PRNC002

PRNC-2

(Health Physics)

wn

AND

REGULATIONS

By J. A.Ferrer Monge

---Page Break---

Pic = 2

(Health Physics)

HEALTH PHYSICS GUIDE AND REGULATIONS

by

Ay Ferrer Monge

Fuerto Rico Nuclear Center

operated By.

University of Puerto Rico

for

U.S, Atomic Energy Comission

Wayagwe, P.Re

Gcteber 1, 1959

---Page Break---

ACHHOMLEDOEENT

?The author expresses his appreciation to Mr,

Fedro Cruz, Mr, Fernando Vallecillo and Hiss Hyrian

Hy Vega of the Health Physica Section and Dr. J. Le

Garcia de Quovedo, Dr. W, W. Miller, Dr, , F. Bonilla

and Hr, Hector Barcelo of PANC staff for their patience

An reading the manuscript and valuable criticisns and

?Suggestions.

---Page Break---

PREFACE

Tats "Guide end Regulations" has been prepared

0 that sll personnel of the PRC and other persons

sociated with the institution can read then care-

fully end thus proceed as instructed.

Radiation protection can bo afforded best when

persons dealing or woriing vith radiocetive materials

snd sources of radiation follow good hous 21a prac

?tices and ?beerve rules, rerulaticns end recenmanda-

tions.

Tt is the responsibility of supezvicors to see

?hat ell persons under their jurisdiction comply

in full with the rules ard regulations cet forth

hero,

---Page Break---

CONTENTS

seitati See rut 2

ionminiaasess ?

soni

stage at ater Hae a

Appendix A

Definition of Terns 28

Appendix B

?Table I Decontamination Procedures a

Personal Decontanination 3

---Page Break---

Section T

organtzations snd Officers Associated with Radiological Safety

Radiological Safety Cornitien

Ay Membership

The Radiologion! Safety Cowittes, hereafter designated RS.

shall consist of the falieving mothers:

J- Director of the Puerto Hico lisclear Center = chairman

22 Director Reactor Frozren,

32 Director tuelear Scicnco Technology Program

Be nB.Gy Area Hears

Si Assistant, DisccMor Son Just Operations

ses Section

B Duties

The R.S.C. will hrve the following duties:

Ls To review and arsrove, cr sugeast revision of proposed regula.

?tons and procedires pertaining te radiation hazard and/or

contanination.

?fo review and axprove peepoved location of radiation areas

in regard to radiation hazard.

3. To pedal regulations and conditions of a tempora-

Ly To receive reports fron the Health Physies Section and

review then.

3. To review radistion incidontes

&. To recommend diccinlimwy cetion when any person using

radiolectopes and other radioactive material or radiation

gource fails to chcsrve ths eafety rules, regulations and

procedures as set forth in this coide.

To consider and toto action on any other matters pertal-

ning te raiiclon fety vhich are not duties of the

Isotope ani/o= To-inier? Connittees.

8, To keep recerds of the rectinzs of the committee in regard

to all trancactions considered under 1 to 7 and other

matterss

©. Heotings

The B,5.0, stall moct 2s érequently as required by circunstan=

ces, but net less Pan once six menths, Attendance of

?other appropriate parcons Sor a epocifie nesting may be

requested throach the Dircctor's offices

---Page Break---

IL, Taotope Connitteo

Ay Monber sh ip

?Thie comittes will consist at least of the following of when

fone will be appointed chairman by the Director of FRI.

1. Gne Padiochenist

2. One Radicbiclogist

fr Atuinistzstive Officer or his arpotates

Fead Health Prysice Section

By Duties

The duties of this comittes are:

1, To reviow and approve, procedures for procurenent of radioiso-

topes and proposal for use of guch material in the Puerto

Rico Huclear Cent

Prinazy consideration is given to the following:

st the person(s) requesting the material is

qualified to handle and usa the radioisotope(s) requested.

thet guitsble facilities are available to earry on the

project vhere the radioisotope(s) is to be used.

c+ ?that the proposed use of the material ie eafe as regards

?to radiation hazard,

2 To keep records of all the meetings of the comitte

Cy Mastings

Regularnaet: 21 be held every month. Special neetings

may be called at the request of the chaiman,

Ti,Technical Committee

Ay enberchi

Reactor Superviser = chairman

Hoalth Fhysies Section Head

UL other scientific personnel as required

By Duties

Ly Review emsrinents in the reactor facilities,

2. Review changes to reactor equipnent and/or procedures.

3. To reviex and approve in advanee propoaale for use of

reactor facilities,

---Page Break---

UL, Periodically review all aspects of reactor facility

operations for possible hazards.

3. Submit results of reviews and recomendations to the

Reactor Division Director and R.S.0..

6, Other duties as may be delegated by the Reactor Division

Director,

7, To delegate such authority to the reactor supervisor ac

they may find appropriate,

8, To keep records of all the meetings of the committee.

Meetings

The conmitvee shall mest as frequently as required by eireune stances, but at least one meeting shall be hold every six sonths.

IV, Radiation Safety Officer

The Head of the Health Physics Section is the Radiation Safety Officer. He is also a nonber of the R.8,, Isotope and Technical Committees The Radiation Safety Officer wili delegate special duties to one or more menbers of the Health Physics Section Staff, As head of the Health Physics Section his responsibilities are (fron the standpoint of radia-?ion safety):

A

?To review all proposed plans or projects for use of radioactive

materials and nske recommendations to the person(s) submitting ?the plan or project or to the person using the radioactive material on the appropriate uso of it,

?To review all plans for proposed use of sourves of ionizing fediation not covered in A above, such as accelerators, reactors, Jeray units, etc, and make recommendations to the experinenter fon the appropriate use of such sources.

To review all requisitions for radioactive naterials and sow oc and insure that a suitable location, storage area, ete, is aril able at tine of receipt.

To survey 211 incoming shipments of radioactive materials, their @istribution and storsre.

To supply personnel ronitoring instriments and instruct in their
To keep records of individual radiation exposures.

To keep records of urinalyei

To supply protective clothing and recommend use of the sane os set down in this guide.

To detemire exposure levels under working conditions including @istarce and tine Linits.

To survey storage and working areas as frequently as neceseary.

To reconnend methods ani procedures for radioactive waste ¢->~

posal and supervise the sane.

---Page Break---

To carry on a permanent personnel and area monitoring progran,

To supervise decontanination.

To calibrate and have repaired survey instruments and personnel

and area monitoring instruments.

0, To supervise the maintenance of records of receipt, transfer, disposal, ete. of radioactive naterial.

P. To keep tecards of accidents and incidents pertaining to radiation safoty such as spills, Ices of radioactive material, overexposures, etce

@. Supervize and? control procedures involving issuance, stocking, collecting, laundering and disposal of protective equipment, clothing, ete.

R, To advise on the design or alteration of installations involving sources of ionising radiation.

8. To make arrangenents for the proper training and indoctrination of personnel whenever necessary.

7. To carry on research and training pertaining to Radiological Physics and Safety.

U, With the advice and approval of the R.3.C. to keep thie Radiological Guide and Regulations up to date,

V, To prepare and distribute manuals, guides, or other publica.

tions pertaining to Health Physics as decned necossary.

W. To supervice and/or direct all irradiation facilities with respect to radiation safety (e.g. uses of the facilities, procedures, ete.)

?he Radiological Safety Officer is appointed by the Director and responsible to him for the fulfilinent of his duties.

Other duties and responsibilities not covered above are fully explained in the next sections of the guide.

Medical Officer

?Ihe duties and responsibilities of the Medical Officer are indicated ?throughout the succeeding sections of the guide only in his relation to radiation safety aspects,

Other Divisions, Departrents, ete.

Directors, heads, forenen, sipervisors, ete., must keop the H.P.S. Anformed of personnel apsigned to dutice involving poseible radia ?tion exposure in order for the section to provide the necessary personnel monitoring instrunonts. Other contacts of superrisore ?with the Health Physics Section are discussed throughout. the guide,

---Page Break---

Section IT

Fermiecible Exposure Levels

Table 1 gives the naximun permissible exposure levels (NPE) fron

external sources of ionizing radiation,

For the maxim permissible concentration of radioisotopes in water and air fefer to National Bureau of Standards, Handbook 69, Maximun Permissible Body Burdens and Maxim Permissible Concentrations of Radionuclides in Air and in Water for Occupational Fypaoure.

?The levels given in Tables 1 and, the NBS handbook shall. not be considered as tolerance levels and efforts jhall be nade to keop those levels as? Jew aB?p ossible, (e.g. as close to background values as possible).

---Page Break---

?Table 1. RECOMENDED LATS ON EXPOSURE TO EXTERNAL RADIATION

?ExrosunE: NATEOWAL COMMITTEE ON RADIATION PROTECTION & MEASUREMENT

PREVIOUS Tw

QCCUPARTONAE,

Critical organs +3 ren/week

(Gancludes the whole | 3" rena/quarter a ab

body, blood forming [15 rens/year b 5 rens/yoar ©

organs, gonads,

15 rems/year a

?ohees? of the eyes) "

Skin (whate body) 16 reey/yook a

30°? rene/year 10 rens/year c@

30 rens/year df

trenities

(sicin dose) 165 rens/wesk b 75 rens/year £

(WON-DOCUPATTONAL

Individuals in ? 1.5 rens/year WS ren/year (average)

vicinity of con

trolled areas a

General popudations | us rens/0-30 yrs, | 10 rens/0-30 yre

(average exposure to (3.3 rens/decado

gonads above backgrounal after age 30)

fron all sources)

a Exposure reeultang

a If «3 ren/woek a Tt Ae expected that modi

fron plant opera is exceeded, fication of the NORP recom

?AHony net anolue |b Assunes 50 work mendations will regult in

ing? backgroun: weeks per year the dropping of a wi

or medical exposure per yes Linitation. sear

D It Se expected that, nodi-

?fication wll regult in

quarterly Linit at 3.75

© Average dose/yr, lifetine

?cccupational.

4 Maximn in one year

© Double the MPD for eri=

?eal organs

£ Asounes 50 workweeks per

years

---Page Break---

Section IIT

Handling Radioactive Materiel

Preventive measures are the foundation of radiation protection, The Preventite and safety rules piven in this manual shall be enployed by all Personnel and enforced by the proper authorities. Laxity in following the rules set forth here will jeoperdize the safety of 211 personnel, Sneluding

?the violoator. In case of doubt on any procedure the Health Physics Section shall be consiilted,

I, Radioactive sources and radiation sources are divided into three Cate= gortess Category 1 (low intensity), Category 2 (intermediate intensity) Category 3 (high intensity). (See Appendix A for definitions).

IL, Intensity Levels and Zones:

In regard to intensity levels fron radiosctive substances or sources

?the following, as detected by survey and monitoring equipment, are established,

A, Radiation Area(s) and High Radiation Area(s). (See Appendix A for defini tion).

B, Radiation Area(s) and High Radiation Area(s) = shall be properly Indicated by use of aprropriate signs, Persone authorized to enter ?hese areas shall wear personal monitoring devices (e.g. dosineter, Pocket chamber) in addition to the film badge,

TIL, Procurenen?

Any acquisition by the FICO of radJoactive material from outside the Center, or cay disposal of radi.artive material fron inside to outside of the Center shall be carried out through tho Adviniotrative Office,

A. The Adninistrative Office shall notify the Health Physies Section of the scheduled arrival of ary radioactive material by filling the appropriate section of Forn Nov c=,

As soon as the Adninictrative ¢frice receives notification of arrival, he shall notify the Health Physics Section, This section will collect, survey and deliver the raterial to the appropriated custodian and notify the Aduinistrative Office of action taken.
The Health Physics Section will corplete the appropriate section of Form Nqéey, and sond a copy to the Acninistrative Office,

Transfer of radioactive material from one storage location to another

for change of custodian within the FRC shall be reported to the HP

Section before the transfer ix nade,

---Page Break---

HOTICE OF MIOMIMG OR OUTGOING RADIOACTIVE MATERIAL,

?To be Pitted by Administrative Office in Duplicate: Yow

Ineoning Outgoing

1, Date of this notice

Expected date of arrivel

3+ Material

3. Type of package

6. Approximate size and weight

Wuantity (C, me or ue)

Storage lecation-room No.

» Telivered by (car, truck, airplane)

To be filled by Health Physics Section:

LL, Parcel ~ Survey

12, Maximum radiation at (distance)

15. Prom (center or surface) Maxinun radiation st

2 rotor Qk. Instrument used

Contanination

. Bridence

YI. Tat. used,

S, Renarke (damaged parcol, no label, possible exposure to areas or persons,

ete.)

Delivered to 20. Date of survey

PRIG-HPS FORM WO, ?661 ?Signature of Surveyor

---Page Break---

?Transfer of radioactive material into or out of FRNC shall only be recorded and monitored by the HFS in eecordanse to spproved proce= Gures, This section will assist, if needed, in such transfer.

Form fiowéq will be filled in any of the above mentioned instances.

Storage!

Whether @ radioactive material is kept in a temporary or permanent storage, such material shall be clearly labeled, The Health Fhysies Section will supply upon request the required labels for all radio-active materials or substances.

A, Permanent Storage Area

(See Appendix A for definitions),

Entrance of unauthorized personnel to this area shall be res-
urieted by use of locks, physical barriers or any other con=
venient method. The Health Physics Section will affix aporo=
priate warning signs. Barricrs, vhen used, should be placed so
that access to surrounding areas will not Tesult in exposures
greater than 7,5 mren/nr or else a liniting tine access be used,
Permanent storage areas shall be maintained under the cognizance
of the Health Physies Section.

B, Temporary Storage Area ~ (See Appendix A for definition).

Temporary areas shall be proporiy indicated by means of warning
signs. These signs will be supplied by the Health Physics Section,
but 1i is the responsibility of supervisors to carry out related
regulated regulations and cafety measures (See section VaA above
song others).

Permanent and Tenporary Storage Space = any person can request space for storage of radioactive materials from the authobity Controlling the desired space, which nay or may not be the Health Prysics Section. The HPS wil give final approval. To apply for storage space £111 out Form ilo. /72 in duplicates

D. Storage Tags - tags for radioactive material in a permanent storage area call have the following information!

Yo.

Material cuantity, (6, me or we)

Date Measured Last Custodian,

Date of Storage

Description of source: (Such as: enclosed tn glass capsule, renote tongs needed, in powder or Liguid fomagrans or niliters, ete.)

Radiation Intensity efor ob (ehietdea)

---Page Break---

?HEALTH PAYSTOS SECTION

Transfer Permit

2, Dates 2, Requested by: 3. No,

h, Present custodian

5. Yew custodian

6, Present storage location (building and room)

7. lew storage loeation (building and room)

5, Description of material and quantity

9, Description of container(s)

10. Date when transfer will be made =

UL, Assistance needed from H.P.S.

?The requester certifies that the person to when the material deseribed abo"

is to be transferred (custodian) is acqu:

rd with the material and with

?he radiation hazards involved in using, handling or working with such nate=

rial. Furthemore the requester indicates that said person 4s acquainted

also with decontamination and disposal procedures pertaining to the material,

Hote: Use reverse side for additional space.

To be Filled Gut by the Health Paysiee Sostion

Pormit granted by

Date

Wot valia after

Penaz!

PRYC-HPS FORM wo, 662

-10-

---Page Break---

prfur at (unsnterded)

Contamination ¢/m (atpha)

cfm (beta, gemma)

HAPS, Date

VE. Reconmendations for? liandling Radtonetive Yatorials

A

B

General

Protection is best afforded in three distinct ways, or a conbination of then: distence, shielding, tine.

It is recomended pot to rush when using radiosotive materiale or substances, but person should not remain extosed to radiation beyond the tine required for completion of work.

The use of gloves, tongs, electronagnetic holders, renote pipetting Gevices, shoe covers, ete, are strongly recomended.

Whenver'the intensity field is such that the devices above are not ?enough, shielding shall be used to further assure protection,

Shielding

Because of the value and connon use of shielding for many opers tions involving use of radioactive substances oF sources, certain general facts should be taken into consideration (keeping in mind ?that shielding problens nay be very complex at tines).

1. For gamnas, lead (high atomic number) is the nost widely used material die to its high density and relative economy.

2, For betas, plastics (low atomic number) like plexiglass and lucite are the most widely used materials, With betas Brensstrahlung rays (secondary ganmas) are produced, AS a rule 1 carie of beta produces about 1 millicurie of gamma eq lent.

3, For beta-ganna sources in which Bronsstrahlung phenomena occur, ?8 combination of plastic and lead is frequently used.

L, For neutrons, paraffin and water are the nost widely used absor- bere and moderators.

-h-

---Page Break---

Section 1V

Contamination and Decontandnation

Contamination

Oriteria for Contanination

Any gp0%, area, tone, surface, etc, exceeding the levels given in Table 2 is to considered as contaninated.

?TL, Froventing Contanination and Spreading of Contarination

ALL radioactive mterial shall be considered ae « potential leaker, In handling or using redioactive materials or substances all itens which may becone contaminated should be considered as such until Proved otherwise by proper monitoring. This applies especially to tens used in conjunction with isotopes in class IT and IIT in Table 3, Glassware shall be thoroughly washed and nonitored after eed. ?Washed glassware chall be stored separately fron umsed Gaoovare, Any equipment, instrunont, tool, ete. of doubtful

cleanliness in regard to radioactive contanination that must re

paired ohll be monitored and approved by the Health Physics Section

before it can be sent for repair.

he following rales shall be cbserved while working or handling

radioactive material:

Ay Avold mnoking, eating or drinking of any kind, use of cometics,

ote.

B, Do Aot use telephone, nor handle reparts, ete, while wearing

doves.

©. No solution, regardless of its nature, shall be pipetted by

mouth, avoiding chance of ingesting, however, renote.

Dy Tn case ono has to leave the prenises be eure to wash exposed

parts of the body, in particular the hands, and check with a

nonitor.

Before leaving the prenise all protective clothing or equipment

such as shoo covers, gloves, coats, masks, etc., shall be left.

An the prenises,

Fs Custodians and/or supervisors are responsible for checking for radon Leakage, evory 3 months, all radiun sources assigned to then or to personnel under their supervision and notifying the Health Physics Section.

G, Tebles, laboratory surfaces, floor surfaces, etes which may Become cor: ainated during an experiment or in handling radioactive

material, shall be covered with appropriate paper towel, absorbent

paper, ete.

The Health Physics group will gladly assist in recommending mate

Fiala to be used in these cases.

-R-

---Page Break---

*su/9 Of 30 yun00

Poynos ore sxwous "2 COT ATeveMOdde 30 vas

?

?Rime oe 03 da

who os

zeq00)

woTony OOTY oy.ony BuUFAEOT

?xouyeyuG SodoqOS TOTREY

suf Sz > oot oprsano

sy/sa Ont #/2 Oot w/o of coat

049) se0us

sym 20 uo ost Burtnot> Tevosseg

Shae 70 ext? 006 uo o> oreo

Fy co spagt/? 006 w/o or eprsuy

wp come (teveesed) ?2004

sar 2°0 4/2 05 rraeoe9p su w/o ore "sta" 04 ques worgean

?reo soy equounsaeuy

erqeioe72p stow up oz sraeisevep ovou 0 ot ions

se posn soopzyo BuTpRTD

erqey9%9p ouow w/o 02 oraey2ove" uo wo or

sy 240 w/9 08 erqersevep oven af ov,

sry/ae 542 yo oo2 eraerse16p suo woo

ays 170, ayo ost Sumoty exryo0.0%g

suf 0 as!/? 05t eog poe SpueH

Eiki = em as ae

ear poyeuruqu0

We pee

Retr

?TOLD. TNGG0O WaWO/Vide GAY VEdTY SSOHO Wor STAANT STMISSHMNE TITIN

C

ed

---Page Break---

?TABLES. CLASSUFICATION OF RADIOTSOTDPES accoRDTNG

"TO THEIR RELATIVE RADIOTOXICITY WITHIN THE BODY

Hazard Class | Activity Level * Maxigun Permissible. Cant:

Class 1 ernedia

Slight Hazard i or [Fatemediatt igh

Bel, 2, ese, oy :

4075, A577, 285, ng? |

i

a _{"%

g

z

a

ted ne | 2 to $0 mej 50 me up

1.0

Clase 1

Moderate Hazard

!

|

WB, UM, Aya?2, p32, 935, 7

a, na, Hes, 29%, Le 500 we|s0 wo to

45,95, % 03, ogl2T, 129 5 me

pa, #37, Hild, #10

coll, ppAh3, Hygah7, %,298

44199, 120, 205

4

1.0

|

0 50 uc 50 uc to

500 we

:

i

'

:

Very Hazardous |

be

t

|

1

a

$$$ +.

cal, 7055, 52,

22255, col, pal, 94210

8

$00 ue up} 0.2

SModifiod after Table 1. NBS 43 UB.1951

Monitoring Instrunenté for beta and gama read usually in mr/hr ot ¢/m, Instruments for beta and alpha usually read in o/n or mrop/a, but for practical purposes in radiation protection the rep and rad difference can be neglected, The rad io the officially adopted unit of absorbed dose.

Mids assuxes 10% transferable alpha, beta or gama, These values are for body con ?tanination only, Values for group contamination other than body are found in Table 2.

-u-

---Page Break---

a

Le

All laboratories or other facilities making use of radioisotopes shall have a properly labeled solid wastes can and/or a liquid wastes container of the type specified by the HPS,

Equipment or materials (e.g. gas cylinders, instruments, reagent bottles, etc.) used in areas of radioactivity shall be checked by 4 Hoalth Fhyoies surveyor before ?they are discarded or transferred or returned to stock rons, etc.

Hops and brooms used in cleaning "hot" laboratories,

high level activity areas or any other area where radioactive substances are used regularly (e.g. Radice

chemistry, Radiobiology labs.) shall never be used to clean other areas, nor placed topether with nops and bbroons used for cleaning Neold" areas, laboratories, offices, classrooms and the Likes

Whenever a radiation area is to be vacated the Hoalth Physies Section shall be notified, The Section shall nake fa survey of the area and if this ie found to be contant~ nated above pernissible levels, will request decontanina~ tion by the person or persons vacating the area, The Health Physics Section will give final approval for Feoccupation of the areas

Spills (see Appendix A for definition) shall be reported

to the Health Physics Section inrediately, In case of

doubt as to how to proceed, contact the Health Fhysics Section, Spills shall be cleaned as? soon as practical, If the radio active material is in liquid form, blot with blotting paper

(aot tovel paper) using rubber gloves, If in powder fom
clean with damp paper towel. Be gure paper is not soaked
wet. Wear rubber gloves. hen dry, monitor and proceed
With decontamination. (Part V of this sano sostion).

Any lass iten in a laboratory or other roon where radioiso=
?topes are present shall never be taken to the glass blowing
shop. For this reascn, it ie qiggosted that glace items
(e.g. beakers, glass tubing, pipettes, tect tubes, eter)

in laboratories and roons where radioisotopes are stored

?or used, be kept in enough quantities to neet the needs,

all other glaco itons of no inrediste use chall be stored

in an appropriate place in accordance with tho idea expressed
above. ?In addition pipettes, glasovare, tubing and sinilar
tens in a laboratory shall never be allowed to touch one's
mouth.

Centrifuges chall be used very care*-lly to avoid spills and/or
contamination. They stall never be operated with the lia
open and the centrifuge tubes shall never be filled less than
1 fnch fron tho rin when radioactive solutions are used,
Note: If contaninant is an alpha cxitter use your best

Judgenent in monitoring. Portable alpha survey neters are

Bot as efficient as other instrunents. The Health Physice

Section will take "snears" if requested or necoosary.

~w-

---Page Break---

TII,Protective Clothing

Ay Expendable clothing (see Appendix A for definstion) wll be

issued to all personnel working in areas where contanination

possible. All expendable clothing that can be laundered

shall be properly identified by a serial marking to indicate

its assigment (including that used by the Health Physics Staff),

By Sone expendable clothing (e.g. paper clothing, plastic shoe

covers, etc.) shall be dscarded after using it once, Other expendable clothing will be discarded accordingly.

©, The Health Physics Section will supply laundry hampers or equivalent for the collection of expendable clothing to be Amundered, One hamper is labeled "Cold Clothing". Garnents giving under 150 /m for alphas and less than 700 c/n for beta-garma, when checked with a laboratory survey instrunent, shall be thrown into this hanper

?The other hanper is labeled "Hot Clothing". Garments reading 150 ¢/m or nore for alphas and 700 e/n or nore for beta-gama ?shall be dumped into this hanper, (See table 2 "Naximm Permix seible Contarination Level 8").

?These hampers shall be used only for fabric clothing,

Protective clothing shall be monitored by the wearer daily before leaving works

?he Health Physics group will collect these hanpere at regular
Antervals.

TV, Contaminated Tools and Equipment.

?This applies to any iten used in handling, transportation, machining,
Gisposal, etc. of radioactive material that can be called tec) or
equipment in the conventional way.

Contaminated tools and equipment shall be casidered as radioactive
material and treated as such until properly decontaninated and proved
to be so» Whenever tools and equipment are suspected of being con-
?taninated, consider then a such until proved otherviae.

Wnonever tools, equipment, glassware, containers, etc. are definite.
ly contaninated, they are?to be placed under water, wider an opera
ting hood or on'top of blotting paper, (whichever the situation
calls for), until decontaninated, but? they shall never de alloved
to rest difectly on exposed surfaces of any kind nor shall they

bo stocked in a storage room or any other Foon on exposed surfaces,
for future decontandnstions

Any itom that has been cleaned and decontaminated shall be monitored
?to assure definite decontanination.

- bs

---Page Break---

%

Decontanirat ion

A

Responsibitity

It is the responsibility of individuals working with radioactive
?substances to get acquainted with decontanination procedures,
particularly suited to their work and they shall be responsible
to carry on these procetures and to take the necessary steps to
avoid spread of contanination to other area:

It is not the responsibility of the Health Physics Section to
carry out decontamination, except when the contaninated material
is such that only this departnent has the facilities to do it
for when a serious problen of contarination nay develop. In
that case this departnent shall be notified at once to take care
of the situation,

?The Health Physics Section shall be consulted at any tine in case of doubt to furnish advise or assistance.

Cute, Vounds and Lesions

Personnel using or vorking with radioactive materials receiving

?a out, wound or lesion shall report at once to the Hedical Officer for diagssis and treatnont, The Medical Officer will notify the Health Physics Section,

If a person is actually engaged in work using a radioactive substance which nay contaminate a cut, vound or skin lesion, proceed as follows:

1, Wash the injured area nnediately sith running water. Apply pressure while washing. ?he tine factor e very inportart to reduce the anount of absorption of contani-nat (if any were present).

2. Notify or have soneone else notify the H.P,S. at once.

32 Secure medical attention as necessary, lio 'parcon under any eireunstance ehall employ antiseptics or self-treat-Rents Any person receiving a cut, wound or ckin lesion should report to the Kedieai Offiger for clearance before

Working oF using radioactive substances again.

Laboratory Equipment, Tools, Apparatus, Materials, tes

Whenever an iten is to be decontaninated the person or persons in charge shall wear rubber gloves, In addition, an apron or coverall (whichever is best for the particular case) and shoe covers or rubber boots (whatever 4s best for the particular case), shall be worn, If fue are involved in the procedures, assault or gas masks shall be worn,

Ordinarily, the majority of contaminated ttene can be

=e

---Page Break---

decomaninated ty the person using these itens or by sone one assigned to this job (not a rember of the Health Physics staff),

Decontanination of low contaninated itens shall not be carried out in laboratories and working areas where teaching and/or research is done as this nay create a potential hazard and/or nay affect background levels.

4A2 itons in this group which are not going to be decontani-
nated imediately shall be properly and clearly labeled

using a sticker, label or tag indicating "Radioactive Contani-
nation" until decontaminated, Such itens shall be placed in a
decontamination room, expedially if bulky or in large nunbers
(eg. part of a machinery, several beakers, etc.)

Wherever they are temporarily staked they chall be placed on
?top of absorbent paper or blotting paper, under water, under
?a hood or in a well exhausted room

As stated in part V of this section, subpart A, the responaibili-
ty for decontaninsticn is taken over by Health Physics Section
only in serious cases of contamination,

However, if a person is not familiar with decontanination proce=
Gures not covered in this guide, the assistance of the Health
Physics group shall be requested, Also, if the physical charac
ter of the contaminated item is such that it can not be decontas
inated with the conventional equipment and materials, the
services of the Health Physics Section shall be requested.

In case of doubt always consult your supervisor and if he can not
help consult the Health Physics Section.

VI. Recommendation for Decontanination

Ae

Genera,

Decontanination is a conplex problen depending on the type of contaminant and the contaminated material, therefore only General decontanination procedires are considered here, giving Particular attention to hand and body deccntanination. Table T (appendix B) presents a list of general routine decontamination procedures, ?the table is to be deed only as a guide,

Personal. Decontamination

In case of persona contamination the procedure outlined in ?Appendix B ie recormended.

- we

---Page Break---

Section ¥

Personnel Monitoring

of personnel monitoring devices, all of which
have a definite ase for a particular type of work with radioactive
material, or to gather specific information in regard to exposure
dose received by personnel. These devices shall be worn ao indicated.
Failure to do oo will be detrinental mainly to the wearer,

Ay Film badges - these badges, made of metal, plastic or cardboard
about Iel/s x 1-3/l, inches in size, shall be worn at all tines
while the! person is within the controlied area (see Appendix A
for definition), ?The badges aecigned will be of 3 types.

1s Permanent, badges ~ every permanent, employes or person a580-
ciated or visiting PRIC fer a period of tine of one year oF
ore will bo assigned a pernanent film badge.

2, Temporary badges = are assigned to persons temporarily em
ployed or associated or visiting the Fuerto Rico liuclear

Conter, for a period of not lees than 3 monthe nor greater

than one year (eng. remular students, part-tint exployees,

eten

Visitars badges - are assigned to persons exployed, wesoe!3-

ted or visiting either regularly or irregularly for a period

fron 88 to 12 weeks.

1k, Hegardless of typo of badge, this shall be worn with the nane toward the fronts

5. Tho badges shall be worn sonevhere around the chest level, outside of all clothing. For persons engaged in special york Sore the hands are exposed nost, wrist Pages vill be iesuede

6, Badges shall be picked up every aorning fron a badge rack lo-cated in the main lobby. The rack is rhnbered serially to correspond with the fin badge
Sedges shall be returned to thet proper place in the rack on Joaving the installation. meee
Tho film 4a aoneitive toa certain extent to temperature, Ine Ridity and heat, therefore, the bedges shall. never be texpered with, taken hone, Left in the dravers or oa top of cold or hob surfaces, ete. if this is done an erroneous reading ay be Fecorded for the person to ston the badge was eesigneds

& Persons employed, associated or visiting for less than 8 weeks

ay or nay not use pocket chanbers and/or dosimeters as doter-

ined by HP.S,

---Page Break---

De

Pocket dosimeters - these are self-reading fountain pen type

electroscopes.

1, These dosineters are assigned by the Health Physics Section to personnel working in radiation areas here the possibility exist of getting an exposure dose greater than LO millirens of X or betarganna radiation in 8 hours (see table 1 Maximum Persnissible Exposures to External Radiat ion).

2, Personnel using pocket dosineters shall be instructed by their Supervisors on how to read them,

3. Pocket dosineters shall never be handled roughly.

Pocket dosimeters shall be picked up from the rack in the nor ning before starting to work, Dosineters are placed next to the badge in the sane rack used for badges, in the main lobby, in slots provided for thems

Before leaving the installation they shall be returned to the rack,

Pocket dosineters are read daily by the Health Physics Section. The section will assign 2 dosimeters to a person, if there are enough available.

Pocket chanbers ~ these devices are sinilar to pocket dosineters, except they are not self-reading and have to be read in a special

instrument in the Health Physics Section.

Pocket chambers are assigned by the Health Physics Section to Personnel working in radistion areas where the normal exposure in 8 hours is not likely to exceed li millirene of X or beta~ ganna radiation and to visitors, since they do not wear X-ray film,

2, Pocket chanbers shall be used in the sane manner as pocket dosi- acters and handled, picked and returned every day as? instructed for pocket dosinetérs (see B 2 and 3 above).

Conbined pocket. chambers ~ these chanbers are similar to the pocket chanbers described under C above, except that in addition to being Sensitive to X, beta and gama radiation, they also detect thermal neutrons.

?These chanbers read in terns of alllirens,

These chanbers will be assigned by the Health Physics Section to personnel working in areas where the possibility exists of being exposed to mixed radiation (e.g. near the reactor).
Conbined chanbers shall be used like pocket chanbers described under C above.

?These chanbers shall be handled, picked up and returned every

Gay 25 Instructed for pocket dosineters (see 2 and 3 under 8

above).

Weutron pocket charbers = these chambers are sinilar to those al

ready described except that they are used to detect thermal neu

?trons only.

---Page Break---

These pocket chenbers also read in millirens,

1, These chanbers are assigned to personnel working in areas where

the possibility exist of getting an exposure of LO nrens or nore

In 8 hours due to thermal neutrons,

2, These chanbers shall be handled, used, picked up and returned as

the other chanbers described before,

F. Others - the Health Physics Section keeps a number of pocket dos ine=

ters (self-reading) for energency cases, There are 3 types of these

Gesinsters: full scale 200 mr, 5 r and thermal neutrons.

Issuance

?The Hoalth Physics Section will issue the proper personnel monitoring instrunent(s) subject to the following:

1, It is the responsibility of supervisors to notify the H.P.S. of Personnel uncer their supervision as well as visitors.

2, Tis supervisors note shall include the position (job) assigned to said personnel to facilitate issuance of the appropriate per~

gerne] ronitoring instrunent(s), In the ease of visitors the

area or areas to be visited shail be indicated,

infornation (above) should be in the hands of the Health

Physics Secticn at least 2 days before enployee reports to work, or visitor arrives.

4. Upon receipt of notice from Supervisor, the Health Physics SESE TILL seterning and issue the appropriate personel mo- itoring instrunent(s).

---Page Break---

QR

In

am,

mw.

Section VI

Radioactive Waste

Genoral

For practical purposes radioactive wastes are divided into three broad classes.

Liquid Waste

Liquid waste shall be placed in appropriate labeled bottles or containers and a tag affixed by the person in charge indicating the radio-Asotope(s) present.

A, Radioisotopes shall be placed in separate containers ae follow:

Shortelived radioisotopes shall be placed in a separate con=
?tainer fron the mediun-lived and long-lived ones. Short
Lived radioisotopes shall be considered those with a half
Life up to 20 days; modiun-lived, those with a Half life fron
20 days up to 210 days; long-lived, those with a half life
greater than 1L0 days,

2, Regardless of half-life no Miguid radioactive waste shall be
@isposed of by pouring into drains, except those deeignated
or approved by the Health Physics Section, Furthermore the
H.P,S. shall approve the disposal whatever means is employed.

3. Wo liquid radioactive waste, whatever its origin, will be
released with an activity greater than 1x 10"> te/ec, This
will assure an activity not groater than 2,63 x 10-? we/ee
of sewage.

Solid Waste

Dry radioactive waste such as papers, towels, Kleenex, ete, shall be
placed in appropriate labeled cans. ?Radioactive waste containers

shall never be used for deposition of uncontaminated material. The cans should be monitored as frequently as good judgenent indicate? by the regular user(s) and if found to exceed permissible levels the Health Fhysics Section should be notified so that waste may be taken to disposal or storage vaults whichever the case may be.

Gaseous and Airborne Radioactive Waste

Radioactive Wastes in gaseous form shall be controlled so that their release to the atnosphere will not result in activity levels in wor-

King areas greater than the pormisolble levels indicated in NBS H5-69, when measured by appropriate monitors.

=

---Page Break---

Section VII

Radiation Souree Equipment,

General

Accelerators, Xaray units, teléthérspy units using radioisotopes a9
source of radiation and other equigment capable of producing radia
?tion are to be considered as sources of hazardous radiation. The
Hazards associated with such equipment is mostly external and as such
Section I applies.

In addition the following regulations are to be observed.

a

Surveys

1, A survey shall be made for all energy levels at which the equip-
nent operates.

2, A survey shall be made whenever there is a significant change
in bean direction, shielding arrangenent and type of target.

3. The Health Physics Section will carry on the surveys mention=
ed in 1 and 2 above, but it is the responsibility of super-
visors to notify the section at least 2 days in advance of
proposed work te be don

Protection

1, fiigh radiation intensity areas around facilities using this type of equipment are considered High Radiation Areas and regulations pertaining to such areas apply (See Section ITT-113).

2, Interlocks, mazes, warning devices (alam systens), ete. shall be installed in stich a way as to prevent entrance into the facility while the equiment is in operation which vould result in an accidental exposure.

3. It is tho responsibility of the person(s) in charge of these facilities to cee that all safety equizment is working properdy st all tines and thet appropriate warning signs, protective barriers, ete, are in use.

The Health Physics Section, upon request, will furntsh acd pert warning signs, establish physical barriers and conduct surveys whenever requested (see A-l, 2 and 3 above).

i, Any person assigned to duties with Ieray and telethorapy wits must fantliarize hinself with the National Bureau of Standards Handbook 60 "X-Ray Protection? and sign a statenent to this effect. Only those persons signing this statement shall be authorized to work with I-ray Teletherapy units.

Be

---Page Break---

?The signed statement will be kept by the Health Physics Section,

C, Radiation Source Statement:

In accordance with the regulations set in this section, part B,

sub-parts l, Form lio, 663 shall be filed with the Health Physics

Section, before authorization be issued for work with X-ray and

teletherapy units.

---Page Break---

PUERTO RICO NUCLEAR CENTER

operated ty

UNIVERSITY OF PUERTO RICO

Por

U.S, ATOMIC ENERGY comsrssToH

Radiation Source Equigment Statenent

Yo. (do not £111) Date

1 » hereby certify that in seconde

ance with Section VII-I, BL and C, T have read and fantliarized myself with:

National Bureau of Standards, Handbook 60, "X-Ray Protection",

Also I certify that (I an, I an not) qualified to operate the factlity(s)

described in the above mentioned handbooks

Signature

Approved by

Health Physies Section

HPS FORM NO. 663

= =

---Page Break---

Section VITE

Protection of Construction and Maintenance Workers

\menever construction and maintenance personnel are requested to work in a radiation arda, the request for use of such personnel shall be approved by the H,P,S.To?assure protection fron radiation hazards, it is the responsi? bility ofthe supervisor(s) concerned to be certain that said personnel under their supervision are acquainted with the offical radiation signs and obey ?he instructions given thereon. Furthermore, the supervisor(s) concerned shall submit at least 2 days in advance the nane (s) of construction and main tenance personnel assigned to work in radiation area(s) to the Health Puysics Section in order that the section can determine tho preventive measures to bo used (Af any) and take the necessary steps. After completion of the job the supervisor(s) will notify the Health Paysics Section in order for the Section to conplete its termination procedures.

Ef needed and/or requested, a Health Physics Section staff member will give 9 briefing to construction? ahd maintenance personnel on radiological safety.

---Page Break---

Section IX

Holidays and After Hours

The regular vorking hours at the Puerto Rico Nuclear Center are from 8:00 AE to 12:00 Tew) and from 1530 PH, to $100 P.M, Monday through Fridey, et which tine the Health Physics Section and the Medical Offic cffer reguler service,

sie inv ving oe of radloastive substances and/or radiation sources on holidays and after hours (5:00 P.M, to 8:00 A.M. Monday through Friday) GclL 02 rutifisd at least 2 days in advance to the Health Physics Section i Boing tie responsibility of the person(s) doing the work to insure that eeupuste rorsenél and area monitoring metere are available.

Scction will pive final approval for vork to be performed

hours.

---Page Break---

Appendix A

Definition of Terns

Generals

In this section a nuber of tems are defined from the point of view of Heaith Paysice or Radiological Safety, These definitions are generally in complete agreenent with the definitions used in other related fields, but sone differ to sone extent.

Definitions:

Airborne Radioactivity Area ~ any roon, enclosure, or operating area

En wich alfeonms Fadiouctive materials exists in concentrations in ?excess of the anounts specified in NBS Handbook 69 for (0 hour week or in concentrations which averaged over the number of hours in any york Guring which individuals are in the area exceed 25% of these vax nes

Container = any object used for temporary or permanent contaiment of Fadioactive material regardless whether the container is used or not for protection fron radiation(e.g. capsules, boxes of say kind of na~ terial, Jers, beakers, cans, shipping containers, ete.).

Controlied trea (Restricted) ~ area under the supervision of a radii Gon safety officer. This implies that a controlled area is one that requires control access occupsncy and working conditions for radiation protection purposee, All facilities of P,Rull.C, wherever they are nested are designcted as controlled areas and subject of the rules, rogulations and procedures given in this guide.

Griticel Organ - in regard to maximum permissible exposure from exter=
?al sourde cf Lonising radiation the critical organo are? the sole
Dody, the head and trunk, the active blood forming organs, the gonads,
the iens of the eyes, In regard to the maximum permissible concentra-
tion of a radioisotope in the body in air and water the critical organ
is that organ receiving the radiotsotope that results in the greatest,
Gamage to the body.

Gurte ~ is the untt of activity of radioactive substance or material,
Uae gerie te that anount of a radioactive material or awbetaree in
eee Deg eeher of derlntageetians per-seemnl 26 5.3 = 3 (ic
3.7 x 1010G/a). One nillseurie {a one-thowsandth of a curie (1 ne =
3:7 x 107, a/2); and one migrocurie ie onecmiliionth of a curke

(G.7 x 10! d/s = 2,22 x 10° a/m).

Excendable Clothing ~ clothing that cante disposed off right after
Sie if navesnary (e.g. shoe covers, gloves, ete. +

Expocure Dose (R) of X or Gamma Radistion - at a certain place is

Feasure of the railation that 1 based on its ability to produce ont

=e

---Page Break---

Health Physicist - any member of the Health Physies Section staff quali-
Fiat ty Walsing cod tayerinane te carey ce reblanion surveys, sane:
ring, setting up calibration facilities, waste disposal nethods and faci-
Lities, etc, and all other normal duties commonly assigned to a Health
inysicist.

Health Physics Surveyor ~ designates a Health Physics Section nenber
those Gaby ie prinRHLTy tnat of surveying and nositoring an regard to
radiation safety.

High Radistion Area - means any area, accesible to personnel in which
TEs cristo radiatiooy st such lovale thst? a mijor portion ofthe tegy
could receive in any one hour @ dose of 150 nillirens.

Maximus Permiasible Concentration in Air and Vator (Wfcg, HO,) = is a 7

value expressed in uc/eo of air or uc/m of water, tO denote the maximum
Permissible concentration of a radioisotope in the corresponding nediun,
Values of MFC are given in 1BS Handbook 69.

Maximum Permissible Exposure or Dose (NP2), (NPD) - is a value, expressed

ERalig-an nilliveno, to dongle masta popmionible emponare to" ceternal

radiation allowed to? persons.

NPE values shall not be considered as tolerance values and efforts should be made to haintain radiation exposures to personel below the recomended HP values,

?These values are given elsewhere in thie guide.

Permanent Storage Area ~ is an area solely used for storage of radioactive aaterial oF aubetanoed.

Radiation Absorbed Dose (rad) - is the unit of absorbed dose (energy inpar-Red to matter per unit mass at place of interest), One rad 1s equal to 100 ergs/gn of natorial.

Radiation Area = means any area, accessible to personnel, in which there ?Grist radiation at such levels that a major portion of the body should receive in any one hour a dose (abeorbed) in excoss of § nillirens, or

in any 5 consecutive days a dose (absorbed) in excess of 150 millirens,

Radiation Safety Officer ~ to used to designate the Head of the Health

Fayeice Seotioae

Radiation Source ~ this tem, although it includes radioactive substances

?in materials, is frequently used to designate aachines or equipnent that

can be used a6 a source of radiation, like particle accelerators, X-ray

diffraction nachines, ete.

Radiation sources aro divided into three estegories defined ast

=

---Page Break---

Category 1: Those sources which have such low intensity that they

Say be fated, inshielaeg for a Tid Stour day sietowt comeing

greater then the permissible daily dose of 60 nrens.

Cate, ?Those sources which only can be handled at distances ?Eos than io ft, sor short tines (lees than 8 fa) without sassing greater than a pornisstble daily dose of 60 mrens. This category includes intensities up to the maximm which can be handled outside of hot cells or other massive shields,

Catepory 3: Those sources of such intensity that they cannot be Taniied biteide of hov cells or other passhes amuses.

Radioactive Substance, Material ~ any substance, material or item which exits oF prodices one Or tore types of ionizing radiation, whether this ie an inherent characteristic or not, Radioactive standards, radioisotopes, calibration sources, are exanples.

Relative Biolonicel Effectiveness (REE) - is the inverse ratio of the

eee of two different radiations necessary to produce the sane biological effect.

Roentem(r) - is the unit of exposure dose of X or gamma radiation.

One Foentgcn ic that. exposure dose of X or ganna radiation such thet the associated corpuscular emission per 0.001293 gn of air produces, in air, dons corrying 1 electrotastic unit (esu) of quantity of electricity of either sign,

Reenteen Zguivalent Han (ren) - is a unit of absorbed dose taking in

Easaeltration SEE Tap ror aan types of radiation.

4s used here it is the product of the absorbed dose in rads of parti-

cular type of radiation and ite corresponding REE (relative biological

effectiveness) value. Its use is limited nostly to radiation safety
atenents in regard to naximim permissible exposure to external radiae

?ion and maximum permissible concentration in water end air to interne]
radiation.

Shad. - as used in this guide implies an order indicating absolute neces
Sty of following the recomendations.

Spill ~ a used in this guide moane the lose or escape of radioactive
Raterial from a container by whatever meand this loss nay occur (eg
leakage, jolting, turn over, breakage of container, of

Temporary Storape Area - an area not solely used for storage of ve.zocsiive Kaverial Or substances, for example, a shielded area of a laboratory, a cabinet in a room, eve.

Uncontrolled Ares (Unrestricted) - area not under the supervision of a Fadlation safety officer.

---Page Break---

APPENDT

B

?Table I

Decontamination Procedures

General ~ Floors, laboratory table tops, benches ond other surfaces never shall be cleaned vith a dry nop, brush or any other item that can be used for cleaning. Always use @

wot or ofl nop, brush, paper tovel, etc. to avoid a dust hazard,

asswere

Porcelain

(with full glaze)

Stainless Steel

Brass

Plastics

Paints

Wood

we

2

chremic acid cleaning solution

Tide or other detergent and vam

water

amoniun citrate, trisodium phos=

phate, amoniun Oiflueride

sane as glass

sane as (2) for glassware

Radiac wach

dilute nitric acta (108)

108 solution sodiun citrate or

other inorganic acid

hydrochloric aeia

wet abrasion

sene as (2) for glassvare

Radiae wash

brass polish

wet abrasion

sane as for (2) glassware

20% solution amoniun eitrate

organic solvents

106 nitric or hydrochloric acid

sane as (2) for glasevare

sodium citrate 10% solution

organic solvents (turpentine)

carbon tetrachloride

caustic soda or potash

wet abrasion

paint

Af not painted or othersiee covered,

?but treated for porosity, plane and

collect shavings

paint

---Page Break---

Quntmun 1, sare as for (2) glassware

2) Radiac wash

3, 108 solution of organic acid

iu, woak inorganic acid

Concrete and brick Ls wet abrasion

21 chiseling or complete removal

?This in many cases is the best

3s paint if snocth surface

Asphalt tile 1, Tide or other detergent and warn

water

2, replace

Rubber tile 1, Tide or other detergent and warm

water

24 Radiae wash

Br 12h avarochterte or nttrte aot

2 replace

Linoleun 1, sane as for (2) glassware

22 earbon tetrachloride

3 kerosene, dilute mineral acide

Vinyl plastic tile 1, Mde or other detergent and ware

water

2, 10K hydrochloric or nitric acid

32 208 hydrochloric or nitric acid

Ls replace

Coranie tile 2, mineral acids

2) amoniun citrate or trisodium

Phosphate

Dust spills Contact Health Physics Department

since this requires a vaccun

cleaner,

Note:

1, If contamination is due to an alpha endtter and decontanination

to the acceptable lintts can not be accomplished, but is very

close to it, 4f of short half-life, cet apart until contanination

is within Linits; 4f of long half-life coat with shellac, varnish

oF paint 4£ possible, in case of valuable equipnent.

Tnorganic acids should be used with caution. Acide funes may be

toxie to personnel and there is aleo tho possibility of corrosion.

3+ Organte solvents should be used with great caution as many are

taxie and flamabli

---Page Break---

APPENDIX. B

Personal Decontaninat:ion

1. Check contaninated area(s) with a survey meters

2, Wash thoroughly contaminated area(s) with warn water and Tide, or

similar detergent for about 2-3 minutes, working a good lather.

Dry well with paper towel, Check contamination again, If it has

been reduced, repeat step 2, two, three or four tines as long as,

there is @ reduction in contanination counts witil this falls
?below the maximun permissible contanination level. If after two
consecutive washing counts renain the sane without reaching to-
lerance level, proceed with step 3.

3+ Repeat step 2? using a hand curgical brush, being earefw not to
apply excess pressure so that the bristles scratch the skin
Repeat step 1, Do not wash more than three tines, 2 minutes each.
If no results proceed with step lor bas

kus Moisten your hands and apply eitrie acid erystals. Rub for about
3 minutes. Repeat 1 again, IF not euecessful try ha.

ua, If contanination 4s known to be due to fission products use titas
nium dioxide in step ly instead of citric acid. However T.D, has
proved good for other contaninants besides fiseion prodict:
?Add encugh T.D, in the palm of your hands to forn a paste
available in paste forms

Work this paste well over contaminated area(s), but be sure to
prevent hardening of the paste by adding water sparingly, for about
2 minutes. Rinse thoroughly with vara water, then use water and

?Tide and scrub with surgical brush assuring that no paste rerains

under and around fingernails or it will form a hard cake which i

Gifficult to removes

Repeat step 1. If step l or la fails to reduce contanination below

tolerance level proceed with step 5.

apply potassium pernangenste (i0ind,) ~ sulfuric acid echution

Freshy made solution ef equal votunas of a saturates potassium per~

Ranganate solution and 1% (er O.2I!) eulfurie acid solution) and

serub with brush for NOT nore than 2 minutes. Rinse thoroughly

with wara water, Repeat step 1. (Exposure to solution for more

than 2 nimites say rexove a layer of sin). Step 5 can be

repeated up to 3 tines,

Jf and vhen decontantnation is satisfactory proceed with (b)

be liash hands thoroughty with a freshly made 3% sodium ackd gulfite

(aiis0q) solution to renave the permanganate stains

ce Wash with Tide and warm water, Dry well with paper? towel.

HE ail the netnods described fail Yo eacontantnate proceed with

step & .

?gply lanolin or an equivalent hand crean to contaninated areas to

soften ding

- 3.

---Page Break---

Notes:

Bt Apply solutions to the neck, ears and face with absorbent cotton.

bs Keop two goacr=te 100 cc bottles, one with a setureted soise

?ion of potassium permanganate and the other with the 1%

gulfurie acid solution

c+ Keep several 10 gn. packets of sodiun acid sulfite to dissolve

in 200 ce of water.

4 Reminders: used paper tovels, and brush if discarded, chal?

be dumped in the dry radioactive waste can.

+ Contaminated clothing shall be pleced in a paper bag and dune

Pad in the corresponding hanper, but if the clothing ie very

wet, place in plastic bag first,

Bo tOt use oxalic acid NOR organic solvents for decentanination.

Before starting decontamination, if this is very low (as iar

Seated by monitoring), you may?carry on decontaninstion without

fy help. Keep cain all the tine, Avoid spreading conterinerien

by grasping detergent container, solution bottles, ete, with «

Raper tovel. If help is required, uhoever assists in decontani-

nation shall wear rubber glove:

---Page Break---