.	
High wines. See Alcohol or alcohol, n. o. s.			
Hydraulic accumulators (pressurized with non-flammable, nonliquefied compressed gas).	See § 173.306 (e) (2)		
Hydrazine, anhydrous.	Cor.	No exemption, 173.278.	Corrosive
Hydroiodic acid.	Cor.	173.244, 173.245.	Corrosive
Hydrobromic acid.	Cor.	173.244, 173.283.	Corrosive
Hydrobromic acid, anhydrous. See Hydrogen bromide.			
Hydrocarbon gas, liquefied.	F. G.	173.306, 173.304, 173.314.	Red Gas
Hydrocarbon gas, nonliquefied.	F. G.	173.306, 173.307.	Red Gas
Hydrochloric (muriatic) acid.	Cor.	173.244, 173.283.	Corrosive
Hydrochloric acid, anhydrous. See Hydrogen chloride.			
Hydrochloric acid mixtures.	Cor.	173.244, 173.283.	Corrosive
Hydrochloric acid solution, inhibited.	Cor.	173.244, 173.283.	Corrosive
Hydrocyanic acid, liquefied.	Pois. A.	No exemption, 173.332.	Poison Gas
Hydrocyanic acid (prussic), liquid.	Pois. A.	No exemption, 173.332.	Poison Gas
Hydrocyanic acid (prussic), unstabilized.	Not accepted.		
Hydrocyanic acid solutions.	Pois. B.	No exemption, 173.331.	Poison

LIST OF HAZARDOUS MATERIALS—Continued

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Hydrofluoric acid	Cor.	173.244, 173.264 (a)	Corrosive
Hydrofluoric acid, anhydrous	Cor.	No exemption, 173.264 (b)	Corrosive
Hydrofluoric and sulfuric acids, mixtures	Cor.	No exemption, 173.290	Corrosive
Hydrofluosulfuric acid	Cor.	173.244, 173.265	Corrosive
*Hydrogen	F. G.	170.306, 173.302, 173.314	Red Gas
Hydrogen bromide	Nonf. G.	173.306, 173.304	Green
Hydrogen chloride	Nonf. G.	173.306, 173.304	Green
Hydrogen, liquefied	F. G.	No exemption, 173.316	Red Gas
Hydrogen peroxide (hydrogen dioxide) solution in water containing over 8 percent hydrogen peroxide by weight	Cor.	173.244, 173.266	Corrosive
Hydrogen sulfide	F. G.	173.306, 173.304, 173.314	Red Gas
Hypochlorite solutions containing more than 7 percent available chlorine by weight	Cor.	173.277	Corrosive
Igniter cord	Expl. C.	No exemption, 173.100 (a)	
Igniter fuse-metal clad	Expl. C.	No exemption, 173.106	
Igniters	Expl. C.	No exemption, 173.106	
Igniters, jet thrust (jato), class A explosives	Expl. A.	No exemption, 173.79	None
Igniters, jet thrust (jato), class B explosives	Expl. B.	No exemption, 173.92	Red #
Igniters, rocket motor, class A explosives	Expl. A.	No exemption, 173.79	
Igniters, rocket motor, class B explosives	Expl. B.	No exemption, 173.92	Red #
Illuminating projectiles fused or not fused, with expelling charges. See Special fireworks.			
Inflammable liquids, n. o. s. See Flammable liquids, n. o. s.			
Inflammable solids, n. o. s. See Flammable solids, n. o. s.			
Initiating explosive	Expl. A.	No exemption, 173.70 to 173.78, incl	
Diazodinitrophenol		No exemption, 173.70	
Pulminate of mercury		No exemption, 173.71	
Guanyl nitrosamino guanhydride hydrazine		No exemption, 173.72	
Lead azide, dextrinated type only		No exemption, 173.73	
Lead mononitrososuccinate		No exemption, 173.70	
Lead stypmate (lead trinitrosuccinate)		No exemption, 173.74	
Nitro mannite		No exemption, 173.75	
Nitroguanidine		No exemption, 173.76	
Pentaerythritol tetranitrate		No exemption, 173.77	
Tetrazene (guanyl nitrosamino guanyl tetrazene)		No exemption, 173.78	
*Ink	F. L.	173.118, 173.144	Red
*Insecticide, dry	Pole. B.	173.364, 173.365	Poison
*Insecticide, liquid	Pole. B.	173.345, 173.346	Poison
*Insecticide, liquefied gas	Nonf. G.	173.305, 173.304	Green
*Insecticide, liquid (vermin exterminator)	F. L.	173.118, 173.119	Red
Instantaneous fuse	Expl. C.	No exemption, 173.100 (a)	
Iodine monochloride	Cor.	No exemption, 173.293	Corrosive
Iron mass, spent	F. S.	No exemption, 173.174	Yellow
Iron sponge not properly oxidized	F. S.	No exemption, 173.174	Yellow
Iron sponge, spent	F. S.	No exemption, 173.174	Yellow
Isobutane or liquefied petroleum gas. See Liquefied petroleum gas.			
Isobutylene or liquefied petroleum gas. See Liquefied petroleum gas.			
Isooctane	F. L.	173.118, 173.119	Red
Isooctene	F. L.	173.118, 173.119	Red
Isopentane	F. L.	173.118, 173.119	Red
Isoprene	F. L.	173.118, 173.119	Red
*Isopropanol	F. L.	173.118, 173.119	Red
Isopropyl acetate	F. L.	173.118, 173.119	Red
Isopropyl mercaptan	F. L.	No exemption, 173.141	Red
Isopropyl percarbonate, stabilized	Cor.	No exemption, 173.282	Corrosive
Isopropyl percarbonate, unstabilized	F. S.	No exemption, 173.218	Yellow
Jet thrust igniter. See Igniters, jet thrust.			
Jet thrust unit (jato) class A explosives	Expl. A.	No exemption, 173.79	
Jet thrust unit (jato) class B explosives	Expl. B.	No exemption, 173.92	Red #
Kegs, reused	See § 173.28		
*Lacquer. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Lacquer base, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Lacquer base or lacquer chips, dry	F. S.	173.163, 173.176	Yellow

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
*Lacquer, base or lacquer chips, plastic (not with alcohol or solvent)	F. L.	173.118, 173.127	Red
*Lacquer removing, reducing and thinning compounds. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
Lauroyl peroxide	Oxy. M.	173.163 (b), 173.167, 173.168	Yellow
Lead arsenate, solid	Pole. B.	173.364, 173.367	Poison
Lead arsenite, solid	Pole. B.	173.364, 173.365	Poison
Lead azide. See Initiating explosive.			
Lead cyanide	See § 173.370		
Lead mononitrososuccinate. See Initiating explosive.			
Lead nitrate	Oxy. M.	173.163, 173.162	Yellow
Lead stypmate (lead trinitrosuccinate). See Initiating explosive.			
*Leather bleach	F. L.	173.118, 173.119	Red
*Leather dressing	F. L.	173.118, 173.119	Red
Levitate	Pole. A.	No exemption, 173.328	Poison Gas
Lighter fluid. See Cigarette and cigarette lighter fluid.			
*Liquefied carbon dioxide. See Carbon dioxide, liquefied.			
Liquefied carbon dioxide gas (mining device). See carbon dioxide gas, liquefied (mining device).			
Liquefied hydrocarbon gas	F. G.	173.306, 173.304, 173.314	Red Gas
Liquefied nonflammable gases charged with nitrogen, carbon dioxide, or air	Nonf. G.	173.306, 173.304	Green
*Liquefied petroleum gas	F. G.	173.306, 173.304, 173.314, 173.316	Red Gas
Liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon dioxide, or air. See Compressed gases, n. o. s.			
Lithium aluminum hydride	F. S.	No exemption, 173.206	Yellow
Lithium aluminum hydride, ethereal	F. L.	No exemption, 173.187	Red
Lithium alkoxide, powdered	F. S.	173.153, 173.166	Yellow
Lithium ferro silico	F. S.	No exemption, 173.206	Yellow
Lithium hydride	F. S.	No exemption, 173.206	Yellow
Lithium hydride in solid form	F. S.	No exemption, 173.206	Yellow
Lithium hypochlorite compounds, dry, containing more than 25 percent available chlorine	Oxy. M.	173.153, 173.217	Yellow
Lithium metal	F. S.	No exemption, 173.206	Yellow
Lithium metal in cartridges	See § 173.206		
Lithium peroxide	Oxy. M.	173.153 (a), 173.154	Yellow
Lithium silico	F. S.	No exemption, 173.206	Yellow
London purple, solid	Pole. B.	173.364, 173.365	Poison
Low explosives	Expl. A.	No exemption, 173.90	
Low blasting explosives. See Low explosives.			
Machines or apparatus	See §§ 173.130, 173.206		
Magnesium arsenate, solid	Pole. B.	173.364, 173.367	Poison
Magnesium dross	See § 173.173		
*Magnesium, metallic, powdered, pellets, turnings, or ribbon	F. S.	173.153, 173.220	Yellow
Magnesium nitrate	Oxy. M.	173.153, 173.152	Yellow
Magnesium perchlorate	Oxy. M.	173.153, 173.154	Yellow
Magnesium peroxide, solid	Oxy. M.	173.153, 173.154	Yellow
Magnesium turnip (borings, clippings, shavings, shreds, turnings or scalings)	F. S.	173.153, 173.220	Yellow
Matches, box. See Matches, strike-anywhere.			
Matches, book, card, or strike-on-box, with other articles	See § 173.176 (g)		
Matches, strike-anywhere	See § 173.176 (g)		
*Medicines, n. o. s. See *Drugs, chemicals, medicines, or cosmetics, n. o. s.			
Mentylaldehyde phthalic anhydride	Cor.	No exemption, 173.298	Corrosive
Mercaptan mixtures, aliphatic	F. L.	No exemption, 173.141	Red
*Mercurial liquid, n. o. s.	Pole. B.	173.345, 173.346	Poison
Mercuric acetate	Pole. B.	173.364, 173.365	Poison
Mercuric ammonium chloride, solid	Pole. B.	173.364, 173.365	Poison
Mercuric borosate, solid	Pole. B.	173.364, 173.365	Poison

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Mercuric bromide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric chloride. <i>See</i> Mercury bichloride, solid.			
Mercuric cyanide, solid	Pois. B.	173.370	Poison
Mercuric iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric iodide solution	Pois. B.	173.345, 173.346	Poison
Mercuric iodate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxide (red), solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxide (yellow), solid	Pois. B.	173.364, 173.365	Poison
Mercuric oxycyanide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric-potassium cyanide, solid	Pois. B.	173.364, 173.365, 173.370	Poison
Mercuric-potassium iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercuric salicylate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric subsulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric sulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercuric sulfo cyanate, solid (mercuric thiocyanate)	Pois. B.	173.364, 173.365	Poison
Mercuriol (mercury nucleate), solid	Pois. B.	173.364, 173.365	Poison
Mercurous bromide, solid	Pois. B.	173.364, 173.365	Poison
Mercurous gluconate, solid	Pois. B.	173.364, 173.365	Poison
Mercurous iodide, solid	Pois. B.	173.364, 173.365	Poison
Mercurous nitrate, solid	Pois. B.	173.364, 173.365	Poison
Mercurous oxide, black, solid	Pois. B.	173.364, 173.365	Poison
Mercurous sulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercury acetate, solid	Pois. B.	173.364, 173.365	Poison
Mercury bichloride, solid (mercuric chloride)	Pois. B.	173.364, 173.372	Poison
Mercury bisulfate, solid	Pois. B.	173.364, 173.365	Poison
Mercury compounds, n. o. s. (solid)	Pois. B.	173.364, 173.365	Poison
Mercury cyanide, solid	Pois. B.	173.370	Poison
Mercury fulminate. <i>See</i> Initiating explosive.			
Metal kegs, reused.	See § 173.28		
*Metal polish. <i>See</i> *Polishes, metal, stove, furniture and wood, liquid.			
Metallic sodium or potassium. <i>See</i> Sodium or potassium, metallic.			
Methanol (methyl alcohol). <i>See</i> Wood alcohol.			
Methane	F. G.	173.306, 173.304	Red Gas
Methyl acetate	F. L.	173.118, 173.119	Red
Methyl acetone	F. L.	173.118, 173.119	Red
Methyl alcohol (methanol). <i>See</i> Wood alcohol.			
Methylacetylene-propadiene, stabilized	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl aluminum sesquibromide	F. L.	No exemption, 173.134	Red
Methyl aluminum sesquichloride	F. L.	No exemption, 173.134	Red
Methyl bromide and chlorpicrin mixture, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide and ethylene dibromide mixture, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide and nonflammable, nonliquefied compressed gas mixtures, liquid	Pois. B.	No exemption, 173.353	Poison
Methyl bromide, liquid (bromomethane)	Pois. B.	No exemption, 173.353	Poison
*Methyl chloride	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl chloride-methylene chloride mixture	F. G.	173.306, 173.304, 173.314	Red Gas
Methyl chloroformate	Cor.	No exemption, 173.288	Corrosive
Methylchloromethyl ether, anhydrous	F. L.	No exemption, 173.143	Hed.
Methyldichloramine	Pois. A.	No exemption, 173.328	Poison Gas
Methyl dichlorosilane	F. L.	No exemption, 173.136	Red
Methyl ethyl ketone	F. L.	173.118, 173.119	Red
Methyl formate	F. L.	173.118, 173.119	Red
Methyl hydrate. <i>See</i> Alcohol or alcohol, n. o. s.			
Methylhydrazine	F. L.	No exemption, 173.145	Red
Methyl isopropenyl ketone, inhibited	F. L.	173.118, 173.119	Red
Methyl magnesium bromide in ethyl ether in concentrations not over 40 percent	F. L.	No exemption, 173.149	Red
Methyl mercaptan	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Methyl methacrylate monomer	F. L.	173.118, 173.119	Red
Methyl parathion, liquid	Pois. B.	No exemption, 173.356	Poison
Methyl parathion mixture, dry	Pois. B.	173.377	Poison
Methyl parathion mixture, liquid	Pois. B.	173.359	Poison
Methyl phosphonothioic dichloride, anhydrous. <i>See</i> Corrosive liquid, n. o. s.			
*Methyl phosphonous dichloride. <i>See</i> Corrosive liquid, n. o. s.			
Methyltrichlorosilane	F. L.	No exemption, 173.135	Red
Methyl vinyl ketone, inhibited	F. L.	173.147	Red
Mild decontaminant (see, metal clad)	Expl. C.	No exemption, 173.104	
Mine rescue equipment	See §§ 173.306 (a) (2) and 173.703 (d)		
Mine, empty	See § 173.65		

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Mine, explosive, with gas material. <i>See</i> Explosive mine.	See § 173.66 (d)		
Mixed acid. <i>See</i> Nitrating (mixed) acid.			
Mixtures of hydrofluoric and sulfuric acids. <i>See</i> Hydrofluoric and sulfuric acids, mixtures.			
Mixtures or solutions of liquefied nonflammable gases and liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon dioxide, or air. <i>See</i> Compressed gases, n. o. s.			
Monochlorotrifluoromethane	Nonf. G.	173.306, 173.304, 173.314	Green
Monochloroethylene, stabilized	Pois. C.	No exemption, 173.384	Tear Gas
Monochloroethylene (unstabilized)	Not accepted		
Monochloroacetic acid, liquid	Cor.	173.304, 173.304	Corrosive
Monochlorodifluoromethane	Nonf. G.	173.306, 173.304, 173.314, 173.315	Green
Monochloroethylene. <i>See</i> Vinyl chloride.			
Monochloropentafluoroethane	Nonf. G.	173.306, 173.304	Green
Monochlorotetrafluoroethane	Nonf. G.	173.306, 173.304	Green
Monochlorotrifluoromethane	Nonf. G.	173.306, 173.304	Green
Monomethylamine	F. L.	173.118, 173.119	Red
Monofluorophosphoric acid, anhydrous	Cor.	No exemption, 173.275	Corrosive
Monomethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Monomethylamine, aqueous solution	F. L.	173.118, 173.119	Red
*Mortar state, liquid	F. L.	173.118, 173.119	Red
*Motion-picture film, nitrocellulose base, including mixed shipments with nonflammable film	F. B.	No exemption, 173.177	Yellow
Motion-picture film, old and wornout (nitrocellulose)	F. B.	No exemption, 173.178	Yellow
Motion-picture film, old and wornout (slow-burning)	See § 173.181 (a) (1)		
*Motion-picture outfits, toy	See § 173.181 (a) (4)		
*Motion-picture film (processed, positive or negative, nitrocellulose)	F. B.	No exemption, 173.177	Yellow
*Motion-picture film (processed, positive or negative, slow-burning)	See § 173.181 (a) (1)		
Motion-picture film scrap (nitrocellulose), samples of	F. B.	No exemption, 173.196	Yellow
Motion-picture film scrap (nitrocellulose), other than samples	F. B.	No exemption, 173.195	Yellow
Motion-picture film scrap (slow-burning)	See § 173.181 (a) (2)		
*Motion-picture film, toy (nitrocellulose)	F. B.	No exemption, 173.179	Yellow
*Motion-picture film, toy (slow-burning)	See § 173.181 (a) (1)		
*Motion-picture film, toy pieces (nitrocellulose)	See § 173.181 (a) (3)		
Motion-picture film, unexposed (nitrocellulose base)	F. B.	173.180	Yellow//
Motion-picture film, unexposed (slow-burning)	See § 173.181 (a) (1)		
Motorcycles	See § 173.120		
Motor fuel antiknock compound	Pois. B.	No exemption, 173.354	Poison
*Motor fuel, n. o. s.	F. L.	173.118, 173.119	Red
Motors, internal combustion	See § 173.120		
Muratic acid. <i>See</i> Hydrochloric acid.			
Mustard gas	Pois. A.	No exemption, 173.328	Poison Gas
*Naphtha	F. L.	173.118, 173.119	Red
*Naphtha distillate	F. L.	173.118, 173.119	Red
*Naphtha, petroleum. <i>See</i> *Petroleum naphtha.			
*Naphtha, solvent	F. L.	173.118, 173.119	Red
Natural gasoline. <i>See</i> Gasoline.			
Neohexane	F. L.	173.118, 173.119	Red
Neon gas	Nonf. G.	173.306, 173.302	Green
New explosives or explosive devices	See §§ 173.61 (q), 173.66, and 174.502 (a) (8)		
Nickel carbonyl	F. L.	No exemption, 173.126	Red
*Nickel catalyst, finely divided, activated or spent	F. B.	No exemption, 173.233	Yellow
Nickel cyanide, solid	Pois. B.	173.370	Poison
Nicotine hydrochloride	Pois. B.	173.345, 173.346	Poison
Nicotine, liquid	Pois. B.	173.345, 173.346	Poison

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Nicotine salicylate.	Pois. B.	173.364, 173.365	Poison
Nicotine sulfate, liquid.	Pois. B.	173.345, 173.346	Poison
Nicotine sulfate, solid.	Pois. B.	173.364, 173.365	Poison
Nicotine tartrate.	Pois. B.	173.364, 173.365	Poison
Nitrate of aluminum. See Aluminum nitrate.			
Nitrate of ammonia. See Ammonium nitrate.			
Nitrate of ammonia explosives. See High explosives.			
Nitrate of ammonia fertilizer. See Ammonium nitrate fertilizer, containing 90 percent or more ammonium nitrate with no organic coating.			
Nitrate of barium. See Barium nitrate.			
Nitrate of lead. See Lead nitrate.			
Nitrate of potash. See Potassium nitrate.			
Nitrate of soda. See Sodium nitrate.			
Nitrate of soda and potash.			
Nitrate of soda bags, empty, unwashed. See Bags, nitrate of soda, empty and unwashed.			
Nitrate of strontia. See Strontium nitrate.			
Nitrates, n. o. s.	Oxy. M.	173.153, 173.152	Yellow
Nitrating (mixed) acid.			
Nitric acid.			
Nitric ether. See Ethyl nitrate.			
Nitric oxide.			
Nitrite of soda. See Sodium nitrite.			
Nitrobenzol, liquid (oil of mirbane).	Pois. B.	173.245, 173.246	Poison
Nitro carbo nitrate.	Oxy. M.	173.153, 173.152	Yellow
Nitrocellulose, colloided, granular, flake or block, wet with alcohol or solvent. See Wet nitrocellulose colloided, granular or flake—20 percent alcohol or solvent; or block—25 percent alcohol.			
Nitrocellulose, colloided, granular, or flake, wet with 80 percent water. See Wet nitrocellulose, colloided, granular or flake—20 percent water.			
Nitrocellulose (collodion cotton), wet with water. See Wet nitrocellulose—20 percent water.			
Nitrocellulose (collodion cotton), wet with alcohol or solvent. See Wet nitrocellulose—30 percent alcohol or solvent.			
Nitrocellulose, dry. See High explosives.			
Nitrocellulose flakes, wet with alcohol or solvent. See Wet nitrocellulose flakes—20 percent alcohol or solvent.			
Nitrochlorobenzene, ortho, liquid.	Pois. B.	173.345, 173.346	Poison
Nitrochlorobenzene, meta or para, solid.	Pois. B.	173.364, 173.374	Poison
Nitrogen.	Nonf. O.	173.300, 173.302, 173.314	Green
Nitrogen dioxide, liquid.	Pois. A.	No exemption, 173.336	Poison Gas
Nitrogen fertilizers solution.	Nonf. O.	173.306, 173.304, 173.314	Green
Nitrogen peroxide, liquid.	Pois. A.	No exemption, 173.336	Poison Gas
Nitrogen, pressurized liquid.	Nonf. O.	No exemption, 173.304	Green
Nitrogen tetroxide, liquid.	Pois. A.	No exemption, 173.336	Poison Gas
Nitrogen tetroxide-nitric oxide mixtures containing up to 33.2 percent weight nitric oxide.	Pois. A.	No exemption, 173.336	Poison Gas
Nitroglycerin, liquid.	See § 173.51 (d).		
Nitroglycerin liquid, desensitized. See High Explosive, liquid.			
Nitroglycerin, spirits of. See Spirits of nitroglycerin.			
Nitrohydrochloric acid.	Cor.	No exemption, 173.278	Corrosive
Nitrohydrochloric acid, diluted.	Cor.	No exemption, 173.278	Corrosive
Nitro manite. See Initiating explosive.			
Nitroguanidine, dry. See High explosives.			
Nitroguanidine, wet with water. See Wet nitroguanidine—20 percent water.			
Nitrosoguanidine. See Initiating explosive.			
Nitrostarch, dry. See High explosives.			
Nitrostarch, wet with alcohol or solvent. See Wet nitrostarch—30 percent alcohol or solvent.			
Nitrostarch, wet with water. See Wet nitrostarch—20 percent water.			
Nitrotylchloride.	Nonf. O.	173.306, 173.304, 173.314	Green
Nitrourea. See High explosives.			
Nitrous oxide.	Nonf. O.	173.306, 173.304, 173.314	Green
Nitrosylol.	Pois. B.	173.345, 173.346	Poison
Nonliquefied gases. See Compressed gases, n. o. s.			

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Nonliquefied hydrocarbon gas.	F. G.	173.300, 173.302	Red Gas
Nonyl trichlorosilane.	Cor.	No exemption, 173.280	Corrosive
Octadecyltrichlorosilane.	Cor.	No exemption, 173.280	Corrosive
Octyl trichlorosilane.	Cor.	No exemption, 173.280	Corrosive
*Oil, described as oil, n. o. s., petroleum oil, or petroleum oil, n. o. s.	F. L.	173.118, 173.119	Red
Oil of mirbane. See Nitrobenzol, liquid.			
Oil of nitrol. See Sulfuric acid.			
Oil well cartridges.	Expl. C.	No exemption, 173.112	Corrosive
Oleum.	Cor.	173.244, 173.272	Poison
*Organic phosphate compound, liquid, n. o. s.	Pois. B.	No exemption, 173.258	Poison
*Organic phosphate compound-mixtures, liquid, n. o. s.	Pois. B.	173.259	Poison
*Organic phosphate compound, mixtures, dry, n. o. s.	Pois. B.	173.277	Poison
*Organic phosphates, n. o. s. mixed with compressed gas.	Pois. A.	No exemption, 173.334	Poison Gas
Ortho-nitroaniline.	Pois. B.	173.304, 173.373	Poison
Oxide, spent. See Spent oxide.			
Oxidizing material, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Oxidizing materials with other articles—fumigants.	See § 173.152 (a)		
*Oxygen.	Nonf. O.	173.306, 173.302, 173.314	Green
Oxygen, pressurized liquid.	Nonf. O.	No exemption, 173.304	Green
*Paint driers, liquid.	F. L.	173.118, 173.128	Red
*Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid.	F. L.	173.118, 173.128	Red
*Paint, varnish and varnish removing, reducing or thinning compounds. See *Compounds, lacquer, paint or varnish, reducing or thinning liquid, etc.			
Paper cap ammunition for toy pistols. See Toy caps.			
Paper caps. See Toy caps.			
Paper stock, wet.	F. B.	No exemption, 173.185	Yellow
Paper waste, wet. See Waste paper, wet.			
Para chlorobenzoyl peroxide. See Chlorobenzoyl peroxide, (para).			
Paramethane hydroperoxide.	Oxy. M.	173.153 (b), 173.224	Yellow
Paranitraniline (paranitraniline), solid.	Pois. B.	173.304, 173.373	Poison
Parathion and compressed gas mixture.	Pois. A.	No exemption, 173.334	Poison Gas
Parathion, liquid.	Pois. B.	No exemption, 173.358	Poison
Parathion, mixture, dry.	Pois. B.	173.377	Poison
Parathion mixture, liquid.	Pois. B.	173.359	Poison
Paris green, solid.	Pois. B.	173.364, 173.367	Poison
Pentaborane.	F. L.	No exemption, 173.128	Red
Pentane.	F. L.	173.118, 173.119	Red
Pentane, methyl.	F. L.	173.118, 173.119	Red
Pentacrythrite tetranitrate. See Initiating explosive.			
Pentacrythrite tetranitrate, desensitized, wet. See High explosives.			
Pentoxide, dry. See High explosives.			
Peracetic acid.	Oxy. M.	173.223	Yellow
Perchlorate of ammonia. See Ammonium perchlorate.			
Perchlorate of potash. See Potassium perchlorate.			
Perchlorates, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Perchloric acid in excess of 72 percent.	See § 173.269		
Perchloric acid not in excess of 72 percent.	Cor.	173.244, 173.269	Corrosive
Perchloro-methyl-mercaptan.	Pois. B.	173.345, 173.346	Poison
Percussion caps.	Expl. C.	No exemption, 173.107	
Percussion fuses.	Expl. C.	No exemption, 173.105	
Pernanganate of potash.	Oxy. M.	173.153, 173.154, 173.194	Yellow
Pernanganate of soda.	Oxy. M.	173.153, 173.154	Yellow
Pernanganates, n. o. s.	Oxy. M.	173.153, 173.154	Yellow
Peroxide of sodium. See Sodium peroxide.			
Peroxides, organic, liquids or solutions, n. o. s.	F. L.	No exemption, 173.119 (m)	Red
Peroxides, organic, liquids, n. o. s.	Oxy. M.	173.153, 173.221	Yellow
Peroxides, organic, solution, liquid, n. o. s.	Oxy. M.	173.153, 173.221	Yellow
Petroleum, crude. See Crude oil.			
*Petroleum distillate.	F. L.	173.118, 173.119	Red
Petroleum ether.	F. L.	173.118, 173.119	Red

LIST OF HAZARDOUS MATERIALS - Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Petroleum gas, liquefied. See Liquefied petroleum gas.			
*Petroleum naphtha	F. L.	173.118, 173.119	Red
Phenol. See Carbolic acid.			
Phenylacetylene chloride	Pois. A.	No exemption, 173.328	Poison Gas
Phenylchloroarsine, liquid	Pois. B.	No exemption, 173.355	Poison
Phenyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Phosgene (diphosphorus)	Pois. A.	No exemption, 173.333	Poison Gas
Phosphoric anhydride	F. S.	No exemption, 173.188	Yellow
Phosphorus, amorphous, red	F. S.	No exemption, 173.189	Yellow
Phosphorus oxybromide	Cor.	No exemption, 173.271	Corrosive
Phosphorus oxychloride	Cor.	No exemption, 173.271	Corrosive
Phosphorus pentachloride	F. S.	No exemption, 173.191	Yellow
Phosphorus sesquioxide	F. S.	No exemption, 173.225	Yellow
Phosphorus trihydride	Cor.	No exemption, 173.270	Corrosive
Phosphorus trichloride	Cor.	No exemption, 173.271	Corrosive
Phosphorus, white or yellow, dry	F. S.	No exemption, 173.190(d) & (e)	Yellow
Phosphorus, white or yellow, in water	F. S.	No exemption, 173.190(b) & (c)	Yellow
Photographic film scrap, X-ray film scrap	F. S.	No exemption, 173.195	Yellow
Photographic flash powder. See Special fireworks or low explosives.			
Picrates dry. See High explosives.			
Picrate of ammonia. See High explosives.			
Picric acid, dry. See High explosives.			
Picric acid, wet, not exceeding 16 ounces.	See § 173.192		
Picric acid, wet, with not less than 10 percent water, over 25 pounds. See High explosives.			
Picric acid, wet, with not less than 10 percent water, in excess of 16 ounces but not exceeding 25 pounds	F. S.	No exemption, 173.193	Yellow
Pinebark. See Common fireworks.			
*Plastic solvent, n. o. s.	F. L.	173.118, 173.119	Red
Poisonous liquid or gas, n. o. s.	Pois. A.	No exemption, 173.328	Poison Gas
Poisonous liquids, n. o. s.	Pois. B.	173.345, 173.346	Poison
Poisonous liquids, n. o. s.	Pois. C.	No exemption, 173.382	Tear Gas
Poisonous solids, n. o. s.	Pois. B.	173.364, 173.365	Poison
Poisonous solids, n. o. s.	Pois. C.	No exemption, 173.382	Tear Gas
*Poisonous gases, poison gas, class A	Pois. A.	No exemption, 173.335	Poison Gas
*Poisonous, metal, stove, furniture and wood, liquid	F. L.	173.118, 173.119	Red
Polymerizable materials	See § 173.21 (b)		
Potash, caustic, solution. See Caustic potash, liquid			
Potassium arsenate, solid	Pois. B.	173.364, 173.365	Poison
Potassium arsenite, solid	Pois. B.	173.364, 173.365	Poison
Potassium bromate	Oxy. M.	173.153, 173.154	Yellow
Potassium chlorate (potash chlorate). See Chlorate of potash.			
Potassium cyanide. See Cyanide of potassium.			
Potassium dichromocyanurate, dry, containing more than 30% available chlorine	Oxy. M.	173.153, 173.217	Yellow
Potassium hydroxide solution. See Caustic potash, liquid			
Potassium, metallic	F. S.	No exemption, 173.206	Yellow
Potassium, metallic liquid alloy	F. S.	No exemption, 173.202	Yellow
Potassium nitrate	Oxy. M.	173.153, 173.182	Yellow
Potassium nitrate mixed (fused) with sodium nitrate	Oxy. M.	173.153, 173.183	Yellow
Potassium nitrate	Oxy. M.	173.153, 173.154	Yellow
Potassium perchlorate	Oxy. M.	173.153, 173.219	Yellow
Potassium permanganate. See Permanganate of potash			
Potassium persulfate	Oxy. M.	No exemption, 173.154	Yellow
Potassium sulfide	F. S.	173.153, 173.207	Yellow
Potato spray (arsenical), liquid. See *Insecticide, liquid.			
Pressurized products. See Compressed gases, n. o. s.			
*Primus. See Cannon, combination, or small-arm rifles.			
Primers, detonating. See Detonating primers.			
Projectiles, explosive. See Explosive projectile.			
Projectiles, gas, nonexplosive. See Chemical ammunition, class A, B, or C.			
*Projectiles, gas, smoke, or incendiary, with burster or booster with or without detonating fuse. See Explosive projectile.			
*Projectiles, illuminating, incendiary or smoke with expelling charge but without bursting charge. See Special fireworks.			
Projectiles, sand-lin ¹ empty, or solid	See § 173.55		

LIST OF HAZARDOUS MATERIALS - Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Propane or liquefied petroleum gas.			
See Liquefied petroleum gas.			
Propellant explosives, class A.	Expl. A.	No exemption, 173.94 (d)	Red
Propellant explosives (liquid), class B.	Expl. B.	No exemption, 173.93	Red
Propellant explosives (solid), class B.	Expl. B.	No exemption, 173.93	Red
Propellant explosives in water (smokeless powder for cannon or small arms).	Expl. B.	No exemption, 173.93	
Propellant explosives in water insoluble, condensed or deteriorated (smokeless powder for cannon or small arms).	Expl. B.	No exemption, 173.93	
Propellant explosives (solid), class B, and small-arm primers. See Propellant explosives, class B.			
Propylene imine, inhibited.	F. L.	No exemption, 173.139	Red
Propylene oxide.	F. L.	173.118, 173.119	Red
*Propyl alcohol. See Alcohol, n. o. s.			
Propyl mercaptan.	F. L.	No exemption, 173.141	Red
Propyl trichlorosilane	Cor.	No exemption, 173.280	Corrosive
Proybur or liquefied petroleum gas.			
See Liquefied petroleum gas.			
Prussic acid. See Hydrocyanic acid.			
*Pyridine	F. L.	173.118, 173.119	Red
Pyrosulfuric liquids, n. o. s.	F. L.	No exemption, 173.124	Red
Pyro sulfuric chloride.	Cor.	173.244, 173.247	Corrosive
*Pyroxilin cement. See Cement, pyroxilin.			
Pyroxilin plastic scrap	F. S.	No exemption, 173.196, 173.199	Yellow
Pyroxilin plastics, rods, sheets, rolls, tubes	F. S.	173.197	Yellow
*Pyroxilin solution	F. L.	173.118, 173.119	Red
*Pyroxilin solvent, n. o. s.	F. L.	173.118, 173.119	Red
*Radio current supply device with electrolyte (acid) or battery fluid	See § 173.259		
Radioactive devices.	H. A. M.	173.391 (b)	None
Radioactive materials, low specific activity (LSA).	H. A. M.	173.392, 173.393	Radioactive
Radioactive materials, n. o. s.	H. A. M.	173.393, 173.395	Radioactive
Radioactive materials, special form.	H. A. M.	173.393, 173.394	Radioactive
Radioactive materials, small quantities.	H. A. M.	173.391 (a)	None
Rags, oily	F. S.	No exemption, 173.199	Yellow
Rags, wet	F. S.	No exemption, 173.200	Yellow
Railway torpedoes	Expl. B.	No exemption, 173.91	Special Firework
*Reducing compounds, paint, varnish, lacquer, etc. See *Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid.			
Refrigerant gas, n. o. s.	See §§ 173.314 (c) table Note 13, 173.315 (a) table Note 9		
Refrigerating machines	See §§ 173.130, 173.306		
*Removing compounds, paint, varnish, lacquer, etc. See *Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid.			
*Resin solution (resin compound, liquid)	F. L.	173.118, 173.119	Red
Resinate of cobalt, precipitated. See Cobalt resin, precipitated.			
Rifle grenades	Expl. A.	No exemption, 173.94	
Rifle powder. See Propellant explosives, class A.			
Propellant explosives, class B, or black powder.			
*Road asphalt or tar, liquid.	F. L.	173.118, 173.131	Red
Rocket bodies, with electric primers or electric squibs	See § 173.56		
Rocket ammunition with empty projectiles	Expl. B.	No exemption, 173.90	
Rocket ammunition with explosive projectiles	Expl. A.	No exemption, 173.57	
Rocket ammunition with illuminating projectiles	Expl. A.	No exemption, 173.57	
Rocket ammunition with gas projectiles	Expl. A.	No exemption, 173.57	
Rocket ammunition with incendiary projectiles	Expl. A.	No exemption, 173.57	
Rocket ammunition with inert-loaded projectiles	Expl. B.	No exemption, 173.90	
Rocket ammunition with smoke projectiles	Expl. A.	No exemption, 173.57	
Rocket ammunition with solid projectiles	Expl. B.	No exemption, 173.90	
Rocket engines (liquid), class B explosives	Expl. B.	No exemption, 173.95	
Rocket fireworks. See Common fireworks.			
Rocket heads. See Explosive projectiles.			
Rocket motors, class A explosives	Expl. A.	No exemption, 173.79	
Rocket motors, class B explosives	Expl. B.	No exemption, 173.92	Red
Roman candles. See Common fireworks.			
*Rough ammunition tankages	F. S.	No exemption, 173.210	Yellow

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
*Rubber cement. See *Cement, rubber.			
*Rubber scrap or rubber buffings.			
*Rubber, shoddy, regenerated rubber, or reclaimed rubber.	F. B.	173.153, 173.201	Yellow
*Rum, denatured.	F. B.	173.153, 173.201	Yellow
Safety fuse.	F. L.	173.118, 173.119	Red
Safety squibs.	See § 173.100 (a)		
Salt peter. See Potassium nitrate.	Expl. C.	No exemption, 173.100	
Salt peter, Chile. See Sodium nitrate.			
Salutes. See Common fireworks and Special fireworks.			
Samples of explosives.	See § 173.89		
Samples, New explosives.	See § 173.89		
Samples of explosives and explosive articles.	See § 173.89		
Scheele's green. See Copper arsenite.			
Self-lighting cigarettes.	See § 173.21 (d)		
Self-propelled vehicles.	See § 173.120, 173.257, 173.300		
Shaped charges, commercial. See High explosives.	See § 173.65 (h)		
*Shellac. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Shellac, liquid.	F. L.	173.118, 173.128	Red
Shells, fireworks. See Common fireworks or Special fireworks.			
Ship distress signals. See Special fireworks.			
Signal flares.	Expl. C.	No exemption, 173.100	
Silicon chloride (tetrachloride).	Cor.	173.244, 173.247	Corrosive
Silicon tetrafluoride.	Nonf. Q.	173.306, 173.302	Green
Silver cyanide.	See § 173.370		
Silver nitrate.	Oxy. M.	173.153, 173.182	Yellow
*Sludge acid.	Cor.	No exemption, 173.248	Corrosive
Small-arms ammunition.	Expl. C.	No exemption, 173.101	
Small-arms ammunition, tear gas cartridges.	Expl. C.	No exemption, 173.101	Tear gas
Small-arms primers.	Expl. C.	No exemption, 173.107	
Smoke candles.	Expl. C.	No exemption, 173.106	
Smoke generators. See Chemical ammunition, class B or C.			
Smoke grenades.	Expl. C.	No exemption, 173.106	
Smoke pots.	Expl. C.	No exemption, 173.106	
Smoke signals.	Expl. C.	No exemption, 173.106	
Smokeless powder for cannon or small arms. See Propellant explosives, class A, or propellant explosives, class B.			
Smokeless powder for small arms (100 pounds or less).	See § 173.68 (f), 173.197a		
Smoke projectiles with bursting charges. See Explosive projectile.			
Smoke projectiles with expelling charge but without bursting charge. See Special fireworks.			
Soda amolal. See High explosives.			
Soda, caustic solution. See Caustic soda, liquid.			
Sodium aluminum hydride.	F. B.	No exemption, 173.206	Yellow
Sodium aluminate, liquid.	Cor.	173.244, 173.249	Corrosive
Sodium amide.	F. B.	No exemption, 173.206	Yellow
Sodium arsenate, solid.	Pois. B.	173.364, 173.365, 173.368	Poison
Sodium arsenite (solution), liquid.	Pois. B.	173.345, 173.346	Poison
Sodium azide.	Pois. B.	173.364, 173.375	Poison
Sodium bromate.	Oxy. M.	173.153, 173.154	Yellow
Sodium cacodylate, solid (sodium dimethyl arsenate).	Pois. B.	173.364, 173.365	Poison
Sodium chlorate (soda chlorate).	Oxy. M.	173.153, 173.163	Yellow
Sodium chloride.	Oxy. M.	No exemption, 173.160	Yellow
Sodium chlorite solution (not exceeding 42 percent sodium chlorite).	Cor.	173.244, 173.263	Corrosive
Sodium cyanide. See Cyanide of sodium.			
Sodium dichloroisocyanurate dry, containing more than 39% available chlorine.	Oxy. M.	173.163, 173.217	Yellow
Sodium hydride.	F. B.	No exemption, 173.198	Yellow
Sodium hydrosulfite.	F. B.	173.163, 173.204	Yellow
Sodium hydroxide solution. See Caustic soda, liquid.			
Sodium, metallic.	F. B.	No exemption, 173.206	Yellow
Sodium, metallic, dispersion in organic solvent.	F. B.	No exemption, 173.230	Yellow
Sodium, metallic liquid alloy.	F. B.	No exemption, 173.202	Yellow
Sodium methoxide, dry.	F. S.	173.184, 173.184	Yellow
*Sodium methoxide, alcohol mixture.	F. L.	173.118, 173.119	Red
Sodium nitrate.	Oxy. M.	173.153, 173.182	Yellow
Sodium nitrite.	Oxy. M.	173.153, 173.184, 173.234	Yellow

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LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Sodium nitrite mixed (fused) with potassium nitrate.	Oxy. M.	173.153, 173.183	Yellow
Sodium nitrite mixtures (sodium nitrate, sodium nitrite, and potassium nitrate).	Oxy. M.	173.153, 173.234	Yellow
Sodium permanganate.	Oxy. M.	173.153, 173.164	Yellow
Sodium peroxide.	Oxy. M.	No exemption, 173.187	Yellow
Sodium picramate wet with 20 percent of water.	F. B.	No exemption, 173.206	Yellow
Sodium potassium alloys.	F. B.	No exemption, 173.206	Yellow
*Sodium sulfide.	F. B.	173.153, 173.207	Yellow
Solvents, n. o. s.	F. L.	173.118, 173.119	Red
*Sparklers. See Common fireworks.			
Special fireworks.	Expl. B.	No exemption, 173.88(d), 173.91	Special Fireworks //
Spent iron mass. See Iron mass, spent.			
Spent iron sponge. See Iron sponge, spent.			
Spent mixed acid.	Cor.	No exemption, 173.248	Corrosive
Spent oxide.	F. B.	No exemption, 173.174	Yellow
Spent sulfuric acid.	Cor.	No exemption, 173.248	Corrosive
Spirits of nitroglycerin.	F. L.	No exemption, 173.133	Red
Spirits of nitroglycerin not exceeding 1 percent nitroglycerin by weight.	F. L.	173.118, 173.133	Red
Spotting powder. See Black powder or Propellant explosives, class B explosives.			
Spray starting fluid. See Engine starting fluid.			
Spreader cartridges. See Special fireworks.			
Squibs, electric or safety. See Electric squibs or Safety squibs.			
*Stain. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Starter cartridges, jet engine, class B explosives.	Expl. B.	No exemption, 173.92	Red /
Starter cartridges, jet engine, class C explosives.	Expl. C.	No exemption, 173.102	
Storage batteries, wet. See Batteries, electric storage, wet.			
Stores, ship or vessel.	See § 171.9		
*Stove polish. See *Polishes, metal, stove, furniture and wood, liquid.			
Strike-anywhere matches. See Matches, strike-anywhere.			
Strike-on-box matches. See Matches, strike-on-box.			
Strontium arsenite, solid.	Pois. B.	173.364, 173.365	Poison
Strontium chlorate.	Oxy. M.	173.153, 173.163	Yellow
Strontium chlorate, wet.	Oxy. M.	173.153, 173.163 (a) (8)	Yellow
Strontium nitrate.	Oxy. M.	173.153, 173.182	Yellow
Strontium peroxide.	Oxy. M.	173.153 (a), 173.154	Yellow
Strychnine and salts thereof, solid.	Pois. B.	173.364, 173.365	Poison
Styphnate of lead. See Initiating explosive.			
Succinic acid peroxide.	Oxy. M.	173.153 (b), 173.157, 173.168	Yellow
Sulfide of sodium. See Sodium sulfide.			
Sulfide of potassium. See Potassium sulfide.			
Sulfur chloride (mono and di).	Cor.	No exemption, 173.247	Corrosive
*Sulfur dioxide.	Nonf. Q.	173.306, 173.304, 173.314, 173.315	Green
Sulfur hexafluoride.	Nonf. Q.	173.306, 173.304	Green
Sulfur trioxide, stabilized.	Cor.	173.244, 173.273	Corrosive
Sulfuric acid (oil of nitric).	Cor.	173.244, 173.273	Corrosive
Sulfuric acid, fuming (oleum) (Nordhausen). See Sulfuric acid.			
Sulfuric acid.	Cor.	173.244, 173.247	Corrosive
Sulfuryl chloride.	Nonf. Q.	173.306, 173.304, 173.314	Green
Sulfuryl fluoride.	Expl. A.	No exemption, 173.69	
Supplementary charges (explosive).			
Tankage. See Garbage tankage.			
Tankage fertilizers.	F. B.	No exemption, 173.209	Yellow
*Tankage, rough ammoniate.	F. B.	No exemption, 173.310	Yellow
Tank car, containing residual phosphorus and filled with water or inert gas.	See § 173.232		
Tank cars, empty (flat contents poisons, class A) and (e).	See § 174.562 (d) and (e)		
Tank cars, gas (must not contain gases that combine chemically).	See § 173.301 (a)		
Tank truck, empty.	See § 173.29		
Tanks, empty.	See § 173.29		
*Tar, liquid.	F. L.	173.118, 173.131	Red
Tear gas candles.	Pois. C.	No exemption, 173.385	Tear Gas
Tear gas cartridges. See Small-arms ammunition tear gas cartridges.			
Tear gas grenades.	Pois. C.	No exemption, 173.385	Tear Gas
Tear gas material, liquid or solid, n. o. s.	Pois. C.	No exemption, 173.382	Tear Gas

HSTB. CH. II (App. A)

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
*Tertiary alcohol. See Alcohol, n. o. s.			
Tertiary butylisopropyl benzene hydroperoxide	Oxy. M.	173.153 (b), 173.224	Yellow
Tetraethyl dithio pyrophosphate and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Tetraethyl dithio pyrophosphate, liquid	Pois. B.	No exemption, 173.358	Poison
Tetraethyl dithio pyrophosphate mixture, dry	Pois. B.	173.277	Poison
Tetraethyl dithio pyrophosphate mixture, liquid	Pois. B.	173.358	Poison
Tetraethyl lead, liquid	Pois. B.	No exemption, 173.354	Poison
Tetraethyl pyrophosphate and compressed gas mixture	Pois. A.	No exemption, 173.334	Poison Gas
Tetraethyl pyrophosphate, liquid	Pois. B.	No exemption, 173.358	Poison
Tetraethyl pyrophosphate mixture, dry	Pois. B.	173.277	Poison
Tetraethyl pyrophosphate mixture, liquid	Pois. B.	173.358	Poison
Tetrafluoroethylene, inhibited	F. G.	173.306, 173.304	Red Gas
Tetranitromethane	Oxy. M.	No exemption, 173.203	Yellow
Tetrazene (guanyl nitrosamine guanyl tetrazene). See Initiating explosive.			
Tetryl. See High explosives.			
Textile waste, wet	F. S.	No exemption, 173.211	Yellow
Thallium salts, solid	Pois. D.	173.364, 173.365	Poison
Thallium sulfate, solid	Pois. D.	173.364, 173.365	Poison
*Thinning compounds, paint, varnish, lacquer, etc. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Thiocarbonyl-chloride. See Thiophosgene.			
Thionyl chloride	Cor.	No exemption, 173.247	Corrosive
Thiophosgene (Thiocarbonyl-chloride)	Pois. D.	No exemption, 173.356	Poison
Thiophosphoryl chloride	Cor.	No exemption, 173.271	Corrosive
Thorium metal, powdered	F. S.	173.226	Yellow
Thorium nitrate, solid	R. A. M. Oxy. M.	173.302	Radioactive and yellow
Time fuses	Expl. C.	No exemption, 173.105	
Tin tetrachloride, anhydrous	Cor.	173.244, 173.247	Corrosive
Titanium metal powder, dry	F. S.	No exemption, 173.208	Yellow
Titanium metal powder, wet, with not less than 20 percent water	F. S.	No exemption, 173.208	Yellow
Titanium sulfate solution containing not more than 45 percent sulfuric acid	Cor.	173.244, 173.297	Corrosive
Titanium tetrachloride	Cor.	173.244, 173.247	Corrosive
Toluol (toluene)	F. L.	173.118, 173.119	Red
Torches. See Common fireworks.			
Torpedoes, cap. See Special fireworks.			
Torpedoes, empty	See § 173.55		
Torpedoes, explosives. See Explosive torpedoes.			
Torpedoes, railway or track. See Railway torpedoes.			
Toy propellant devices	Expl. C.	No exemption, 173.111	
Toy smoke devices	Expl. C.	No exemption, 173.111	
Toy torpedoes. See Special fireworks.			
Toy caps	Expl. C.	No exemption, 173.100 (p), 173.109	
Tracers	Expl. C.	No exemption, 173.105	
Tracer fuses	Expl. C.	No exemption, 173.105	
Tractors	See § 173.120		
Trailer or truck body with refrigerating or heating equipment on flat cars	See §§ 173.120 (c), 173.306		
Trichloroacetic acid, dry, containing more than 30% available chlorine	Oxy. M.	173.153, 173.217	Yellow
Trichloroallene	F. L.	No exemption, 173.136	Red
Trick matches	Expl. C.	No exemption, 173.111	
Trick noise makers, explosive	Expl. C.	No exemption, 173.111	
Trifluorochloroethylene	F. G.	173.306, 173.304, 173.314	Red Gas
Trimethylamine, anhydrous	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Trimethylamine, aqueous solution	F. L.	173.118, 173.119	Red
Trimethylchlorosilane	F. L.	No exemption, 173.135	Red
Trinitrobenzene. See High explosives.			
Trinitrobenzene, wet (not to exceed 16 ounces)	F. S.	173.212	
Trinitrobenzene acid, dry. See High explosives.			
Trinitrobenzoic acid, wet, not exceeding 16 ounces	See § 173.192		
Trinitrobenzoic acid, wet with not less than 10 percent water, in excess of 16 ounces but not exceeding 65 pounds	F. S.	No exemption, 173.193	Yellow
Trinitrobenzoic acid, wet, with not less than 10 percent water, over 65 pounds. See High explosives			
Trinitroresorcinol. See High explosives.			
Trinitrotoluene. See High explosives			

LIST OF HAZARDOUS MATERIALS—Continued

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
Trinitrotoluene, wet (not to exceed 16 ounces)	F. S.	173.212	
Tri-(1-aziridinyl) phosphine oxide	Cor.	173.244, 173.290 (a)	Corrosive
*Turpentine substitutes	F. L.	173.118, 173.119	Red
Uranyl nitrate, solid	R. A. M. Oxy. M.	173.302, 173.306	Radioactive and yellow
Urea nitrate wet with not less than 10 percent of water, over 65 pounds. See High explosives.			
Urea nitrate wet with not less than 10 percent of water, in excess of 16 ounces but not exceeding 65 pounds	F. S.	No exemption, 173.193	Yellow
Urea nitrate, dry. See High explosives.			
Urea nitrate, wet with not less than 10 percent of water, not exceeding 16 ounces	See § 173.192		
*Urea peroxide	Oxy. M.	173.153 (b), 173.227	Yellow
Vanadium oxytrichloride	Cor.	173.244, 173.247	Corrosive
Vanadium tetrachloride	Cor.	173.244, 173.247	Corrosive
*Varnish. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Varnish driers. See *Paint driers, liquid.			
*Varnish remover or reducer. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
*Varnish thinning compounds. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.			
Very signal cartridges	Expl. C.	No exemption, 173.108	
Vinyl acetate	F. L.	173.118, 173.119	Red
Vinyl chloride	F. G.	173.306, 173.304, 173.314, 173.315	Red Gas
Vinylidene chloride, inhibited	F. L.	173.118, 173.119	Red
Vinyl fluoride inhibited	F. G.	173.306, 173.304	Red Gas
Vinyl methyl ether, inhibited	F. G.	173.306, 173.304, 173.314	Red Gas
Vinyl trichloroethane	F. L.	No exemption, 173.135	Red
*War heads. See Explosive projectiles.			
Waste paper, wet	F. S.	No exemption, 173.186	Yellow
Waste textile, wet	F. S.	No exemption, 173.211	Yellow
Waste wool, wet	F. S.	No exemption, 173.213	Yellow
*Water treatment compound, liquid. See *Compounds, tree or weed killing, liquid.			
Wet hair. See Hair wet.			
Wet nitrocellulose, colloided, granular or flake—20 percent alcohol or solvent; or block—25 percent alcohol	F. L.	173.118, 173.127	Red
Wet nitrocellulose, colloided, granular or flake—20 percent water	F. S.	173.163, 173.164	Yellow
Wet nitrocellulose—20 percent alcohol or solvent	F. L.	173.118, 173.127	Red
Wet nitrocellulose—20 percent water	F. S.	173.163, 173.164	Yellow
Wet nitrocellulose flakes—20 percent alcohol or solvent	F. L.	173.118, 173.127	Red
Wet nitroguanidine—20 percent water	F. S.	173.153, 173.164	Yellow
Wet nitrostarch—20 percent water	F. S.	173.153, 173.164	Yellow
Wet nitrostarch—30 percent alcohol or solvent	F. L.	173.118, 173.127	Red
Wet paper stock. See Paper stock, wet.			
Wet rags. See Rags, wet.			
Wet textile waste. See Waste textile, wet.			
Wet waste paper. See Waste paper, wet.			
Wet waste wool. See Waste wool, wet.			
Wood alcohol (methanol, methyl alcohol)	F. L.	173.118, 173.125	Red
*Wood filler. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
*Wood polish. See *Polishes, metal, stove, furniture and wood, liquid.			
*Wood stain, liquid. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.			
Wool waste, wet. See Waste wool, wet.			
X-ray film (nitrocellulose base)	F. S.	No exemption, 173.177	Yellow
X-ray film (slow-burning)	See § 173.161 (a)		
X-ray film scrap (nitrocellulose base), samples of	F. S.	No exemption, 173.166	Yellow
X-ray film scrap (nitrocellulose base), other than samples	F. S.	No exemption, 173.165	Yellow

LIST OF HAZARDOUS MATERIALS--Concluded

Article	Classed as	Exemptions and Packing (see sec.)	Label required if not exempt
X-ray film scrap (slow-burning)	Sec § 173.181 (a) (2)		
X-ray film, unexposed (nitrocellulose base)	F. S.	173.180	Yellow //
Xylol (Xylene)	F. L.	173.118, 173.119	Red
Xylol bromide	Pois. C.	No exemption, 173.382	Tear Gas
Zinc ammonium nitrate	Oxy. M.	No exemption, 173.228	Yellow
Zinc arsenate	Pois. B.	173.354, 173.355	Poison
Zinc arsenite, solid	Pois. B.	173.384, 173.385	Poison
Zinc chlorate	Oxy. M.	173.153, 173.163	Yellow
Zinc cyanide	Sec § 173.370		
Zinc ethyl. See Pyrophoric liquids, n.o.s.			
Zinc nitrate. See Nitrates, n.o.s.			
Zinc permanganate	Oxy. M.	173.153, 173.164	Yellow
Zinc peroxide	Oxy. M.	173.153, 173.164	Yellow
Zirconium metal, dry, mechanically produced, finer than 270 mesh particle size	F. S.	No exemption, 173.214	Yellow
Zirconium metal, dry, chemically produced, finer than 20 mesh particle size	F. S.	No exemption, 173.214	Yellow
Zirconium metal, wet, mechanically produced, finer than 270 mesh particle size	F. S.	No exemption, 173.214	Yellow
Zirconium metal, wet, chemically produced, finer than 20 mesh particle size	F. S.	No exemption, 173.214	Yellow
Zirconium, metallic, solutions or mixtures thereof, liquid	F. L.	No exemption, 173.140	Red
Zirconium picramate, wet with 20 percent of water	Oxy. M.	No exemption, 173.216	Yellow
Zirconium scrap (borings, clippings, shavings, shreds, or turnings)	F. S.	173.153, 173.220	Yellow

APPENDIX "B"

LOADING CHART

for

HAZARDOUS SUBSTANCES

APPENDIX "B"

LOADING CHART OF HAZARDOUS SUBSTANCES

Hazardous Substances must not be loaded, transported, or stored together, except as provided in the Loading and Storage Chart of Hazardous Substances, shown in this section.

The following table shows the explosives and other dangerous articles which must not be loaded or stored together. The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuses, class A, with or without radioactive components & horizontal column must not be loaded or stored with high explosives, or propellant explosives, class A, & vertical column.	Low explosives or black powder														
	a	b	c	d	e	f	g	1	2	3	4	5	6	7	8
CLASS A EXPLOSIVES															
Low explosives or black powder	a		X												
High explosives or propellant explosives, class A	b		X	AX			X			X				X	X
Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamine, guanidylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitroguanidine, penterythritol tetranitrate, tetrazene, lead mononitroarsenate	c	X	X		X										
Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	d		X			X									
Ammunition for cannon with explosive projectiles, gas, projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell; ammunition for small arms with incendiary projectiles; rocket ammunition with explosive projectiles; gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles; boosters (explosives); bursters (explosives); and supplementary charges (explosives)	e														
Explosive projectiles: bombs; torpedoes; mines; rifle or hand grenades (explosives); jet thrust units (jato), class A; igniters, jet thrust, class A; rocket motors, class A; igniters, rocket motor, class A	f														
Detonating fuses, class A, with or without radioactive components	g														
Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles; rocket ammunition with empty, inert-loaded or solid projectiles	1														
Propellant explosives, class B: jet thrust units (jato), class B; igniters, jet thrust, class B; rocket motors; class B; rocket engines (liquid); class B; igniters, rocket motor, class B; starter cartridges; jet engine; class B	2														
Fireworks, special or railway torpedoes	3	X	X	X	AX	X	X								

The following table shows the explosives and other dangerous articles which must not be loaded or stored together. The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuses, class A, with or without radioactive components & horizontal column must not be loaded or stored with high explosives, or propellant explosives, class A, & vertical column.	Low explosives or black powder														
	a	b	c	d	e	f	g	1	2	3	4	5	6	7	8
CLASS A EXPLOSIVES—Continued															
Explosive projectiles: bombs; torpedoes; mines; rifle or hand grenades (explosives); jet thrust units (jato), class A; igniters; jet thrust; class A; rocket motors; class A; igniters; rocket motor; class A	f		X	X						X				X	X
Detonating fuses, class A, with or without radioactive components	g		X	X		X								X	X
CLASS B EXPLOSIVES															
Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles; rocket ammunition with empty, inert-loaded or solid projectiles	1			X											
Propellant explosives, class B: jet thrust units (jato), class B; igniters, jet thrust, class B; rocket motors; class B; rocket engines (liquid); class B; igniters, rocket motor, class B; starter cartridges; jet engine; class B	2			X											
Fireworks, special or railway torpedoes	3	X	X	X	AX	X	X								

See footnotes at end of table.

		a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLASS C EXPLOSIVES																							
Small arms ammunition.....	4			X																			
Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets.....	5			X																			
Percussion fuses, tracer fuses or tracers.....	6			X																			
Time, combination or detonating fuses, class C.....	7			X																			
Cordeau detonant fuse, safety quibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs, instantaneous fuse or igniter cord.....	8			X																			
Fireworks, common, highway fuses or railway fuses.....	9	X	X	X	AX	X		X	X														X
HAZARDOUS MATERIALS																							
Flammable liquids or compressed flammable gases, red label.....	10	X	X	X	AX	X		X	X														X
Flammable solids or oxidizing materials, yellow label.....	11	X	X	X	AX	X		X	X														X
Acids or corrosive liquids, white label.....	12	X	X	X	AX	X		X	X	AX	AX												X
Compressed nonflammable gases, green label.....	13	X	X	X	AX	X		X	X														X
Poisonous gases or liquids in tank car tanks, cylinders, projectiles or bombs, poison gas labels.....	14	X	X	X	X	X		X	X	X	X						X	X	X	X			
Radioactive materials.....	15	FX	FX	FX	FX	FX		FX	FX														

A-Blasting caps or electric blasting caps in quantities not exceeding 1,000 caps may also be loaded and transported with articles named in vertical and horizontal columns 3, 9, 10, 11, 12 and 13. Loading and transportation of blasting caps or electric blasting caps, except as prescribed in 177.835, in any quantity with articles named in vertical or horizontal columns b, c, e or f is prohibited.

B-Acid or other corrosive liquids, white label, must not be loaded above or adjacent to flammable solids or oxidizing materials, yellow label, ammoniums for cannon with or without projectiles, or propellant explosive, except that shippers loading truckloads shipments of white label and yellow label packages and who have obtained prior approval from the Bureau of Explosives may load such articles together when it is known that the mixture of contents would not cause a dangerous evolution of heat or gas.

C-Explosives, class A and explosives, class B must not be loaded or stored with chemical ammunition containing incendiary charges or white phosphorous either with or without bursting charges.

D-Burners (explosive), boosters (explosive), or supplementary charges (explosive) without detonators when shipped by, to or for the Departments of the Army, Navy, and Air Force of the United States Government, may be loaded with any of the articles named, except those in columns e, d, 3, 9, 10, 11, 12, 13, 14 and 15.

X-Does not include nitro carbide nitrate or ammonium nitrate, fertilizer grade, which may be loaded, transported or stored with high explosives or with blasting caps or electric blasting caps, and detonating primers.

F-Normal uranium, depleted uranium, and thorium metal in solid form may also be loaded and transported with articles named in vertical and horizontal columns a, b, c, d, e, f, and g.

Note 1-Charged electric storage batteries must not be loaded in the same vehicle with explosives, class A.

Note 2-Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

Note 3-Caps identification sets may be loaded and transported with all articles named except those in column e.

Note 4-Nitric acid, when loaded in the same motor vehicle with other acids or other corrosive liquids in carboys, must be separated from the other carboys. A 2 by 6 inch plank, set on edge, should be nailed across the motor vehicle floor at least 12 inches from the nitric acid carboys, and the space between the plank and the carboys of nitric acid should be filled with sand, sifted ashes, or other incombustible absorbent material.

Note 5-Smokeless powder for small arms, in quantities not exceeding 100 pounds net weight in one motor vehicle shall be cleaned as a flammable solid for purposes of transportation.

The above forms may be obtained from the Hazardous Substances Transportation Board, 1004 Transportation and Safety Building, Harrisburg, Pa. 17120.

PRESCRIBED FORMS FOR RECORDING FINDINGS

and

HIGHWAY TRANSPORTATION OF HAZARDOUS SUBSTANCES

**TO DETERMINE PHYSICAL FITNESS OF
DRIVERS ENGAGED IN THE**

EXAMINING PHYSICIAN

for

INSTRUCTIONS

APPENDIX "C"

APPENDIX "D"

QUESTIONS AND ANSWERS

for

WRITTEN EXAMINATIONS

Copies of Questions and Answers for written examinations may be obtained from the Hazardous Substances Transportation Board, 1004 Transportation and Safety Building, Harrisburg, Pa. 17120.

SPECIFIC REGULATIONS

Governing the Highway Transportation

of

Radioactive Materials

HAZARDOUS SUBSTANCES TRANSPORTATION BOARD

Harrisburg, Pennsylvania

Telephone: Area Code (717) 787-7445

For Radiation Emergency Assistance—(717) 787-2180

Off Duty—(717) 787-4343

Issued: September 14, 1972

Effective: December 1, 1972

Chapter 15

Regulation 1

PENNSYLVANIA HAZARDOUS SUBSTANCES

TRANSPORTATION BOARD

Specific Regulations

Promulgated Under Authority of Act #323

Approved 11/9/65, as Amended

GOVERNING THE HIGHWAY TRANSPORTATION

OF

RADIOACTIVE MATERIALS

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SPECIFIC REGULATIONS

for

RADIOACTIVE MATERIALS

I. GENERAL INFORMATION

A. Scope

1. The regulations contained herein apply to the intrastate transportation of radioactive materials on the highways and toll roads of the Commonwealth of Pennsylvania. Such intrastate transportation of radioactive materials shall be either in full compliance with the U.S. Department of Transportation Regulations or with the regulations contained herein.

2. These regulations are in addition to the General Regulations of the Hazardous Substances Transportation Board found in Chapter 11.

3. Interstate shipments of radioactive materials, while being transported on the highways and toll roads of the Commonwealth, are governed by the Safety Regulations of the Department of Transportation (DOT) found in the Code of Federal Regulations, Title 49, Parts 170 through 179 and Parts 290 through 297, Motor Carrier Safety Regulations.

4. The Hazardous Substances Transportation Board shall grant exceptions from the requirements of these regulations, provided a request for such exception has been made in accordance with provisions of Sections III B-2 or IV B-6, and it can be established that such exception may be granted without undue hazard to the health and safety of the public.

B. General Exemptions

The following are exempt from these regulations:

1. The highway transportation of radioactive materials under the jurisdiction of and in conformity with the requirements of the U.S. Department of Defense and/or the U.S. Atomic Energy Commission.

2. The transportation of Radioactive Materials in the normal

GENERAL INFORMATION

and emergency operations of federal agencies such as the Armed Forces, the Federal Bureau of Investigation, the Secret Service; the transportation by fire and police departments, providing they are acting in proper performance of their duties; the transportation by an agency of the Commonwealth when existing emergency conditions make it necessary.

II. DEFINITIONS

1. Radioactive Material—Any substance or material, or combination of materials, which spontaneously emits ionizing radiation. Materials in which the estimated specific activity is not greater than 0.002 microcuries per gram of material and in which the radioactivity is essentially uniformly distributed are not considered to be radioactive materials.

2. Low Specific Activity Radioactive Material—

(a) Uranium or thorium ores and physical or chemical concentrates of those ores;

(b) Unirradiated natural or depleted uranium or unirradiated natural thorium;

(c) Tritium oxide in aqueous solutions provided the concentration does not exceed 5 millicuries per milliliter;

(d) Material in which the activity is uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

(1) 0.0001 millicuries of Group I (See Transport Group) radionuclides; or

(2) 0.005 millicuries of Group II radionuclides; or

(3) 0.3 millicuries of Groups III or IV radionuclides.

Note: This includes, but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper and cardboard; solid or liquid plant waste; sludges and ashes.

(e) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination

DEFINITIONS

when averaged over an area of one square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,220,000 disintegrations per minute) per square centimeter of other radionuclides.

3. Small Quantities of Radioactive Materials—Radioactive materials in normal form, not exceeding 0.01 millicurie of Group I radionuclides, 0.1 millicurie of Group II radionuclides, 1 millicurie of Group III, IV, V, or VI radionuclides, 25 curies of Group VII radionuclides; tritium oxide in aqueous solution with a concentration not exceeding 0.5 millicuries per milliliter and with a total activity per package of not more than 3 curies; or 1 millicurie of radioactive material in special form containing not more than 15 grams of uranium-235.

4. Large Quantity of Radioactive Materials—A quantity of radioactive materials, the aggregate activity of which exceeds that specified as follows:

(a) Groups I or II radionuclides: 20 curies.

(b) Groups III or IV radionuclides: 200 curies.

(c) Group V radionuclides: 5,000 curies.

(d) Group VI or VII radionuclides: 50,000 curies.

(e) Special form material: 5,000 curies.

5. Type "A" Quantity and Type "B" Quantity Radioactive Materials—A quantity the aggregate radioactivity of which does not exceed that specified as follows:

<u>Transport group</u> (see definition #10)	<u>Type A</u> quantity (in curies)	<u>Type B</u> quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VII	1,000	50,000
Special form	20	5,000

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6. Radioactive Devices—Manufactured articles such as instruments, clocks, electronic tubes or apparatus, or other similar devices, having radioactive materials (other than liquids) in a non-dispersible form as a component part.

7. Fissile Radioactive Material—Radioactive material which has the additional property that it affords a possibility of a self-sustaining nuclear fission reaction. Fissile material includes plutonium-238, plutonium-239, plutonium-241, uranium-233, and uranium-235 as elements, compounds or mixtures. (See note #3). Packages of fissile material are classified according to the controls needed to provide nuclear criticality safety during transportation as follows:

(a) Fissile Class I.—Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(b) Fissile Class II.—Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(c) Fissile Class III.—Shipments of packages which do not meet the requirements of Fissile Class I or II and which are controlled to provide nuclear criticality safety in transportation by special arrangements between the shipper and the carrier.

Note 1: Uranium-235 exists only in combination with various percentages of uranium-234 and uranium-238. "Fissile radioactive material" as applied to uranium-235 refers to the amount of uranium-235 actually contained in the total quantity of uranium being transported.

Note 2: Radioactive material may consist of mixtures of fissile and nonfissile radionuclides. "Fissile radioactive material" refers to the amount of plutonium-238,

DEFINITIONS

plutonium-239, plutonium-241, uranium-233, or uranium-235 or any combination thereof actually contained in the mixture. The "radioactivity" of the mixture consists of the total activity of both the fissile and non-fissile radionuclides. All mixtures containing "fissile material" shall be subject to Appendix 15-A-X.

Note 3: The following materials are not classified as fissile radioactive materials:

- (1) Not more than 15 grams of fissile material;
- (2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material;
- (3) Uranium compounds other than metal (e.g., UF_4 , UF_6 , or uranium oxide in bulk form, not pelleted or fabricated into shapes), and aqueous solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0 percent by weight of the uranium-235 content, and the total fissile content does not exceed 1 percent by weight of the total uranium content;
- (4) Homogenous hydrogenous solutions or mixtures containing not more than:
 - (i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7,600; or
 - (ii) 800 grams of uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of other fissile material is not more than 1.0 (one) percent by weight of the total uranium-235 content; or
 - (iii) 500 grams of uranium-233 and uranium-235, if the atomic ratio of hydrogen to fissile material is greater than 5,200, and the content of plutonium

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is not more than 1.0 (one) percent by weight of the total uranium-233 and uranium-235 content.

- (5) A package containing less than 350 grams of fissile material, if there is not more than 5 grams of fissile material in any cubic foot within the package.

8. Special Form Radioactive Materials—Those radioactive materials which, if released from a package, might present some direct radiation hazard but would present little hazard due to radiotoxicity and little possibility of contamination. This may be the result of inherent properties of the material (such as metals or alloys), or acquired characteristics, as through encapsulation. The criteria for determining whether a material meets the definition of special form are prescribed in Appendix 15-C.

9. Normal Form Radioactive Materials—Radioactive materials which are not special form radioactive materials. Normal form radioactive materials are grouped into Transport Groups. (See Section III-G herein).

10. Transport Group—Any one of seven groups into which normal form radionuclides are classified according to their radiotoxicity and potential hazard in transportation, and as listed in Section III-G herein.

11. Transport Index—The number placed on a package to designate the degree of control to be exercised by the carrier during transportation. The transport index to be assigned to a package of radioactive materials shall be determined by either subparagraph (a) or (b) of this paragraph, whichever is larger. The number expressing the transport index shall be rounded up to the next highest tenth; e. g., 1.01 becomes 1.1.

(a) The highest radiation dose rate, in millirem per hour at 3 feet from any accessible external surface of the package; or

(b) For Fissile (Class II) packages only, the transport index number calculated by dividing the number fifty (50) by the number of similar packages which may be transported together, as determined by the procedures prescribed in the regulations of the

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11. S. Atomic Energy Commission, Title 10, Code of Federal Regulations, Part 71.

12. Specific Permit—A written authorization by the Hazardous Substances Transportation Board which allows shipments not otherwise provided for in these regulations.

13. Package—The packaging plus its content of hazardous substances, as presented for transportation.

14. Packaging—The assembly of the containers and any other components necessary to assure compliance with the prescribed packaging requirements.

15. Specification Container—Any packaging approved for use in the transportation of hazardous substances and described in Part 178 of the regulations of the U. S. Department of Transportation.

16. Approved Container—Any packaging not a specification container, but otherwise specifically approved for use in the transportation of specified hazardous substances by the Hazardous Substances Transportation Board, as provided for in Chapter 11, Section III-A, General Regulations.

17. Type "A" Packaging—Packaging which is designed in accordance with the general packaging requirements of Appendix 15-A-I and 15-A-II, and which is adequate to prevent the loss or dispersal of the radioactive contents and to retain the efficiency of its radiation shielding properties if the package is subject to the tests prescribed in Appendix 15-A-V.

18. Type "B" Packaging—Packaging which meets the standards for Type A packaging, and, in addition, meets the standards for hypothetical accident conditions of transportation as prescribed in Appendix 15-A-VI.

19. Removable Radioactive Contamination—Radioactive contamination which can be readily removed in measurable quantities by wiping the contaminated surface with an absorbent material. The measurable quantities as measured on the wiping material shall be

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considered as being not significant if they do not exceed:

- (a) 10^{-11} curie per square centimeter beta-gamma (2,200 disintegrations/min. per 100 square centimeters) and 10^{-12} curie per square centimeter alpha (220 disintegrations/min. per 100 square centimeters) for all contaminants except natural or depleted uranium and natural thorium; or
- (b) 10^{-10} curie per square centimeter beta-gamma (22,000 disintegrations/min. per 100 square centimeters) and 10^{-11} curie per square centimeter alpha (2,200 disintegrations/min. per 100 square centimeters) where the only contaminant is known to be natural or depleted uranium or natural thorium.

20. Transport Vehicle—The conveyance used for the transportation of hazardous substances. Each cargo-carrying body is a separate vehicle.

21. C. F. R.—U. S. Code of Federal Regulations.

22. A. E. C.—Atomic Energy Commission.

23. D. O. T.—U. S. Department of Transportation.

III. SHIPPER RULES AND REGULATIONS

A. General Requirements for Packages

1. All radioactive materials offered for transport shall be packaged to comply with the requirements of Appendix 15-A unless otherwise authorized by the Hazardous Substances Transportation Board.

2. Radioactive materials in special form must also be packaged in accordance with Appendix 15-A-VIII or in an approved container.

3. Radioactive materials in normal form must also be packaged in accordance with Appendix 15-A-IX, or in an approved container. Radioactive materials in normal form also qualifying as a small quantity of radioactive material (Section II-3) or as a manufactured device

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(Section II-6) may be packaged in accordance with requirements of Appendix 15-A-III or IV. (See also Section III-D-Exemptions).

4. Fissile material must also be packaged in accordance with Appendix 15-A-X or in an approved container.

5. Low specific activity materials must also be packaged in accordance with Appendix 15-A-VII.

6. Containers previously used for shipments of radioactive materials may be shipped as EMPTY when securely closed and when free of significant removable contamination (Section II-19) and the radiation dose rate at the external surface of the package does not exceed 0.5 millirem per hour.

7. The exterior surface of containers used to transport radioactive materials shall be cleaned or free of significant contamination. Packages of small quantity radioactive materials and manufactured devices must exhibit no detectable radioactive surface contamination.

B. Acceptable Packages

1. Any package authorized by the U. S. D. O. T. as an approved specification container for the transported commodity.

2. Any package or shipment approved under an existing A. E. C. license authorizing its use for the commodity.

3. Any package or shipment authorized for transport of the commodity by a permit issued by the U. S. D. O. T. or Bureau of Explosives.

4. Any approved package or shipment authorized for transport of the commodity by the International Atomic Energy Agency.

5. Any package or shipment authorized by a specific permit issued by the Hazardous Substances Transportation Board to others for transport of the commodity.

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6. Any package otherwise approved by the Hazardous Substances Transportation Board.

Note: Prior to use of any container other than those of Section B-1 above, a copy of the license, permit, certificate or other authorizing document shall be submitted to the Hazardous Substances Transportation Board.

C. Outage

(Not applicable for Radioactive Materials)

D. Shipper Exemptions

1. Small quantities of radioactive materials are exempt from other packaging, marking and labeling requirements when in compliance with Appendix 15-A-III.

2. Radioactive devices are exempt from packaging, marking, labeling requirements when in compliance with Appendix 15-A-IV.

E. Radioactive Materials Not Specifically Provided For

(Purposely Left Blank)

F. Marking and Labeling

1. Packages of radioactive materials shall be labeled as provided in Appendix 15-B.

2. Labels

(a) Labels for packages of radioactive materials must be of diamond shape, in colors specified in this section, with each side at least four (4) inches long. Printing must be in black inside a black line border measuring at least $3\frac{1}{2}$ inches on each side and as shown in this section.

(b) "Radioactive White-I" label for radioactive materials. Label must be white in color. The single vertical bar on the

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SHIPPER RULES AND REGULATIONS

lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

(c) "Radioactive Yellow-II" label for radioactive materials. The upper half of the label must be bright yellow and the bottom half must be white. The two vertical bars on the lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

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(d) "Radioactive Yellow-III" label for radioactive materials. The upper half of the label must be bright yellow and the bottom half must be white. The three vertical bars on the lower half of the label must be bright red in color. This label is diamond shape, and each side is 4 inches long.

(Reduced size)

(e) "Empty Container" label for radioactive materials must be not less than 6 inches on each side, white in color, and printed in letters not less than one (1) inch high in black ink as shown in this section.

(Reduced size)

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SHIPPER RULES AND REGULATIONS

3. Labeling as prescribed in Appendix 15-B is required on all packages containing radioactive materials except for Department of Defense shipments exempted by Appendix 15-B-II.

4. Packages containing other hazardous substances in addition to radioactive materials must be labeled as prescribed by Chapters 12, 13, and 14 in addition to the requirements of Appendix 15-B.

Note 1: (Example) Packages containing the solid nitrates of uranium or thorium must bear both a "radioactive" label and a "yellow" oxidizing materials label.

Note 2: (Example) Packages containing nitric acid solutions of radioactive materials must bear both a "radioactive" label and a "white" corrosive acid label.

5. Labels which conform to the model prescribed in the regulations of the International Atomic Energy Agency, and which are similar in appearance to the labels prescribed herein (although the inscriptions on the labels may be in a foreign language) are authorized in place of the labels prescribed herein for import or export shipments only.

G. Transport Groups of Radionuclides

1. List of Radionuclides:

ELEMENT 1	RADIONUCLIDE 2	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
ACTINIUM (89)	AC-227							
	AC-228							
AMERICIUM (95)	AM-241							
	AM-243							
ANTIMONY (51)	SB-122							
	SB-124							
	SB-126							
ARGON (18)	AR-37							
	AR-41							
	AR-41 (UNCOMPRESSED) 2							
ARSENIC (33)	AS-73							
	AS-74							
	AS-76							
	AS-77							
ASTATINE (85)	AT-211							
BARIUM (56)	BA-131							
	BA-133							
	BA-140							
BERKELIUM (97)	BK-249							
BERYLLIUM (4)	BE-7							

See footnotes at end of table

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1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ²	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
BISMUTH (83)	BI-206							
	BI-207							
	BI-210							
	BI-212							
BROMINE (35)	BR-82							
CADMIUM (48)	CD-109							
	CD-115M							
	CD-115							
CALCIUM (20)	CA-48							
	CA-47							
CALIFORNIUM (98)	CF-249							
	CF-250							
	CF-252							
CARBON (6)	C-14							
CERIUM (58)	CE-141							
	CE-143							
	CE-144							
CESIUM (55)	CS-131							
	CS-134M							
	CS-134							
	CS-135							
	CS-136							
	CS-137							
CHLORINE (17)	CL-36							
	CL-38							
CHROMIUM (24)	CR-51							
COBALT (27)	CO-58							
	CO-57							
	CO-58M							
	CO-58							
	CO-60							
COPPER (29)	CU-64							
CURIUM (96)	CM-242							
	CM-243							
	CM-244							
	CM-246							
	CM-248							
	CM-248							
DYSPROSIUM (66)	DY-154							
	DY-155							
	DY-160							
ERBIUM (68)	ER-169							
	ER-171							
EUROPIUM (63)	EU-150							
	EU-152M							
	EU-152							
	EU-154							
	EU-155							
FLUORINE (9)	F-18							
GADOLINIUM (64)	GD-153							
	GD-159							
GALLIUM (31)	GA-67							
	GA-72							
GERMANIUM (32)	GE-71							
GOLD (79)	AU-193							
	AU-194							
	AU-195							
	AU-196							
	AU-198							
	AU-199							
HAFNIUM (72)	HF-161							
HOLMIUM (67)	HO-166							
HYDROGEN (1)	H-3 (SEE TRITIUM)							
INDIUM (49)	IN-113M							
	IN-114M							
	IN-115M							
	IN-115							

See footnotes at end of table

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SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ²	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
IODINE (53)	I-124							
	I-126							
	I-128							
	I-129							
	I-131							
	I-132							
	I-133							
	I-134							
	I-135							
IRIDIUM (77)	IR-190							
	IR-192							
	IR-194							
IRON (26)	FE-55							
	FE-59							
KRYPTON (36)	KR-83M (UNCOMPRESSED) ³							
	KR-85							
	KR-85 (UNCOMPRESSED) ³							
	KR-87							
	KR-87 (UNCOMPRESSED) ³							
LANTHANUM (57)	LA-140							
LEAD (82)	PB-203							
	PB-210							
	PB-212							
LUTECIUM (71)	LU-172							
	LU-177							
MAGNESIUM (12)	MG-28							
MANGANESE (25)	MN-52							
	MN-54							
	MN-56							
MERCURY (80)	HG-197M							
	HG-197							
	HG-203							
MIXED FISSION PRODUCTS	MF-P							
MOLYBDENUM (42)	MO-99							
NEODYMIUM (60)	ND-147							
	ND-149							
NEPTUNIUM (93)	NP-237							
	NP-239							
NICKEL (28)	NI-56							
	NI-58							
	NI-62							
	NI-65							
NIOBIUM (41)	NB-93M							
	NB-98							
	NB-97							
OSMIUM (76)	OS-185							
	OS-191M							
	OS-191							
	OS-193							
PALLADIUM (46)	PD-103							
	PD-109							
PHOSPHORUS (15)	P-32							
PLATINUM (78)	PT-191							
	PT-193							
	PT-193M							
	PT-197M							
	PT-197							
PLUTONIUM (94)	PU-238 ⁴							
	PU-239 ⁴							
	PU-240 ⁴							
	PU-241 ⁴							
	PU-242							
	PD-210							
POLONIUM (84)	PO-210							
POTASSIUM (19)	K-42							
	K-43							

See footnotes at end of table

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SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
PRASEODYMIUM (69)	PR-142							
	PR-143							
PROMETHIUM (61)	PM-147							
	PM-149							
PROTACTINIUM (91)	PA-230							
	PA-231							
	PA-233							
	PA-234							
RADIUM (88)	RA-223							
	RA-224							
	RA-226							
	RA-228							
RADON (86)	RN-220							
	RN-222							
RHENIUM (75)	RE-183							
	RE-186							
	RE-187							
	RE-188							
RHODIUM (45)	RH-103M							
	RH-105							
ROBIDIUM (37)	RB-86							
	RB-87							
RUTHENIUM (44)	RU-97							
	RU-103							
	RU-106							
	RU-108							
SAMARIUM (62)	SM-145							
	SM-147							
	SM-151							
	SM-153							
SCANDIUM (21)	SC-46							
	SC-47							
	SC-48							
SELENIUM (34)	SE-75							
SILICON (14)	SI-31							
SILVER (47)	AG-105							
	AG-110M							
	AG-111							
SODIUM (11)	NA-22							
	NA-24							
STRONTIUM (38)	SR-89M							
	SR-90							
	SR-91							
	SR-92							
	SR-93							
	SR-94							
SULPHUR (16)	S-35							
TANTALUM (73)	TA-182							
TECHNETIUM (43)	TC-98M							
	TC-98							
	TC-97M							
	TC-97							
	TC-99M							
	TC-99							
TELLURIUM (52)	TE-125M							
	TE-127M							
	TE-127							
	TE-129M							
	TE-129							
	TE-131M							
TERBIUM (65)	TE-132							
	TE-160							
THALLIUM (81)	TL-200							
	TL-201							
	TL-202							
	TL-204							

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See footnotes at end of table

SHIPPER RULES AND REGULATIONS

1. List of Radionuclides: (Cont'd)

ELEMENT ¹	RADIONUCLIDE ³	TRANSPORT GROUP						
		I	II	III	IV	V	VI	VII
THORIUM (90)	TH-227							
	TH-228							
	TH-230							
	TH-231							
	TH-232							
THULIUM (69)	TH-234							
	TH NATURAL							
	TM-168							
	TM-170							
TIN (80)	TM-171							
	SN-113							
	SN-117M							
	SN-121							
TRITIUM (1)	SN-125							
	H-3							
TUNGSTEN (74)	H-3 (AS A GAS, AS LUMINOUS PAINT, OR ADSORBED ON SOLID MATERIAL)							
	W-181							
	W-186							
URANIUM (92)	U-187							
	U-230							
	U-232							
	U-233							
	U-234							
	U-235							
VANADIUM (23)	U-238							
	U-239							
	U NATURAL							
	U ENRICHED							
XENON (54)	U DEPLETED							
	V-40							
	V-48							
YTERBIUM (70)	XE-129							
	XE-131M							
	XE-131M(UNCOMPRESSED)							
	XE-133							
	XE-133 (UNCOMPRESSED)							
	XE-135							
YTTTRIUM (39)	XE-135 (UNCOMPRESSED)							
	YB-175							
ZINC (30)	Y-88							
	Y-90							
	Y-91M							
	Y-91							
	Y-92							
	Y-93							
ZIRCONIUM (40)	ZN-65							
	ZN-69M							
	ZN-69							
ZIRCONIUM (40)	ZR-93							
	ZR-95							
	ZR-97							

¹ ATOMIC NUMBER SHOWN IN PARENTHESES.

² UNCOMPRESSED MEANS AT A PRESSURE NOT EXCEEDING 14.7 P.S.I. (ABSOLUTE).

³ ATOMIC WEIGHT SHOWN AFTER THE RADIONUCLIDE SYMBOL.

⁴ FISSIONABLE RADIOACTIVE MATERIAL.

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SHIPPER RULES AND REGULATIONS

2. Any radionuclide not listed in the above table shall be assigned to one of the groups in accordance with the following table:

RADIONUCLIDE	RADIOACTIVE HALF-LIFE		
	0-1,000 days	1,000 days to 10 ⁶ years	Over 10 ⁶ years
Atomic number 1 - 81	Group III	Group II	Group III
Atomic number 82 and over.	Group I	Group I	Group III

Note 1: No unlisted radionuclides shall be assigned to Groups IV, V, VI, or VII.

3. For mixtures of radionuclides the following shall apply:

(a) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(b) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(c) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(d) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except if a radionuclide "x" has a half-life longer than that of the first member and an activity greater than that of any other member including the first at any time during transportation; in that case, the transport group of the nuclide "x" shall be the transport group for the mixture and

SHIPPER RULES AND REGULATIONS

the activity of the mixture shall be the maximum activity of the nuclide "x" during transportation.

II. General Requirements

1. Radioactive materials handling. When radioactive materials are loaded into vehicles by the shipper, the shipper shall observe all applicable requirements of C. F. R., Title #49, Part 177 as applicable.

2. Specific Permits. The Hazardous Substances Transportation Board shall issue upon application, specific permits to allow persons to package, load, or transport radioactive materials in intrastate commerce when it is established that transportation can be accomplished without undue hazard to the public health and safety. Such permits shall:

- Describe the situation to which the permit applies.
- Authorize such exemptions as may be warranted.
- Establish the period of time in which the permit is effective.
- Impose any new or special conditions which must be observed.
- The decision as to whether or not a specific permit will be issued, is solely that of the Hazardous Substances Transportation Board. An application for a specific permit shall be made to the Hazardous Substances Transportation Board, Department of Transportation, Harrisburg, Pennsylvania, and shall include the following:
 - Name and address of applicant.
 - Business of applicant.
 - Requested exemptions to regulations.
 - Reason a specific permit is required.
 - Points of origin-destination and proposed routes.
 - Evidence to establish that transportation can be accomplished without undue hazard to public health and safety.
 - Period during which permit is to be effective.
 - Additional information as may be required.

SHIPPER RULES AND REGULATIONS

Note: Specific permits for fissile radioactive materials will not be issued unless packaging is approved by the U. S. A. E. C. or U. S. D. O. T.

IV. CARRIER RULES AND REGULATIONS

A. General Requirements for Packages

1. Packaging furnished by a carrier shall comply with the requirements of Section III-A and III-B of these regulations.

B. Transportation of Radioactive Materials

1. Improperly packaged or damaged shipments discovered in transit: For the protection of the public against contamination or other further hazard, the carrier shall immediately report to the shipper and to the Hazardous Substances Transportation Board all instances of improperly packaged or damaged shipments of radioactive materials discovered or occurring in transit.

2. Disposal of vehicle: A carrier shall not sell, junk, abandon or otherwise dispose of any contaminated vehicle used for the transportation of radioactive materials until he has found that the vehicle meets the requirements of decontamination found in paragraph 3-(a) below, except that this requirement shall not prevent disposal of the vehicle as radioactive waste.

3. Contamination of vehicles:

(a) Each vehicle used for transporting low specific activity radioactive materials in bulk or unpackaged truckload lots must be surveyed by the carrier, with radiation detection instruments after each use. If the survey shows that the surface radiation dose rate exceeds 0.5 millirem per hour, or that there is significant removable radioactive surface contamination, the carrier is responsible for cleaning the vehicle so that the radiation dose rates are reduced below 0.5 millirem per hour and the removable contamination meets the limits discussed in Definition #19 of Section II, *Removable Radioactive Contamination*.

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CARRIER RULES AND REGULATIONS

(b) This section does not apply to any vehicle used solely for transporting radioactive material if a survey of the interior surface shows that the radiation dose rate does not exceed 10 millirem per hour at the interior surface or 2 millirem per hour at 3 feet from any interior surface. Such vehicles must be stenciled with the words "FOR RADIOACTIVE MATERIALS USE ONLY" in lettering at least 3 inches high in a conspicuous place, on both sides of the exterior of the vehicle.

(c) In the event that radioactive material leaks from a package as the result of breakage or an accident or other cause, the vehicle, equipment, areas, and buildings must be decontaminated so that at any accessible surface the beta-gamma radiation dose rate is less than 0.5 millirem per hour and there is no significant removable radioactive surface contamination prior to returning such vehicle, equipment, area or building to transportation or public service. The shipper and the Board must be notified immediately upon the discovery of such leakage. In the event that radiological advice or assistance is needed, contact the nearest U.S. Atomic Energy Commission office, or the Office of Radiological Health, Department of Environmental Resources, Harrisburg.

4. Loading and Unloading of Radioactive Materials

(a) Mixing of packages of other types of radioactive materials, including Fissile Class I, with Fissile Class II packages is permitted if the total transport index in any one transport vehicle of storage location does not exceed 50.

(b) For Fissile Class II packages shipped under the exclusive use provisions of Appendix 15-A-II (i) to provide for packages with high radiation dose rates, the transport index number which is calculated for nuclear criticality control purposes must not exceed 10 for any single package or a total of 50 for the full load, unless specifically authorized by the Department for Fissile Class III shipments.

(c) Packages of radioactive material bearing "radioactive yellow-II" or "radioactive yellow-III" labels shall not be placed in vehicles or other places closer than the distances shown in the

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CARRIER RULES AND REGULATIONS

following table to any area which may be continuously occupied by passengers, employees, or shipments of animals, nor closer than the distances shown in the table below to any package containing undeveloped film (if so marked). If more than one of these packages is present, the distance shall be computed from the following table on the basis of the total transport index number (determined by adding together the transport index numbers on the labels of the individual packages) of packages in the vehicle or storeroom.

Total transport index	Minimum separation distances in feet to nearest undeveloped film for various times of transit					Minimum distance in feet to area of persons, or minimum distance in feet from dividing partition of cargo compartments
	Up to 2 hours	2-4 hours	4-8 hours	8-12 hours	Over 12 hours	
NONE.....	0	0	0	0	0	0
0.1 to 1.0.....	1	2	3	4	5	1
1.1 to 5.0.....	3	4	6	8	11	2
5.1 to 10.0.....	4	6	9	11	15	3
10.1 to 20.0.....	5	8	12	15	22	4
20.1 to 30.0.....	7	10	15	20	28	5
30.1 to 40.0.....	8	11	17	22	33	6
40.1 to 50.0.....	9	12	19	24	36	7

Note: The distance in the table must be measured from the nearest point on the packages of radioactive materials.

5. Controlled Shipments

(a) Fissile Class III shipments may be made only in accordance with subparagraph (1) or (2) of this paragraph, or in accordance with other procedures authorized by the Hazardous Substances Transportation Board. The transport controls must provide nuclear criticality safety and shall be carried out by the shipper or carrier, as appropriate, to protect against loading, transporting, or storing of that shipment together with other fissile material.

(1) Transportation in a transport vehicle assigned for the sole use of that consignor, with a specific restriction for such sole use to be provided in the special arrangements, and with instructions to that effect issued with the shipping papers; or

CARRIER RULES AND REGULATIONS

(2) Transportation under escort by a person in a separate vehicle, with the escort having the capability, equipment, authority, and instructions to provide administrative controls adequate to assure compliance with this paragraph.

6. Specific Permits

(a) The Hazardous Substances Transportation Board shall issue specific permits to allow carriers to transport radioactive materials in intrastate commerce when it is established that a permit can be granted without undue hazard to the public health and safety. Such permits shall be issued and applications shall be submitted in accordance with Section III-II-2 of this Chapter.

7. Fire Extinguishers

(a) Not less than one fire extinguisher having a rating of at least 10 BC, approved by a nationally recognized fire equipment testing laboratory, and placed on the vehicle where readily accessible when needed; and meeting all the requirements as set forth in Section IV-D-1(a), General Regulations, Chapter 11.

V. VEHICLE OPERATION, INSPECTION AND MAINTENANCE

A. Vehicle Operation

1. Accidents - Radioactive Materials

(a) In the event of an accident involving any vehicle transporting radioactive materials, every available means shall be used to protect all persons. All personnel shall be warned of the hazard of congregating in the vicinity. Care shall also be taken to prevent radioactive materials from contaminating streams or flowing into sewers.

(b) In case of fire, accident, breakage, or unusual delay involving shipments of radioactive materials, the carrier shall immediately notify the shipper and the Hazardous Substances Transportation Board. Vehicles, buildings, areas, or equipment in which radioactive materials have been spilled may not be again placed in

VEHICLE OPERATION, INSPECTION AND MAINTENANCE

service or routinely occupied until the radiation dose rate at any accessible surface is less than 0.5 millirem per hour and there is no significant removable radioactive surface contamination.

(c) In the instances outlined in (b) above, the package or materials should be segregated as far as practicable from personnel contact. If radiological advice or assistance is needed, contact the U.S. Atomic Energy Commission or the Office of Radiological Health, Pennsylvania Department of Environmental Resources, Harrisburg, Pennsylvania. In case of obvious leakage, or if it appears likely that the inside container may have been damaged, care should be taken to avoid inhalation, ingestion, or contact with the radioactive material. Any loose radioactive material should be left in a segregated area and held pending disposal instructions from qualified persons.

B. Inspection and Maintenance

1. Sections V-C-2 and V-E, Chapter 11, General Regulations, are not applicable to carriers of radioactive materials.

VI. DRIVER QUALIFICATIONS

A. Minimum Requirements

1. Drivers of vehicles engaged in the transportation of radioactive materials are exempt from the requirements of Sections VI and VII (except Sections VII-A.2 and VII-B) of Chapter 11, General Regulations, when all of the following conditions are met:

(a) The loaded vehicle driven has a gross weight of no more than 21,000 pounds and has no more than two axles.

(b) The driver shall possess an operator's license valid in the Commonwealth of Pennsylvania.

(c) The vehicle is operated in accordance with the Pennsylvania Motor Vehicle Code.

(d) The operation of such vehicle in the transportation of radioactive materials is on a casual basis, or the transportation of radioactive materials is not a significant part of the driver's assigned duties.

(e) Appropriate management of the shipper is notified of the manner in which radioactive materials are to be transported.

RECORDING AND REPORTING OF ACCIDENTS

VII. HOURS OF SERVICE AND DRIVER'S DAILY LOG

Section VII-A and VII-C, Chapter 11, General Regulations are not applicable to intrastate transportation of radioactive Materials.

VIII. RECORDING AND REPORTING OF ACCIDENTS

Section VIII-A, Chapter 11, General Regulations, is not applicable to intrastate transportation of Radioactive Materials by not-for-hire carriers.

APPENDIX 15-A

PACKAGING REQUIREMENTS

for

RADIOACTIVE MATERIALS

PACKAGING REQUIREMENTS - RADIOACTIVE MATERIALS

(Note: Specification containers referenced herein are those described in U. S. D. O. T. regulations, 49 C.F.R., Part 170)

I. STANDARD REQUIREMENTS FOR ALL PACKAGES

(a) Each package used for shipping radioactive materials under this chapter shall be so designed and constructed, and its contents so limited, that under conditions normally incident to transportation:

1. There will be no significant release of the radioactive material to the environment;

2. The effectiveness of the packaging will not be substantially reduced; and

3. There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging.

(b) Materials for which detailed specifications for packaging are not set forth in this part must be securely packaged in strong, tight packages meeting the requirements of this section.

(c) Packaging used for the shipment of radioactive materials under this chapter shall, unless otherwise specified or exempted therein, meet all of the following design and construction criteria:

1. Each specification container shall be marked in an unobstructed area with letters and numerals identifying that specification (e.g., ICC-6J, DOT-6L, DOT MC 306, ICC-105a200-F);

(i) The marking is a certification that the packaging complies with all specification requirements.

(ii) The name and address or the symbol of the manufacturer, or the user, who assumes responsibility for compliance with the specification requirements, shall be included. Symbol letters

STANDARD REQUIREMENTS FOR ALL PACKAGES

must be registered with the Bureau of Explosives. Duplicate symbols are not authorized.

(iii) The markings shall be stamped, embossed, burned, printed, or otherwise marked on the packaging to provide adequate accessibility, permanency, and contrast so as to be readily apparent and understood.

(iv) Unless otherwise specified, letters and numerals shall be at least $\frac{1}{8}$ inch high.

(v) Packaging which does not comply with the applicable specification listed in 49 C.F.R. Parts 178 and 179 must not be marked to indicate such compliance.

2. Steel used shall be low-carbon commercial quality steel. Stainless, open hearth, electric, basic oxygen, or other similar quality steels are acceptable. Steel sheets of specified gauges shall comply with the following:

Gauge No.	Nominal Thickness (Inches)	Minimum Thickness (Inches)
12-----	0.1046	0.0946
13-----	0.0897	0.0817
14-----	0.0747	0.0677
15-----	0.0673	0.0603
16-----	0.0598	0.0533
17-----	0.0530	0.0478
18-----	0.0478	0.0428
19-----	0.0418	0.0378
20-----	0.0359	0.0324
22-----	0.0299	0.0269
24-----	0.0239	0.0209
26-----	0.0179	0.0159
28-----	0.0149	0.0129
30-----	0.0120	0.0110

3. Lumber used shall be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

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STANDARD REQUIREMENTS FOR ALL PACKAGES

4. Welding and brazing shall be performed in a workmanlike manner using suitable and appropriate techniques, materials, and equipment.

5. Packaging materials and contents shall be such that there will be no significant chemical or galvanic reaction among any of the materials in the package.

6. Closures shall be adequate to prevent inadvertent leakage of the contents under normal conditions incident to transportation. Gasketed closures shall be fitted with gaskets of efficient material which will not be deteriorated by the contents of the container.

7. Nails, staples, and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to cause failures.

8. The nature and thickness of the packaging shall be such that friction during transport does not generate any heating likely to decrease the chemical stability of the contents.

(d) For specification containers, compliance with the applicable specifications in 49 C.F.R. Parts 178 and 179 shall be required in all details, except as otherwise provided in this chapter.

II. GENERAL PACKAGING REQUIREMENTS

(a) The outside of each package must incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that the package has not been illicitly opened.

(b) The smallest outside dimension of any package must be 4 inches or greater.

(c) Radioactive materials must be packaged in packagings which have been designed to maintain shielding efficiency and leak tightness, so that, under conditions normally incident to transportation, there will be no release of radioactive material. If necessary, additional suitable inside packaging must be used. Each package must

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GENERAL PACKAGING REQUIREMENTS

be capable of meeting the standards in Appendix 15-C. Specification containers listed as authorized for radioactive materials shipments may be assumed to meet those standards, provided the packages do not exceed the gross weight limits prescribed for those containers in 49 C.F.R. Part 178.

1. Internal bracing or cushioning, where used, must be adequate to assure that, under the conditions normally incident to transportation, the distance from the inner container or radioactive material to the outside wall of the package remains within the limits for which the package design was based, and the radiation dose rate external to the package does not exceed the transport index number shown on the label. Inner shield closures must be positively secured to prevent loss of the contents.

(d) The packaging must be so designed, constructed, and loaded that, when transporting large quantities of radioactive material:

1. The heat generated within the package because of the radioactive materials present will not, at any time during transportation, affect the efficiency of the package under the conditions normally incident to transportation, and

2. The temperature of the accessible external surfaces of the package will not exceed 122°F. in the shade when fully loaded, assuming still air at ambient temperature. If the package is transported in a transport vehicle consigned for the sole use of the consignor, the maximum accessible external surface temperature shall be 180°F.

(e) Pyrophoric materials, in addition to the packaging prescribed in this subpart, must also meet the packaging requirements of Chapter 13, *Specific Regulations for Flammable Liquids and Solids*.

(f) Liquid radioactive material must be packaged in or within a leak-resistant and corrosion-resistant inner container. In addition:

1. The packaging must either be adequate to prevent loss or dispersal of the radioactive contents from the inner container, if the package were subjected to the 30-foot drop test

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GENERAL PACKAGING REQUIREMENTS

prescribed in Appendix 15-A-VI(b) (I), or

2. Enough absorbent material must be provided to absorb at least twice the volume of the radioactive liquid contents. The absorbent material may be located outside the radiation shield only if it can be shown that if the radioactive liquid contents were taken up by the absorbent material the resultant dose rate at the surface of the package would not exceed 1,000 millirem per hour.

(g) There must be no significant removable radioactive surface contamination on the exterior of the package.

(h) Except for shipments described in paragraph (i) of this section, all radioactive materials must be packaged in suitable packaging (shielded, if necessary) so that at any time during the normal conditions incident to transportation the radiation dose rate does not exceed 200 millirem per hour at any point on the external surface of the package, and the transport index does not exceed 10.

(i) Packages for which the radiation dose rate exceed the limits specified in paragraph (h) of this section, but does not exceed at any time during transportation any of the limits specified in subparagraphs (1) through (4) of this paragraph, may be transported in a transport vehicle assigned for the sole use of that consignor, and unloaded by the consignee from the transport vehicle in which originally loaded.

1. 1,000 millirem per hour at 3 feet from the external surface of the package (closed transport vehicle only);

2. 200 millirem per hour at any point on the external surface of the car or vehicle (closed transport vehicle only).

3. 10 millirem per hour at 6 feet from the external surface of the car or vehicle; and

4. 2 millirem per hour in any normally occupied position in the car or vehicle, except that this provision does not apply to private carriers.

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PACKAGING REQUIREMENTS FOR SMALL QUANTITY RADIOACTIVE MATERIALS

III. PACKAGING REQUIREMENTS FOR SMALL QUANTITY RADIOACTIVE MATERIALS

Note: Small quantities of radioactive materials are exempt from specification packaging, marking and labeling and from the General Package Requirements (Appendix 15-A-II), provided the following conditions are met.

(a) The materials are packaged in strong tight packages such that there will be no leakage of radioactive materials under conditions normally incident to transportation.

(b) The package must be such that the radiation dose rate at any point on the external surface of the package does not exceed 0.5 millirem per hour.

(c) There must be no significant removable radioactive surface contamination on the exterior of the package.

(d) The outside of the inner container must bear the marking "Radioactive."

IV. PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

(a) Manufactured articles such as instruments, clocks, electronic tubes or apparatus, or other similar devices, having radioactive materials (other than liquids) in a nondispersible form as a component part, are exempt from specification packaging, marking, and labeling, and are exempt from the provisions of Appendix 15-A-II if the following conditions are met:

Note: For radioactive gases, the requirement for radioactive material to be in a nondispersible form does not apply.

1. Radioactive materials are securely contained within the devices, or are securely packaged in strong, tight packages, so that there will be no leakage of radioactive materials under conditions normally incident to transportation.

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PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

2. The radiation dose rate at four inches from any unpackaged device does not exceed 10 millirem per hour.

3. The radiation dose rate at any point on the external surface of the outside container does not exceed 0.5 millirem per hour. However, for truckload lots only, the radiation at the external surface of the package or the item may exceed 0.5 millirem per hour, but must not exceed 2 millirem per hour.

4. There must be no significant removable radioactive surface contamination on the exterior of the package.

5. The total radioactivity content of a package containing radioactive devices must not exceed the quantities shown in the following table:

Transport Group	Quantity in Curies	
	Per Device	Per Package
I-----	0.0001	0.001
II-----	0.001	0.05
III-----	0.01	3
IV-----	0.05	3
V or VI-----	1	1
VII-----	25	200
Special Form-----	0.05	20

6. No package may contain more than 15 grams of fissile material.

(b) Manufactured articles, other than reactor fuel elements, in which the sole radioactive material is natural or depleted uranium, are exempt from specification packaging, marking, and labeling and are exempt from the provisions of Appendix 15-A-II if the following conditions are met:

1. The radiation dose rate at any point on the external surface of the outside container does not exceed 0.5 millirem per hr;

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PACKAGING REQUIREMENTS FOR MANUFACTURED DEVICES

2. There must be no detectable radioactive surface contamination on the exterior of the package;

3. The total radioactivity content of each article must not exceed 3 curies;

4. The outer surface of the uranium is enclosed in an inactive metallic sheet.

Note: Such articles may be packagings for the transportation of radioactive materials.

V. PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

(a) Type A packaging must be so designed and constructed that, if it were subject to the environmental and test conditions prescribed in this section:

1. There would be no release of radioactive material from the package;

2. The effectiveness of the packaging would not be substantially reduced; and,

3. There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(b) Environmental conditions:

1. Heat. Direct sunlight at an ambient temperature of 130°F. in still air.

2. Cold. An ambient temperature of -40°F. in still air and shade.

3. Reduced pressure. Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 p.s.i.a.).

PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

4. Vibration. Vibration normally incident to transportation.

(c) Test conditions: The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:

1. Water spray. A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combination thereof, are exempt from the water spray test.

2. Free drop. Between 1½ to 2½ hours after the conclusion of the water spray test, a free drop through a distance of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

3. Corner drop. A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

4. Penetration. Impact of the hemispherical end of a vertical steel cylinder 1½ inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

5. Compression. For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of

PACKAGING REQUIREMENTS FOR TYPE "A" PACKAGE

24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

VI. PACKAGING REQUIREMENTS FOR TYPE "B" PACKAGE

(a) Type B packaging must meet the applicable Type A packaging standards and must be designed and constructed and its contents so limited that, if subjected to the hypothetical accident conditions prescribed in this paragraph, it will meet the following conditions:

1. The reduction of shielding would not be enough to increase the radiation dose rate at three feet from the external surface of the package to more than 1,000 millirem per hour.

2. No radioactive material would be released from packages containing Type B quantities of radioactive material. The allowable release of radioactivity from packages containing large quantities of radioactive material is limited to gases and contaminated coolant containing total radioactivity exceeding neither 0.1 percent of the total radioactivity of the package contents nor 0.01 curie of Group I radionuclides, 0.5 curie of Group II radionuclides, and 10 curies of Groups III and IV radionuclides, except that for inert gases the limit is 1,000 curies.

(b) Test conditions: The conditions which the package must be capable of withstanding must be applied sequentially, to determine their cumulative effect on a package, in the following order:

1. Free drop. A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal target surface, striking the surface in a position for which maximum damage is expected.

2. Puncture. A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface, the bar shall be 6 inches in diameter, with the top horizontal and its edge rounded

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PACKAGING REQUIREMENTS FOR TYPE "B" PACKAGE

to a radius of not more than one-fourth inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface.

3. Thermal. Exposure to a thermal test in which the heat input to the package is no less than that which would result from exposure of the whole package to a radiation environment of 1,475°F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have an absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature of the inside of the package has begun to fall in less than 3 hours.

4. Water immersion (fissile radioactive materials packages only). Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 8 hours.

VII. PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

(a) Low specific activity materials, when transported on transport vehicles other than those assigned for the sole use of the consignor, are exempt from the provisions of Appendix 15-A-II(a) thru (f); however, they must be packaged in accordance with the requirements of Appendix 15-A-IX and must be marked and labeled as required in Appendix 15-B and Section III-F of this Chapter.

(b) Low specific activity materials which are transported in transport vehicles assigned for the sole use of that consignor are exempt from specification packaging, marking, and labeling provided the shipments meet the requirements of paragraph (c) or (d) of this section.

(c) Packaged shipments of low specific activity materials transported in transport vehicles assigned for the sole use of that consignor must comply with the following:

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PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

1. Materials must be packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transportation.

2. Packages must not have any significant removable surface contamination.

3. External radiation levels must comply with Appendix 15-A-II-(i).

4. Shipments must be loaded by consignor and unloaded by consignee from the transport vehicle in which originally loaded.

5. There must be no loose radioactive material in the car or vehicle.

6. Shipment must be braced so as to prevent leakage or shift of lading under conditions normally incident to transportation.

7. Except for shipments of uranium or thorium ores, un-concentrated, the transport vehicle must be placarded with the placards prescribed in accordance with 49 C.F.R. 177.823 (a) and Chapter 11 (General Regulations) Section V-A-7-(a).

8. The outside of each outside package must be stencilled or otherwise marked "Radioactive-LSA."

(d) Unpackaged (bulk) shipments of low specific activity materials transported in closed transport vehicles assigned for the sole use of that consignor must comply with the following:

1. Authorized materials are limited to the following:

(i) Uranium or thorium ores and physical or chemical concentrates of those ores.

(ii) Uranium metal or natural thorium metal, or alloys of these materials, or

PACKAGING REQUIREMENTS FOR LOW SPECIFIC ACTIVITY MATERIALS

(iii) Materials of low radioactive concentration, if the average estimated radioactivity concentration does not exceed 0.001 millicurie per gram and the contribution from Group I material does not exceed one percent of the total radioactivity.

(iv) Objects of nonradioactive material externally contaminated with radioactive material, if the radioactive material is not readily dispersible and the surface contamination, when averaged over one square meter, does not exceed 0.0001 millicurie per square centimeter of Group I radionuclides or 0.001 millicurie per square centimeter of other radionuclides. Such objects must be suitably wrapped or enclosed.

2. Bulk liquids must be transported in the following:

(i) Spec. MC 310, MC 311, MC 312, or MC 331 (Parts 178.330, 178.331, 178.337, or 178.343, Title 49, C.F.R.) cargo tanks. Authorized only where the radioactivity concentration does not exceed 10 percent of the specified low specific activity levels. The requirements of Appendix 15-A-II-(f) do not apply to these cargo tanks. Bottom fittings and valves are not authorized. Trailer-on-flat-car service is not authorized.

3. External radiation levels must comply with subparagraphs (2), (3), and (4) of Appendix 15-A-II-(i).

4. Shipments must be loaded by the consignor, and unloaded by the consignee from the transport vehicles in which originally loaded.

5. Except for shipments of uranium or thorium ores, un-concentrated, the transport vehicle must be placarded with the placards prescribed in accordance with 49-C.F.R. 177.828 (a).

6. There must be no leakage of radioactive materials from the vehicle.

**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
IN SPECIAL FORM**

**VIII. PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS IN
SPECIAL FORM**

A. Type "A" Quantities

1. Type A quantities of special form radioactive materials must be packaged as follows:

(a) Spec. 5B, 5D, 6A, 6B, 6C, 6J, 6K, 6L, 6M, 17C, 17H, 42B, or 42C (Sections 178.82, 178.84, 178.97, 178.98, 178.99, 178.100, 178.101, 178.103, 178.104, 178.107, 178.108, 178.115, and 178.118 of 49 C. F. R.) metal drums.

(b) Spec. 21C (Section 178.224 of 49 C. F. R.) fiber drums.

(c) Spec. 14, 15A, 15B, 15C, 15D, 19A, or 19B (Sections 178.168, 178.169, 178.170, 178.171, 178.190, and 178.191 of 49 C. F. R.) wooden boxes.

(d) Any Spec. 12 series (Sections 178.205 through 178.212 of 49 C. F. R.) fiberboard boxes, 200-pound test minimum or Spec. 23F or 23H (Sections 178.214 or 178.219, 49 C. F. R.) fiberboard boxes.

(e) Spec. 55 (Section 178.250 of 49 C. F. R.) metal-encased shielded container. Additionally authorized for not more than 300 curies per package, for domestic shipments only.

(f) Spec. 7A (Section 178.350 of 49 C. F. R.) Type A general package.

(g) Foreign-made packagings which bear the symbol "Type A" may be used for transportation of radioactive materials from the point of entry in the United States to their destination in the United States or through the United States en route to a point of destination outside of the United States.

**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS IN
SPECIAL FORM**

B. Type "B" Quantities

1. Type B quantities of special form radioactive materials must be packaged as follows:

(a) Spec. 55 (Section 178.250 of 49 C. F. R.) metal-encased ~~shielded container~~. Authorized only for not more than 300 curies per package. Authorized for domestic shipments only (See also Section 178.394 (a) (5) of 49 C. F. R.).

(b) Spec. 6M (Section 178.304 of 49 C. F. R.) metal packaging.

(c) Any Type B packaging specifically approved for such use by the Hazardous Substances Transportation Board.

2. Large quantities of radioactive materials in special form must be packaged as follows:

(a) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. Radioactive thermal decay energy must not exceed 10 watts.

(b) Any Type B packaging which meets the standards in the regulations of the U. S. Atomic Energy Commission (10 C. F. R. Part 71) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R., Part 170. In applying for D. O. T. authorization of packages for large quantities of radioactive materials to be used in shipments by the U. S. Atomic Energy Commission, or one of its contractors or licensees, a copy of the license amendment or other approval issued by that Commission will be accepted in place of the package structural integrity evaluation.

**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

**IX. PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

A. Type "A" Quantities

1. Type A quantities of normal form radioactive materials must be packaged as follows:

(a) Spec. 5B, 5D, 6A, 6B, 6C, 6J, 6K, 6L, 6M, 17C, 17H, 42B, or 42C (Section 178.82, 178.84, 178.97, 178.98, 178.99, 178.100, 178.101, 178.103, 178.104, 178.107, 178.108, 178.115, and 178.118 of 49 C.F.R.) metal drums.

(b) Spec. 21C (Section 178.224 of 49 C.F.R.) fiber drums.

(c) Spec. 14, 15A, 15B, 15C, 15D, 19A, or 19B (Sections 178.165, 178.168, 178.169, 178.170, 178.171, 178.190, and 178.191 of 49 C.F.R.) for wooden boxes.

(d) Any Spec. 12 series (Sections 178.205 through 178.212 of 49 C.F.R.) fiberboard boxes 200-pound test minimum; or Spec. 23F or 23H (Sections 178.214 or 178.219) fiberboard boxes. (49 C.F.R.)

(e) Any Spec. 3 or 4 series (Section 178.36 through 178.44 or 178.47 through 178.58 of 49 C.F.R.) cylinders.

(f) Spec. 55 (Section 178.250 of 49 C.F.R.) metal-encased shielded container.

(g) Spec. 7A (Section 178.350 of 49 C.F.R.) Type A general package.

(h) Foreign-made packagings which bear the symbol "Type A" may be used for transportation of radioactive materials from their point of entry in the United States to their destination in the United States or through the United States en route to a point of destination outside of the United States.

B. Type "B" Quantities

1. Type B quantities of radioactive materials in normal form must be packaged as follows:

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**PACKAGING REQUIREMENTS RADIOACTIVE MATERIALS
NORMAL FORM**

(a) Spec. 6M (Section 178.104 of 49 C.F.R.) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250°F.

(b) Any Type B packaging specifically approved for such use by the D.O.T. or Hazardous Substances Transportation Board.

C. Large Quantities

1. Large quantities of radioactive materials in normal form must be packaged as follows:

(a) Spec. 6M (Section 178.104 of 49 C.F.R.) metal packaging. Authorized only for solid or gaseous radioactive materials which will not decompose at temperatures up to 250°F. Radioactive thermal decay energy must not exceed 10 watts.

(b) Any Type B packaging which meets the standards prescribed in the regulations of the U. S. Atomic Energy Commission of 10 C. F. R., Part 71) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R. Part 170 of this chapter. In applying for D. O. T. authorization of package for large quantities of radioactive materials to be used in shipments by the U. S. Atomic Energy Commission, or one of its contractors or licensees, a copy of the license amendment or other approval issued by that Commission will be accepted in place of the package structural integrity evaluation.

X. FISSILE RADIOACTIVE MATERIALS

A. Type "A" Quantities - Special and Normal Form

1. Fissile radioactive materials containing not more than Type A quantities of radionuclides, in either normal form or special form, must be packaged as follows:

(a) Spec 6L (Section 178.103 of 49 C. F. R.) metal packaging. Authorized only for enriched uranium, the fissile content

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FISSILE RADIOACTIVE MATERIALS

not to exceed 14 kilograms of uranium-235 as metal or oxide, or as compounds or alloys which will not decompose at temperatures up to 750°F. Each package shipped as Fissile Class II must be assigned a transport index of 1.3 (unless external radiation levels require a higher assignment). The atomic ratio of hydrogen to uranium-235 must not exceed three, all sources of hydrogen within the specification 2R inner containment vessel being considered. The gross weight of the loaded package must not exceed 350 pounds for the 55-gallon size or 480 pounds for sizes up through 110 gallons.

(b) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. See Part D-1-(b) of this section for authorized contents.

(c) Any packaging listed in Appendix 15-A-IX-A-1. Authorized only for not more than the following:

(i) 500 grams of uranium-235 as Fissile Class III, or not more than 40 grams of uranium-235 as Fissile Class II. For Fissile Class II shipments, the transport index to be assigned to each package shall be 0.4 for each gram of uranium-235 above 15 grams up to a maximum of 40 grams (transport index of 10).

(ii) 320 grams of plutonium-239 as plutonium-beryllium neutron sources in special form. Total radioactivity content must not exceed 20 curies. The transport index to be assigned to each package shall be 0.5 for each 20 grams, or fraction thereof, of fissile plutonium.

(d) Any other packaging which meets the standards in the regulations of the U. S. Atomic Energy Commission, (10 CFR Part 71) the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T. under 49 C. F. R. part 170 of this chapter.

B. Type "B" Quantities Special and Normal Form

1. Fissile radioactive materials containing Type B quantities of radionuclides, in either normal form or special form, must be packaged as follows:

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FISSILE RADIOACTIVE MATERIALS

(a) Spec. 6L (Section 178.103 of 49 C. F. R.) metal packaging. Authorized only for enriched uranium, the fissile content not to exceed 14 kilograms of uranium-235 as metal or oxide, or as compounds or alloys which will not decompose at temperatures up to 750°F. Each package shipped as Fissile Class II must be assigned a transport index of 1.3 (unless external radiation levels require a higher assignment). The atomic ratio of hydrogen to uranium-235 must not exceed three, all sources of hydrogen within the specification 2R inner containment vessel being considered. The gross weight of the loaded package must not exceed 350 pounds for the 55-gallon size or 480 pounds for sizes up through 110 gallons.

(b) Spec. 6M (Section 178.104 of 49 C. F. R.) metal packaging. Authorized only for solid radioactive materials which will not decompose at temperatures up to 250°F. Radioactive thermal decay energy output shall not exceed 10 watts. Large quantity radioactive materials in normal form must be packaged in one or more sealed and leaktight metal cans or polyethylene bottles within the Spec. 2R containment vessel.

(i) Fissile Class I packages. The following quantities of fissile radioactive material are authorized for Fissile Class I packages: 1.6 kilograms uranium-235; 0.9 kilograms of plutonium (see Note); 0.5 kilograms of uranium-233. The maximum ratio of hydrogen to fissile material must not exceed three, all sources of hydrogen within the Spec. 2R containment vessel being considered.

Note: Because of the 10-watt thermal decay heat limitation, the limit for plutonium-238 is only 0.02 kilograms.

(ii) Fissile Class II and III Packages. Quantities of fissile radioactive material as shown in the following table are authorized for Fissile Class II and Fissile Class III packages. Where a maximum ratio of hydrogen to fissile material is specified in the table, only the hydrogen interspersed with the fissile material need be

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FISSILE RADIOACTIVE MATERIALS

considered. For Fissile Class II packages, the minimum transport index to be assigned is shown in the table. For Fissile Class III packages, the maximum number of similar packages per transport vehicle is shown. Fissile Class III shipments are also subject to paragraph 2(a) and (b) of this section.

TABLE OF AUTHORIZED CONTENTS¹

URANIUM-235 ²			PLUTONIUM ^{3 4}			FISSILE CLASS II	FISSILE CLASS III, MAXIMUM
COMPOUNDS			COMPOUNDS			TRANSPORT INDEX	NUMBER PACKAGES PER TRANSPORT VEHICLE
METAL OR ALLOY			METAL OR ALLOY				
H/R ≤ 0	H/R ≤ 0	H/R ≤ 3	H/R ≤ 0	H/R ≤ 0	H/R ≤ 3		
7.2	7.6	8.2	3.1	4.1	3.4	0.1	1,250
6.7	9.6	6.4	5.4	4.5	4.1	0.2	625
11.2	13.9	6.3	4.2	-----	4.5	0.5	250
13.5	16.0	10.1	4.5	-----	-----	1.0	125
-----	26.0	16.1	-----	-----	-----	5.0	25
-----	32.0	18.5	-----	-----	-----	10.0	12

1. QUANTITY IN KILOGRAMS.

2. MAXIMUM URANIUM-235 ENRICHMENT IS 93 WEIGHT PERCENT.

3. MINIMUM PERCENTAGE OF PLUTONIUM-240 IS 5 WEIGHT PERCENT.

4. 4.5 KILOGRAM LIMITATION ON PLUTONIUM DUE TO 10 WATT DECAY HEAT LIMITATION.

(c) Any other packaging which meets the standards prescribed in the regulations of the U.S. Atomic Energy Commission (Title 10, Code of Federal Regulations, Part 71) or the 1967 regulations of the International Atomic Energy Agency, and which has been specifically authorized for such use by the D. O. T., 49 C. F. R. - Part 170, or the Hazardous Substances Transportation Board.

2. Fissile Class III shipments may be made only in accordance with subparagraph (a) or (b) of this paragraph or in accordance with other procedures authorized by the Department. The transport controls must provide nuclear criticality safety and shall be carried out by the shipper or carrier, as appropriate, to protect against loading, transporting, or storing of that shipment together with other fissile material.

(a) Transportation in a transport vehicle assigned for the sole use of that consignor, with a specific restriction for such sole use to be provided in the special arrangements, and with

HSTB CH. 15 (APP 15-A) (X)

FISSILE RADIOACTIVE MATERIALS

instructions to that effect issued with the shipping papers; or

(b) Transportation under escort by a person in a separate vehicle, with the escort having the capability, equipment, authority, and instructions to provide administrative controls adequate to assure compliance with this paragraph.

XI. REUSE OF CONTAINERS

(a) Containers used more than once (refilled and reshipped after having been previously emptied) must be in such condition, including closure devices and cushioning materials, that they comply in all respects with the prescribed requirements for those containers. Repairs must be made in an efficient manner in accordance with requirements for materials and construction as prescribed in 49 C. F. R. Parts 178 and 179, for new containers, or as otherwise prescribed. Parts that are weak, broken, or otherwise deteriorated must be replaced.

(b) Except as provided in this section, single-trip containers made under specifications prescribed in 49 C.F.R. Part 178, from which contents have once been removed following use for shipment of any commodity, shall not be again used as shipping containers for explosives or other dangerous articles. Single-trip containers may be reused if retested before each reuse in accordance with methods approved by the Bureau of Explosives for service for specific commodities or classes of commodities. Applications for permission for reuse should be made to the Bureau of Explosives, American Railroads Building, 1920 "L" Street, Washington, D.C. 20036.

XII. PREVIOUSLY AUTHORIZED PACKAGING

(a) Where the regulations require Spec. 6D or 37M (Sections 178.102 or 178.134 of 49 C. F. R.) cylindrical steel overpacks, Spec. 5B, 6J, or 37A (single-trip container) (Sections 178.82, 178.100, or 178.131 of 49 C. F. R.) metal drums manufactured before March 18, 1964, having inside Spec. 2S, 2St., 2T, or 2Tt. (Sections 178.21, 178.27, 178.35 or 178.35a of 49 C. F. R.)

HSTB CH. 15 (APP 15-A) (X-XI-XII)

PREVIOUSLY AUTHORIZED PACKAGING

polyethylene container, may be continued in use for the commodities and gross weights for which they were previously authorized.

(b) Reusable molded polyethylene containers for use without overpack complying with Spec. 34 (Section 178.19 of 49 C. F. R.), manufactured before September 5, 1966, may be continued in use, if they are plainly marked "ICC-34", and are embossed with the maker's name or symbol, rated capacity, and the month and year of manufacture.

XIII. EMPTY CONTAINERS

(a) All packagings and accessories which have been used for shipments of radioactive materials and which contain residual internal radioactive contamination when shipped as empty, must be securely closed. The external surface must be free of significant removable radioactive contamination, and the radiation at the external surface of the packaging must not exceed 0.5 millirem per hour. The "Empty" label, described in Section III-2(c) of this chapter, must be affixed to the packaging.

APPENDIX 15-B

LABELING

FOR

RADIOACTIVE MATERIALS

EXEMPTIONS FROM LABELING

II. EXEMPTIONS FROM LABELING

A. Labels are not required on truckload lots of shipments of radioactive materials made by, for, or to the Department of Defense if the shipments are loaded by the shipper and unloaded by the consignee from the transport vehicle in which originally loaded and if the shipments are accompanied by qualified personnel supplied with equipment to repair leaks or other container failures which would permit escape of contents. The proper shipping name of the contents must be marked on each package shipped under this exemption.

APPENDIX 15-C

SPECIAL TESTS

FOR

RADIOACTIVE MATERIALS

LABELING FOR RADIOACTIVE MATERIALS

1. LABELING PACKAGES OF RADIOACTIVE MATERIALS

A. Each package of radioactive materials, unless exempted, shall be labeled as provided in this section. The label to be used shall be determined by the transport index or other considerations as follows:

1. Radioactive White-I Label. Each package not exceeding 0.5 millirem per hour at any point on the external surface of the package, and which does not come within the provisions of subparagraph (2) or (3) below. Not authorized for Fissile Class II packages.

2. Radioactive Yellow-II Label. When the limit in subparagraph (1) of this paragraph is exceeded but the provisions of subparagraph (3) of this section are not met; and --

(a) Each package not exceeding 10 millirem per hour at any point on the external surface of the package and not exceeding 0.5 millirem per hour at 3 feet from the external surface of the package; or

(b) Each package for which the transport index does not exceed 0.5 at any time during transportation.

3. Radioactive Yellow-III Label. When either of the limits in subparagraph (2) above is exceeded. In addition, the following types of packages must also bear this label:

(a) Each Fissile Class III package;

(b) Each package containing a large quantity of radioactive material or;

(c) Each package being transported under a special or specific permit.

B. Each package must be labeled with two such labels, affixed to opposite sides of the package.

SPECIAL TESTS FOR RADIOACTIVE MATERIALS

(Note: It is not necessary to actually conduct the tests prescribed in this section if it can be clearly shown, through engineering evaluations or comparative data, that the material or item would be capable of performing satisfactorily under the prescribed test conditions.).

I. SPECIAL FORM MATERIAL

A. To qualify as special form material, the radioactive material must either be in massive solid form or encapsulated. Each item in massive solid form or each capsule must either have no overall dimension less than 0.5 millimeters, or must have at least one dimension greater than 5 millimeters. Each item, or the capsule material, must not dissolve or convert into dispersible form to the extent of more than 0.005 percent, by weight, by immersion for 1 week in water at pH 6-8 and 68°F., and a maximum conductivity of 10 micro-mhos/centimeter, and by immersion in air at 86°F. If in massive solid form, the radioactive material must not break, crumble, or shatter if subjected to the percussion test prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,000°F. If encapsulated, the capsule must retain its contents when subjected to all of the performance tests prescribed in this section, and must not melt, sublime, or ignite at temperatures below 1,475°F.

1. Free drop. A free drop through a distance of 30 feet on to a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

2. Percussion. Impact of the flat circular end of a one inch diameter steel rod weighing three pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than one inch thick, supported by a smooth, essentially unyielding surface.

3. Heating. Heating in air to a temperature of 1,475°F. and remaining at that temperature for a period of 10 minutes.

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SPECIAL FORM MATERIAL

4. Immersion. Immersion for 24 hours in water at room temperature. The water shall be at pH 6-pH 8, with a maximum conductivity of 10 micro-mhos/cm.

II. NORMAL TRANSPORT TEST CONDITIONS FOR TYPE A PACKAGES.

A. Test conditions for normal transport are given in Appendix 15-A, Section V.

III. HYPOTHETICAL ACCIDENT CONDITIONS FOR TYPE B PACKAGES

A. Test conditions for hypothetical accident conditions applicable to type B packages are given in Appendix 15-A, Section VI.

HSTB CH. 15 (APP 15-C) (I-II-III)

APPENDIX C

SELECTED NEWSPAPER ARTICLES

April 12, 1979

EFFECTS OF LOW LEVELS OF RADIATION A 'MYSTERY'

By ANDREW SCHNEIDER
Associated Press Writer

During the last 30 years about \$5 billion has been spent on more than 100,000 investigations of what radiation can do to your health.

Yet when specialists at Three Mile Island were pressed to say what the radiation dangers were, they had to say "there is no risk — based on what we know today."

The accident at Three Mile Island is the centerpoint now but it's far from the only problem on scientific investigators' minds. Among the others are:

— A study reporting a higher incidence of cancer among nuclear workers at Portsmouth Naval Shipyard at Kittery, Maine.

— Findings by a county health officer that people around Denver, living downwind from the government's Rocky Flats plutonium weapons plant are contracting cancer at a rate higher than the rest of the nation.

— Research on soldiers who participated in the early testing of the atomic bomb and people living near the Utah and Nevada test sites have shown an increase in certain

Nuclear Age

types of cancer.

— Studies have been done which show higher cancer among people living near a Connecticut nuclear power plant; residents of dwellings built on or with uranium mine tailings, and workers at the government's Hanford plutonium-processing plant in Richland, Wash.

Many scientists say that today we still don't know what level of radiation is dangerous and many believe we will never know.

Other experts believe the answer will never be known because there is no danger from low-level radiation.

"It's not because the government isn't trying," said Dr. Donald Frederickson, director of the Na-

tional Institutes of Health. "More than \$5.5 billion has been spent for radiation health research. Fifteen to 20 federal agencies are somehow concerned with radiation and they report to no fewer than 50 congressional committees.

"Everyone is looking for the answer but that answer is not easy to find."

Scientists say the health effects of exposure to high-level doses are well known and have been documented extensively from studies on survivors of the bombings of Hiroshima and Nagasaki, people treated with high doses of therapeutic X-rays and a handful of people injured in military or occupational radiation accidents.

But the effects of long-term exposure to low levels of radiation are far more difficult to document.

"No one in his right mind would suggest exposing people to radiation to determine the health effects," said Vice Adm. Robert Monroe, Nuclear Defense Agency director. "So we must rely on animal experiments and what little human data we can find."

"In low-level radiation investi-

Continued on next page.

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April 12, 1979

(Continued)

gations we have to work around the edges picking up a bit of data here and another study there. We may have enough of the bits to build a frame for a picture but we have no idea what the picture looks like."

Doctors say obvious medical symptoms which rapidly appear with high level exposure are absent at lower doses.

"With low-level exposure there are no easy markers or signals such as radiation illness," Frederickson said. "Diseases which may be caused by radiation, primarily cancers, have a long development period. Sometimes it takes 15 to 20 years from time of exposure to the first sign of disease."

To determine a relationship between radiation and disease, researchers must have precise information on the amount of radiation received by the population being studied. This information must be based on accurate monitoring or dosimetry of radiation.

"In the majority of cases we are faced with poor dosimetry and massive uncertainties in record keeping and, to be useful, these inadequacies must be overcome years after the

Fourth of five articles

exposures occurred," Frederickson said.

Some scientists believe studies of the Portsmouth workers offer a large enough population and period to provide new data on the radiation-cancer link. The shipyard has been involved in nuclear work since the late 1950s, the start of the nation's atomic submarine program.

In 1977, a Boston blood specialist, Dr. Thomas Najarian, reported a higher incidence of leukemia among nuclear workers than among those who worked outside radioactive areas. The Department of Energy and the Center for Disease Control in Atlanta have been collecting records on the workers almost two years.

"At Portsmouth we may have a unique opportunity to investigate what we're told are very carefully kept records on individual workers," said Dr. William Foege, CDC director. "If we are able to link those exposure records with accurate health histories of the workers we may be able to tell something."

Under pressure from Congress, several agencies have started reevaluating studies they had earlier discounted:

— The Department of Energy and the Department of Health, Education and Welfare are repeating and expanding Najarian's study of the Portsmouth workers.

— The Nuclear Regulatory Commission has three independent teams of researchers reviewing studies on the health of workers at the DOE's Hanford atomic plant by Dr. Thomas Mancuso, who believes there are serious dangers in low-level radiation.

— The Government Accounting Office also is evaluating the Hanford study.

— The NRC is redoing a double study by Dr. Ernest Sternglass, which he said showed increased cancer among people living near Denver's Rocky Flats plutonium plant and the Millstone nuclear plant in Connecticut.

— The NRC also is reviewing another Rocky Flats study just completed by Dr. Carl Johnson, the health officer for Jefferson County, Colo., where the plant is located.

May 16, 1979

As nuclear wastes pile up

Almost as much as safety, disposal of nuclear wastes has become a problem that worries the nation and beclouds the future of nuclear power.

The Three Mile Island accident has thrown a spotlight on the dilemma of what to do with radioactive trash, making us more aware that our current "solutions" are only stopgap measures.

There are two kinds of nuclear waste, high-level and low-level, depending on degree of radioactivity. And they present somewhat different disposal problems.

Most of the high-level residue is spent fuel from the country's 72 nuclear reactors, plus leftovers from the production of nuclear weapons. Some of this stuff is extremely "hot," with radioactivity that will last hundreds of thousands of years.

Most high-level wastes are now being

stored in 40-foot-deep pools at reactor sites, a temporary expedient. But the Federal Government does not envision a permanent hot-waste disposal plan being ready for maybe 10 years, and the reactor sites don't have enough capacity for 10 years' trash.

Obviously, interim arrangements must be improved while ultimate disposal is sought. The ultimate solution will have to be worked out with state and local officials at whatever site is chosen.

Disposal of low-level atomic wastes raises other difficulties and issues, many of which were discussed in a Bulletin series last week. These materials, not so hot as used uranium but still dangerously radioactive, have been spilled during shipment and been left in rain-washed "graves" to leach into soil and ground

water.

Equally troubling has been the apparent lack of adequate supervision at the nation's six commercial sites for this stuff, three of them operating, three now shut down. Congress's General Accounting Office found that the Nuclear Regulatory Commission "does not routinely monitor the performance of waste treatment systems in operation."

Again, it seems obvious that NRC regulation at these dumps needs to be a lot tighter, both as to licensing and monitoring, at all six sites.

The nation has muddled along up to now with the radioactive wastes problem, patching here, improvising there. Much more careful planning is needed. The fate of the nuclear industry may well hang in that balance.

Aug. 20, 1979

State shelves its search for N-wastes burial site

By TIM PETTIT

Associated Press Writer

Pennsylvania has shelved its efforts to find a site for a low-level radioactive burial ground, authorities say, because of the public uproar over the Three Mile Island nuclear accident.

"We decided not to worry about the waste site right away because there were too many other problems with Three Mile Island. It's on a back burner," said Thomas Gerusky, head of the state's Bureau of Radiological Health.

A state advisory committee had hoped to decide by September on possible disposal sites for contaminated clothes, chemicals and equip-

ment used in medical treatment and research and by nuclear power plants and industries.

"After TMI, the issue has become so blurred and so intensely emotional, it will be a long time before low-level sites studies are done in Pennsylvania," said Dr. Frank Clemente, a Penn State professor who headed a preliminary waste site study.

That study showed that Pennsylvania has the proper geological formations for a below-ground waste site, but did not pinpoint specific sites, said Gerusky.

The nuclear wastes, sealed in steel containers, would be buried about 25 feet below the ground in

areas where, theoretically, groundwater would not come into contact with them.

"We must have a place to store this waste, because so much of it comes from hospitals and medical treatments, things no one wants to stop, like cancer research and treatment," Clemente said.

Since only three low-level sites are open in the country, and every state has Pennsylvania's waste problem, Gerusky is hoping a coalition of states will find a solution.

Pennsylvania has been shipping its nuclear garbage to sites in Hanford, Wash.; Barnwell, S.C.; and Beatty, Nev. The latter has been closed temporarily.

Sept. 3, 1979

Nuclear graveyard giving S.C. pause

By Marilyn Thompson

Special to The Inquirer

BARNWELL, S.C. — With a radiation meter clipped to his shirt pocket, Lee Hebbard strolled past the row of marble tombstones and looked out across the 240-acre Barnwell County burial ground he manages.

"In a few years, this field could be a golf course or a children's playground," he said, gesturing across the sandy terrain. "Over there is a company picnic area where men can

eat their lunches, bring their families for barbecues. They aren't scared, and we think other people should see how safe this place really is."

Hebbard stood only a few feet from one of the flat grave markers dotting the desolate South Carolina countryside. But he seemed unaffected by its inscription.

It read simply "Low-Level Radioactive Waste."

The same inscription is carved into each marker here at the Chem-Nuclear Systems Inc. burial ground, 80 miles downwind from Columbia, the state capital, and not far from the Georgia border.

Beneath each of the gravestones lie dozens of sealed casks and wooden crates packed with radioactive wastes from nuclear power plants, laboratories, hospitals and universities all over the country.

All told, Hebbard's "playground of the future" now serves as the repository for 85 percent of the low-level nuclear waste generated east of the Mississippi. It has been receiving an average of 20 truckloads a day of the nuclear garbage since 1971 when the plant — dubbed as a "pollution control facility" — opened with the encouragement of state and local officials.

But suddenly, with growing public concern about nuclear dangers, site manager Hebbard and Chem-Nuclear are facing rising opposition from state political leaders and private citizens determined to change South Carolina's long-held reputation as a nuclear dumping ground.

Opposition has been mobilizing since April, when Gov. Dick Riley ordered two truckloads of waste en

(See BURY on 4-A)

BURY, From 1-A

route to Chem-Nuclear from the disabled Three Mile Island Nuclear Plant near Harrisburg, Pa., to turn around and take the radioactive cargo elsewhere.

Riley, fearful that the trucks contained some high-level waste from the damaged reactor in unit number two, decreed that the wastes could not be buried at Chem-Nuclear nor could any other waste from plants shut down in the wake of the Three Mile Island accident.

It was the first time a South Carolina governor has interfered with the operations of the privately owned Chem-Nuclear facility.

Since then, Riley and a growing band of state legislators have taken steps to limit drastically the amount of low-level waste coming into South Carolina (largely from northeastern states) for burial in land Chem-Nuclear leases from the state under long-term contract.

Riley's aim is to make other states begin to share the responsibilities and risks of storing their own nuclear refuse.

"As long as everybody can ship it off to South Carolina and forget about it," the governor explained, "then everybody is going to regard low-level waste as a South Carolina problem."

When the site opened eight years ago, state health officials estimated that its storage capacity would last until the turn of the century.

However, the shutdown of burial sites in Kentucky, Illinois and New York during the past several years has left those who generate low-level radioactive waste with few places to send their nuclear garbage.

One of 3 states

South Carolina, Nevada and Washington are now the only states operating burial sites, and, as a result, each state has been receiving unexpectedly large quantities of nuclear material for disposal.

This influx from other regions has Riley worried that the Barnwell site, originally conceived as a burial ground for use by Southern states,

will be filled by its private owners and turned over to the state for perpetual maintenance long before the year 2,000.

Under a contract worked out with state leaders in 1971, Chem-Nuclear has been paying 16 cents per cubic foot of waste stored at the site into a fund maintained by the state treasurer. The money, already over \$1 million, will be used by the state to monitor the facility after Chem-Nuclear has filled and vacated it.

But because it takes hundreds of years for radioactive material to decay, no one is sure how long the site will have to be monitored. The fund could be depleted long before the monitoring can be ended, thus leaving the state to pay the costs.

Riley wants to increase the charge to at least 50 cents per cubic foot and substantially boost the \$10,000 annu-

Continued on next page.

September 3, 1979
(Continued)

After eight years, opposition develops to S.C.'s nuclear graveyard

Resembling a tombstone, a marker gives data on waste buried at a site in Barnwell, S.C.

al license fee Chem-Nuclear pays the state.

He also has joined Washington Gov. Dixy Lee Ray and Nevada Gov. Robert List in a demand that the Nuclear Regulatory Commission (NRC) come up with plans within the next few months for regional storage of low-level waste. The NRC has promised to try, but it has said that the reluctance of other states to allow low-level waste storage would make it difficult to comply with the demand.

Riley is making these forceful moves even though he has publicly praised the Chem-Nuclear firm, which is based in Bellevue, Wash., as the safest, most conscientious waste storage company in the nation.

Heyward Shealy, the state's chief of radiological health, agrees, calling the Chem-Nuclear burial ground in Barnwell a "model site," which has been emulated in foreign countries.

Although Shealy has placed a full-time inspector at the site since the Three Mile Island accident, he be-

lieves the public's increased concern over Chem-Nuclear's operation is unwarranted.

"If you took a little of this low-level waste and dumped it in everybody's backyard, nobody would be that worried about it," he said. "But when you put it all in one spot and start controlling it, everyone suddenly becomes concerned."

Although the U.S. Environmental Protection Agency says any dangers posed by the site should show up within 100 years, Shealy said it could be opened for public use much sooner.

"It could be used almost as soon as it is filled," Shealy said. "There's no reason why it couldn't be used for grazing land, a golf course or even a playground — anything that wouldn't disturb the soil."

While those within the nuclear industry insist that such sites are safe, there is some dispute about that, even within the NRC. The traditional argument by the industry is that the sites wouldn't be licensed by the regulatory agencies if they were hazardous.

The NRC is a bit more cautious. "The answers are not all in," said one NRC official. "There is no uniform agreement on the subject. Even though we regulate these sites, we don't know a lot about long-term effects."

State health officials seem satisfied about the future safety of the site

because of what Chem-Nuclear calls "elaborate precautions" taken with disposal of the radioactive materials.

Much of the waste buried in Barnwell contains isotopes whose radioactive content will dissipate and gradually disappear in about 40 years. But the most dangerous wastes stored at the site have radioactive content that could be lethal for 250 to 300 years.

Included in this broad low-level category are such items as protective garments worn by nuclear plant workers, animal carcasses used in laboratory experiments and garbage and some worn parts from reactors.

Regular procedure

When the materials arrive at Chem-Nuclear, they are checked in at a guard station and transported to a 20-foot-deep trench. Workers use cranes to lift the casks and place them side-by-side in the clay-lined graves. It takes about six months to fill one of the trenches.

Before the trenches are covered with six feet of soil, the exact location of each drum is logged and recorded in Chem-Nuclear's computerized information system. Company officials say they could pinpoint a problem cask at any time.

State and federal agencies and Chem-Nuclear technicians take regular samples from the trenches to check for cask leakage.

Despite the high marks officials have given Chem-Nuclear for safety (Continued on next page)

Continued on next page.

September 3, 1979

(Continued)

S.C. looking anew at nuclear graveyard

Continued from preceding page
at the Barnwell site, the company has failed each time it has attempted to locate a similar facility in another state. Hebbard said the firm has tried in virtually every state in the nation but has met stiff local opposition wherever it has gone.

And while that opposition has spread to Columbia, Chem-Nuclear has managed to hold onto its friendly relationship with the local folk of Barnwell County (population 18,700), who see the company's \$1 million annual payroll as an important factor in the area's economic stability.

For years, in fact, the area has prospered financially from disposing of nuclear wastes, including highly radioactive material from all over the world.

The Chem-Nuclear site sits only a few miles from the massive Savannah River Plant, a nuclear weapons facility and high-level waste storage site operated by the U.S. Department of Energy. The plant has been the area's largest employer since the early 1950s.

Fuel enrichment program

One of the plant's major functions is reprocessing spent nuclear fuel from research reactors all over the world. Under a section of the Atomic Energy Act of 1954, the United States agreed to supply highly enriched uranium reactor fuel for research purposes to a number of foreign nations.

But under the bilateral agreements, such countries are required to return the used reactor fuel — as a safeguard against the fuel being reprocessed abroad and the recovered uranium being used to produce nuclear weapons. That used fuel comes back to the Savannah River Plant, which reprocesses it and sends the uranium it recovers to Oak Ridge, Tenn.

Just down the road from Chem-Nuclear is the Allied General Nuclear Services Plant, a completed but still-unlicensed commercial nuclear fuel reprocessing facility.

Barnwell County residents, who have lived in the midst of nuclear wastes for decades now, cannot understand all the fuss suddenly being raised in the state capital over Chem-Nuclear.

Barnwell Mayor Rodman Lemon said most people in the county "are just not concerned about the word 'nuclear' because they've worked at Savannah River Plant with high-level waste and never had any problems."

Lemon, a seed and supply salesman whose firm does a limited business with Chem-Nuclear, said "by and large people here just aren't concerned" by the low-level waste burial ground. "To them," he said, "it's just like any other business."

Chem-Nuclear has worked to maintain its favorable image in the site's home county by purchasing the trash cans that line Barnwell's downtown streets, financing scholarships at the local high school and encouraging its workers to get involved in civic activities.

"They do a lot for the community, not just monetarily," said insurance agent and Boy Scout leader John McCutcheon.

The only thing that bothers McCutcheon about the burial site is the protest marchers from urban areas of the state who have begun to show up regularly outside Chem-Nuclear's gates.

McCutcheon believes they are "paid protesters" financed by "communist money" to stir up controversy. "They're scroungy people, a bunch of weirdos who are only in it for money and sex," the insurance salesman insisted.

Hebbard complains that it has reached the point where protesters are "out there on a regular basis with their cameras and telephoto lenses hoping they can find something wrong." The site has been targeted for a major fall protest by the Palmetto Alliance, a Columbia-based anti-nuclear coalition.

The site manager said the protesters are "making our jobs more difficult" and threatening the image the firm has spent years building in Barnwell County.

BeeBee Verdery, a Palmetto Alliance member, feels differently, however.

"Chem-Nuclear creates its own image by the work it does," she said. "It is a profit-making enterprise which buries dangerous radioactive wastes in our backyard — garbage that our tax dollars will have to maintain long after Chem-Nuclear is gone."

Nov. 1, 1979

S.C. orders 50% slash in nuclear dumping

By Ronnie Lovler
Associated Press

COLUMBIA, S.C. — Gov. Dick Riley yesterday ordered a 50 percent reduction over two years in the amount of low-level nuclear waste buried annually in South Carolina. The nation's two other nuclear waste dump sites have been shut down indefinitely.

At a news conference, Riley said that by October 1981 Chem-Nuclear Systems Inc. would have to cut the amount of solid waste stored at its Barnwell facility from 2.4 million cubic feet a year to 1.2 million cubic feet.

The 240-acre facility is the only commercial site for disposal of nuclear wastes still operating in the United States. A facility in Washington State was closed Oct. 4, and another in Nevada was shut down last week.

The Barnwell plant has been receiving about 85 percent of all low-level solid nuclear waste in the United States. The state has already banned disposal of liquid nuclear wastes at the site.

Reductions in shipments will begin immediately, Riley said, with Chem-Nuclear expected to cut its

November waste load from about 200,000 cubic feet to 100,000.

Riley said the plant would continue to accept all low-level nuclear waste generated in South Carolina, but would reduce shipments from other states.

He said he hoped that his announcement would result in action on the national level.

"I do think there will be a resolution in Congress, but this has been in a juggling process for a number of months. I hope this will result in Congress resolving the problem of nuclear waste disposal," Riley said.

The governor said that he had given other governors and the federal government ample warning of his plan to reduce South Carolina's waste load.

"I set out my policy when I took office. We put the governors and everyone in the nation on notice we would handle the situation in this way.

"I said where we were going in January and that's where we're going," he said.

Riley said the reduction was being made through amendments to Chem-Nuclear's operating license, issued by the state. The new license goes into effect today.

Nov. 8, 1979

More nuclear-waste dumps urged

By Tom Raum
Associated Press

WASHINGTON — The governors of Washington and South Carolina told Congress yesterday that the rest of the nation should begin looking elsewhere than their states to dump radioactive wastes.

Govs. Dixy Lee Ray of Washington and Richard W. Riley of South Carolina told a subcommittee of the House Science and Technology Committee that they were tired of having their states serve as burial grounds for low-level nuclear wastes from around the country. Nevada is the only other state with such burial facilities.

At the same hearing, representatives of the medical community testified that any steps by the three states to shut or restrict their sites for burial of nuclear wastes could affect nearly every hospital in the country.

"Inability to dispose of low-level medical nuclear-waste products threatens to make life-saving diag-

unavailable to thousands of persons who desperately need these services," said Dr. Leonard M. Freeman, testifying on behalf of the American Medical Association.

The hearing was held to look into recent actions by the governors of the three states in closing down or placing restrictions on disposal sites within their borders.

The sites are the only three available for disposal of commercial, low-level nuclear wastes in the country. Low-level wastes include materials with small doses of radioactivity, such as contaminated protective clothing worn by nuclear power-plant employees and gloves worn by doctors or technicians in hospital or university radiology departments.

"I believe it's hypocritical to stick it under someone else's rug," Ms. Ray said. "It doesn't make sense to be having trucks coming from New England across the country to Washington."

"We have been receiving from all over the country shipments that are

improperly packaged . . . arriving slit open and spilling all over the place," she said.

The disposal site at Hanford, Wash., was ordered closed Oct. 4 until it can be determined that shipments of nuclear materials are being made safely, testified Ms. Ray, former chairman of the Atomic Energy Commission, now defunct. When the Hanford site reopens, she said, it will operate under strict controls.

In South Carolina, the disposal site at Barnwell remains open, but the amount of wastes it will receive has been cut in half and a stiff fee is being charged.

Riley said that each state produces low-level radioactive wastes and that "every state has the capability to see that such wastes are properly disposed of."

The third site, at Beatty, Nev., has been closed since Oct. 23.

Ms. Ray and Riley suggested the possibility of regional burial sites to be used by several states.

Gov. Dixy Lee Ray

says shipments are unsafe

Nuke Disposal Site Survey Asked In State

PITTSBURGH PRESS

December 9, 1979

By MATTHEW KENNEDY

State radiation experts have requested a geology survey to locate possible sites for a Pennsylvania low-level radiation dump to replace similar but undependable facilities in the states of Washington, Nevada and South Carolina.

Low-level radiation dumps are used for disposal of materials from nuclear medicine and research programs, as well as some contaminated industrial materials.

In recent months, on-again off-again restrictions on waste shipments to sites in the other three states have sent a ripple of concern through the institutional sector.

Without a place to send contaminated material, research and cancer treatment programs, among others, would grind to a halt.

Thomas Gerusky, chief of the state's radiation protection bureau, says his office has requested a statewide geology survey to determine if there are any appropriate sites for a low-level dump in Pennsylvania.

Opening new dumps is generally viewed as the only long-term solution to the space shortage at current disposal facilities, where local and state governments are taking a dimmer and dimmer view of out-of-state waste shipments.

While the Washington and South Carolina sites are open for business again, postponing the disposal crisis feared by medical and research institutions, the problem is not over, Gerusky said.

The Pennsylvania survey, he stressed, is only a preliminary step by the state, as his department presses for a concerted action by Northeastern states to start handling their own low-level waste.

Even if the geology survey finds possible locations for radioactive dumps in Pennsylvania, it would be years before the selection process narrowed down to a specific site, he said.

"Right now, the Northeastern states produce about 50 percent of all radioactive wastes in the country, including 50 percent of the institutional wastes and 50 percent of all the nation's reactor waste," Gerusky said.

If other Northeastern states are reluctant to take the nuclear bull by the horns, Gerusky said Pennsylvania would probably consider going it alone, and limiting the site to commonwealth waste only.

"But the best solution would be one where the states joined in a cooperative venture," he said.

One suggestion would be for the states to rotate disposal sites over a period of a hundred years or more, so that as some facilities reached capacity, new facilities in other states could be opened.

"In that fashion, we could equitably share the problem, and no one state would have to worry about everyone's waste," he said.

Gerusky conceded that any proposal to open a low-level waste dump could encounter stiff public resistance.

Overcoming such resistance will require explaining to the public just how low "low-level radiation" really is, compared to hazards posed by other industrial waste, he said.

"The proposal for the site would not include dumping anything from Three Mile Island, for instance. We're talking mostly about items from medical treatment and what have you," he said.

Waste from Metropolitan Edison's Reactor No. 2 at Three Mile Island has been shipped to the Washington state dump as cautious cleanup of the accident site continues.

Gerusky estimated that the cleanup could include 3,000 shipments of waste to Washington over the next five years.

Any low-level disposal site in Pennsylvania would have to meet U.S. Environmental Protection Agency and Nuclear Regulatory Commission standards, as well as the state's own regulations, he said.

Pennsylvania is already looking for places where industrial wastes, including toxic chemicals, can be safely disposed of.

"While I could understand having a radiation site and a hazardous chemical site near each other, I wouldn't want to see the two combined," Gerusky said.

He said the dangers of toxic chemicals are often much more worrisome than the problems posed by low-level radiation contaminants. Low-level radiation waste eventually decays to safe levels while chemicals remain toxic indefinitely.

"Yet it's radiation that the public seems to be most afraid of and in that sense, I wouldn't want to jeopardize our toxic waste disposal plan by combining it with a low-level radiation site," Gerusky said.

Jan. 12, 1980

Nuclear wastes in perspective

To the Editor:

The Dec. 19 Op-ed piece on "The nuclear waste disposal bomb" by Deborah Bowers is a hodge-podge of irrelevancies and lack of perspective.

The first part is devoted to plutonium criticality accidents like the one alleged to have occurred in the Soviet Union, although this problem has no relevance to commercial nuclear waste. Such accidents, which relate principally to weapons production, were a bit of a problem until the early 1960s, but Ms. Bowers and others who worry about them now may find comfort in learning that for the past 15 years there has been an essentially fool-proof technology guaranteeing against them. In any case, there is no conceivable way that buried high-level waste from commercial nuclear power plants can cause a plutonium criticality accident.

Ms. Bowers then goes into the low-level waste-burial question, which is only partially relevant to commercial nuclear power. Much of this radioactivity comes from hospitals where it saves thousands of lives each year. In any case, I have shown in a Dec. 1979 Nuclear Technology article that even if all the low-level waste buried in this country leaked out of its burial grounds and became distributed through the soil and no precautions were taken, we could still expect only of 1 or 2 fatalities over the next million years. That is why it is called "low-level" waste.

Only in the latter part of her article does Ms. Bowers mention the only really relevant problem, high-level waste, but even here she discusses leaks of military waste at Hanford in Washington State, where it is stored in a system based on 1940 technology.

Contrary to Ms. Bowers' implication, this technology is not being used for storage of waste generated in the 1970s.

Ms. Bowers concludes with a plea that we stop our nuclear power program because the waste problem does not have a perfect solution. Here she completely loses perspective. The wastes from burning coal, our principal alternative to nuclear power, are now killing 10,000 Americans each year and there is little prospect that this number can be greatly reduced.

There is not a shred of evidence in the scientific literature which suggests that nuclear waste will ever claim more than a small fraction of one percent of that number, and most estimates are very much lower still.

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Feb. 7, 1980

EPA fears radioactive leak offshore

By Thomas Toch
Times Staff Service

WASHINGTON.— An Environmental Protection Agency official warned yesterday that the Middle Atlantic coast could be contaminated by low-level radioactivity seeping from deteriorating barrels of nuclear waste dumped into the ocean.

He said, however, that it is not known if the waste poses a problem because the dump sites have not been adequately monitored.

In an interview at a conference on the oceans and nuclear waste at Georgetown University Law Center, Robert Dyer, of EPA's Office of Radiation Programs, said that between 1946 and 1970, more than 75,000 barrels of low-level nuclear waste had been dumped into coastal and offshore waters.

Dyer said there has been no detectable damage done to the environment as a result of the seepage, but he said EPA scientists worry there may be direct contamination of fish by radioactivity escaping on the sea floor and subsequent contamination of humans who eat the fish.

About 28,000 barrels were dumped into the middle Atlantic 120 miles off the Delaware-Maryland coast.

According to Dyer, the barrels were not designed to remain intact for long periods of time. In fact, it was assumed that the contents would eventually be released into the ocean. Dyer said that strong ocean currents could carry the waste to land, including the coast of New Jersey, Delaware and Maryland.

Dyer explained that when the dumping started, scientists did not

think that low-level radioactivity leaking into the ocean would cause biological or health problems. But subsequent tests indicated that such dumping was not without its risks.

In 1970, the U.S. banned the dumping, but that did not solve the problem, according to Dyer. The radioactive material is still out there, and could come ashore.

There was no low-level study done before the dumping was commenced in the 1950's," said Dyer. "And there has been no consistent periodic monitoring since. The best scientific approach has not been observed."

Dyer said no information exists concerning how strong currents moving toward the shore might effect the movement of the radioactive materials.

And he said tests measuring radio-

tion seepage may be invalid because the barrels may not have been dumped in the site surveyed.

According to Dyer, several thousand underwater photographs taken of the supposed Atlantic Ocean dump site in 1961 failed to show any of the 28,000 radioactive waste drums.

Dyer concluded in his paper that "this could suggest that much of the early survey work was not conducted in the immediate vicinity in which the radioactive waste packages were actually dumped."

The conference at Georgetown, sponsored by the Oceanic Society, brought together representatives of government, science and environmental groups to discuss the feasibility of using the world's oceans as a repository of the country's radioactive waste.

April 21, 1980

'State Should Keep Own N-Waste'

WASHINGTON (AP) — A panel of governors and other state and local officials said yesterday that each state should take responsibility for storing its own low-level radioactive waste.

The panel, appointed by President Carter two months ago to advise the White House and Congress on the disposal of nuclear waste, confined its second meeting mostly to housekeeping matters.

But on a motion by Washington Gov. Dixie Lee Ray, the panel made clear it believes each state should on its own or in agreement with another state bury its low-level wastes. Low-level wastes include byproducts from commercial nuclear power plants and pharmaceuticals from hospitals and laboratories.

Gov. Ray suggested, and the panel agreed, that arrangements should be concluded by the end of this year on low-

level burial procedures in all 50 states.

She conceded, however, the panel represents a small number of states and there may be difficulty in reaching a consensus on the subject.

The 18-member State Planning Council on Radioactive Waste Management includes eight governors, a number of state legislators, local officials and four federal Cabinet members.

Its conclusions and recommendations, not expected for some time, are not binding, but they are expected to influence legislation in Congress and a nuclear waste disposal plan eventually developed by the Carter administration.

South Carolina, Nevada and Washington have the only low-level waste dumps in the nation, and the governors of the three states have in the past said they do not want to take wastes from other states.

Nov. 15, 1980

Wash. Nuclear Waste Dump to Reopen

OLYMPIA, Wash. (AP) — Citing humanitarian concerns, Gov. Dixy Lee Ray announced yesterday that the commercial low-level nuclear waste dump at the Hanford nuclear reservation would be reopened next week.

"The decision to reopen the site is based on several important factors, the primary one being humanitarian," said Miss Ray.

"The nation's medical institutions and medical research communities must have a storage site for the low-level radioactive residue resulting from the latest and most effective methods used in saving the lives of cancer, leukemia and other patients," she said.

The Washington site, one of only three low-level waste dumps in the nation, was closed by Miss Ray on Oct. 4 after improperly packaged materials and defective trucks were discovered there.

Later, Nevada Gov. Robert List ordered a similar site at Beatty, Nev., closed for what he said was sloppy oper-

ation. That left only a site near Barnwell in South Carolina receiving low-level wastes, and Gov. Dick Riley said his state would not accept wastes normally dumped in Washington and Nevada.

Along with her announcement, Miss Ray released a letter from White House aide Jack H. Watson Jr., who had urged reopening of the site "once you are satisfied that safe operation can be resumed.

"Without the immediate availability of adequate disposal facilities, medical treatments for millions of Americans and critical medical research involving the use of radioactive materials will be severely interrupted," Watson wrote.

The bulk of material received at the sites includes hypodermic needles, rubber gloves, paper towels and other materials used in medical treatment involving radioactive material. Before the closure, the Hanford site also received contaminated tools and clothes from the Three Mile Island nuclear plant near Harrisburg, Pa.

The Nevada and Hanford sites are operated by Nuclear Engineering Co. of Louisville, Ky. But unlike List, Miss Ray did not blame NECO for the closure.

In her announcement, Miss Ray said she, List and Riley had "reached an interstate agreement that will strengthen our positions on controlling the situation relating to low-level waste and that agreement will be signed and put into effect shortly."

The governor said that agreement would require generators, brokers and shippers of nuclear wastes to certify that each shipment meets all federal and state requirements. Truckers will be required to provide a certificate of compliance stating that trucks entering each state meet minimum safety requirements.

"Violations will result in the violator being suspended from using the commercial sites in Nevada and South Carolina as well as Washington state," said Miss Ray.

Nov. 16, 1980

N-Waste Dump Closings A Problem for Hospitals

WASHINGTON (AP) — U.S. hospitals could soon find themselves hard pressed to offer patients radiation diagnosis or therapy because of the closing of crucial nuclear waste disposal dumps, the American Medical Association told Congress yesterday.

But Govs. Dixy Lee Ray of Washington and Richard W. Riley of South Carolina told a House science and technology subcommittee that they are tired of having their states used as the nation's nuclear dumping grounds.

- They said states should find their own solution to disposing of low-level radioactive wastes generated within their boundaries — or at least seek regional solutions to the problem.

Two of the nation's three commercial burial sites for such wastes — in Hanford, Wash., and Beatty, Nev. — were closed last month by state officials and new restrictions were placed on the third site, in Barnwell, S.C.

"Inability to dispose of low-level medical nuclear waste products threatens to make life-saving diagnostic and therapeutic procedures unavailable to thousands of persons who desperately

need these services," said Dr. Leonard M. Freeman, testifying in behalf of the American Medical Association.

He appealed to the governors of the three states involved to "once again make their sites available for medical waste disposal."

Low-level wastes include materials with small doses of radioactivity. This includes contaminated protective clothing worn by nuclear power plant employees and gloves, aprons, test tubes and isotopes used by doctors and technicians in hospital or university radiology departments.

"I believe it's hypocritical to stick it under someone else's rug," Ms. Ray testified in defense of the decision to close temporarily the Hanford, Wash., site.

"We have been receiving from all over the country shipments that are improperly packaged...arriving split open and spilling all over the place," she said.

The disposal site at Hanford was closed Oct. 4. Ms. Ray, former chairman of the old Atomic Energy Commission, said it will remain shut until she is satisfied that shipments of nuclear materials can be made safely.

When it is reopened, it will operate under strict controls, she said.

In South Carolina, the disposal site at Barnwell remains open, but the amount of waste it will receive has been cut in half and a stiff fee is being charged.

The third site, at Beatty, Nev., was closed Oct. 23.

State seeking nuclear disposal sites in Penna.

Associated Press

HERSHEY, Pa. — Gov. Thornburgh has revealed that the state is looking for sites in Pennsylvania for disposal of low-level nuclear wastes.

Thornburgh said Thursday night that Pennsylvania and neighboring states were negotiating a regional agreement that would provide a number of sites in different states.

"We are examining in Pennsylvania those sites, possibly restricted to state-owned lands, we can use in the short run," Thornburgh said on an hour-long Pennsylvania Public Tele-

vision Network program during which he answered questions phoned in by viewers.

He said that such wastes could now be disposed of in only three sites in three states — Washington, Nevada and South Carolina — and that the scarcity of sites was why the regional discussion was begun.

"I must say, these three states are not particularly happy about being fingered to receive all of the nuclear wastes produced by commercial nuclear sites in the nation," Thornburgh said in response to a viewer's question about possible nuclear-

waste disposal in Pennsylvania.

The governor emphasized that he was talking only of low-level wastes.

"The federal government has assumed sole responsibility for high-level nuclear wastes," he said.

Thornburgh said Pennsylvania was moving "constructively" to deal with the low-level wastes. "We hope to have a comprehensive plan established before long," he said.

On his budget proposal to be presented to the legislature next week, Thornburgh did not rule out a tuition increase for students at state-

affiliated colleges.

A caller from Lock Haven asked Thornburgh to comment on rumors that tuition at the colleges would increase between \$150 to \$200 under the proposed budget.

Thornburgh avoided answering the question directly and said the state had increased its aid to education by \$350 million since he took office in 1979.

He also said the state has aided college students through the Higher Education Assistance Authority, which makes grants and guarantees loans for students.