RADIATION HEALTH SERIES

No. 2

SAFE HANDLING

OF

RADIOACTIVE CONSIGNMENTS

RADIATION HEALTH DIVISION
DEPARTMENT OF HEALTH

As a transport worker, you may at time be required to handle or come close to a radioactive cargo. It may be a large freight container or a small package of only 15cm cube. No doubt you will receive some radiation as a result of your work. However, unless you are unduly careless, the radiation you receive from your work in a year would account to only a fraction of that you normally receive from the natural environment. Yet, this is no cause for complacency. If you prepared to take some simple precautions, you can reduce the amount further in line with the International Commission on Radiological Protection's ALARA (As Low As Reasonably Achievable) principle. The following Question and Answers are aimed at helping you to achieve this end.

Q.1 What is radiation?

Radiation is all around us, we live in a radioactive world. Some radiation is man-made, caused by human activities, but most of it comes from natural sources. Radioactive materials spontaneously convert into other materials, and as they do so they give off radiation. Some of these radioactive substances, such as uranium and thorium, can be found in rocks and minerals, for example, granite and limestone. As the rocks weather they form soils, which also contain traces of the radioactive materials. The soils are used to grow food, or are washed into the rivers, and the radioactive materials are naturally absorbed into the food we eat. So almost everything we eat or drink is mildly radioactive.

Q.2 How is radiation produced?

Radioactive materials are made up of unstable atoms which convert into more stable forms during a process known as radioactive decay. As the decay process takes place energy is released in the form of Gamma rays. The decay process may also cause the original substance to lose some of its mass, which is given off in the form of Alpha and Beta particles. Gamma rays, Alpha particles and Beta particles are the three types of radiation, and they are distinguished by their different penetration properties.

Alpha particles are relatively slow and heavy. They have very little penetrating power and can be stopped just by a sheet of paper.

Beta particles are lighter and faster. They are more penetrating than alpha particles, but can be stopped by a sheet of metal foil.

Gamma rays are even more penetrating; the most energetic forms of gamma rays can only be stopped by a thick layer of materials.

Q.3 What are the units of radiation?

The amount of radiation received is called the radiation dose or radiation exposure. To measure radiation, appropriate units are needed. For some purpose we may need to know how energetic or penetrating the radiation is, or whether it is in the form of alpha, beta or gamma rays. But in general the most important thing we need is a measure of the effect radiation has on people. A single unit can be used for this, which takes into account the different ways of radiation interact with living matter. This unit has the scientific name **sievert (Sv).** It is a large unit and so it is more common to use the **millisievert (mSv)** which is one-thousandth of a sievert.

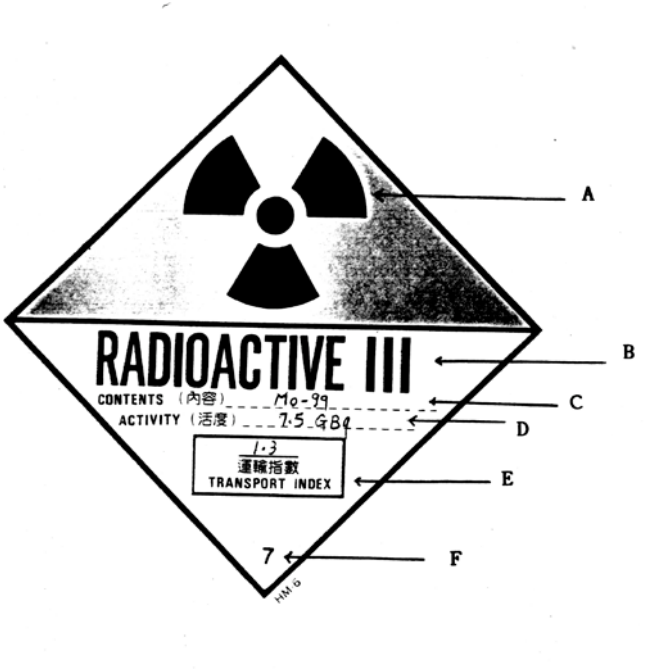
Q.4 Is it safe for an untrained person to transport radioactive materials?

All radioactive materials in conveyance must be packaged according to International Atomic Energy Agency's (IAEA) transport regulations (the standards of International Civil Aviation Organisation (ICAO) representing the airlines and International Maritime Organisation (IMO) representing the shippers are similar to IAEA's). These are to ensure that radioactive materials can be safely transported between member countries and the harm to the transport worker is minimal. In accordance with international practice, transport workers are not categorized as occupational radiation workers because in all likelihood they receive very little radiation in the course of their work and they do not require special training.

Q.5 How do I know I am handling a radioactive cargo?

All containers and packages containing radioactive materials must have a label similar to the one shown below on the outside. Excepted packages are exempted from this

requirement on account of their low radioactive content.



Where

A is the universally accepted trefoil sign representing ionizing radiation, black colour in yellow colour background.

B is the package category number (Category III in this example). The other two categories are I and II. Category I presents the least hazard and the Category III the most.

C identifies the radionuclide in the package (Mo-99 in this example). For low specific activity materials the contents may be described as RADIOACTIVE LSA.

D gives the quantity of radioactivity. The higher the value the more radionuclide in the package (7.5GBq in this example).

E is the Transport Index (TI) (1.3 in this example). Multiply the number by 10 gives the dose-rate in μSv/h at one metre. The greater the number the higher the external radiation. TI is not required for Category I packages because of the low external dose rate.

F denotes the class of restricted articles. For radioactive material, it is always '7'.

Q.6 What are the precautions that I should take when I am transporting a radioactive cargo?

Although in your normal course of duty you receive very little radiation, there are precautions you can take to protect yourself from receiving unnecessary radiation doses.

For cargo handlers:

i) If the cargo is a freight container, it is handled by machinery. There are times when you may have to spend some time on top of or close to the container. Try to make your stay as short as possible but remember that you have to do a good job. Do not stay too close to the container unnecessarily, 5 meter from the container should be a rather safe distance.

ii) Consignments consisting of heavy packages and drums are normally shipped in a freight container. You may be asked to load and unload these packages and drums. Use a fork-lift whenever possible. At times you may be asked to carry a heavy drum on your shoulder during loading and unloading operations. This is permissible if there is no better way, but use a push-cart if you have to carry it to a distance. You can move a few drums with the push-cart at one time. Remember, the push-cart not only helps you to cover the distance quicker but also enables you to increase the separation between the drums and you. You may be able to achieve a more than 10-folds reduction in radiation dose.

iii) A light package coming in by air can be handled by hand. Try to hold it not too close to your body. If you have to move a large number of packages, use a push-cart.

iv) Work out a system beforehand as how you would do the job. The less time you spend with the cargo the less radiation you receive. When you have finished your job, try to stay at least a few metre away from the cargo.

v) Handle all packages carefully as if they are fragile.

vi) Although there is no or very little radioactive contamination outside the package, it is always a good practice to wash your hands with soap and water every time after work.

vii) Do not move any visibly damaged package or a package that is looking or showing signs of having been tampered with. Inform your supervisor of such cases.

viii) **In case of fire, use the fire extinguisher and inform the Fire Services Department and the Radiation Health Division as soon**

as possible.

For the Driver

i) The package should be positioned securely in the vehicle and as far away as possible from your driving seat. If you have a number of packages, position those with the highest Transport Index furthest away from you. Do not put any other dangerous goods into the same vehicle.

ii) Choose a route with the least traffic and drive carefully. Although the package design is such that it will withstand the damaging effect of a traffic accident, a severe accident or fire may cause the loss of containment and shielding resulting in leakage of radioactivity and radiation.

iii) Never leave the vehicle with the radioactive consignment unattended. Unless you are delivering the whole consignment to a single consignee and the consignment consists of light packages of category I or II, you should always be accompanied by a cargo handler.

iv) In case of fire, use the fire extinguisher and inform the Fire Services Department and the Radiation Health Division as soon as possible.

For Inspectors of Shipments and Supervisors

i) Since you spend little time in close proximity to the cargo, it is unlikely that you would receive more radiation than the handlers and the drivers.

ii) As an inspector or Customs and Excise Officer, you may wish to open a certain package and inspect the content, unless you are very familiar with what is inside, you should consult a Physicist of the Radiation Health Division of the Department of Health, who should be able to advise you on the necessary precautions.

iii) As a supervisor, you may have to make arrangement for the temporary storage of some radioactive cargo while awaiting loading. You should see to it that they are segregated from living quarters, places frequented by workers and members of the public, undeveloped photographic films and other dangerous goods.

iv) Double check all safety precautions when loading or unloading a freight container. A nasty accident may mean closure of the container terminal.

v) If you have reasons to believe that radioactivity is leaking out from a package or the package has been seriously damaged or tampered with, keep uninvolved personnel a few meter away from the package.

Inform the Radiation Health Division as soon as possible at

Office Hours :
Tel: 2886 1551 Fax: 2834 1224
After Office Hours : Tel: 6211 0058 and give your name and contact telephone number.
e-mail: rhd@dh.gov.hk Domain: https://www.rhd.gov.hk/

Q.7 What should I do in case a road accident happens?

In case of a road accident, if you have reasons to suspect that a package may have been damaged or is leaking, you should take the following actions:

i) Inform the Police, Fire Services and the Radiation Health Division as soon as possible.

ii) Try to keep the public away from the vehicle, subject to the overriding needs of saving life, until the Police or other help arrives.

iii) Keep at hand any consignment note, invoice or other document which will provide information about the nature of the radioactive material.

iv) Do not attempt to remove the load from the vehicle if there is reason to suspect that any of the packages containing radioactive materials have been damaged.

Q.8 If I want to get more information, what can I do?

Information on radiation protection can be obtained from :

Radiation Health Division
3/F., Sai Wan Ho Health Centre,
28 Tai Hong Street,
Sai Wan Ho, Hong Kong
Tel: 2886 1551 Fax: 2834 1224
E-mail: rhd@dh.gov.hk
Domain: https://www.rhd.gov.hk/