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REGULATIONS FOR THE TRANSPORTATION OF RADIOACTIVE MATERIALS

-USSR-

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REGULATIONS FOR THE TRANSPORTATION OF RADIOACTIVE MATERIALS
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Table of Contents

Table of Contents(Continued) Page

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REGULATIONS FOR THE SHIPMENT OF RADIOACTIVE MATERIALS

Approved Chief State Sanitation Inspector of the USSR M. Nikitin 26 December, 1960 No. 349-60

Approved Deputy President State Committee of the Council of Ministers of the USSR on the Uses of Atomic Energy V. Levsha 27 December 1960

INTRODUCTION

These regulations are mandatory for agencies, organizations and activities of all ministries, departments and sovnarkhozes concerned with transportation, storage, and use of radio active materials.[1]

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[1]These regulations do not extend to the following packages and manufactured goods:

a. Packages containing radioactive materials having a specific activity less than 0.002 microcurie per gram and total activity for one package less than 0.1 microcurie.

b. Packages of radioactive materials having an activity less than 0.01 microcurie with any specific activity.

c. Manufactured goods (except liquids): instruments, clocks, electron tubes, equipment, etc. containing radioactive materials in a form which resists dispersion.

In all cases the radioactive materials must be so packaged that the materials cannot disperse into the surrounding medium, the strength of the radiation dosage at the surface of the package must not exceed 0.3 milliroentgens per hour. The package exterior must not be contaminated with radioactivity. Under the enumerated conditions such packages can be carried by all forms of transportation and can be stored in general warehouses as ordinary goods.

The regulations have been developed in consonance with the requirements of the "sanitary regulations covering work with radioactive materials and sources of ionizing radiation", No. 333-60, taking into account the international recommendations of 1960.

Responsibility for fulfillment of the requirements of these regulations is assigned to the administrations of the activities shipping, transporting, and receiving packages of radioactive materials.

I. GENERAL RULES

1. Shipping packages with radioactive materials should be treated as sources of ionizing radiation not causing radioactive contamination under anticipated conditions of transportation and storage covered by these regulations.

Violation of these regulations in receiving, transporting, and storing packages containing radioactive materials can result in the following:

a) irradiation of service personnel by beta, gamma, and neutron radiation;

b) radioactive contamination of people, cargoes, buildings, and transportation equipment;

c) exposure of undeveloped motion picture, photographic, and x-ray films and plates.

2. During transportation of radioactive materials by all types of carrier and in storage, precautions should be taken to:

a) package the radioactive materials in containers that service personnel and people in the vicinity are not subjected to irradiation;

b) prevent radioactive contamination of service personnel, warehouses, transportation equipment, and ordinary cargo being transported together with the radioactive materials;

c) load and unload containers of radioactive materials as quickly as possible using mechanical loading equipment;

d) place containers of radioactive materials at distances not less than those indicated in Appendix 3 of these regulations from areas where people congregate;

e) place undeveloped motion picture, photographic, and x-ray films and plates at distances which will preclude their exposure by packages of radioactive substances (see Appendix 3).

3. Personnel continuously engaged in loading, unloading, storing and transporting containers of radioactive materials by all types of transportation must be trained in the regulations covering the handling of such containers, methods of dealing with accidents, as well as means of personal protection and familiarization with measures of personal prophylaxis. Each permanent worker must pass a minimum technical knowledge test, which shall be repeated every six months.

Persons temporarily (episodically) assigned to loading, carrying, or storing containers of radioactive materials must be thoroughly instructed prior to commencing work.

II. CLASSIFICATION OF SHIPMENTS OF RADIOACTIVE MATERIALS

4. Radioactive materials (sources of ionizing radiation) during transportation and storage are conditionally classified into three groups according to the physical characteristics of their emitted radiation.

1st group: radioactive substances radiating, together with alpha or beta particles, gamma rays (e.g., radium 226, cobalt 60, iodine 131, iridium 192, cerium 137, etc.)

2nd group: sources of neutrons and gamma rays.

3rd group: radioactive substances radiating alpha or beta particles (e.g., polonium 210, strontium 90, phosphorus 32, sulphur 35, carbon 14, etc.)

III. CATEGORIES OF SHIPPING CONTAINERS

5. To facilitate the shipment of radioactive materials and for dosimetic and radiometric control, four categories are established for shipping packages, based on the strength of the gamma radiation and (or) neutron flux at the surface of the package or at the distance of 1m from the package surface.

6. The list of shipping container categories is given in Table I.

Table 1.

Category	maximum allowable gamma radiation dosage or flux of fast neutrons			
	at package surface		one meter from package surface	
	mr/hr	fast neutrons cm^2/sec	mr/hr	fast neutrons cm^2/sec
I	0.4	0.2		not considered
II	10.0	40.0	0.4	2.0
III	200.0	800.0	10.0	40.0
IV	not standardized		50.0	200.0

For brevity, only gamma radiation dosage will be given below.[1]

[1] Transportation of containers of tritium having activity above 20 curies as well as radioactive ores and fissionable radioactive substances are regulated by special instructions.

IV. PACKING REQUIREMENTS FOR TRANSPORTATION OF RADIOACTIVE MATERIALS

7. Packages for transportation of radioactive substance is classified as follows:

a. primary vessels (glass or metal ampules or flacons, cases [tubes] etc.;

b. internal packaging (additional sheathing, padding, paraffin containers, sorbtion materials, etc.);

c. containers[1] of metal or plastic;

d. external packaging (paper or rubberized casings, cardboard boxes, wood or metal boxes).

8. Radioactive solutions or gases shall be placed in primary hermetic containers (sealed metal or glass ampules, penicillin type flacons, or cases [tubes]. These containers shall be capable of withstanding temperature variations between -70° and +50°C and atmospheric pressure drop from 1.0 to 0.2 atm.

Transportation of radioactive materials is permissible in hermetically sealed vessels not meeting the specified temperature and pressure variations; however, in such cases the label on the outside of the package and shipping documents shall carry warning notices.

If the packaged radioactive material cannot withstand temperature variations between -70 and +50°C and atmospheric pressure variation between 1.0 and 0.2 atm, then the label and the shipping documents (shipper's) shall bear warning notices.

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[1] In contrast to general purpose railway, truck, and other containers for carrying ordinary goods, containers which are part of the packaging of radioactive substances are termed simply "containers" below.

The ampule or case with liquid radioactive material shall be placed in a container; the space between the ampule or case and the container shall be filled with absorbent material (cotton, filter paper, lignin, silica gel, etc.), in order to prevent the radioactive material from reaching and contaminating the outside surface of the container. The quantity of absorbent material shall be such that in case the ampule should break its entire contents would be absorbed by the material. It is recommended that ampules of intensely radioactive liquid, having a long half-life, should be placed inside additional polyethylene sheaths.

9. Powdered and solid radioactive materials shall be placed in securely sealed vessels (glass ampules with ground seals or rubber stoppers, metal cases, etc.).

10. Containers may be made of various materials (plastics, aluminum, steel, iron, tin, etc.) considering the group to which the radioactive material being transported belongs and the intensity of its activity.

The container for radioactive materials of Group 1 shall be made of very dense material (lead, iron, etc.). The selection of the container type depends on the activity of the radioactive material it is to be used for and the energy of its gamma rays.

The container for radioactive materials of Group 2 shall be made of materials which attenuate gamma rays (tin, iron, and other heavy materials, depending on the type of source), and for maximum absorption of neutrons, the container is filled with paraffin, boron, cadmium, and other similar substances.

The container for radioactive materials of Group 3 shall be made of materials of low density (e.g., aluminum, plastics, fiberboard, etc.), and if there should be Bremsstrahlung radiation, of a level exceeding that allowable for the corresponding transportation category, there shall be an additional covering of heavy materials which will attenuate the radiation to allowable limits.

11. Containers shall be mechanically strong, and resist jars, accelerations, turning, and shaking; the surface shall be smooth to facilitate ease of washing in case of radioactive contamination; the cover (stopper) of the container shall protect the internal volume from moisture, and shall close simply and lock reliably.

12. The body and cover of the container shall be clearly marked (container type and its number), clearly readable at a distance of 1 meter. The radiation danger label shall appear on the container (see Appendix 4).

13, Packages for transportation of radioactive materials shall correspond to the technical requirements agreed to with the State Committee of the Council of Ministers USSR on the uses of atomic energy and the State Sanitation Inspector USSR. The presentation of shipments of radioactive materials in other packages is prohibited.

14. Packages and containers weighing over 5 kilograms shall be provided with handles, grips, eye-bolts, etc., for hand carrying and carrying with mechanical lifts.

15. The weights and dimensions of packages shall not exceed those established for the transportation of shipments by the type of transport being used, and shall comply with special restrictions established by the applicable sections of these regulations.

16. In order to avoid radioactive contamination of personnel, accompanying shipments or ordinary cargo, buildings, and transport vehicles, the containers shall be enclosed in an additional external package having sufficient mechanical strength appropriate to the type of transport being used. Shipment of containers of radioactive materials without external packaging is prohibited.

17. Contamination of the external surface of the container shall not exceed 200 alpha particles or 500 beta particles per 150 cm^2 per minute. The dosage of gamma radiation at the outside surface of empty containers shall not exceed the values established for packages

of Transportation Category I (0.4 mr/hr); the outside surface of containers shall be tested for contamination prior to external packaging. The outside surface of the external package shall have no contamination.

V. GENERAL CONDITIONS FOR TRANSPORTING PACKAGES CONTAINING RADIOACTIVE MATERIALS

1. General Requirements

18. Radioactive materials in packages of the I, II, III, IV Transportation categories may be carried by air, rail, water, and highway transport.

Packages of radioactive materials shall not be carried over urban transportation systems (street cars, trolley buses, buses, subway).

19. Packages with radioactive materials shall not be shipped or stored together (in the same airplane, railroad car, truck, semitrailer, boxcars, and other transportation containers, ship compartment, nor in a neighboring railroad car, etc., or warehouse) with explosives or flammable materials.

20. Containers subject to shipment with radioactive materials shall be sealed by the material-preparing organization, which shall be responsible for the correct packaging of the radioactive materials inside containers of the appropriate type and for the containers meeting the requirements of these Regulations.

21. Prior to shipment of packages of radioactive materials the shipper shall measure the gamma radiation level from each package to determine their transportation categories and the appropriate conditions of shipment, check for radioactive contamination of the outside surface of the containers for compliance with the requirements of par. 17, and also the outside surfaces of the external packages for absence of radioactive contamination. The results of the test for correct determination of the transportation category and

the absence on the packages of radioactive contamination, and also the safe distances in case of accidents resulting in the breaking of the container, shall be recorded by the shipper on a label of the approved sample (see Appendix 5) and the label shall be signed by the dosimetrist.

A label shall be attached to two outside surfaces of the external package. If the dimensions of the label are larger than the dimensions of the package, the label shall be attached to a plywood tag which shall be securely fastened to the package.

Packages with radioactive materials without labels of the kind required by these Regulations shall not be accepted for shipment.

22. On the basis of data indicated on the label (Par. 21), the shipper certifies the transfer of packages of radioactive materials for shipment to the transportation organization (completes and signs the necessary sections of the label, puts the shipping documents in order, and in such cases as covered by these Regulations, conducts loading and securing of packages etc.).

The shipper shall be responsible for the nonfulfillment of the packaging and shipment requirements of these Regulations.

23. Radioactive materials shall be accepted for shipment on the basis of prior application, notification, etc. submitted to the appropriate transportation agency. The notification shall indicate the date on which the packages are to be sent, their transportation categories, number, and total weight. When short-lived and medical radioactive materials are being shipped, the notification shall indicate the delivery time. If the packages require special conditions for transportation or storage, such conditions shall be included in the notification.

24. If there are no storage facilities at the railroad station, port (pier), or airport, the shipper shall deliver the cargo at the appropriate time for immediate loading on the railroad car, airplane,

or ship as specified by the chief of the station, port (pier), or airport.

25. Lading or other accompanying documents are completed and accompany the cargo during the entire route, both for small shipments and large.

The accompanying documents shall carry the name of the radioactive material, its activity, category, and weight of the shipping package. The shipper shall also indicate on these documents "Shipping Regulations for Radioactive Materials No. 340-60 are known".

26. The organization accepting the packages of radioactive materials for transport has the right to carry out a dosimetric test in the presence of the shipper. Upon determination of incompatibility (higher transportation category than shown on the label), such packages shall not be accepted for transportation. On evidence of violations, a document is prepared and copies (one each) are sent to the local and departmental sanitary inspection organs.

27. Packages of radioactive materials are accepted for transportation by the weight indicated by the shipper on the labels and in the lading and other shipping documents provided for by the regulations and instructions pertaining to shipment of cargoes by various transportation organization.[5]

28. The organization accepting a cargo for transportation may test-weigh the cargo, and on finding the declared weight to be wrong, have the right to refuse acceptance and transportation in accordance with requirements covering ordinary cargoes.

29. In preparing the notification of shipment of packages of radioactive materials of any transportation category, the shipping station (port, airport, etc.) shall give the shipper the number of the trip or transport (airplane, ship, etc.) and the departure date. These data, as well as the total weight of the packages and special remarks

on heavy weights and short-lived isotopes, shall be telegraphed to the addressee by the shipper.

30. In shipping packages of radioactive materials by any means of transportation (airplane, railroad, automotive vehicle, universal railroad or other container, etc.) and in selected parts of ships, as well as in storage, the packages may be shielded by ordinary cargoes or partitions, or shall be located at distances from places where people congregate sufficient to assure safety (see Appendix 3).

31. When transporting or storing undeveloped motion picture, photographic, and x-ray films and plates it is necessary to keep them at sufficient distances from packages of radioactive materials, or screen them with ordinary cargoes and (or) partitions, in order to prevent them from becoming exposed (see Appendix 3).

32. If the labels and documents accompanying packages indicate special conditions for transportation (allowable temperatures, pressures, etc.), such conditions shall be rigidly observed during storage and transportation of the packages. If for technical reasons the indicated conditions cannot be observed, the transporting organization shall warn the shipper of this fact upon receipt of the shipment request (notification).

33. When transporting or storing packages, they shall be placed upright and fastened securely in order to avoid upsetting the packages during turns, jolts, braking, and swaying.

For securing the packages during transportation the shipper shall provide the necessary tie-down materials which are provided for by the general transportation regulations for ordinary cargoes requiring lashing.

34. During transportation and storage of packages of radioactive materials, their complete safekeeping shall be assured.

35. Packages or radioactive materials shall be carried by the most direct route available or with the minimum number or

reloadings (trans-shipments).

36. Upon arrival of packages of radioactive materials, the chief of the station, port (pier), airport, or other designated shipping point shall immediately notify the addressee, except in those cases in which the cargo is delivered directly to the warehouse of the addressee, his sidings, and moorings.

Such notification shall be made by telephone, and in the absence of a telephone connection, by telegram.

37. Packages of radioactive materials are turned over to the addressee with the sender's seal [intact] without checking their contents and weight. The addressee has the right to conduct a control test of the radioactive contamination of the outside surfaces of the packages to determine correspondence with their transportation categories. In the event of noncorrespondence, the addressee shall inform the local organs of the sanitary inspector and the militia of the facts for their investigation according to established procedures.

38. In the event the addressee is tardy in claiming packages of radioactive materials which have arrived at the designated points, the chief of the railroad station, port, airport, or auto freight depot shall take measures against him according to established procedures, except in those cases provided for in par. 83, concerning packages of the IV transportation category.

39. At the designated point if there is no addressee as indicated in the bill of lading, the shipment shall be issued to another addressee or sent to a new address as directed by the shipper by telegram; the shipper shall be charged for expenses involved in additional transportation.

40. If the external package is damaged or (and) in the absence of a seal, a statement is drawn up according to established procedure without opening the container and checking its contents.

If simultaneously the container seal is damaged or is absent, statement is drawn up, again without opening the container and

checking its contents, however the occurrence shall be reported immediately to the shipper and to the local organs of the sanitation inspector.

The contents of a container shall be checked only under conditions of safety (on the shipper's premises). The results of the examination shall be drawn up in a statement with the participation of the local organs of the sanitation inspector and the militia. If during the examination there is found partial or complete absence of radioactive material, then measures shall be taken to determine the reasons for it and the possibilities of radioactive contamination.

41. The transporting organization is not responsible for changes in the quality and quantity of radioactive material in packages, except in cases in which the spoilage has occurred through violation by the transporting organization of the established transportation schedule, shipping conditions, and general rules of shipping.

2. TRANSPORTATION OF PACKAGES OF RADIOACTIVE MATERIALS BY COMMON CARRIERS.

42. Packages of radioactive materials of the I, II, and III transportation categories may be transported by common carriers (aircraft, railroad cars, automotive vehicles, etc.). Packages of the IV transportation category may be shipped only on special carriers.

43. During transportation of packages of radioactive materials of the I, II, and III transportation categories by any means of transportation, and during storage in ordinary warehouses, they need not be separated from other cargoes, except for cargoes of undeveloped motion picture, photographic, and x-ray films and plates, which shall be separated by distances not less than those given in Appendix 3.

Between the packages of radioactive materials and places where people congregate, as well as places where undeveloped

motion picture, photographic, and x-ray films and plates are kept, it is advisable to place ordinary cargo to weaken (shield) the radiation.

44. The number of packages of the I and II transportation categories stored in the same ordinary warehouse or being transported in the same transportation unit (railroad car, airplane, ship, general purpose railroad or other container, automotive vehicle, etc.) is not limited. However, regardless of the properties of the radioactive materials being transported or their type of radiation, not more than 2000 microcuries of radioactive materials in the exposed form or not more than 2000 curies of radiation sources in sealed form shall be placed simultaneously in one package of the I and II transportation categories. The number of packages is limited only in cases specially provided for in these Regulations, depending on specific features of certain types of transportation.

The number of packages of the III and IV transportation categories stored in the same warehouse or being transported in the same transportation unit is limited (see the respective sections of these Regulations for the various types of transportation).

In one package of the III transportation category may be placed at one time radioactive materials in open form having an activity not more than 200 curies and sealed radiation sources with unlimited activity. In one package of the IV transportation category it is permissible to place at the same time an unlimited quantity of radioactive materials in open or sealed form.[1]

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[1]It is recommended that radioactive materials in open form having a half-life up to 1 year and activity greater than 200 curies in single packages of the IV transportation category be carried by land and water transport.

45. Loading of packages of the I, II, and III transportation categories on the carriers and unloading is carried out by the transportation organization or by the shipper, in accordance with the regulations covering these operations for ordinary cargoes.

Loading and unloading operations should be carried out quickly, and wherever possible by mechanical means.

46. Up to 4 packages of the III transportation category may be carried at one time on a common carrier (railroad car, airplane, automotive vehicle, universal container, except ships).

Up to 4 packages of the III transportation category may be carried in the same place on a passenger-cargo river boat, and up to 10 packages in one place on a cargo vessel.

Up to20 packages of the III transportation category may be carried in the same place on an ocean-going ship, and up to 40 packages of the III transportation category may be carried in the same place on a cargo ship.

47. Packages of radioactive materials of the I, II, and III transportation categories arriving at the unloading point may be stored temporarily in the cargo warehouses of the station (port, airport), however the packages shall not be placed directly next to the warehouse walls adjacent to places where people congregate (offices, lounges, etc.).

During temporary storage of packages the dosage level of the radiation on the outside surfaces of the building shall not exceed 200 mr/hr, and at a distance of 3.0 meters not more than 10 mr/hr. Radiation within the nearest buildings and on land not belonging to the given establishment shall not exceed the background normal to the locality by more than 0.01 mr/hr.

48. In all cases of transportation and storage of packages of radioactive materials, the packages shall be located at distances not less than those given in Appendix 3 from places where people congregate and places of storage of undeveloped motion picture,

photographic, and x-ray films and plates.

3. TRANSPORTATION OF PACKAGES OF RADIOACTIVE MATERIALS BY SPECIAL CARRIERS

49. Packages of radioactive materials of any transportation category and in any quantity, subject to the conditions of par. 51, may be transported by special carriers (airplanes, railroad cars, automotive vehicles, etc.) as well as in special locations aboard ship. Simultaneous shipment of packages of radioactive materials and cargoes of nonradioactive materials and transportation of people not engaged in the transportation of the packages is prohibited.

As a rule, packages of radioactive materials being transported by special carriers shall not be accomplished without an escorting individual. In those cases in which the shipper deems it necessary to provide an escorting individual to accompany the shipment during its transportation, the irradiation of that individual during the time of transit shall not exceed the allowable limits.

50. Loading and unloading of packages of the I, II, III transportation categories shall be carried out by the transportation organization or by the shipper, in accordance with the conditions for these operations for ordinary cargoes, provided that at one time there are not more than 10 packages of the III transportation category being shipped in the same transportation unit and no packages of the IV transportation category.

If the number of packages of the III transportation category exceeds 10, or simultaneously packages of the IV transportation category are being shipped, loading shall be accomplished by the shipper and unloading by the recipient.

If mechanical loading and unloading facilities are available at the station (port, airport), they shall be provided to the shipper (recipient) for loading (unloading) on the same basis as for loading (unloading) of ordinary cargoes.

51. Packages of radioactive materials shall be so placed or (and) shielded that the radiation dosage level at any easily accessible point at the external surfaces of the transporting vehicle (side of the automotive vehicle, aircraft fuselage, wall of the railroad car, etc.) and at the boundaries of the specially designated locations aboard ships shall not exceed 200 mr/hr. The shipper shall measure the radiation dosage level and attach to the surfaces indicated above the radioactive danger label(see Appendix 4).

The distances between packages and places where people sojourn shall not be less than those given in Appendix 3.

After loading the packages on the special carrier the shipper shall measure the radiation dosage level in places on the carrier where people will sojourn continuously. These dosage levels (mr/hr) shall not exceed 100 divided by the number of hours during which people will remain in the location being measured.

The measurement of dosage level shall be recorded in a statement and signed by the shipper and the representative of the transportation organization. If it should be found during measurements that the dosage level exceeds that indicated above or those given in Appendix 3, the departure of the transport shall not be permitted.

For the resulting delay of the transport and for other delays for which the shipper is at fault, the shipper shall be held materially responsible in accordance with the Tariff Regulations.

52. In time with the arrival of packages of radioactive materials at the destination point the addressee is obliged to provide transportation for their removal from the station (port, airport) of destination.

At destination points, after unloading packages of radioactive materials from special carriers, the recipient shall make a

radiometric examination of the transport equipment for the absence or radioactive contamination.

If radioactive contamination is found exceeding the allowable limits, the transportation equipment may be used only after deactivation. Expenses involved in lay-over of transportation for this reason and in deactivation are charged to those responsible.

In the event the recipient fails to appear at the time of arrival of a special carrier, without valid reason the costs of the lay-over while awaiting unloading shall be paid for by the recipient.

Packages of the I, II, and III transportation categories may be temporarily stored at the station (port, airport) of destination warehouse, in compliance with the requirements of par. 47 and Appendix 3.

4. TRANSPORTATION AND STORAGE OF PACKAGES OF THE IV TRANSPORTATION CATEGORY

53. Packages of the IV transportation category may be transported only by special carriers and in specially designated places in ships, in compliance with the requirements of Subsection 3 of Section V.

54. Packages of the IV transportation category are loaded on transport equipment by the resources of the shipper directly from the shipper's vehicles, and are unloaded by resources of the recipient to his own vehicles.

55. Packages of the IV transportation category shall not be stored in ordinary warehouses; they may be stored only in specially designated warehouses complying with the requirements of par. 47 pertaining to radiation dosage levels.

In the event the recipient fails to appear at the time of arrival at the destination point of packages of the IV transportation category, the transportation organization has the right to call on the militia and the local organs of the sanitation inspector to take measures against the addressee for the purpose of expediting the removal of the cargo.

VI. TRANSPORTATION OF PACKAGES WITH RADIOACTIVE MATERIALS BY THE CIVIL AIR FLEET

1. GENERAL REQUIREMENTS FOR TRANSPORTATION

56. Packages of radioactive materials may be transported in cargo and special airplanes as well as in baggage compartments of passenger airplanes.

57. Packages of radioactive materials of the I, II, and III transportation categories may be shipped by air with the permission of the chief of the airport, while packages of the IV transportation category may be shipped with the permission of the chief of the territorial administration [Terupravlinie] or of the commander of the particular air group of the Civil Air Fleet.

58. Any number of I and II transportation category packages may be carried in baggage and cargo compartments of non-special turbojet and piston-engine passenger airplanes with passengers and on cargo airplanes without segregation from other cargoes, except that in the same baggage compartment there shall not be more than 10 packages of the II transportation category.

59. Up to 4 packages of the III transportation category but not more than 1 to each compartment may be carried in baggage and cargo compartments of non-special turbojet and piston-engine passenger airplanes with passengers and on cargo airplanes without segregating them from other cargoes.

60. Packages shall be placed on the floor of the baggage or cargo sections (compartments) of airplanes at distances from the crew and passengers not less than those given in Appendix 3.

61. Additional requirements are provided for packages shipped by air: they shall not exert a load on the floor exceeding 200 kg/m^2; when necessary, the packages shall be provided with a bottom plate not less than 3 cm thick which shall assure uniform distribution of weight.

62. Upon presentation for shipment of one or several packages weighing more than 80 kg each (heavy-weight) the shipper

must agree on the order in which they shall be loaded and unloaded with the chief of the airport. The overall weight of packages of radioactive materials presented for shipment on a non-special passenger airplane shall not exceed 500 kg, and for a cargo airplane, shall not exceed its payload capacity.

63. The shipper, as directed by the airport of departure, shall provide each package weighing more than 80 kg with necessary means of securing it in the airplane (straps, lines, ropes, soft padding materials, etc.) to prevent shifting and jarring during takeoff and landing and from possible jolting of the aircraft in rough air during flight.

64. In those cases in which radioactive materials cannot be transported at low (to -70°C) and high (to +50°C) temperatures, as well as at reduced atmospheric pressure (to 0.2 atm.), the shipper shall indicate these facts on the shipping certificate in the column "Special Notes". In the absence of such notes the packages are carried on any airplane.

If the conditions indicated above cannot be provided, the packages shall not be accepted for transportation.

65. Packages of the IV transportation category are accepted for transportation only on airplanes specially designated for this purpose.

66. If it is necessary to designate a specific airplane for the transportation of packages with radioactive materials, the shipper shall present a declaration to the chief of the airport indicating the minimum distance which it is necessary to provide on the aircraft between the nearest package and the pilot's cabin, as well as the number of packages and their total weight.

NOTE: Designation of an escort during shipment of radioactive materials by special airplane is carried out in accordance with the requirements of the regulations covering air transport of dangerous cargoes.

67. The number of packages of radioactive materials of any transportation category carried by specially designated airplanes is not limited, provided the distances between the packages and the crew of the airplane are not less than those indicated in Appendix 3.

The total weight of the packages of radioactive materials shall not exceed the payload capacity of the airplane, and the packages shall not adversely affect the balance of the airplane nor excessively load the floor.

Simultaneous transportation on these airplanes of cargoes of nonradioactive materials is not allowed.

During the time a specially designated airplane is being loaded, the shipper (during unloading, the recipient) shall attach to the outside surface of the fuselage the radiation danger marking (see Appendix 4).

68. Loading of packages of radioactive materials on specially designated airplanes is carried out by airport personnel or by the shipper in accordance with the requirements of par. 50 in the presence and under the direction of the chief of the shipping section or an authorized worker of that section, the freight dispatcher, and the airplane crew member responsible for loading.

69. Packages of radioactive materials located at the airport as well as airplanes loaded with packages shall be guarded, as a rule, by airport forces and resources.

Persons designated to guard the indicated packages shall be thoroughly instructed in guard procedures and in measures which they may be required to take in the event of fire or other accidents.

70. Transportation of packages with short-lived radioactive materials shall, as a rule, be over direct routes to the points of destination.

In those cases in which there is no direct route to the designated point of destination, packages of the I, II, and III transportation categories may be shipped to and transferred at airline junction airports, but under the condition that the schedules

provide for air planes on which the shipment of packages may continue in compliance with the requirements of these Regulations.

In such cases the chief of the shipping section at the airport of departure shall query the junction (transient) airport with regard to receiving packages of radioactive materials and reloading them, and accepts such cargoes only with the approval of the junction airport, taking into account their delivery on schedule as provided by shipping regulations or by arrangement with the shipper.

The transfer airport shall trans-ship the arriving packages of radioactive materials to their destination by the shortest route.

2. PROCEDURES FOR SHIPPING, RECEIPT, LOADING ON AIRPLANES AND DELIVERY OF PACKAGES OF RADIOACTIVE MATERIALS

a. Acceptance of packages for shipment

71. Packages of radioactive material are shipped on the basis of the shipper's plan notification for a definite time period (month, quarter, year) and specific individual notifications for the shipment of separate packages or lots.

In the shipper's plan notification, which shall be presented to the chief of the airport of departure not less than five days prior to the beginning of the month or quarter, data is given on the anticipated shipments of packages of radioactive materials during the period covered, indicating the number of packages, their transportation categories, weight, and shipping routes.

In the specific individual notifications, which are presented by the shipper to the chief of the airport for each individual package or lot of radioactive materials at the time of delivery of such packages for shipment, shall be indicated all data provided in the notification form shown in Appendix 6.

72. Packages of radioactive materials intended to be carried on scheduled airplanes are delivered to the airport on a general basis.

The time at which the packages are delivered to the airport for

loading on special airplanes is agreed to between the shipper and the chief of the airport.

73. For the transportation of packages of radioactive materials the shipper completes a cargo certificate and in the column "Additional Remarks" indicates the maximum period allowable for the given cargo to be delivered at its destination, calculating this period from the time the load is delivered to the airport to the time of surrender to the addressee.

In addition, the shipper and the airport of departure shall stamp the cargo certificates as follows:

"Packages of radioactive material of the .....
transportation categories."

74. Packages of radioactive materials accepted for transportation marked "Short-lived" shall be shipped by the shortest routes and delivered to the airport of destination at a time not later than that indicated on the label and in the cargo certificate in the column "Shipper's Special Notes."

Packages of radioactive materials without such notes are shipped at times agreed to with the shipper, but not later than the time for the delivery of cargoes established by the Shipping Regulations.

75. In the event of flight cancellation because of bad weather or for other reasons, when the cargo cannot be delivered to the point of destination within the time period indicated by the shipper in the notification and the cargo certificate, the chief of the airport shall expeditiously notify the shipper of the necessity for removing the cargo from the airport to his own warehouse and inform him of the earliest date on which the shipment can be rescheduled.

76. Undeveloped motion picture, photographic, and X-ray films and plates, passengers' handbags and baggage are carried and stored together with packages of radioactive materials of the I transportation category. Undeveloped motion picture, photographic, and

X-ray films and plates, passengers handbags and baggage[1] are carried and stored at distances from packages of the II and III transportation categories indicated in Appendix 3.

If it is not possible to locate motion picture, photographic, and x-ray films and plates at the required distances (even considering the attenuation of radiation by other cargoes), such cargoes are not accepted for transportation on airplanes in which packages of radioactive materials are being carried, but are carried on other airplanes not having packages of radioactive materials on board.

b. Loading of packages of radioactive materials on airplanes.

77. Conditions of transportation safety given in these Regulations shall be observed when loading packages of radioactive materials on airplanes; the packages shall be firmly secured.

78. Packages of radioactive materials of the I, II, and III transportation categories shall be loaded in accordance with paras. 45 and 77 of these Regulations, in the presence of the storekeeper, cargo dispatcher, and the crew-member responsible for loading.

Packages of radioactive materials are loaded on special airplanes in the presence and under the direction of the chief of the shipping section or an authorized representative of the section, the cargo dispatcher, and the crew-member responsible for loading. The designated individuals carry personal responsibility for the proper placement and securing of packages of radioactive materials in airplanes and for the observance of all requirements of these Regulations.

Packages of radioactive materials are placed vertically in airplanes. Their placement on their sides or upside down is prohibited.

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[1] Baggage and handbags are separated only because they may contain undeveloped motion picture, photographic, and x-ray films and plates.

79. Prior to loading packages of radioactive materials on an airplane, the chief of the airport shipping section or his substitute (shift chief) shall instruct the crew members of the airplane and cargo handlers loading these packages (loaders, storekeepers) in handling procedures and shall indicate exactly the compartment of the aircraft to be used, and the distances to be maintained from the crew, passengers, their baggage and handbags, as well from cargoes of undeveloped motion pictures, photographic, and x-ray films and plates when loading the packages of radioactive material, and how and with what they shall be secured.

VII TRANSPORTATION OF RADIOACTIVE MATERIALS BY RAILROAD

80. Packages of radioactive materials may be transported by rail, by freight or passerger train, in freight cars, baggage cars, mail cars, passenger cars, and special cars, as well as in universal containers.

1. Transportation by Freight Train

81. Packages of radioactive materials of the I, II, and III transportation categories may be carried as small shipments together with other cargoes as well as in separate cars.

Any number of packages of the I and II transportation categories and not more than 4 packages of the III category may be transported together with other cargo in a railroad car.

Packages of radioactive materials shall as much as possible be transported on cars routed directly.

82. Packages of radioactive materials of the IV transportation category may be transported only in separate freight cars, or in special shipper's (receiver's) cars.

83. In carload shipments of packages of the I and II transportation categories the number of packages per car is not limited.

In carload shipments of packages of the III and IV transportation categories the number of packages is also not limited, but the shipper shall load them in such a way that the radiation level at the accessible sides, front, and rear surfaces of the car does not exceed 200 mr/hour, and at a distance of 3.0 meters from these surfaces does not exceed 10 mr/hour.

The shipper shall attach the radiation danger marking on the outside walls of the car (see Appendix 4).

A car loaded separately with packages containing the radioactive materials shall not be coupled in a train directly to a passenger car, to a freight car having a braking platform, to a freight car or a plateform with people accompanying cargoes, nor to cars loaded with explosive, flammable, poisonous, or specially dangerous cargoes.

The requirements of par. 50 shall be observed for carload shipments.

2. Transportation by passengers trains

84. Small urgent shipments of packages of radioactive materials of the I and II transportation categories may be accepted for shipment on baggage cars of passenger trains (as baggage freight) on the same basis as first-class shipments. The gross weight of any one shipment shall not exceed 165 Kg.

The number of shipments or packages of the I transportation category carried at one time in a baggage car, is not limited, but the number of packages of the II transport category shall not exceed 5.

The transportation of packages of the III and IV transportation categories in baggage cars of passenger trains is prohibited.

85. Packages of radioactive materials are accepted by

appointment at stations open for baggage operations, where the train which is to carry the cargo has a stop; shipments having a special place, weighing more than 75 Kg., are accepted only at stations where the train is scheduled to stop and stand for not less than 5 min.

86. Radioactive materials authorized for shipment as baggage freight shall be delivered by the shipper to the station of departure not less than 2 hours prior to train departure.

87. Packages of radioactive materials of the III and IV transportation categories may be carried at passenger speeds only in separate baggage or freight cars and in compliance with the requirements of par. 83. The provision of such cars and their coupling to a passenger train shall be authorized in each individual case by the ministry of transportation.

Cars with packages of radioactive materials in this case carry the seals of the shipper, who shall also attach to the doors on both sides of the car the radioactivity danger markings (see Apendix 4).

The radiation level on the outside of such cars shall not exceed 200 mr/hr., and at a distance of 3.0 meters from these surfaces, 10 mr/hr.

Such cars shall by loaded by the forces and resources of the shipper and recipient at locations removed from passenger platforms. The station shall supply (when available) loading and unloading equipment.

88. Packages of radioactive materials of the I transportation category may be transported also in handbags in separate closed compartments in passenger cars. The total weight of such handbags shall not exceed 200 Kg. The responsibility for safeguarding such handbags with packages of radioactive materials and for the observance of the conditions for their transportation shall be carried by the escort (s).

The passenger carrying packages of radioactive materials by handbag shall report at the proper time to the stationmaster and

present to him the trip certificate and documents confirming that the bearer has been commissioned to transport radioactive materials. The documents shall indicate: the stations of departure and destination, the transportation category of the packages, the number of places* and their weight. The passenger shall pay for the transportation of such handbaggage at the baggage freight rate.

89. Packages of radioactive materials are carried at passenger speed also in mail cars as special delivery mail in accordance with the requirements of Section IX of these Regulations.

VIII TRANSPORTATION OF RADIOACTIVE MATERIALS BY AUTO TRANSPORT

90. Specially adapted vehicles shall be used for continuous transportation of packages within a city and between cities.

91. The equipment of vehicles specially adapted to the transportation of packages of radioactive materials shall include:

a) provisions facilitating the washing of radioactive contamination from the vehicle body, for which purpose the sides and floor of the body shall be covered with nonabsorbent material and provided with drainage for liquid during deactivation.

b) protection of the body from penetration by water and snow, for which the body shall have a canvas tent or other cover enclosing it from all sides.

c) shielding for the driver's cab to attenuate the radiation level when transporting packages of the III and IV transportation categories, for which purpose there shall be a tin or steel shield (sheet) placed behind the cab, which shall assure attenuation of the radiation within the driver's cab to allowable limits.

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*[Space required for the baggage – tr. note]

During transportation of packages of radioactive materials the shipper shall have the radiation danger markings displayed on the sides of the vehicle (see Appendix 4).

92. Vehicles specially adapted for continuous transportation of packages of radioactive materials shall not be used to transport people, foodstuffs, or other cargoes.

Vehicles shall be equipped, in case of accident enroute, with individual means of protection against radioactive contamination, a shovel, and long pliers.

93. One-time transportation of packages of radioactive materials may be carried out in ordinary vehicles, trucks and passenger cars, provided that the vehicle is tested for radioactive contamination afterward.

Packages of radioactive materials being transported in passenger cars shall be carried only in the trunk.

Transportation of packages of radioactive materials on delivery and passenger taxis is prohibited.

94. During one-time transportation of packages of radioactive materials, an automobile may carry any number of packages of the I and II transportation categories, not more than 4 packages of the III transportation category, or not more than 1 package of the IV transportation category.

95. Packages of the I, II, III, and IV transportation categories over the entire route are not separated from other cargo except for undeveloped motion picture, photographic, and x-ray films and plates, which shall be separated from the packages by distances not less than those indicated in Appendix 3.

96. Packages of the I and II transportation categories may be placed on the bed directly against the driver's cab and the sides of the vehicle, semitrailer, or trailer.

Packages of the III and IV transportation categories shall be placed at specific distances from the chauffer's cab or the shield,

depending on the number of packages, but not less than indicated in Appendix 3.

Packages of the III transportation category may be placed next to the sides and rear end of the vehicle, semi-trailer, or trailer, but packages of the IV category at distances not less than 0.6 meters from them.

During continuous transportation of packages of radioactive materials on specially adapted vehicles the shipper shall so load the packages that the ionization radiation level at any point on the outside surface of the body of the vehicle, trailer, semi-trailer does not exceed 200 mr/hr, and at a distance of 3 meters from these surfaces, 10 mr/hr; in this case the radiation level in the chauffeur's cab shall not exceed 28 mr/hr.

97. Packages of radioactive materials shall be transported with the minimum transfers from vehicle to vehicle en route.

98. Prior to dispatching vehicles specially assigned to carry packages of radioactive materials the motor pool (auto-freight station) administration shall give detailed instructions to the vehicle drivers on safety measures. During the instruction each chauffeur shall be given the exact route to be followed.

99. Packages of radioactive materials are loaded and unloaded, secured and unlashed on the vehicles by the forces and means of the shipper on the general basis established for automotive transport. Securing of the packages shall preclude their shifting during travel, in turns, during braking, etc. Securing shall be under the control and direction of the chauffeurs. Using a chauffeur for loading and unloading is prohibited.

100. During transportation of packages of radioactive materials the vehicle shall not deviate from the specified route. The route is given in detail on the trip ticket.

101. Layover of vehicles loaded with packages of radioactive materials at places continuously occupied by people is prohibited.

102. In the event of technical difficulty en route which cannot be corrected on the spot, the chauffeur shall call the nearest motor pool for a repair truck.

103. Carrying of persons, including escorting personnel, in the body of vehicles loaded with packages of radioactive materials is prohibited. When an escort is necessary, he shall ride in the chauffuer's cab.

104. While a vehicle loaded with packages of radioactive materials is in motion, the chauffeur shall periodically check the position of the cargo in the body and in case of shifting or loosening of the lashings he shall immediately take appropriate measures.

105. Upon return of a vehicle to the motor pool and prior to parking, it shall be examined for radioactive contamination. If radioactive contamination is found which exceeds the allowable limits (see appendix 2), specially trained personnel shall clean (deactivate) the vehicle to levels not exceeding those allowable. Deactivation shall be conducted at places intended for the washing of automobiles.

106. For radiometric control of radioactive contamination the car pool (auto station) shall have sets of appropriate instruments (see Appendix 9).

The list of motor pools (auto stations) having the necessary sets of instruments for measurement of contamination and radiation levels, and for individual dosimetric control, is given in the Collected Shipping and Tariff Regulations.

107. The director of the motor pool is required to:

a) establish strict control over the number of trips of vehicles carrying radioactive materials, not permitting more than 12 trips per year for a vehicle not specially adapted, and to direct one of the motor pool supervisors to conduct an accurate and timely accounting of the trips with radioactive materials made by each vehicle;

b) establish strict control over radioactive contamination of the rolling stock after each trip, as well as over the observance by the chaufeur and escorting personnel (of the motor pool) of the personal prophylaxis measures indicated in these Regulations.

IX. TRANSPORTATION OF PACKAGES OF RADIOACTIVE MATERIALS BY SPECIAL DELIVERY ORGANS [SPETSSVIAZ'].

108. Special delivery organs shall accept and transport packages of radioactive materials only in parcels corresponding to the requirements applying to packages of the I transportation category.

109. Parcels (packages) of radioactive materials are sent to all destination points through the special delivery service of the Ministry of Communications of the USSR.

110. The maximum weight of parcels (packages) of radioactive material (including the weight of the container and the external packaging) shall not exceed 20 kg.

111. The maximum radioactivity of the material which may be carried in one parcel (package) shall not exceed the level indicated in par. 44

112. In each lot of parcels of radioactive materials being shipped to one address the shipper shall include an accompanying envelope with shipping invoice on which the name of the material and its activity is indicated.

113. Parcels of radioactive materials shall be sealed by the shipper (see pars. 20-23), who shall be responsible for the accurate fulfillment of the requirements applying to such packages in these Regulations covering the transportation of radioactive materials.

114. The responsibility of the Special Delivery Service for the timely delivery and safety of parcels is determined on the general bases in accordance with the Regulations of the Special Delivery Service.

I. PROCEDURE FOR RECEIVING AND HANDLING PACKAGES (PARCELS) OF RADIOACTIVE MATERIALS.

115. Packages (parcels) of radioactive materials shall be accepted by a representative of the Special Delivery Service on the basis of a notification previously submitted by the shipper. The notification contains the date the parcels are to be presented. When parcels with short-lived radioactive materials are presented, a special note of the fact is made in the notification.

166. Parcels of radioactive materials are accepted by the weight indicated on the accompanying documents and on the label on the outside packaging of the container, and may be weighed for the purposes of control and refusal.

117. Parcels of radioactive materials and their accompanying envelopes may be turned over to representatives of the Special Delivery Service as valuables or without specifying their value.

118. Addresses to which the parcels are being sent are written on special labels, which are pasted to the side of the external package, or on a tag attached to the parcel. The address is written on the label in ink or with indelible pencil clearly and without blots or corrections.

Labels shall be made of smooth, nonglazed paper, fiber, or other material, and shall carry the text shown in Appendix 8.

shown in appendix 5 shall be

In addition, labels of the form attached to two sides of the external package.

NOTE: For small packages one label may be used.

119. When parcels of radioactive materials with declared value are presented, the notation "Valued at _____ rubles" (the sum is repeated, written out) shall be entered on the tag above the address.

120. Packages (parcels) of radioactive materials not meeting the requirements of these Regulations, without labels, seals, or with damaged seals, with incorrect or incomplete addresses are not accepted.

Parcels of radioactive materials shall be accepted from the shipper with the following documents at hand:

a) registration f. 1, which is prepared in two copies and completed in accordance with the Regulations of the Special Delivery Service of the Ministry of Communications, USSR; in column 9 of the registration is entered the number of the descriptive list by which the package is being forwarded.

b) the list is prepared by the shipper in three copies for each destination point, in the form established by the Special Delivery Service (see Appendix 7).

Registrations and descriptive lists are numbered sequentially by the shipper.

Registrations and descriptive lists shall be signed and certified by the shipper's stamp.

121. The special delivery agent signs the registration f. 1 and applies the impression of stamp f. 17 for the number of parcels of radioactive materials and their accompanying envelopes accepted. One copy of the completed registration together with the certificate f. 1 is given to the shipper, the second copy of the registration together with the descriptive lists is kept by the agent.

122. Payment for the transportation of parcels of radioactive materials is in accordance with tariffs confirmed by the Council of Ministers of the USSR for series "K" parcels.

123. Parcels of radioactive materials accepted by the special delivery agent and their accompanying envelopes with two copies of the descriptive lists are attached to invoice f. 11 for forwarding over the route, and the third copy of the descriptive list is attached to the [office] copy of the invoice.

2. PROCEDURES FOR HANDLING PACKAGES (PARCELS) OF RADIOACTIVE MATERIALS, THEIR SAFEKEEPING, AND TRANSPORTATION.

124. Packages (parcels) of radioactive materials accepted from the shipper shall be transported with the observance of measures for personal and public safety.

125. Throwing, overturning, and tipping of parcels of radioactive materials is prohibited.

126. One-time transportation of parcels of radioactive materials (not more often than 12 times a year) is permitted on regular vehicles (pickups, trucks, and in trunks of passenger cars) with subsequent testing for radioactive contamination.

127. For continuous intra-city transportation of parcels of radioactive materials, specially adapted vehicles meeting the requirements of par. 91 "a" and "b" of these Regulations shall be used.

128. A vehicle assigned to continuous transportation of radioactive materials shall be equipped with a set of individual means for safety against radioactive contamination, a shovel and long special pliers, and instructions with addresses of the public institutions which should be called in case of accident.

129. A vehicle permanently assigned to carrying parcels of radioactive materials shall not be used to transport people, foodstuffs, and other cargo.

130. Parcels of radioactive materials in transit shall not be unloaded from one vehicle to another except in case of vehicle breakdown.

3. PROCEDURE FOR TRANSPORTATION OF PACKAGES (PARCELS) OF RADIOACTIVE MATERIALS.

131. Packages (parcels) of radioactive materials shall be transported in the open, without doing them up in sacks, over rail, air, water, and highway routes of the Special Delivery Service.

132. Parcels shall be carried: by railroad in mail cars in iron chests of the "Vulkan" type, and if such are not available, in the transit storeroom, or in the usual order; on airplanes, in the baggage compartment; on ships, in the mail room or rented cabin; in cities and on highways by automotive vehicles.

133. Parcels of radioactive materials shall be sent to their destination (address) by direct route or with the minimum transfers.

134. During transportation by all types of transport, parcels shall be so placed that they cannot shift from the vertical position.

135. If the seals on the external packaging of the parcels of radioactive materials are damaged in transit, the couriers prepare an f. 8 statement in accordance with the requirements of par. 40 of these Regulations.

135. At exchange points parcels of radioactive materials and their accompanying envelopes are turned over to exchange-couriers by invoice f. 11, together with two copies of the descriptive list.

4. PROCEDURE FOR SURRENDER OF PACKAGES (PARCELS) OF RADIOACTIVE MATERIALS TO ADDRESSEES.

137. Arriving packages (parcels) of radioactive materials shall be immediately taken to the Special Delivery Office (Section) or delivered directly to the addressee.

138. Parcels of radioactive materials are handed over to the addressee personally or to his authorized agent who shall sign and stamp one copy of the descriptive list.

139. In case the addressee is beyond the city limits, or outside the zone of the regional center, the chief of the section (office, point) shall immediately telephone the addressee or his agent authorized to receive parcels of radioactive material.

140. Employees of the Special Delivery Service are categorically prohibited from opening parcels with radioactive materials

and their accompanying envelopes.

X. TRANSPORTATION OF PACKAGES OF RADIOACTIVE MATERIALS ON SHIPS OF THE OCEAN AND RIVER FLEET

141. Packages of radioactive materials of the I, II, III, and IV transportation categories may carried on ocean, river, and other cargo and cargo-passenger vessels.

142. The number of packages of the I and II transportation categories which may be carried in cargo holds on one cargo and cargo-passenger vessel is not limited.

143. Up to 5 packages of the I transportation category may be carried in cabins on cargo-passenger vessels. The total weight of the shipment carried in an individual cabin of an ocean or river vessel shall not exceed 200 kg.

The responsibility for safeguarding the packages and observing the conditions of transportation in such instances is carried by the escorts.

144. A passenger carrying packages of radioactive materials in handbags shall report ahead of time to the chief of the port and present the trip authorization and the documents verifying that the bearer has been ordered to transport packages of radioactive materials. The documents shall indicate: points of departure and destination, the transportation category of the packages, the number of places required, and the weight of the packages.

145. The maximum number of packages of radioactive materials of the III and IV transportation categories which may be carried in one place in the holds of cargo and cargo-passenger vessels is shown in Table 2.

all data on the shipping markings, name of the radioactive material, its activity, package transportation category, and its weight.

When delivering short-lived isotopes for transportation the shipper shall also indicate in the shipping order the maximum transit time of the cargo.

149. Packages of radioactive materials authorized for shipment shall be delivered to the port (pier) by the shipper not less than 2 hours prior to sailing.

150. Packages of the IV transportation category shall be loaded by the resources of the shipper and unloaded by the recipient directly to his own transport.

151. Packages of radioactive materials shall be secured so as not to shift when the boat is rocking.

152. The weight of one package of radioactive materials being transported by ocean vessel is not limited. The total weight of packages is determined by the shipping rules for ordinary cargoes.

153. The weight on one package of radioactive materials being shipped by river boat shall not exceed 80 kg. The transportation of packages weighing more than 80 kg is permitted in individual cases by agreement with the port and can be accomplished when mechanical means are available in the loading and unloading ports.

The total weight of packages is determined by the regulations for transportation of ordinary cargoes.

154. Packages are accepted for transportation with the seals of the shipper and by weight indicated by the shipper in the shipping order, and are surrendered without weighing.

155. Upon arrival of packages with radioactive materials the chief of the port shall immediately notify the addressee, who shall remove the cargo from the territory of the port not later than 24 hours after its arrival.

XI. TRANSPORTATION OF PACKAGES OF RADIOACTIVE MATERIALS IN UNIVERSAL RAILROAD, AUTOMOTIVE, AND OTHER CONTAINERS.

156. Packages with radioactive materials shall be accepted for transportation in universal containers according to established procedures for container transport only at stations (ports) which can accept containers, excepting universal automotive containers, in which the transportation of cargoes is not limited.

157. Prior to dispatching packages of radioactive materials in universal containers the shipper shall radiometrically measure the radiation dosage level at the outside surface of the universal container and at a distance of 1 meter from it and established the transportation category for the shipment (container) in accordance with table 1 (par. 6) from the maximum measurements obtained.

The transportation category of the shipment established is recorded in the shipping documents and on the label which is attached to the universal container.

Regardless of what packages of radioactive materials are placed inside the container, the radiation dosage level at the outside surface of the container and at a distance of 1 meter from it shall not exceed levels established in par. 6 for packages of the III transportation category.

158. A universal container provided for the transportation of packages of radioactive materials shall be examined by the employees of the transportation organization and by the shipper prior to loading. Loading of a container having any defect is categorically prohibited.

159. Loading of packages of radioactive materials into a universal container is carried out directly at the shipper's premises and unloading at the recipient's premises.

Transportation in this container of other cargoes is prohibited.

The weight of the cargo in the container shall not exceed its load capacity, and the loading on the floor of the container shall not exceed 1000 kg per square meter; provided the indicated conditions are observed, the weight of one package is not limited.

In order to provide stability in transit, packages of radioactive materials shall be firmly secured by planks nailed to the floor of the container by the shipper.

Outside the container, on the facing and back walls, 1 meter above the floor of the container, the shipper shall attach the radioactivity warning marking.

160. Loading of universal containers with radioactive materials shall take place, as a rule, on railroad flatcars, ships, and trucks which are routed directly. Such containers are usually placed in the middle portion of the railroad flatcar, in the rear portion of the truck body, and in ship holds in places removed from places where people congregate, in accordance with requirements of transportation of packages of radioactive materials.

161. Transportation of containers loaded with undeveloped motion picture, photographic, and x-ray films and plates on the same flatcar (truck) with containers loaded with radioactive materials is prohibited, except in cases when the container with packages of radioactive materials is comparable to packages of the 1 transportation category.

162. At container sites at shipping and receiving points and during sorting, containers with radioactive materials shall be placed at distances not less than 5 meters from containers loaded with undeveloped motion picture, photographic, and x-ray films and plates; the distances for containers comparable to packages of the I transportation category is not standardized.

XII REQUIREMENTS FOR TEMPORARY STORAGE OF PACKAGES OF RADIOACTIVE MATERIALS.

163. In warehouses of airports, special delivery sections, motor freight stations, railroad stations, and ocean and river ports continuously engaged in the transportation of packages of radioactive materials, special locations or places having areas not less than 10 m^2 shall be designated for temporary storage of the indicated cargoes.

164. The number of packages of the I and II transportation categories stored at one time in the specially designated locations in general warehouses is not limited; the number of packages of the III transportation category shall not exceed 4.

The total number of designated places for storage of radioactive materials in one building shall not be more than 5, with compliance to the requirements of pars. 44, 47, and Appendix 3.

165. In warehouses at airports, special delivery sections, motor freight stations, railroad stations, and ocean and river ports which receive and distribute radioactive materials may temporarily store at one time any number of packages of the I and II transportation categories in non-specially designated places in ordinary warehouses, and not more than 4 packages of the III transportation category, with compliance to the requirements of pars. 44, 47, and Appendix 3.

166. Packages of radioactive materials of the I, II, and III transportation categories may be stored without separating them from other cargoes, except for undeveloped motion picture, photographic, and x-ray films and plates, which shall be placed at distances indicated in Appendix 3.

167. Storage of packages of the IV transportation category in ordinary warehouses is prohibited.

168. Packages without radioactive materials may be stored in any warehouse in unlimited number, while observing the requirements of Section XIII.

XIII TRANSPORTATION OF PACKAGES WITHOUT RADIOACTIVE MATERIALS

169. Returnable containers without radioactive materials shall be placed in clean external packaging which is not contaminated with radioactivity.

170. Packages with containers used for radioactive materials not contaminated with radioactivity may be carried by all types of transport without limitations.

171. The internal volume of the container shall be carefully cleaned and shall contain no foreign radioactive materials (opened ampules or cases, cotton, etc.) The container shall be closed with a cap or stopper.

172. The shipper returning packages with containers used for radioactive materials shall attach to the shipping document a statement certifying the cleanliness of the inside and outside of the container as well as of the outside surface of the external package, in accordance with par. 17 of these Regulations. This certificate is signed by the director of the establishment or by a person authorized to do so by a special order. In the column "Name of Cargo" on the shipping document shall be indicated: "Package used for radioactive material."

173. The radioactive warning markings and labels shall be removed from the packages or masked out.

XIV MEASURES TO BE TAKEN WHEN PACKAGES ARE DAMAGED.

174. In cases of accident, fire, etc. on the transport carrying packages of radioactive materials, the area of the accident shall be isolated from people and [other] cargo being transported to distances indicated on the label.

175. When the hermetic seal of the packages of radioactive materials is broken in transit, it is necessary to take the following

measures: move all people to safe distances away from the accident, block-off the area and post warning signs, separate near-by cargoes to prevent their contamination by the radioactive materials, cover the contaminated area with sawdust, earth, sand, or other absorbent material.

176. Occurance of incidents indicated in pars. 174 and 175 shall be reported immediately to the shipper and the sanitary inspector of the region in which the accident took place.

A forced landing or airplane accident shall be reported also to the sanitary inspection organs of the Civil Air Fleet (CAF) and nearby subsections of the CAF.

The presence of packages of radioactive materials on board the aircraft is reported also to the airports of departure and destination.

Clearing away of the accident shall be carried out after receiving special instructions from the shipper and the local organs of the sanitary inspector.

177. Clearing away of accidents shall be carried out by persons knowing the regulations covering work with radioactive materials, observing safety measures necessary for such operations.

178. Responsibility for the accident is carried by those persons at fault for its occurrance.

179. The transport on which packages indicated in pars. 174 and 175 have been damaged may be used only after radiometric testing which establishes that its radioactive contamination does not exceed the allowable level (see Appendix 2, Table 5).

XV SANITARY AND HEALTH REQUIREMENTS

180. Personnel of airports, freight warehouses, special delivery sections, railroads, ocean and river ports, continuously engaged in loading and unloading and storing of packages of radioactive materials (storekeepers, cargo handlers, cleaning maids, etc.)

shall be subjected to medical examination prior to employment. Subsequently, persons of this category shall be examined not less than once a year.

181. Persons continuously engaged in loading, unloading, transporting, and storing of packages of radioactive materials shall strictly observe measures of safety and personal hygiene, and shall be subject to individual dosimetric control and use special clothing on general bases.

182. Baggage (cargo) sections of airplanes, ship holds, and truck bodies in which packages of radioactive materials are transported, or places of storage, shall be subject to periodic radiometric control, and when radioactive contamination is found, to deactiavtion.

During deactivation, measures shall be taken to prevent radioactive contamination of personnel (use of rubber gloves, rubberized aprons or other special clothing, remote control instruments, etc.).

The periodicity of the radiometric measurements shall be established by the administration by agreement with the local organs of the sanitary inspector, based on the number of shipments.

183. All persons found on a contaminated transport, as well as persons conducting the deactivation, shall test the radioactive contamination of their clothing and bodies. Upon detection of excessive radioactive contamination, the clothing is collected in collection containers and sent to the special laundry for washing. When hands become contaminated they shall be washed carefully in water and industrial soap, and if this is insufficient, special detergents shall be used. When the body is contaminated, it should be washed in a shower with soap or (when necessary) with special detergents.

When transport equipment and warehouses are contaminated with radioactive materials, they are deactivated by forces and resources of the organization at fault for the contamination.

CONCLUSION

These Regulations become effective upon publication.

Upon publication of these Regulations the "Temporary sanitary regulations for transportation of radioactive materials," No. 255-59, Approved 3 June 1959, and departmental documents issued in accordance with the temporary regulations and regulating the procedure for transporting radioactive materials are rescinded as no longer valid.

On the basis of these Regulations the administrations of the organizations providing for loading, unloading, transportation, and temporary storage of packages of radioactive materials shall develop their own instructions in view of specific local conditions and in agreement with local organs of the sanitary inspector.

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-END-

APPENDIX 1

Maximum allowable levels of Radiation

1. For persons continuously working with radioactive materials, the maximum yearly radiation dosage of the entire organism is 5 r of gamma radiation or its biological equivalent (ber) for beta particles and neutrons. This dosage corresponds to a weekly dosage of 0.1 r (ber).

2. The maximum allowable dosage of 0.1 r (ber) per week corresponds to the maximum allowable radiation flux indicated in Table 3.

Table 3

Type of Radiation	Dosage or quantity of radiation per week	Maximum allowable strength of dosage or intensity of radiation		
		measurement unit	working a 36-hr work week	working t hours per week
gamma rays	0.1 r	mr/hr	2.8	$\frac{100}{t}$
Beta rays	$2.5 \cdot 10^6 \frac{\beta\text{-part.}}{cm^2}$	$\frac{\beta\text{-part.}}{cm^2 \cdot sec}$	20.0	$\frac{700}{t}$
Thermal neutrons	$100 \cdot 10^6 \frac{neutr.}{cm^2}$	$\frac{neutr.}{cm^2 \cdot sec}$	750	$\frac{27,000}{t}$
Fast neutrons	$2.6 \cdot 10^6 \frac{neutr.}{cm^2}$	"	20	$\frac{720}{t}$

3. For persons temporarily assigned to work with radioactive materials as well as those not working with these materials but present withing the radiation zone, the maximum allowable radiation dosage of the organism per year shall not exceed 0.5 r (ber).

4. For the hands the maximum allowable levels of irradiation may be increased by a factor of 5, and for beta-particles by a factor of 10 as compared with those allowed for the entire organism, provided that the entire body is not subjected to a dosage exceeding the yearly allowance.

The instruments indicated in Table 4 may be used for making measurements.

Table 4

Name of Instrument	Type	Purpose
Individual dosimetric control kit	KID-1	personal dosimetric control
same	DK-0.2	same
medical microradiometer	MRM-1	measurement of gamma radiation strength
Portable neutron radiometer	RPN-1M	measurement of neutron flux
Universal beta-gamma radiometer	Ray A	Measurement of beta and gamma radiation
Searching scintillation radiometer	SRP-2	measurement of gamma radiation
Field alpha radiometer	RAP-1	measurement of surface alpha contemination
Universal radiometer	TISS	measurement of alpha and beta radiation

NOTE: In addition to the instruments indicated, other instruments having analogous purposes may be used.

APPENDIX 2

1. Maximum allowable contamination by radioactive materials shall not exceed the values given in Table 5.

Table 5

object contaminated	Number of particles from 150 cm^2 surface per minute			
	alpha particles		beta particles	
	before cleaning	after cleaning	before cleaning	after cleaning
hands	75	background	5000	background
special linens and towels	75	background	5000	background
cotton work clothes	500	100	25000	5000
plastic [film] clothing	500	200	25000	10000
outside of gloves	500	100	25000	5000
outside of special shoes	500	200	25000	5000
working surfaces and equipment	500	200	25000	5000

NOTE: Contamination of the body is prohibited.

2. Objects which cannot be cleaned to the maximum allowable levels of contamination shall be treated as radioactive expendibles, if their use with residual radioactivity is not justified.

NOTE: Measurement instruments are given in Table 4 of Appendix 1.

APPENDIX 3

Minimum distances between packages of radioactive materials and places where people sojourn or locations of cargoes of undeveloped motion picture, photographic and x-ray films and plates.

1. Data is given in Tables 7, 8, and 9 for determination of minimum distances between various numbers of packages of the different transportation categories and places where people sojourn and places where undeveloped motion picture, photographic and x-ray films and plates are transported or stored in a warehouse for differnt times.

These tables can be used for approximate determination of dosage strength at different distances from the packages.

2. Tables 7, 8, and 9 are computed taking into account that the maximum allowable dosage received during transportation and storage is 10 mr for motion picture, photographic, and x-ray films and plates and 1000 mr for people.

These tables do not account for additional shielding of packages resulting from screening when packages are placed in multiple rows.

Table 6

Name of material	Thickness of soreen (in cm^2)	
	attenuation by factor of 10	attenuation by factor of 100
Ordinary cargoes, the density of which is approximately that of water	about 70	about 115
brick	50	80
ordinary concrete	32	55
steel	9.3	16
tin	4.5	8,5

3. Distances given in Tables 7, 8, and 9 are measured from the outside surfaces of packages of radioactive materials to outside surfaces of cargoes with undeveloped motion picture, photographic, and x-ray films and plates, and the distances to places of sojourn of people are measured from the outside surface of the package to the place of sojourn of people at a point 0.6 meter from the floor.

4. Tables 8 and 9 are computed taking into account the attenuation of radiation[1] by materials the thickness of which is given in Table 6.

Example of use of tables 7, 8, and 9.

1. Determine the distance from 10 packages of the III transportation category at which cargoes of motion picture, photographic, and x-ray films and plates maybe place and where people may remain continuously for a transit time of 24 hours.

For placement of the motion picture and other film according to table 7 at the intersection of the columns "24 hours" and "10 packages III transportation category" we find the minimum distance of 20 meters.

For people, according to Table 8, at the intersection of the same columns we find 6.1 meters.

2. Under the same conditions, determine the respective distances if there is a radiation shielding cargo 75 cm thick.

For motion picture and other films from Table 8, we find the distance of 6.1 meters, and for people, from Table 9, 1.5 meters.

---

[1]The attenuation is computed for cobalt-60, having an approximate average radiation energy of 1.25 mev; the actual attenuation is usually greater because the radiation is softer; for harder radiation (e.g., sodium-24), attenuation is less.

3. Determine how many packages the III transportation categories can be placed at a distance of 3 meters from places continuously occupied by people for 10 days if the packages are shielded with two steel plates each 5 cm thick.

4. A shield 2 x 5 = 10 cm weakens radiation by a factor of 10, therefore from Table 9 for the time 10 x 24 = 240 hours we find that we can place 2 packages of the III transportation category.

Table 7

Minimum distances between cargoes of undeveloped motion picture, photographic and x-ray films and plates and transportation packages of radioactive materials in the absence of other shielding materials (walks, cargoes, etc.) between the packages and the cargoes. [1]

1 Категория упаковки	2 Число упаковок	3 Минимальное расстояние м										
		4 Время перевозки или хранения в часах (сутках) не более										
		1	3	6	10	20	24 (1)	48 (2)	120 (5)	240 (10)	480 (20)	960 (40)
I	1	+	+	+	+	+	+	+	0,3	0,6	1,0	1,4
	2	+	+	+	+	+	+	+	0,5	1,0	1,5	2
	3	+	+	+	+	+	+	0,3	0,7	1,2	1,9	2,6
	4	+	+	+	+	+	+	0,4	0,8	1,4	2,2	3,2
	5	+	+	+	+	+	+	0,5	1,0	1,6	2,4	3,3
	6	+	+	+	+	+	+	0,6	1,2	2,0	2,8	4,2
	10	+	+	+	+	+	0,3	0,9	1,6	2,2	3,3	4,6
	15	+	+	+	+	+	0,3	1,2	2,0	3,0	5,4	6,6
	20	+	+	+	+	+	0,3	1,5	2,4	3,5	6,0	7,2
	30	+	+	+	+	+	0,5	1,8	2,9	4,2	6,4	9,5
	40 и больше	+	+	+	+	+	0,5	2,0	3,2	5,0	7,5	10,0
II	1	+	0,4	0,5	0,6	1,0	1,2	1,7	2,8	4,3	6,2	8,4
	2	+	0,6	0,8	1,0	1,4	1,8	2,5	4,0	6,5	8,5	12,0
	3	+	0,8	1,1	1,2	1,9	2,0	3,0	5,0	7,4	10,5	13,0
	4	+	1,0	1,3	1,4	2,2	2,5	3,5	6,0	8,7	12,3	16,0
	5	0,4	1,1	1,4	1,6	2,5	3,0	4,0	7,0	10,5	14,0	20,0
	8	0,5	1,5	2,0	2,3	3,3	3,6	5,4	9,6	12,5	18,0	26,0
	10	0,6	1,6	2,2	2,5	3,6	4,1	6,0	10,0	14,0	20,0	28,0
	15	0,7	1,9	2,7	3,0	4,5	5,0	7,5	12,0	17,0	25,0	35,0
	20	0,9	2,5	3,5	4,0	5,7	6,2	9,0	14,0	20,0	29,0	40,0

1. Package Category
2. Number of packages
3. Minimum distance (meters)
4. Time of transit or storage in hours (days) minimum

See footnote 1 on page 53.

Table 7 (Continued)

Package Category	Number of Packages	Minimum distance (meters)										
		Time of transit or storage in hours (days) maximum										
		1	5	8	10	20	24 (1)	48 (2)	120 (5)	240 (10)	480 (20)	960 (40)
	30	7.0	16.0	20.0	22.5	32.0	35.0	-	-	-	-	-
	20	5.9	13.1	16.2	18.5	26.0	29.0	40.0	-	-	-	-
	40 or more	8.0	18.5	23.4	26.0	37.0	40.0	-	-	-	-	-
IV	1	2.9	6.6	8.3	9.3	13.1	14.4	20.3	32.2	-	-	-
	2	4.1	9.3	11.7	13.1	18.5	20.3	28.7	-	-	-	-
	3	5.0	11.4	14.3	16.0	22.5	25.0	35.0	-	-	-	-
	4	5.9	13.2	16.2	18.5	26.0	28.5	40.0	-	-	-	-
	5	6.1	14.6	17.1	20.5	29.0	31.8	-	-	-	-	-
	6	7.0	16.0	20.0	22.5	32.0	35.0	-	-	-	-	-
	8	8.0	18.5	23.2	26.0	37.0	40.0	-	-	-	-	-
	10	9.0	20.0	25.6	29.0	40.0	-	-	-	-	-	-

1 (from page 53)
The sign "+" indicates that the distances are not limited; the sign "–" indicates that the distances were not calculated (over 40 meters).

Table 8

Minimum distances between cargoes of undeveloped motion picture, photographic, and x-ray films and plates and transportation packages of radioactive materials when there are materials (cargoes) which attenuate the radiation by a factor of 10 between the packages and the cargoes.

These distances shall also be observed between places where people sojourn and transportation packages of radioactive materials, if between the places where people sojourn and the packages there are no other materials (walls, cargoes, etc.)[1]

1. Package Category
2. Number of Packages
3. Minimum distance (meters)
4. Time of transit or storage in hours(days) maximum

1 Категория упаковок	2 Число упаковок	3 Минимальное расстояние, м — 4 Время перевозки или хранения в часах (сутках) не более										
		1	5	8	10	20	24 (1)	48 (2)	[illegible]	2.0 (12)	480 (20)	960 (40)
I	1	+	+	+	+	+	-	+	+	+	+	0,2
	2	+	+	+	+	+	-	[illegible]	+	+	+	0,5
	3	+	+	+	+	+	+	+	+	+	0,4	0,7
	4	+	+	+	+	+	+	+	+	+	0,5	0,8
	5	+	+	+	+	+	+	+	+	+	[illegible]	[illegible]
	8	+	+	+	+	+	+	+	+	0,7	0,8	1,2
	10	+	+	+	+	+	+	+	+	0,6	0,9	1,5
	15	+	+	+	+	+	+	+	+	[illegible]	1,1	1,9
	20	+	+	+	+	+	+	+	[illegible]	0,9	1,5	2,3
	30	+	+	+	+	+	+	+	[illegible]	[illegible]	1,9	2,7
	40 и более	+	+	+	+	+	+	+	[illegible]	[illegible]	2,3	3,3
II	1	+	+	+	+	+	+	0,4	[illegible]	1,2	1,7	2,6
	2	+	+	+	+	+	+	0,7	1,2	[illegible]	[illegible]	3,8
	3	+	+	+	+	+	+	0,9	1,5	2,1	3,[illegible]	4,7
	4	+	+	+	+	+	0,4	1,0	1,8	2,6	3,7	5,4
	5	+	+	+	+	+	0,5	1,1	2,0	2,9	4,2	6,1
	8	+	+	+	+	+	0,8	1,5	2,6	3,8	5,6	7,8
	10	+	+	+	0,4	0,8	1,0	1,6	2,8	4,1	6,1	8,8
	15	+	+	0,5	0,6	1,1	1,3	2,1	3,7	5,3	7,6	10,8

[1] The sign "+" indicates that the distances are not limited; the sign "—" indicates that the distances were not calculated (over 40 meters).

Table 8 (Continued)

Категория упаковки	Число упаковок	Минимальное расстояние, м										
		Время нахождения или хранения в часах (сутках) не более										
		1	3	8	10	20	24 (1)	48 (2)	120 (5)	240 (10)	480 (20)	960 (40)
	20	+	0,4	0,7	0,9	1,3	1,7	2,6	4,3	6,1	8,8	12,6
	30	+	0,6	1,0	1,2	1,8	2,1	3,2	5,2	7,6	10,9	15,5
	40 и более	+	0,7	1,1	1,4	2,2	2,5	3,7	6,2	8,8	12,5	18,0
III	1	+	0,6	0,8	1,0	1,5	1,7	2,7	4,3	6,1	8,8	12,6
	2	+	1,0	1,2	1,6	2,3	2,5	3,8	6,2	8,8	12,5	18,0
	3	0,5	1,2	1,6	1,9	2,9	3,2	4,7	7,7	10,9	15,5	22,0
	4	0,4	1,5	1,9	2,3	3,4	3,7	5,6	9,0	12,5	17,8	25,3
	5	0,5	1,7	2,2	2,6	3,8	4,2	6,2	10,0	14,0	20,0	28,5
	6	0,7	2,2	2,9	3,3	4,8	5,4	7,8	12,5	17,8	25,0	36,0
	10	0,8	2,8	3,3	3,8	5,5	6,1	8,8	14,0	20,0	28,5	40,0
	15	1,0	3,1	4,1	4,7	6,8	7,5	10,7	17,5	24,7	35,0	—
	20	1,2	3,7	4,8	5,5	7,9	8,8	12,5	20,0	28,5	40,0	
	30	1,5	4,7	6,0	6,8	9,8	10,8	15,5	25,0	35,0	—	
	40 и более	2,0	5,5	7,0	7,9	11,4	12,5	18,0	29,0	—	—	
IV	1	0,6	1,8	2,3	2,6	3,8	4,1	6,0	10,0	14,0	20,0	28,5
	2	1,0	2,5	3,4	3,7	5,5	6,0	8,8	14,0	20,0	28,5	40,0
	3	1,1	3,2	4,1	4,7	6,8	7,5	10,7	17,5	24,5	35,0	—
	4	1,3	3,6	4,8	5,5	7,8	8,7	12,5	20,0	28,5	40,0	—
	5	1,4	4,2	5,5	6,2	8,8	9,8	14,0	22,5	31,5	—	—
	6	1,5	4,7	6,1	6,8	9,7	10,8	15,5	25,0	35,2	—	—
	8	1,7	5,5	7,0	7,8	11,3	12,5	17,8	29,0	—	—	—
	10	1,9	6,0	7,5	8,9	12,7	14,0	20,0	32,2	—	—	—

1. Package Category
2. Number of Packages
3. Minimum distance meters
4. Time of transit or storage in hours (days) maximum.

Table 9

Minimum distances between cargoes of undeveloped motion picture, photographic, and x-ray films and plates and transportation packages of radioactive materials when there are materials (cargoes) which attenuate the radiation by a factor of 100 between the packages and cargoes.

These distances shall also be observed between places continuously occupied by people and transportation packages of radioactive material when between such places and the packages there are materials (cargoes) which attenuate the radiation by a factor of 10 (walls, cargoes, etc.).[1]

1 Категория упаковки	2 Число упаковок	3 Максимальное расстояние, м 4 Время перевозки или хранения в часах (сутках) не более										
		1	5	8	10	20	24 (1)	48 (2)	120 (5)	240 (10)	480 (20)	960 (40)
I	Не огран.	Расстояния не ограничиваются										
II	1	+	+	+	+	+	+	+	+	+	0,3	0,6
	2	+	+	+	+	+	+	+	+	+	0,5	0,8
	3	+	+	+	+	+	+	+	+	0,3	0,7	1,0
	4	+	+	+	+	+	+	+	+	0,5	0,8	1,3
	5	+	+	+	+	+	+	+	0,3	0,6	1,0	1,5
	8	+	+	+	+	+	+	+	0,5	0,9	1,3	2,0
	10	+	+	+	+	+	+	+	0,5	1,0	1,5	2,5
	15	+	+	+	+	+	+	0,4	0,7	1,3	2,0	3,0
	20	+	+	+	+	+	+	0,5	0,9	1,6	2,4	3,8
	30	+	+	+	+	+	0,6	0,8	1,2	2,0	3,0	4,5
	40 и более	+	+	+	+	+	0,8	0,7	1,5	2,4	3,7	5,5
III	1	+	+	+	+	+	0,3	0,5	1,1	1,7	2,6	3,7
	2	+	+	+	+	+	0,5	0,9	1,6	2,5	3,7	5,4
	3	+	+	+	+	0,3	0,7	1,1	2,0	3,1	4,6	6,7
	4	+	+	+	+	0,4	0,8	1,3	2,4	3,6	5,8	7,5
	5	+	+	+	+	0,5	0,9	1,5	2,8	4,1	6,0	8,6
	8	+	+	0,5	0,7	0,9	1,3	2,0	3,7	5,4	7,8	10,7
	10	+	+	0,7	0,8	1,0	1,5	2,5	4,1	6,1	8,7	12,5
	15	+	0,6	0,9	1,2	1,7	2,1	3,0	5,0	7,6	10,8	15,5
	20	+	0,7	1,1	1,4	2,1	2,5	3,7	6,1	8,8	12,5	17,8
	30	+	1,0	1,3	1,7	2,6	3,0	4,5	7,5	10,8	15,5	22,0
	40 и более	+	1,2	1,6	2,1	3,2	3,6	5,3	8,7	12,5	17,8	25,5
IV	1	+	0,4	0,5	0,6	1,0	1,1	1,7	2,9	4,2	6,1	8,8
	2	+	0,5	0,7	0,9	1,4	1,6	2,5	4,1	6,1	8,7	12,5
	3	+	0,6	0,9	1,2	1,7	2,0	3,1	5,1	7,3	10,7	15,5
	4	+	0,8	1,1	1,5	2,2	2,5	3,8	6,1	8,8	12,5	17,8
	5	+	0,9	1,2	1,6	2,5	2,8	4,2	6,8	9,8	14,1	18,9

1 The sign " " indicates that the distances are not limited; the sign " " indicates that the distances were not calculated (over 40 meters).

Legend on following page.

Table 9 (Continued)

1 Категория упаковки	2 Число упаковок	3 Минимальное расстояние, м										
		4 Время перевозки или хранения в часах (сутках) не более										
		1	6	8	10	20	24 (1)	48 (2)	120 (5)	240 (10)	480 (20)	960 (40)
VI	6	+	1,0	1,3	1,7	2,8	3,1	4,6	7,5	10,8	15,5	20,0
	8	+	1,2	1,7	2,2	3,4	3,7	5,3	8,7	12,5	17,8	25,5
	10	0,4	1,5	2,0	2,5	3,7	4,1	6,0	9,8	14,0	20,0	28,3

Legend:

1. Package Category
2. Number of packages
3. Minimum distance (meters)
4. Time of transit or storage in hours (days) maximum

5. For approximate determination of the maximum possible radiation dosage at various distances from various numbers of packages (without shielding) it is necessary to determine the allowable transit time for the respective numbers of packages and distances and divide 10 mr into this time, using Table 7; 100 mr using table 8; and 1000 mr, using table 9.

When materials are present which attenuate the radiation the dosage will be lessened in porportion to the degree of attenuation.

Examples:

1. Determine the radiation dosage level at a distance of 6 meters from 20 packages of the II transportation category. From table 7 the time is approximately 20 hours. Then the dosage is 10 mr ÷ 20 = 0.5 mr/hr.

If we use table 8, then at a distance of 6.1 meters the time is 240 hours, and therefore the radiation dosage is 100 mr ÷ 240 = 0.4 mr/hr.

2. Determine the number of packages of the III transportation category which may be placed together without the dosage strength at a distance of 1.6 meters from the packages exceeding 10 mr/hr.

From table 7, prepared for 10 mr/hr we find that 2 packages of the III transportation category may be transported or stored for a period of 1 hour.

3. Determine the number of packages and their transportation category if at a distance of 1.6 meters, with cargoes attenuating radiation by a factor of 10, the dosage is 10 mr/hr.

From table 8 we find that we can transport a store for 1 hour any number of packages of the I and II transportation categories or up to 30 packages of the III transportation category or up to 6 packages of the IV transportation category.

6. Radiation attenuation can be computed approximately from the thickness of materials attenuating radiation by a factor of 2. To attenuate the radiation of cobalt-60 by factors of from 0 to 500, the

following approximate thicknesses of materials (in cm), which halve the radiation may be used: Water - 19, brick - 13, concrete - 8.5, steel - 2.6, lead - 1.4.

Examples:

1. Determine the radiation attenuation by a cargo 40 cm thick. The number of layers attenuating by half is $40 \div 19 = 2.1$, i.e., the attenuation will be $2^{2.1} \approx 2 \times 2 = 4$, that is, by approximately four times.

When shielding with several materials it is necessary to reduce them conditionally into terms of one of the materials, computing the thickness of the different materials in inverse proportion to their densities, and determining the radiation attenuation from the total conditional thickness of one material of the same density.

2. Determine the radiation attenuation of cobalt-60 by an ordinary cargo of thickness $b_c = 60$ cm, a steel partition $b_{st} = 1$ cm, and a lead shield $b_l = 2$ cm. Reduce the thickness of the shielding materials to terms of steel.

Ordinary cargo is equivalent to steel in the relation

$$b'_{st} = b_c \frac{\rho c}{\rho st} = 60 \left(\frac{1}{7.9} \right) \approx 7.6 \text{ cm}$$

Lead shielding in terms of steel thickness is

$$b''_{st} = b_l \frac{\rho l}{\rho st} = 2 \left(\frac{11.3}{7.9} \right) \approx 2.9 \text{ cm}$$

The total equivalent thickness of steel will be

$$b_{st} + b'_{st} + b''_{st} = 1 + 7.6 + 2.9 = 11.5 \text{ cm.}$$

The number of layers of half attenuation of steel will be $11.5 \div 2.6 = 4.4$; i.e., attenuation will be by approximately $2^{4.4}$ or by a factor of approximately 20.

7. If packages of different transportation categories are included in the same lot (shipment), to determine the minimum

distances (from the appropriate tables) between the lot and packages of motion picture, photographic, and x-ray films and plates, as well as distances to places occupied by people, it is necessary to equate all of the packages to one transportation category. We can consider approximately that 1 package of the III transportation category is equivalent to 20 packages of the II transportation category or 500 packages of the I transportation category; 1 package of the IV transportation category is equivalent to 5 packages of the III transportation category.

The magnitude of the dosage is directly proportional to time of irradiation and approximately inversely proportional to the square of the distance from the packages.

APPENDIX 4

Radiation Warning Sign

The radiation warning sign is used to mark objects, premises, equipment, structures, materials, etc. within or on the surface of which there is or possibly is danger from ionizing radiation.

The inside disc and the three leaves shall be red. The sign shall be on a yellow background (6R).

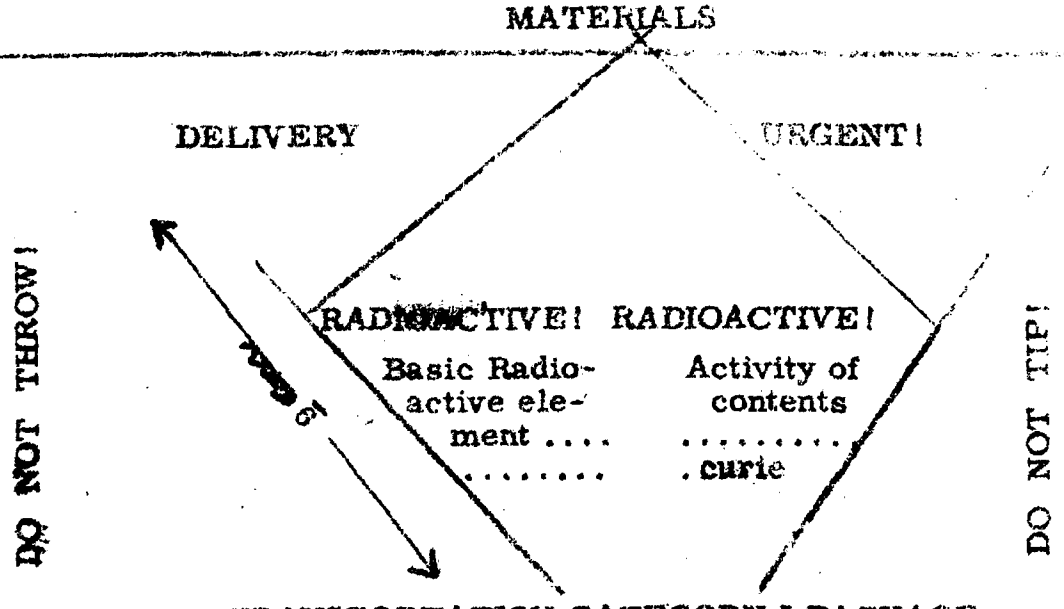
R
CAREFUL, 1.5R RADIOACTIVITY!
5R
6R

The dimensions of the sign shall be proportional to the objects, premises, equipment, etc., but not less than R = 0.2 cm. and not more than R = 2 cm.

Below the sign there shall be the warning, "Careful, Radioactivity!"

APPENDIX 5

LABELS FOR PACKAGES OF RADIOACTIVE MATERIALS



TRANSPORTATION CATEGORY I PACKAGE

Permitted to be transported without limitations and without segregation from passengers and other cargoes except undeveloped motion-picture, photographic, and x-ray films and plates.

In case of accident resulting in breakage of the container; safe distance is not less than ..... meters.

Container No ..... Gross Weight ..... kg.

The external container has no radioactive contamination.

Dosimetrist ..... Shipper .....
signature signature

Date tested .....

[Everything in red box on page 62
of this manuscript repeats except
all cap line.]

TRANSPORTATION CATEGORY II PACKAGE

Unless necessary, keep away!

[Everything in red box on page 62
of this manuscript repeats except
all cap line.]

TRANSPORTATION CATEGORY III PACKAGE

[Everything in red box on page 62
of this manuscript repeats except
all cap line.]

TRANSPORTATION CATEGORY IV PACKAGE

APPENDIX 6

Form _____

To the Chief of the Airport _____

NOTIFICATION

For the Transportation of Packages of Radioactive Materials by Air Transportation

Shipped by _____

[full name of organization, postal, telegraph

_____

address and telephone number)

Request acceptance for transportation to destination airport _____

_____

(accurate name of addressee, postal,

_____

telegraph address and telephone number)

1. Packages of radioactive materials of the _____

written out

transportation category.

2. Number of places (total) _____

weight (total) _____ kg.

3. Name of radioactive material and its activity _____ microcuries.

4. Maximum allowable transit time from the time of deposit to the time of delivery of the cargo to the recipient _____ hours (only for short lived materials).

5. The surfaces of the external packages has no radioactive contamination; the radiation dosage level does not exceed the values established for the respective transportation categories. This is

substaniated by a test conducted by dosimetrist

(name, date, time of test)

Packages of radioactive materials correspond to transportation categories indicated on the labels and all of the technical requirements established by the Regulations covering the Transportation of Radioactive materials.

Shipper _____

(sign clearly)

"____" _____ 196 ___.

APPENDIX 7

DESCRIPTIVE LIST NO. ___

for packets and parcels sent by _____ (name of

_____ via the special delivery service of

shipper)

the Ministry of Communications USSR to _____

destination

"____" _____ 196___

No. p/p	Type shipment (packet or parcel)	No. on accompanying packet	No. of stamp or seal	Addressee	Reciept signature (title, last name, first name, middle name, certified by stamp.

Total _____ packets and parcels _____

Signature of shipper _____

APPENDIX 8

SPECIAL DELIVERY TAG

1. Where _____
(destination, name of district, province, republic)

2. To whom _____
(complete, not abbreviated name of addressee)

3. Sender _____
(address of sender)

4. To packet, orig. No. _____

5. Signature and stamp of sender _____