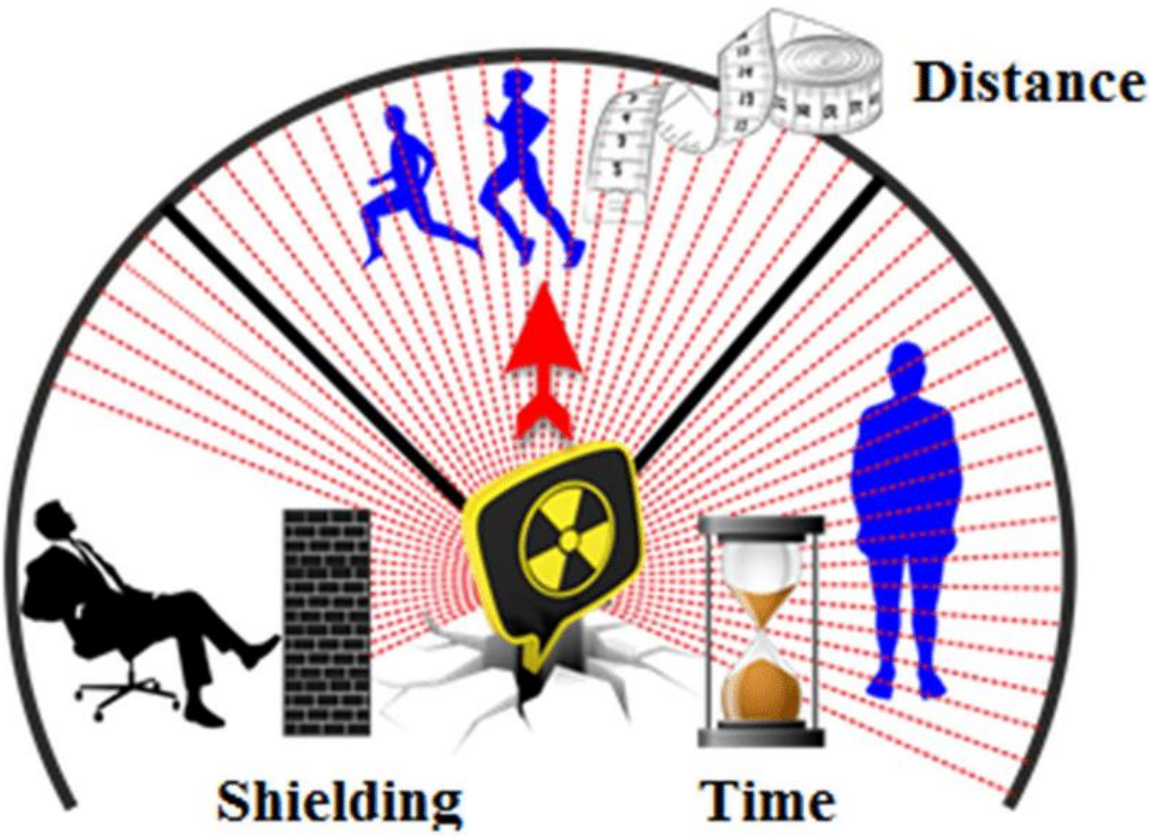
Prokem
SPECIALITY CHEMICALS

PROPLASTER ANTIRADIANT®



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SPECIALITY CHEMICALS

INDEX

About Us …………………………………………………………………………...… 1

Reasoning …………………………………………………………………………..… 2

Scope ……………………………………………………………………………….. 3

Where to use these types of plastering products ……………………………..………. 6

Absorption values of anti radiation plaster …….……………………………...…... 7

Difinitions ……………………………………………………………………...….. 8

Radiation dose unit ……………………………………………………………...…... 9

Questions and Answers ……………………………………………………...….. 11

Supporting Data ……………………………………………………………....… 21

Proplaster Antiradiation 100 T.D.S ……..…………………………………..…… 21

Proplaster Antiradiation 200 T.D.S ……..…………………………………..…… 23

Proplaster Antiradiation 300 T.D.S ……..…………………………………..…… 25

Proplaster Antiradiation 100, 200, 300 M.S ……..…………..………..…… 27

Proplaster Antiradiation 100 Test ……..…..………………………………..…… 30

Proplaster Antiradiation 200 Test ……..……..…………………………..…… 34

Proplaster Antiradiation 300 Test ……..……..…………………………..…… 36

- **Prokem** is a national leading supplier of chemical systems and formulations in the construction industry.

- **Prokem** range of products is the result of more than 25 years of experience in research, product development, testing and utilization of recourses.

- **Prokem** has an expert team of engineers who offer exceptional, specially tailored solutions from our products that are cost effective, energy efficient and environmentally friendly.

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PROPLASTER ANTIRADIANT®

Reasoning:

- **PROPLASER ANTIRADIANT 100, 200, 300** are the most efficient alternative to lead in the lining walls, floors and ceiling preventing radiation leakage.
- These types of plaster are used as a shielding material in installation housing gamma rays as well as x-ray in order to minimize exposure to individuals.

These types of plaster accomplish the following advantages:

- Economic.
- High absorption and shielding ability.
- Safety.
- Aesthetic appearance.
- Saving areas.
- Easy to install.

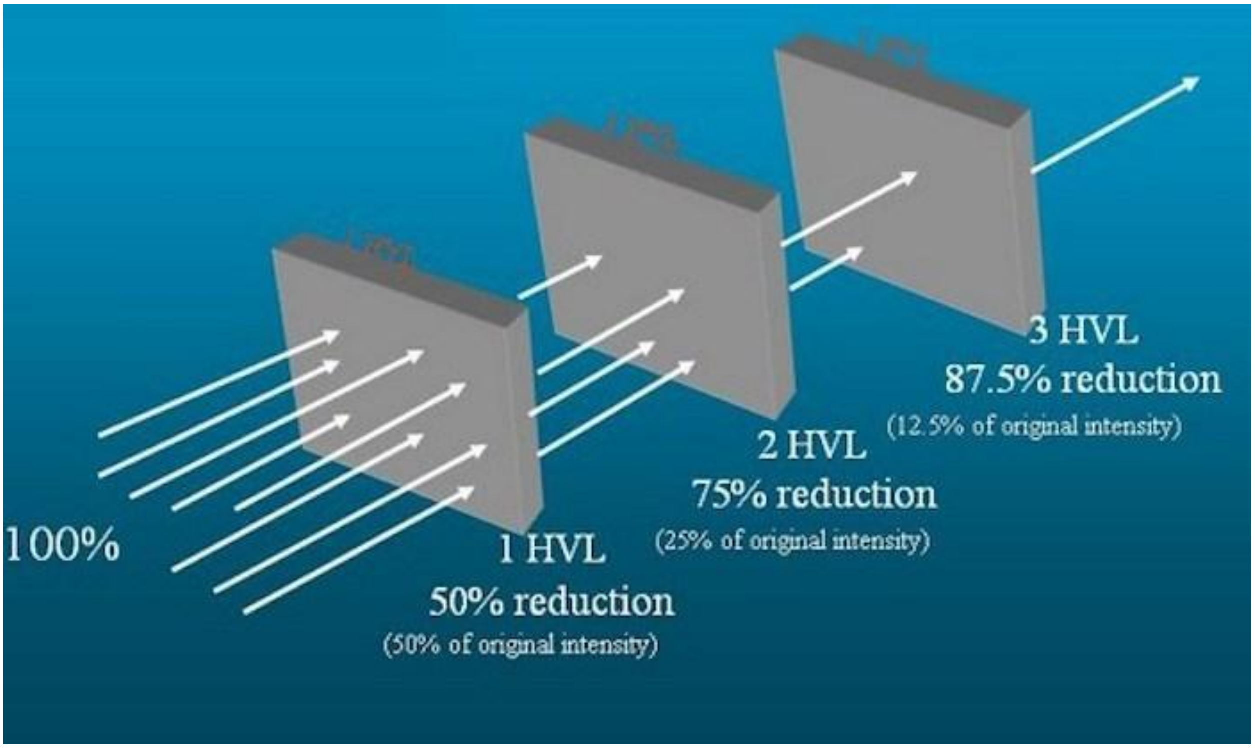
They are complying with EN DIN 6812, ISO 60, 80,110 & 150.

Scope:

- The depth of penetration for a given photon energy is dependent upon the material density (atomic structure)
- The more subatomic particles in the material (higher Z number), the greater the likelihood that interactions will occur and radiation will lose its energy.
- The denser a material is the smaller the depth of radiation penetration will be.
- Materials such as lead and uranium have a high (Z) numbers, so they are affective in shielding radiation.
- Concrete is not as effective in shielding radiation.
- Different materials alienate radiation to different degrees (half value layer (HVL)) is commonly used for this purpose and to determine the thickness necessary to reduce the exposure rate from a source to some level.
- There is a level at which the radiation intensity become $1/_2$ that at the surface of the material, this depth is known as (HVL) for that material
- Also the (HVL) is the amount of material necessary to reduce the exposure rate from source to $1/_2$ its unshielded value
- Table of HVL (in cm) at gamma ray energies 100, 200, 500 Kev

Absorber	100 Kev	200 Kev	500Kev
Air	3555 cm	4359 cm	6189 cm
Water	4.15 cm	5.1 cm	7.15 cm
Carbon	2.07 cm	2.53 cm	3.54 cm
Aluminum	1.59 cm	2.14 cm	3.05 cm
Iron	0.26 cm	0.64 cm	1.06 cm
Copper	0.18 cm	0.53 cm	0.95 cm
Lead	0.012 cm	0.068 cm	0.42 cm

- **HVL** – the thickness of absorbing material needed for reduction of the radiation intensity by a factor of (2).
- **HVL** decreases as the atomic number of the absorber material increases.
  e.g.: 35 m of air is needed to reduce the intensity of a 100 Kev gamma ray by a factor of 2= 0.12 mm of lead can do the same.
- **HVL** of all materials increases with the energy of γ rays. 0.26 cm of iron at 100 Kev = 1.06 cm at 500 Kev.

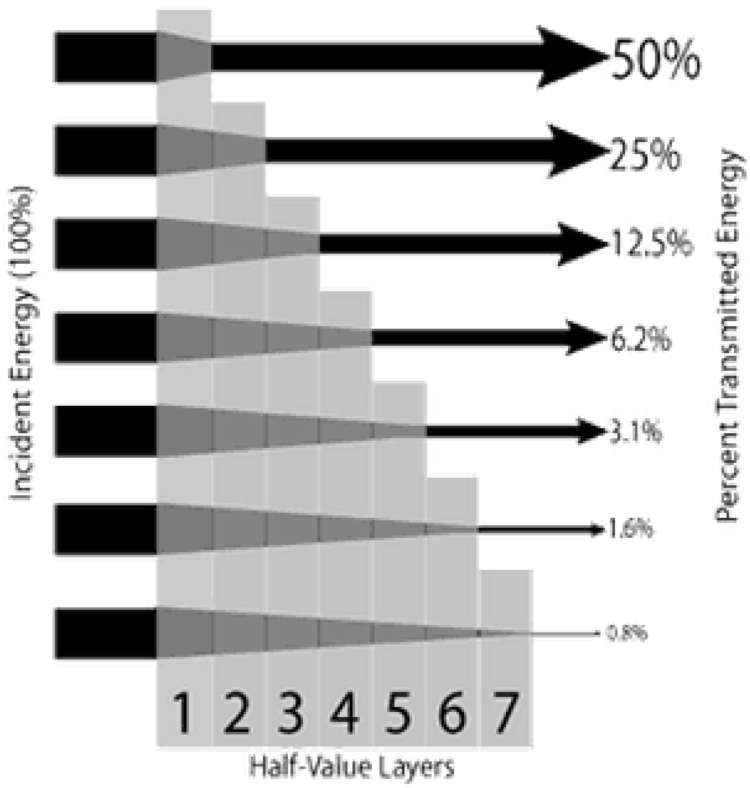


$$r_1 = \frac{I}{I_0} = 0.5\ \frac{Thickness}{HVL}$$

Where r_1 = intensity reduction ratio

$$\text{Thickness} = \text{HVL}\left(\frac{\log r_1}{\log 0.5}\right)$$

To determine thickness of materials if HVL is known



Where to use these types of plastering products includes the following:

- **PROPLASTER ANTIRADIATION 100:**
  - X-ray, Radiology & Radiographic
  - Imaging rooms.
  - Dental X-Ray.
  - Mammography.
  - MRI or Radio Frequency rooms.
  - Ultrasonography / Ultra Sound Rooms.

- **PROPLASTER ANTIRADIATION 200:**
  - Fluoroscopy Rooms.
  - Emergency Rooms, Special Procedures and Operating Rooms.
  - Angiography room / Cardiac Catheterization Labs.
  - A Computerized Tomography / C.T.
  - Scanner rooms

- **PROPLASTER ANTIRADIATION 300:**
  - Nuclear Power Station.
  - Gamma Knife Rooms.
  - Linear Accelerators / Radiation Therapy.
  - Positron Emission Tomography / Pet Scanner room

The absorption values of anti-radiation plaster products as well as concrete floor anti-radiation finishing thickness

Plaster thickness	100 KV	150 KV	200 KV	250 KV
1.0 cm	1.25	0.70	0.60	0.50
1.5 cm	1.75	1.00	0.80	0.80
2.0 cm	2.30	1.35	1.10	1.10
2.5 cm	3.00	1.50	1.35	1.35

Floor finish thickness	100 KV	150 KV	200 KV	250 KV	300 KV
4.0 cm	5.40	2.40	2.10	2.10	2.10
5.0 cm	6.80	3.00	2.60	2.80	3.00
6.0 cm	8.40	3.60	3.20	3.50	3.80
8.0 cm	-	4.80	4.30	5.00	5.50
10.0 cm	-	-	5.70	6.30	7.00

Definitions:

- **Reflection** is the process by which electromagnetic radiation is returned either at the boundary between two media (surface reflection) or at the interior of a medium (volume reflection)
- **Transmission** is the passage of electromagnetic radiation through a medium
- **Diffusion** (also called **scattering**), which is the process of deflecting a unidirectional beam into many directions.
- **Absorption** is the transformation of radiant power to another type of energy, usually heat, by interaction with matter.

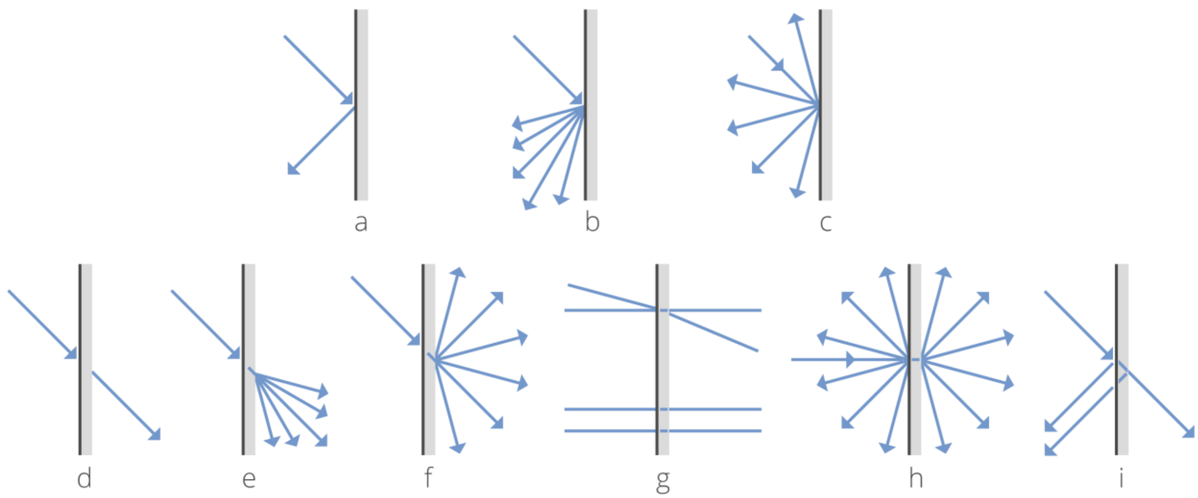
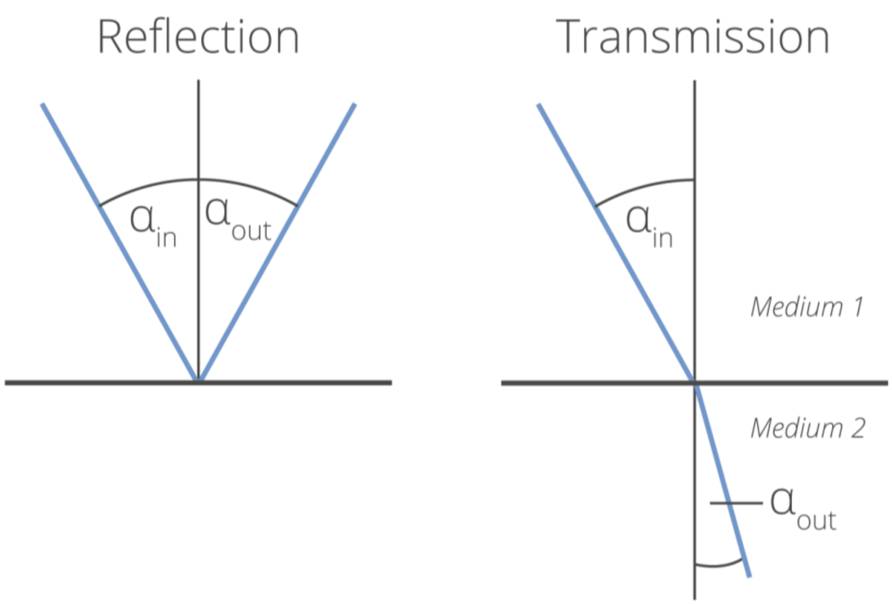
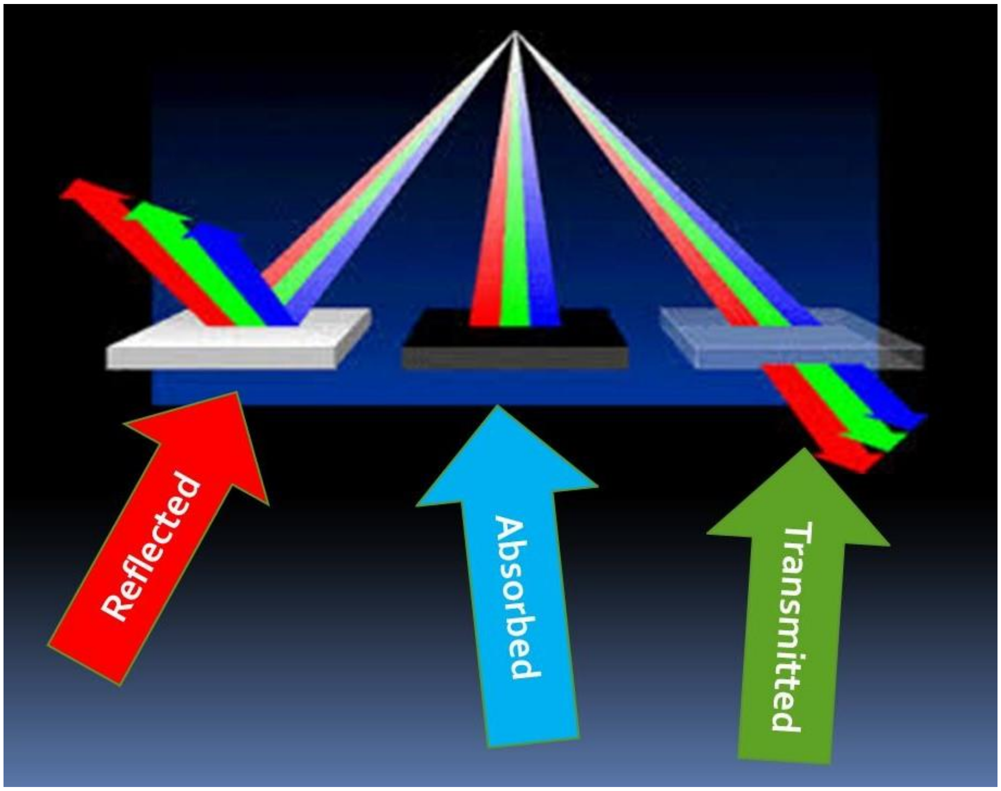


Fig. (1): top: Direct, mixed and diffuse reflection bottom: direct, mixed and diffuse transmission





Radiation Dose Unit:

- **Radiation absorbed dose** and **effective dose** in the international system of units (SI system) for radiation measurement uses "gray" (Gy) and "sievert" (Sv), respectively.
- In the United States, **radiation absorbed dose**, effective dose, and exposure are sometimes measured and stated in units called rad, rem, or roentgen (R).
- For practical purposes with gamma and x rays, these units of measure for exposure or dose are considered equal.
- This exposure can be from an external source irradiating the whole body, an extremity, or other organ or tissue resulting in an **external radiation dose**. Alternately, internally deposited radioactive material may cause an **internal radiation dose** to the whole body, an organ, or a tissue.

- Smaller fractions of these measured quantities often have a prefix, such as milli (m) that means 1/1,000. For example, 1 sievert = 1,000 mSv. Micro (μ) means 1/1,000,000. So, 1,000,000 μSv = 1 Sv, or 10 μSv = 0.000010 Sv.

Conversions from the SI units to older units are as follows:

- 1 Gy = 100 rad
- 1 mGy = 100 mrad
- 1 Sv = 100 rem
- 1 mSv = 100 mrem

Questions and Answers:

Q: What is ionizing radiation?

A: Ionizing radiation is radiation that has enough energy to remove electrons from atoms or molecules (groups of atoms) when it passes through or collides with some material. The loss of an electron with its negative charge causes the atom (or molecule) to become positively charged. The loss (or gain) of an electron is called ionization and a charged atom (or molecule) is called an ion.

Note: Microwave, infrared (IR) and ultra-violet (UV) radiation are examples of **non**-ionizing radiation. Non-ionizing radiation does not have enough energy to remove electrons.

Q: What are some examples of ionizing radiation?

A: There are natural and artificial sources of ionizing radiation. Artificial sources of radiation include X-ray machines, radioactive isotopes used in nuclear medicine, gamma cameras, nuclear gauges and nuclear power plants.

X-rays refer to a kind of electromagnetic radiation generated when a strong electron beam bombards metal inside a glass tube. The frequency of this radiation is very high - 0.3 to 30 Ehz (exahertz or billion gigahertz). By comparison FM radio stations transmit at frequencies around 100 MHz (megahertz) or 0.1 Ghz (gigahertz).

Natural sources of radiation include:

- Background radiation from space,
- Cosmic radiation from cosmic rays,
- Terrestrial radiation from minerals in the earth’s crust,
- Radiation from inhaling radon gas,
- Radiation from ingesting food and drinking water that may contain radioactive potassium-40.

Minerals such as uranium and thorium are radioactive and give off radiation when the nucleus breaks down or disintegrates. The three kinds of radiation generated by radioactive materials or sources are alpha particles, beta particles and gamma-rays.

Q: What properties are considered when ionizing radiation is measured?

A: Ionizing radiation is measured in terms of:

- The strength or radioactivity of the radiation source,
- The energy of the radiation,
- The level of radiation in the environment, and
- The radiation dose or the amount of radiation energy absorbed by the human body.

From the point of view of the occupational exposure, the radiation dose is the most important measure. Occupational exposure limits like the ACGIH TLVs are given in terms of the permitted maximum dose. The risk of radiation-induced diseases depends on the total radiation dose that a person receives over time.

Q: What units are used for measuring radioactivity?

A: Radioactivity or the strength of radioactive source is measured in units of becquerel (Bq).

1 Bq = 1 event of radiation emission or disintegration per second.

One becquerel is an extremely small amount of radioactivity. Commonly used multiples of the Bq unit are kBq (kilobecquerel), MBq (megabecquerel), and GBq (gigabecquerel).

1 kBq = 1000 Bq, 1 MBq = 1000 kBq, 1 GBq = 1000 MBq.

An old and still popular unit of measuring radioactivity is the curie (Ci).

1 Ci = 37 GBq = 37000 MBq.

One curie is a large amount of radioactivity. Commonly used subunits are mCi (millicurie), µCi (microcurie), nCi (nanocurie), and pCi (picocurie).

1 Ci = 1000 mCi; 1 mCi = 1000 µCi; 1 µCi = 1000 nCi; 1 nCi = 1000 pCi.

Another useful conversion formula is:

1 Bq = 27 pCi.

Becquerel (Bq) or Curie (Ci) is a measure of the rate (not energy) of radiation emission from a source.

Q: What does half-life mean when people talk about radioactivity?

A: Radiation intensity from a radioactive source diminishes with time as more and more radioactive atoms (radionuclides) emit energy to become stable atoms. Radioactive decay is the decline in radiation intensity. Half-life is the time after which the radiation intensity is reduced by half. This happens because half of the radioactive atoms will have decayed in one half-life period. For example a 50 Bq radioactive source will become a 25 Bq radioactive source after one half-life.

Radioactive Decay	
Number of half-lives elapsed	Percent radioactivity remaining
0	100
1	50
2	25
3	12.55
4	6.25
5	3.125

Half-lives differ widely from one radioactive material to another and range from a fraction of a second to millions of years.

Q: What units are used for measuring radiation energy?

A: The energy of ionizing radiation is measured in electronvolts (eV). One electronvolt is an extremely small amount of energy. Commonly used multiple units are kiloelectron (keV) and megaelectronvolt (MeV).

6,200 billion MeV = 1 joule

1 joule per second = 1 watt

1 keV = 1000 eV, 1 MeV = 1000 keV

Watt is a unit of power, which is the equivalent of energy (or work) per unit time (e.g., minute, hour).

Q: What units are used for measuring radiation exposure?

A: X-ray and gamma-ray exposure is often expressed in units of roentgen (R). The roentgen (R) unit refers to the amount of ionization present in the air. One roentgen of gamma- or x-ray exposure produces approximately 1 rad (0.01 gray) tissue dose (see next section for definitions of gray (Gy) and rad units of dose).

Another unit of measuring gamma ray intensity in the air is "air dose or absorbed dose rate in the air" in grays per hour (Gy/h) units. This unit is used to express gamma ray intensity in the air from radioactive materials in the earth and in the atmosphere.

Q: What units are used for measuring radiation dose?

A: When ionizing radiation interacts with the human body, it gives its energy to the body tissues. The absorbed dose is the amount of energy absorbed per unit weight of the organ or tissue and is expressed in units of gray (Gy). One gray dose is equivalent to one joule radiation energy absorbed per kilogram of organ or tissue weight. Rad is the old and still used unit of absorbed dose. One gray is equivalent to 100 rads.

1 Gy = 100 rads

Equal doses of all types of ionizing radiation are not equally harmful to human tissue. Alpha particles produce greater harm than do beta particles, gamma rays and X-rays for a given absorbed dose, so 1 Gy of alpha radiation is more harmful than 1 Gy of beta radiation. To account for the way in which different types of radiation cause harm in tissue or an organ, radiation dose is expressed as equivalent dose in units of sievert (Sv). The dose in Sv is equal to the total external and internal "absorbed doses" multiplied by a "radiation weighting factor" (WR - see Table 2 below) and is important when measuring occupational exposures. Before1990, this weighting factor was referred to as Quality Factor (QF).

Radiation Weighting Factors		
Item	Type of Radiation and Energy Range	Weighting Factor
1	Photons, all energies	1
2	Electrons and muons, all energies1	1
3	Neutrons2 of energy < 10 keV	5
4	Neutrons2 of energy 10 keV to 100 keV	10
5	Neutrons2 of energy > 100 keV to 2 MeV	20
6	Neutrons2 of energy > 2 MeV to 20 MeV	10
7	Neutrons2 of energy > 20 MeV	5
8	Protons, other than recoil protons, of energy > 2 MeV	5
9	Alpha particles, fission fragments and heavy nuclei	20

[1] Excluding Auger electrons emitted from nuclei bound to DNA.
[2] Radiation weighting factors for these neutrons may also be obtained by referring to the continuous curve shown in Figure 1 on page 7 of the 1990 Recommendations of the International Commission on Radiological Protection, ICRP Publication 60, published in 1991.

Source: The Canadian Radiation Protection Regulations, Schedule 2 (SOR/2000-203).

Equivalent dose is often referred to simply as "dose" in every day use of radiation terminology. The old unit of "dose equivalent" or "dose" was rem.

Dose in Sv = Absorbed Dose in Gy x radiation weighting factor (WR)

Dose in rem = Dose in rad x QF

1 Sv = 100 rem

1 rem = 10 mSv (millisievert = one thousandth of a sievert)

1 Gy air dose equivalent to 0.7 Sv tissue dose (UNSEAR 1988 Report p.57)

1 R (roentgen) exposure is approximately equivalent to 10 mSv tissue dose

Q: What is the relationship between SI units and non-SI units?

A: Table 3 shows SI units (International System of Units or Systéme Internationale d'unités), the corresponding non-SI units, their symbols, and the conversion factors.

Units of Radioactivity and Radiation Dose			
Quantity	SI unit and symbol	Non-SI unit	Conversion factor
Radioactivity	becquerel, Bq	curie, Ci	1 Ci = 3.7 x 1010 Bq = 37 Gigabecquerels (GBq) 1 Bq = 27 picocurie (pCi)
Absorbed dose	gray, Gy	rad	1 rad = 0.01 Gy
"Dose" (Equivalent dose)	sievert, Sv	rem	1 rem = 0.01 Sv 1 rem = 10 mSv

Q: What is a "committed dose"?

A: When a radioactive material gets in the body by inhalation or ingestion, the radiation dose constantly accumulates in an organ or a tissue. The total dose accumulated during the 50 years following the intake is called the committed dose. The quantity of committed dose depends on the amount of ingested radioactive material and the time it stays inside the body.

Q: What is an "effective dose"?

A: The effective dose is the sum of weighted equivalent doses in all the organs and tissues of the body.

Effective dose = sum of [organ doses x tissue weighting factor]. Effective dose is measured in sieverts (Sv).

Tissue weighting factors (Table 4) represent relative sensitivity of organs for developing cancer.

Organ Or Tissue Weighting Factors		
Item	Organ or Tissue	Weighting Factor
1	Gonads (testes or ovaries)	0.20
2	Red bone marrow	0.12
3	Colon	0.12
4	Lung	0.12
5	Stomach	0.12
6	Bladder	0.05
7	Breast	0.05
8	Liver	0.05
9	Oesophagus	0.05
10	Thyroid gland	0.05
11	Skin1	0.01
12	Bone surfaces	0.01
13	All organs and tissues not listed in items 1 to 12 (remainder organs and tissues) collectively, including the adrenal gland, brain, extra-thoracic airway, small intestine, kidney, muscles, pancreas, spleen, thymus and uterus2,3	0.05
14	Whole body	1.0

[1] The weighting factor for skin applies only when the skin of the whole body is exposed.

[2] When the equivalent dose received by and committed to one of these remainder organs and tissues exceeds the equivalent dose received by and committed to any one of the organs and tissues listed in items 1 to 12, a weighting factor of 0.025 shall be applied to that remainder organ or tissue and a weighting factor of 0.025 shall be applied to the average equivalent dose received by and committed to the rest of the remainder organs and tissues.

[3] Hands, feet and the lens of an eye have no weighting factor.

Source: The Canadian Radiation Protection Regulations, Schedule 1 (SOR/2000-203).

Q: What are the limits of exposure to radiation?

A: The Threshold Limit Values (TLVs) published by the ACGIH (American Conference of Governmental Industrial Hygienists) are occupational exposure limits adopted by many jurisdictions as guidelines or legal limits:

20 mSv - TLV for average annual effective dose for radiation workers, averaged over five years

In Canada, the *Radiation Protection Regulations* set radiation exposure limits for the public and nuclear energy workers.

The annual effective dose limit is 1mSv for the Canadian public. This dose limit aligns with the International Commission on Radiological Protection (ICRP) recommended annual dose limit of 1 mSv for the general public.

Based on information from regular monitoring of the most exposed workers, such as a radiographer, shows that the average annual doses are 5 mSv per year.

Q: What are the main ways to control radiation exposure?

A: The main ways to control radiation exposure include engineering controls, administrative controls and personal protective equipment. Examples of these controls include:

- Education and training
- Reducing exposure time
- Increasing the distance from the radiation source
- Using a physical barrier that modifies the pathway between worker and source of radiation e.g., concrete or lead
- Monitoring of exposures (individual and collective monitoring)
    - Recording exposures
    - Providing health surveillance
    - Promoting a health and safety culture
    - Complying with established radiation exposure (dose) limits

Approximately forty-four (44) percent of monitored workers worldwide are exposed to artificial sources of radiation. Of those workers exposed to artificial sources, seventy-five percent work in the medical sector. Table 5 shows trends in global radiological exposure of workers since the 1970s.

Trends in Global Radiological Exposure of Workers (mSv)*				
Sources	1970s	1980s	1990s	2000s
Natural				
Air crew	-	3.0	3.0	3.0
Coal mining	-	0.9	0.7	2.4
Other mining**	-	1.0	2.7	3.0
Miscellaneous	-	6.0	4.8	4.8
Total	-	1.7	1.8	2.9
Artificial				
Medical uses	0.8	0.6	0.3	0.5
Nuclear industry	4.4	3.7	1.8	1.0
Other industries	1.6	1.4	0.5	0.3
Miscellaneous	1.1	0.6	0.2	0.1
Total	1.7	1.4	0.6	0.5

* Estimates of average effective dose per worker in a year.

** Uranium mining is included in nuclear industry.
Source: Radiation: Effects and Sources, United Nations Environmental Programme (UNEP), 2016

Q: What effects do different doses of radiation have on people?

A: One sievert is a large dose. The recommended TLV is average annual dose of 0.05 Sv (50 mSv).

The effects of being exposed to large doses of radiation at one time (acute exposure) vary with the dose. Here are some examples:

10 Sv - Risk of death within days or weeks

1 Sv - Risk of cancer later in life (5 in 100)

100 mSv - Risk of cancer later in life (5 in 1000)

50 mSv - TLV for annual dose for radiation workers in any one year

20 mSv - TLV for annual average dose, averaged over five years

Q: What are "working level" and "working level month"?

A: In underground uranium mines, as well in some other mines, radiation exposure occurs mainly due to airborne radon gas and its solid short-lived decay products, called radon daughters or radon progeny. Radon daughters enter the body with the inhaled air. The alpha particle dose to the lungs depends on the concentration of radon gas and radon daughters in the air.

The concentration of radon gas is measured in units of picocuries per litre (pCi/L) or becquerels per cubic metre (Bq/m3) of ambient air. The concentration of radon daughters is measured in working level (WL) units this is a measure of the concentration of potential alpha particles per litre of air.

The worker's exposure to radon daughters is expressed in units of Working Level Months (WLM). One WLM is equivalent to 1 WL exposure for 170 hours.

1 WL = 130,000 MeV alpha energy per litre air

= 20.8 µJ (microjoules) alpha energy per cubic meter (m3) air

WLM = Working Level Month

= 1 WL exposure for 170 hours

1 WLM = 3.5 mJ-h/m3

Often people use the concentration of radon gas (pCi/L) in the air to estimate the WL level of radon daughters. Such estimates are subject to error because the ratio of radon to its decay products (radon daughters) is not constant.

Equilibrium factor is the ratio of the activity of all the short-lived radon daughters to the activity of the parent radon gas. Equilibrium factor is 1 when both are equal. Radon daughter activities are usually less than the radon activity and hence the equilibrium factor is usually less than 1.

Conversion of radon exposure units (equilibrium factor = 0.40)

1 WLM = 3.54 mJ-h/m^3

1 MBq-h/m^3 = 2.22 mJ-h/m^3

1 MBq-h/m^3 = 0.628 WLM

Annual exposure from measured radon concentration

(A) At home : assuming 7,000 hours spent indoors per year

1 Bq/m^3 = 0.0156 mJ-h/m^3

1 Bq/m^3 = 0.0044 WLM

1 WLM = 4 mSv

1 mJ-h/m^3 = 1.1 mSv

(B) At work : assuming 2,000 hours work per year

1 Bq/m^3 = 0.00445 mJ-h/m^3 = 0.00126 WLM

1 mJ-h/m^3 = 1.4 mSv

1 WLM = 5 mSv

Source: ICRP Publication 65, Protection Against Radon at Home and at Work

mJ-h/m3 = millijoule hours/per cubic metre

MBq-h/m3 = megabecquerel hours per cubic meter

Joule is unit of energy

1 J = 1 Watt-second = Energy delivered in one second by a 1 Watt power source

1 calorie = 4.2 J

MBq/m3 = megabecquerel per cubic metre

WLM = Working Level Months

Product Data Sheet
Edition 0.8.2020
Identification No. H R □13

Prokem
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PROPLASTER ANTIRADIANT 100

□arium Plaster Radiation shield

Description

□t is a radiation shield plaster for □ric□ ,concrete floor , walls, ceilings with consistency of 2mm.P□ e□ui□alent . it is of □2□3cm□thic□.for walls & for floors □6 □10 cm . thic□□

□t complies with EN □□N 6□12

Where to use

- □□ray, Radiology & Radiographic imaging rooms .
- □ental □□Ray .
- Mammography.
- MR□or Radio□re□uency rooms.
- Ultrasonography / Ultra Sound Rooms.

Advantages

- Protection against □ray.
- Smooth & solid surface .
- Painta□le.
- Economic □60□ less than lead □
- Safe & Life time .
- Protection against radio isotops.

Properties

Color	white , grey
Sp. Gr.	2.□ □0.2
Pot Life	1 □our.
Compressive strength 2□days	1□ □17 N/mm²
□rying Time□ □nitial □inal	1 □2 days 7 days
□ Radiation Transmission	0□ □50 □□□
□.□.L.	2.5 □3.1 mm. □100 □□□
□ Radiation Transmission	1.3□ □2.□6 □ □100 □□□
Lead E□ui□alnt	0.□ □0.7 mm. □100 □□□

How to use

Surface preparation:

- The surfaces must □e clean , sound.
- Remo□e all dust ,oils, loose particles impurities completely.
- □ et dry surfaces.

Mixing:

- Add □□5 L water□to 25□g. sac□of material and mi□ thoroughly □□00 rpm□to o□tain a homogenous mi□.

Application:

- Apply the material on the walls, columns and sealings in layers not more than□12mm .thic□□ at one time with trowel .
- Each layer must □e wet floated while drying .
- Soc□ets must □e □loc□ed with lead .
- □loor ducts must □e □ac□ed with lead strips.
- Lea□e to dry 2□ □□□hours.

Cleaning:

Tools and equipment should be cleaned with water immediately after use.

Theoretical coverage:

25 □g /m2/cm thic□

Packaging:

25 kg/ sacks

Shelf life & Storage

One year in its sealed packs stored under proper conditions

Quality Needs Quality

pk

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Quality Needs Quality

Health and Safety

- Use goggles-gloves and a breathing mask when applying.
- Apply forced ventilation in confined spaces.
- Remove splashes from skin with hand cleanser or soap and water.
- Eye splashes to be washed with plenty of water.

Additional Information

PROKEM provides the construction industry with a comprehensive range of construction chemicals and specialty products answering the queries of modern engineers for trouble free durable structure.
PROKEM designs tailor made products should there be critical application that requires specific properties rather than our main range.
For our customer's satisfaction, **PROKEM** extends technical services to include after sales support to assist users in a proper handling of our products.

Quality Needs Quality

PROPLASTERANTIRADIANT 200

□arium Plaster Radiation shield

Description

□t is a radiation shield plaster for □ric□ ,concrete floor , walls, ceilings with consistency of 2mm.P□ e□ui□alent . it is of □2□3cm□thic□.for walls & for floors □6 □10 cm . thic□ □
□t complies with EN □□N 6□12

Where to use

- □luoroscopy Rooms .
- Emergency Rooms, Special Procedures and □perating Rooms .
- Angiography room / Cardiac Catheri□ation La□s.
- AComputeri□ed Tomography / C.T. Scanner rooms

Advantages

- Protection against □ray & Gamma .
- Smooth & solid surface .
- Painta□le.
- Economic □60□ less than lead □
- Safe & Life time .
- Protection against radio isotops.

Properties

Color	white , grey
Sp. Gr.	2.□ □0.2
Pot Life	1 □our.
Compressive strength 2□ days	1□ □17 N/mm²
□rying Time□ □nitial □inal	 1 day 7 days
□ Radiation Transmission	0□ □50□100 □□□
□.□.L.	3.7 mm. □150 □□□
□ Radiation Transmission	3.□0 □ □150 □□□
Lead E□ui□alnt	0.□2 mm. □150 □□□

How to use

Surface preparation:

- The surfaces must □e clean , sound.
- Remo□e all dust ,oils, loose particles impurities completely.
- □ et dry surfaces.

Mixing:

- Add □□5 L water□to 25□g. sac□of material and mi□ thoroughly □□00 rpm□to o□tain a homogenous mi□.

Application:

- Apply the material on the walls, columns and sealings in layers not more than□12mm .thic□□ at one time with trowel .
- Each layer must □e wet floated while drying .
- Soc□ets must □e □loc□ed with lead .
- □loor ducts must □e □ac□ed with lead strips.
- Lea□e to dry 2□ □□□hours.

Cleaning:

Tools and equipment should be cleaned with water immediately after use.

Theoretical coverage:

25 □g /m2/cm thic□

Packaging:

25 kg/ sacks

Shelf life & Storage

One year in its sealed packs stored under proper conditions

Product Data Sheet
Edition 08.2020
Identification No. H R - 14

Prokem
SPECIALITY CHEMICALS

Quality Needs Quality

Health and Safety

- Use goggles-gloves and a breathing mask when applying.
- Apply forced ventilation in confined spaces.
- Remove splashes from skin with hand cleanser or soap and water.
- Eye splashes to be washed with plenty of water.

Additional Information

PROKEM provides the construction industry with a comprehensive range of construction chemicals and specialty products answering the queries of modern engineers for trouble free durable structure.
PROKEM designs tailor made products should there be critical application that requires specific properties rather than our main range.
For our customer's satisfaction, **PROKEM** extends technical services to include after sales support to assist users in a proper handling of our products.

Product Data Sheet
Edition 08.2020
Identification No. H R □15

Prokem
SPECIALITY CHEMICALS

PROPLASTER ANTIRADIANT 300

□arium Plaster Radiation shield

Description

□t is a radiation shield plaster for □ric□ ,concrete floor , walls, ceilings with consistency of 2mm.P□ e□ui□alent . it is of □2□3cm□thic□.for walls & for floors □6 □10 cm . thic□□

□t complies with EN □□N 6□12

Where to use

- Nuclear Power Station.
- Gamma Knife Rooms .
- LinearAccelerators/ Radiation Therapy.
- Positron Emission Tomography / Pet Scanner room

Advantages

- Protection against □ray , Gamma & Radio Cesium 137 & Uranium 237.
- Smooth & solid surface .
- Painta□le.
- Economic □60□ less than lead □
- Safe & Life time .
- Protection against radio isotops.

Properties

Color	white , grey
Sp. Gr.	2.□ □0.2
Pot Life	1 □our.
Compressive strength 2□ days	1□ □17 N/mm²
□rying Time□ □nitial □inal	1 day 7 days
□ Radiation Transmission	70□ □50□100 □□□
□.□.L.	37.6 mm. □Cs 137, Ur 237□
□ Radiation Transmission	70 □ □>150 □□□
Lead E□ui□alnt	1.50 mm. □150 □□□

How to use

Surface preparation:

- The surfaces must □e clean , sound.
- Remo□e all dust ,oils, loose particles impurities completely.
- □ et dry surfaces.

Mixing:

- Add □□5 L water□to 25□g. sac□of material and mi□ thoroughly □□00 rpm□to o□tain a homogenous mi□.

Application:

- Apply the material on the walls, columns and sealings in layers not more than□12mm .thic□□ at one time with trowel .
- Each layer must □e wet floated while drying .
- Soc□ets must □e □loc□ed with lead .
- □loor ducts must □e □ac□ed with lead strips.
- Lea□e to dry 2□ □□□ hours.

Cleaning:

Tools and equipment should be cleaned with water immediately after use.

Theoretical coverage:

25 □g /m2/cm thic□

Packaging:

25 kg/ sacks

Shelf life & Storage

One year in its sealed packs stored under proper conditions

Quality Needs Quality

Prokem
SPECIALITY CHEMICALS

Quality Needs Quality

Health and Safety

- Use goggles-gloves and a breathing mask when applying.
- Apply forced ventilation in confined spaces.
- Remove splashes from skin with hand cleanser or soap and water.
- Eye splashes to be washed with plenty of water.

Additional Information

PROKEM provides the construction industry with a comprehensive range of construction chemicals and specialty products answering the queries of modern engineers for trouble free durable structure.
PROKEM designs tailor made products should there be critical application that requires specific properties rather than our main range.
For our customer's satisfaction, **PROKEM** extends technical services to include after sales support to assist users in a proper handling of our products.

Prokem
SPECIALITY CHEMICALS

Edition 12.2018
Identification No. HR – 13

PROPLASTER ANTIRADIATION 100, 200 & 300

□arium Plaster Radiation shield

1 .<u>Description:</u>

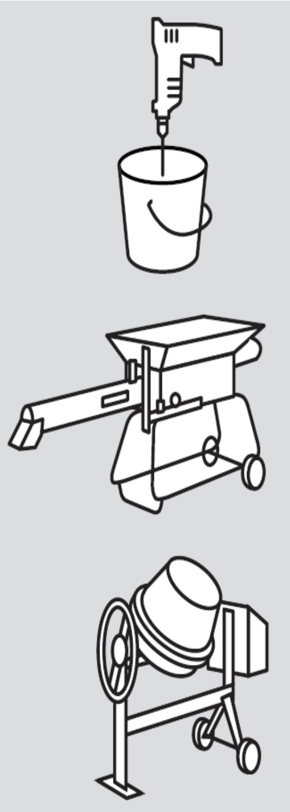
□t is a radiation shield plaster for □ric□,concrete floor , walls, ceilings with consistency of 2mm.P□ e□ui□alent . it is of □2□3cm□thic□.for walls & for floors □6 □10 cm . thic□□ □t complies with EN □□N 6□12.

2 .<u>Scope:</u>

THE subject of protective walls is of interest to all who are planning new or revamping old laboratories. Investigation shows that the ordinary tile-and-plaster wall so widely used in building construction is not adequate protection against X-rays produced at radiographic or therapeutic voltages, when the tube is in an open lead glass bowl, in the size of room that is ordinarily allotted to X-ray purposes. It is true that such walls can be covered with lead to give any desired protection, and there is no better protection than this method can afford, provided the lead has a sufficient thickness and is properly laid. In fact, any other wall materials should be compared to lead as a standard.

Photographic tests were made of sections of wall of varying thickness using the barium plaster described above. The tests were made as follows: a section of wall and a lead echelon with uniform steps were laid side by side on the same film (film enclosed in Eastman cardboard holder) and exposed to the X-rays. In this way the tests were independent of exposure times, fluctuating milliamperage or voltage, photographic emulsion, developer temperatures, etc. The results of the tests were as follows: less than ½ inch of barium plaster fails to act as a homogeneous filter and cannot be said to have a lead equivalent;¾ inch barium plaster is equivalent at radiographic voltages (8 inch gap) to approximately 1⁄16th inch metallic lead; at therapeutic voltages (200 kilovolts) 2 inches of barium plaster, weighing 30 pounds to the square foot, is equivalent to approximately 5⁄32ds inch of metallic lead. The protective coefficient, the ratio of the lead equivalent thickness to the thickness of the barium wall, is in the first case 0.083 and in the second case 0.078, apparently constant for the two voltages

3. Limitation:



- **PROPLASTER ANTIRADIATION can** be hand mixed using an electric drill and bucket, in a wheelbarrow or with a cement mixer.
- **PROPLASTER ANTIRADIATION** can be easily worked to any required or specified finish from bold high profiles to smooth sponge, or steel float textures. Workability is assisted by controlled setting times (2-6 hours depending on product and conditions).
- The substrate for **PROPLASTER ANTIRADIATION** cement plaster shall be sound, free from dust, loose particles, release oils or other contaminates which may affect adhesion or bond strength.
- Preparation before application of **PROPLASTER ANTIRADIATION** shall include:
  - A clean surface by light brushing or waterblasting.
  - Suitable sealer for high absorbing substrates such as AAC.
- Application of **PROPLASTER ANTIRADIATION** may be by hand and then can be spread using a straight edge and trowels. With the use of a soft sponge and extra water, the surface can be worked to an even smooth finish as required.

Edition 12.2018
Identification No. HR – 13

4. How to use:

4.1. Surface preparation:

4.1.1. All surfaces as fair concrete, brick and blocks shall be sound and clean.
4.1.2. Surface must be free from loose particles, dust and oils.
4.1.3. Wet dry surfaces.

4.2. Mixing:

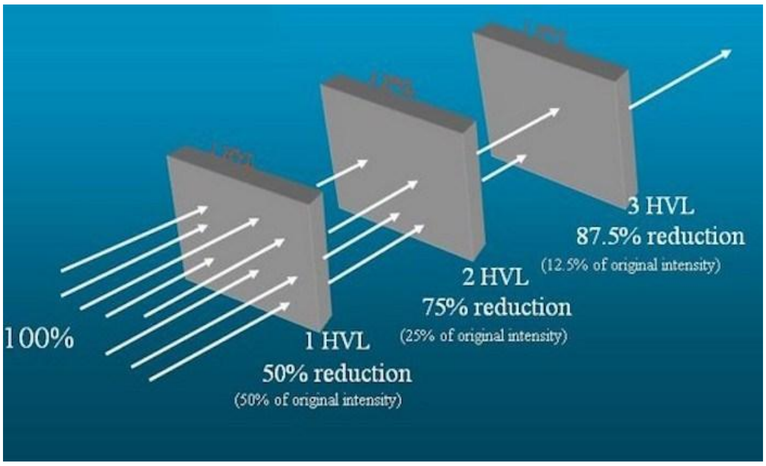
4.2.1. Add (4-5 L water) to 25kg. sack of material and mix thoroughly (400 rpm) to obtain a homogenous mix.

4.3. Application:

4.3.1. Apply the material on the walls, columns and sealings in layers not more than(12mm .thick) at one time with trowel.
4.3.2. Each layer must be wet floated while drying.
4.3.3. Sockets must be blocked with lead
4.3.4. Floor ducts must be backed with lead strips
4.3.5. Leave to dry 24 - 48 hours.

5. Theoretical Coverage:

- 25 kg/m^2 (cm thickness).



A material's half-value layer, or half-value thickness, is the thickness of the material at which the intensity of radiation entering it is reduced by one half

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وزارة التعليم العالى والبحث العلمى
المعهد القومى للمعايرة

El- Sadat (Tersa) St., El Haram, Giza, Egypt - P.O.Box 136 Giza - Code 12211 - Tel. / Fax: +202 - 33867452 - NIS Tel +202 - 37401113

TEST REPORT
تقرير اختبار

Report No.: 672/31/2018

- **NIS Lab** اسم المعمل : Ionizing Radiation Metrology Lab.
- **Issued For** صادر الى : شركه بروكيم
- **Contact Information of the Customer** بيانات التواصل بالزبون : 01124144244
- **Sample Specification** وصف العينة : بلاطه سمك 2 سم
    - **Manufacturer** اسم الشركة المنتجة : ------------------
    - **Code** كـود : B
- **Reference Number of Test** رقم الاختبار المرجعي : 4367/288/31/2018
- **Date of Receipt** تاريخ الاستلام : 19/12/2018   **Date of Test** تاريخ الاختبار : 25/12/2018
- **Issue Date** تاريخ الإصدار : 2/1/2019

Approved by

Head of Laboratory	NIS President
A. R. El-Sersy	Moh. Nour
Prof. Dr. Ahmed R. El-Sersy	Prof. Dr. Mohamed A. Amer

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Standard/Reference/Major Equipment Used and Date of Calibration:

Name	Type	Manufacturer	Cal. on.
Cal. Source	X-ray tube	-------------	-------------
UNIDOS meter	App. Nr. 10001-10522	PTW, Freiburg	July, 2017 (BIPM)
Ion chamber 0.6 cc	M30013(#2016)	PTW, Freiburg	July, 2017 (BIPM)

Results

Transmission %	St. Dev. %
1.34	0.35

Notes:-

1- The combined uncertainty value is 1.75 % for secondary standard dosimetry laboratory, NIS.

2- The plate was tested at 50 kV X-Ray with no transmission.

3- The plate was tested at 100 kV X-Ray.

4- HVL for tested plate (Pro Plaster anti radient) was 0.31±0.018 cm.

5- Lead equivalent for tested plate was 0.04±0.005 cm.

Tested by:

Reviewed by: Khaled Mostafa

Report No.:- 672/31/2018	Code:- B	Type:- -------------
Instrument:- Plate	Test Date:- 25 / 12 / 2018	Page Seq.:- 2/2

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TEST REPORT
تقرير اختبار

Report No.: 671/31/2018

- **NIS Lab** اسم المعمل : Ionizing Radiation Metrology Lab.
- **Issued For** صادر الى : شركه بروكيم
- **Contact Information of the Customer** بيانات التواصل بالزبون : 01124144244
- **Sample Specification** وصف العينة : بلاطه سمك 1 سم
  - **Manufacturer** اسم الشركة المنتجة : ------------------
  - **Code** كـود : A
- **Reference Number of Test** رقم الاختبار المرجعي : 4367/288/31/2018
- **Date of Receipt** تاريخ الاستلام : 19/12/2018 **Date of Test** تاريخ الاختبار : 25/12/2018
- **Issue Date** تاريخ الإصدار : 2/1/2019

Approved by

Head of Laboratory	**NIS President**
A. R. El-Sersy	Moh. Nour
Prof. Dr. Ahmed R. El-Sersy	Prof. Dr. Mohamed A. Amer

Standard/Reference/Major Equipment Used and Date of Calibration:

Name	Type	Manufacturer	Cal. on.
Cal. Source	X-ray tube	-------------	-------------
UNIDOS meter	App. Nr. 10001-10522	PTW, Freiburg	July, 2017 (BIPM)
Ion chamber 0.6 cc	M30013(#2016)	PTW, Freiburg	July, 2017 (BIPM)

Results

Transmission %	St. Dev. %
2.86	0.26

Notes:-

1- The combined uncertainty value is 1.75 % for secondary standard dosimetry laboratory, NIS.

2- The plate was tested at 50 kV X-Ray with no transmission.

3- The plate was tested at 100 kV X-Ray.

4- HVL for tested plate (Pro Plaster anti radient) was 0.25±0.011 cm.

5- Lead equivalent for tested plate was 0.05±0.02 cm.

Tested by: Prof. Dr. Hany ... Shousha

Reviewed by: Khaled Mostafa

Report No.:- 671/31/2018	Code:- A	Type:- ------------
Instrument:- Plate	Test Date:- 25 / 12 / 2018	Page Seq.:- 2/2

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TEST REPORT
تقرير اختبار

Report No.: 79/31/2019

- **NIS Lab** اسم المعمل : Ionizing Radiation Metrology Lab.
- **Issued For** صادر الى : بروكيم للكيماويات المتخصصة
- **Contact Information of the Customer** بيانات التواصل بالزبون : 01124144244
- **Location of Test** مكان اجراء الاختبار : National Institute For Standards
- **Sample Specification** وصف العينة : بلاطه (Pro Plaster anti radient)
  - **Manufacturer** اسم الشركة المنتجة : ------------------
  - **Code** كـود : A
- **Reference Number of Test** رقم الاختبار المرجعي : 346/30/31/2019
- **Date of Receipt** تاريخ الاستلام : 27/1/2019 — **Date of Test** تاريخ الاختبار : 28/1/2019
- **Issue Date** تاريخ الإصدار : 10/2/2019

Approved by

Head of Laboratory	NIS President
A. R. El-Sersy	Moh. Nour
Prof. Dr. Ahmed R. El-Sersy	Prof. Dr. Mohamed A. Amer

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Standard/Reference/Major Equipment Used and Date of Calibration:

Name	Type	Manufacturer	Cal. on.
Cal. Source	X-ray tube	-------------	-------------
UNIDOS meter	App. Nr. 10001-10522	PTW, Freiburg	July, 2017 (BIPM)
Ion chamber 0.6 cc	M30013(#2016)	PTW, Freiburg	July, 2017 (BIPM)

Results

Transmission %	St. Dev. %
3.41	1.6×10^{-5}

Notes:-

1- The combined uncertainty value is 1.75 % for secondary standard dosimetry laboratory, NIS.
2- The X-Ray beam was completely absorbed when plate tested at 50 and 100 kV.
3- The plate was tested at 150 kV X-Ray.
4- HVL for tested plate was 0.37±0.007 cm.
5- Lead equivalent for tested plate was 0.09±0.002 cm.
6- The transmission value in the above table was measured for 1.79 cm of tested plate.

Tested by:
Prof. Dr. Hany El-shousha

Reviewed by:
Fatma. M. R

Report No.:- 79/31/2019	Code:- A	Type:- ------------
Instrument:- Plate	Test Date:- 28 / 1 / 2019	Page Seq.:- 2/2

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TEST REPORT
تقرير اختبار

Report No.: 80/31/2019

- **NIS Lab** اسم المعمل : Ionizing Radiation Metrology Lab.
- **Issued For** صادر الى : بروكيم للكيماويات المتخصصة
- **Contact Information of the Customer** بيانات التواصل بالزبون : 01124144244
- **Location of Test** مكان اجراء الاختبار : National Institute For Standards
- **Sample Specification** وصف العينة : بلاطه (Pro Plaster anti radient)
    - **Manufacturer** اسم الشركة المنتجة : ------------------
    - **Code** كــود : B
- **Reference Number of Test** رقم الاختبار المرجعى : 346/30/31/2019
- **Date of Receipt** تاريخ الاستلام : 27/1/2019 **Date of Test** تاريخ الاختبار : 28/1/2019
- **Issue Date** تاريخ الإصدار : 10/2/2019

Approved by

Head of Laboratory	**NIS President**
A. R. El-Sersy	Moh. Nour
Prof. Dr. Ahmed R. El-Sersy	Prof. Dr. Mohamed A. Amer

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Standard/Reference/Major Equipment Used and Date of Calibration:

Name	Type	Manufacturer	Cal. on.
Cal. Source	^{137}Cs	--------------	--------------
UNIDOS meter	Webline (T10021#000770)	PTW, Freiburg	May, 2017 (BIPM)
Ion chamber30 cc	2530 (#424)	NE., LTD	May, 2017 (BIPM)

Results

Transmission %	St. Dev. %
70.02	0.001

Notes:-

1- The combined uncertainty value is 1.75 % for secondary standard dosimetry laboratory, NIS.

2- The X-Ray beam was completely absorbed when plate tested at 50 and 100 kV.

3- The plate was tested at ^{137}Cs source.

4- HVL for tested plate was 3.76±0.95 cm.

5- Lead equivalent for tested plate was 0.15±0.04 cm.

6- The transmission value in the above table was measured for 1.92 cm of tested plate.

Tested by: Prof. Dr. Hany [illegible]

Reviewed by: [illegible]

Report No.:- 80/31/2019	Code:- B	Type:- -------------
Instrument:- Plate	Test Date:- 28 / 1 / 2019	Page Seq.:- 2/2

اقرأ معلومات تهمك (٧)

البياض المقاوم للاشعاع

- للوقاية من اخطار الاشعة بانواعها تم استحداث بياض و خرسانة للأرضيات تحقق وقاية بديلة لشرائح الرصاص حتي سمك ٧ مم.
- المنتجات تحقق وفر من المساحات الداخلية لقاعات الأشعة و وحدات العلاج بالاشعاع كما تحقق الامان للعاملين و العملاء.
- المنتجات اقتصادية توفر أكثر من ٥٠% من تكاليف الرصاص و صالحة للاستخدام للمصادر الاشعاعية حتى ٣٠٠ كيلوفولت.
- المنتجات تعطى سطح ناعم و ثابت و متجانس و خالى من العيوب صالح للدهان.
- البياض المقاوم للاشعاع يعطى حاجز وقائى طبقا لنظريات الامتصاص و التشتيت و التفاعل الداخلى مع الجسيمات الصادرة من المواد المشعة و الاشعاعات بانواعها (اكس، جاما).
- تحتفظ المنتجات بخواصها بامتصاص الجرعات المشعة مهما كانت كمياتها و تحتفظ بخواصها الوقائية طوال عمر المنشأ حيث أنها Dose Independent.
- المنتجات عبواتها بلاستيكية جاهزة الاستخدام سواء للبياض أو الخرسانة.
- المنتجات تعطى أفضل نتائج و التى يكون فيها احتمال التسرب الاشعاعى طبقا للمواصفات العالمية (١٠٠ مللى رونتجن/ ساعة/ متر) أى ما يعادل ٠,٨٧٥ مللى جراى/ ساعة عند جهد (١٥٠ كيلو فولت/ Kvp 150 أى ١٥٠٠٠٠ فولت مع العلم بأن المسافة الأمنة ١,٨ متر أو أكثر.
- Kvp هى أقصى جهد كهربائى يمر عبر أنبوب الأشعة السينية و هو يحدد الطاقة الحركية للالكترونات.
- mAs هى عدد الفوتونات التى تنتجها أنبوب أشعة اكس.
- يراعى عمل شفط للهواء داخل الغرف بحيث يجدد الهواء كل $1/2$ ساعة مع طرد الهواء المسحوب من أعلى المبنى.
- يجب أن تكون جميع وصلات الدخول و الخروج للكهرباء/ المياه/ الصرف الصحى مائلة بزاوية ٤٥ درجة على الجدران.
- التوصية بعمل البياض للحوائط من الاتجاهين (الداخل و الخارج) بالاضافة الى الأسقف و الأرضيات.
- التوصية بتركيب جهاز انذار مبكر (Radiation area monitor).
- يراعى معايرة المصادر الاشعاعية مرة كل ٦ شهور