X-RAY PROTECTION

BUREAU OF STANDARDS
U.S. DEPARTMENT OF COMMERCE
proper and recognized committees. The National Bureau of Standards after consultation with
minds that any ultimate changes of these proposals be made by
the existence of the committee is not permanent, it recom-
mittee recognizes that future development of the

Committee

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Executive Committee

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Representing the International Safety Committee and National Bureau of

The following members compose the committee:

By the manufacturers through notification and ballot.

The members representing the manufacturers were selected
were each asked to appoint one psychologist and one radiologist
as president of the radiological societies.

The presidents of the radiological societies are appointed by
the psychological and radiological representatives of the sectional plants of the art, the two
members representing the sectional plants of the art, the two

Dr. W. O. Knapp and Dr. Stanley Held.

On the suggestion of the secretaries of the International

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I. PROTECTION FROM X RAYS

1. GENERAL RECOMMENDATIONS

A. DEFINITIONS

1.01. Throughout these recommendations the word "shall" indicates advisory requirements to be applied when possible.

1.02. The "lead equivalent" of a protective material is defined as the thickness of lead which will have the same true absorption for a given x-ray beam as the protective material.

1.03. The "protection coefficient" of a protective material is the ratio of the thickness of lead to the thickness of the material which absorbs a given x-ray beam to the same extent.

1.04. In expressing the protection coefficient, the x-ray voltage at which the measurement is made shall be given for all materials containing their high absorptive power to other than lead content. For determining the protection coefficient either photographic substitution or ionization substiution method, which takes the true absorption into consideration, shall be used.

1.05. For the purpose of specifying high-tension spark-over distances, the following table gives the approximate needle point spark-gap distance for peak voltages up to 300 kv (750 mm atmospheric pressure and 20°C).
Other gases, be provided with suction ventilation to remove nitrous oxide and other fumes. Where high tension is present, the oil of other places shall be removed near the ceiling at the opposite side of the room.

10.6. Rooms containing high tension generators, all the entered near the room, and near the doors, and that shall be such that fresh air or operators. The ventilation should be such that fresh air enters the room at or near the doors, and all rooms occupied by patients without gases and ozone from all rooms occupied by patients.

10.8. Forced ventilation shall be provided to remove ground floor. All rooms should be decorated in light colors.

10.7. X-ray and control rooms shall be so located as to provide a good atmosphere and to provide ventilation and light.

A. Rooms for X-ray apparatus from the patient and any parts of the room or apparatus. The term "direct radiation" shall refer to the direct radiation scattered radiation shall refer to the scattered radiation. The term scattered radiation used in examination or treatment. X-rays shall be used of X rays shall include that part of the beam not used of X rays shall include all radiation from the X-ray machine other than the useful beam emanating from the X-ray machine, and the X-ray machine other than the useful beam emanating from the X-ray machine.

<table>
<thead>
<tr>
<th>Volts (kV)</th>
<th>Needle Point Gap (mm)</th>
<th>Needle Point Gap (mm)</th>
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</thead>
<tbody>
<tr>
<td>100</td>
<td>0.5</td>
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<tr>
<td>110</td>
<td>0.6</td>
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<td>150</td>
<td>1.0</td>
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TABLE I

STANDARDS
1.7. All X-ray protective materials shall be marked by the manufacturer in such a manner as to readily show the lead equivalent thickness of the material. (See Table 2.)

2. For protective materials containing other than adequate lead equivalent sand and lead, see Table 2 for the lead equivalent of the X-rays in the treatment or examination room or booth shall overlap so as to adequately prevent the passage of X-rays.

3. The protective lead covering of any door leading to the treatment or examination room or booth shall provide at least the same degree of protection as the remainder of the walls.

4. Corner construction of the floor and ceiling of lead and concrete covered with lead are adequately covered with lead, unless such holes are adequately covered by such materials as masonry, sheet lead or concrete.

5. Structures and protective lead covering for reception room, guardhouse, X-ray rooms and apparatus, and protective lead covering for X-ray rooms shall be intended to be used in conjunction with sheet lead or concrete.

6. X-ray rooms (except for dental radiography)
lead to cause the high absorption, the voltage at which the

equivalence applies shall be given.

1.16. All X-ray tube inclosures made of lead, glass, all
domestic shields, and oil-immersed X-ray tube containers shall
be marked by the manufacturer in such a manner as to
readily show the equivalent lead thickness of the protective
material.

D. TUBE INCLOSURES

1.17. A protective inclosure shall surround all X-ray

1.18. Classification of X-Ray Installations

1.18. Class A. X-ray installations for diagnostic purposes
at voltages up to 130 kV peak.

Class B. X-ray installations for superficial therapy
at voltages up to 140 kV peak.

Class C. X-ray installations for voltages from 140
to 250 kV peak, in which the X-ray tube is housed in an inclosure, affording the

2. SPECIAL REQUIREMENTS FOR APPARATUS OF CLASS A

2.01. A protective inclosure shall surround the X-ray tube
bulb, and the arms for a distance of 4 inches from the bulb.

Open bulbs shall not be used.

2.02. In the case of X-ray tubes having built-in protection,
the equivalent lead thickness shall conform to Table 9,

2.03. An aluminum filter, at least 0.5 mm thick, shall be
permanently mounted in all fluoroscopic and radiographic
tube inclosures.
should be provided during fluoroscopic work, the following protective measures should be used:

1. To protect the operator from secondary radiation,

- Protection from Scattered Radiation

   - The edges of the glass shield should be cut and extended at least 6 inches beyond the outer edge of the housing to prevent the protective lead container from actinic exposure to be removed or opened when on the fluoroscopic screen. A protective lead frame shall contain a protective lead frame.

   - The protective screen shall be provided with an adjustable diaphragm which, when open, is utilized to the fluoroscopic apparatus in such a manner as to provide suitable protection.

   - Aprons may be worn by the operator, or may be per-

   - The protective screen shall be covered with plate.

   - A Production of Physician and Personnel

   - The same body area exposed during fluoroscopic work should be used in a series of exposures for the protection of a certain person.

   - It is recommended that the fluoroscopic work be used in a series of exposures for the protection of a certain person.

   - Place between the tube and filter next to the filter.

   - Permanent covering or asbestos board at least 0.5 mm thick.

   - The diaphragm of the tube container shall have a
of 0.1 mm lead equivalent.

either placed in a separate room or surrounded by material 3.1.2. When thermionic rectifiers are used they shall be
dangerous and shall be disconnected.

2.1.6 The use of movable protective screens is

least a suitable large lead-glass window of 0.1 mm lead equivalent.

3.1.2.1 Further control of salt of booth shall be provided with

3.1.2.5. Further control room of booth shall be provided with

nurses in an adjacent room, as in paragraph 3.1.2, it may be

otherwise. When it is impractical to place the control apo-

scopic work when practicable.

during all radiographic exposures and during all radio-

tronic controls, operators should be behind control

3.1.6. To protect the operator and personnel, control apo-

protected by a lead screen of at least 0.5 mm of lead equivalent.

access to uncovered room.

Exception—This may be omitted only on outside walls and sides

mamillar of assumed quality, uniformity, and permanence

3.1.2.9. Radiographic and radioscopic rooms shall be headed

following order:

telescopic features of sections (v) and (q) above should be

3.1.3.1.1 Horizontal microscopes—Wherever practicable, the pro-

or cover the entire length of the table.

and should either move with the fluoroscopy screen and some

should exceed from the above-mentioned shields to the floor.

Shields of the following material (1/2 mm lead equivalent)

shield (rigid or movable), one on

one-fourth inch. (See Sec. 2.07.)

fluoroscopic screen and shall overlap the screen cover glass

be provided to extend 6 inches to each side and top of the

Wings of protective material (1/2 mm equivalent) shall

shielded for all positions of the screen.

the horizon that the physician's legs and body will be thoroughly

fluoroscope and extending from one-fourth inch inside

Protective shield of at least 1/2 mm lead equivalent, fastened

Protective shield (standing or sitting patients) —
1. Protection from Scattered Radiation

Building Walls. Sides adjacent to permanently uncovered rooms or outside directed in paragraphs 3.04 and 3.05 may be plated only on

8.06. Protection from direct and useful radiation as in-

The lead shielding should be held with 2.5 mm of lead.

2.04. When the X-ray tube is so arranged that radiation can be taken only in a single direction, all parts of the room can be regarded as so arranged that radiation

I. The X-ray beam, determined by the

2.06. When the X-ray tube is so arranged that radiation

3.06. When the X-ray tube is so arranged that radiation

4. Special Requirements for Apparatus of Class

X-Ray Protection
4.03. The diaphragm of the tube container shall be a perforated metal having lead equivalent as given in Table 2. In all directions by projection material having lead equivalent not less than half the lead thickness of the lead lining of the room. Amount equal to the thickness of the lead lining of the room shall be reduced by an amount equal to the lead equivalent thickness as given in Table 2.

4.04. In the case of the containers for water-cooled tubes, the shielded beam of absorption board at least 0.6 in. thick, or the container covering of asbestos board at least 0.5 in. thick, placed between the tube and the X-ray, there shall be mounted in the diaphragm of the tube container. The tube shall be completely enclosed in a lead container.

4.05. The X-ray tube shall be completely enclosed in a lead container. When the therapeutic X-ray treatment is to be made in a separate room or surrounding by projection material of 0.1 in. lead equivalent or in a room of a building, the X-ray equipment shall be used in the specified room and not in a patient's room. The tube shall be mounted in a diaphragm of the lead container. The tube container shall be complete and the treatment table should be so arranged that the usual beam points away from the operator and the patient. The operator is in a normal and comfortable position with a suitable large protective glass window or window of 0.1 in. lead. Such a room or booth shall be provided with a sufficient ventilation. Well-ventilated booth lined with a suitable large protective glass window or window of 0.1 in. lead.
II. ELECTRICAL PROTECTION

Material of 0.5 mm lead equivalent placed either in a separate room or surrounded by protective boxes shall be used, if necessary.

4.10. When the protective box is required and not hermetically sealed, the lead tube shall be located in a separate room.

4.08. All control apparatus shall be located in a separate room.

4.07. In the case of paragraphs 4.05 and 4.06, the entire control enclosure from scattered radiation.

Table 2.

Table 2.

When the lead thickness of 1 mm, less than the values specified in the room, the lead sheet shall be placed on the inner surface of the room. The lead sheet shall be placed on the inner surface of the room.

4.06. When the lead thickness of 1 mm, less than the values specified in the table, the lead sheet shall be placed on the inner surface of the room.

X-RAY PROTECTION

X-RAY PROTECTION
transformers, based on the maximum working voltage and inserted into a 60 per cent overload on the primary of the apparatus the fault current shall be ad-
justed to 40 per cent overload. The fault current of the breaker shall be ad-
justed for the fault current on the circuit-breaker. For diagnostic
and protective purposes the fault current shall be adjustable
installed thereon.

The value of the fault current shall be adjustable.

Apparatus shall be an integral part of the apparatus and perma-
mently attached to the supply circuit. This should be
acting, the motor-generator group being interposed between the
acme, and the apparatus shall be provided with a quick-
breaker. 0.60 V.A. A transformer shall be in series with an auxiliary switch
located on the control panel.

X-ray transformers shall be in series with an auxiliary switch
located on the control panel.

X-ray transformers shall be in series with an auxiliary switch
located on the control panel.

0.60 A. A foot switch used in an operating switch for the

switch.

By a button so arranged that the switch can not be closed by

6.06. A foot switch shall have a rigid shield above the

located on the control panel.

X-ray transformers shall be in series with an auxiliary switch
X-ray transformers shall be in series with an auxiliary switch
located on the control panel.

6.06. A foot switch used in an operating switch for the

box.

position, and shall be inserted in a suitable grounded metal
shall be secured by a locking device or by gravity in the case

0.60 V.A. The switch referred to in paragraphs 6.06 and 6.06

be inserted in the line.

for set be interposed between the mains and the X-ray

0.60 V.A. If a transformer, rotary-converter, or motor-generator

use of a 220-volt 3-wire system the neutral shall be ungrounded.

In the case of a double-pole switch shall be used for direct and single phase

To the mains by means of an approved immersed switch.

X-ray apparatus shall be permanently connected to

0.60 V.A. If the power input under paragraphs 6.06 exceeds 6.5

indicated. Leads to such apparatus shall be according to the

burned on standards.
6.06. If an X-ray generator be permanently installed in the control board is closed.

In such a case, there shall be in the control room a device which indicates automatically and continuously during the time that the transformer primary switch is closed and which indicates automatically and continuously when such switch is opened.

6.07. In the case of fluoroscopic equipment, where the generator is self-contained, in a room or in excess of 12 inches.

6.08. When the X-ray generator is self-contained in a wooden inclosure wherein the spark-over distance are in excess of 12 inches, and where no exposed high-tension leads are accessible or less than 2 feet above the floor, there shall be an additional grounded switch by which the high-tension circuit may be completely disconnected in each such inclosure.

6.09. In case of such inclosures for value high-tension equipment.

6.10. A switch shall be provided in a separate bar.

6.11. The installation of water coolers shall comply with all regulations pertaining to high-tension equipment and shall be adjustable to 20 per cent overload on the primary current. For therapy apparatus, the trip-fuses shall be made inaccessible.

6.11. X-RAY PROTECTION
brush discharge. Sharp edges of poles in the high-tension system should be avoided so far as possible in order to minimize sparking. Sharper edges or points in the high-tension system will provide higher and prevent corona. All permanent overhead high-tension systems shall be constructed of insulating rods of block of sufficient diameter to

8.0.1. All permanent overhead high-tension conductors

(A) Operating Voltage

operating voltage as shown in Table 1; corresponding to the maximum high-tension part, the equivalent point spark-gap of any point to any high-tension part, and in no case be placed nearer to any high-tension part than the equivalent point spark-gap of the local maximum. An insulation necessary to withstand the local maximum open-circuit voltage, the protective barrier, including the air space between the barrier and any high-tension part, shall provide a low-tension generator permanently grounded through a low-tension apparatus with the neutral of the high-tension apparatus.

B) Operating Voltage

operating voltage as shown in Table 1; corresponding to the maximum high-tension part, the equivalent point spark-gap of any point to any high-tension part, and in no case be placed nearer to any high-tension part than the equivalent point spark-gap of the local maximum. An insulation necessary to withstand the local maximum open-circuit voltage, the protective barrier, including the air space between the barrier and any high-tension part, shall provide a low-tension generator permanently grounded through a low-tension apparatus with the neutral of the high-tension apparatus.

such square protective barrier at the mean area does not exceed one-half.

7. INSULATED HIGH-TENSION BARRELS

barrel in accordance with paragraphs 7.0.2, 7.0.3, and 7.0.4. A grounded metal grid or screen may be used as a protective barrier at the mean area does not exceed one-half...
for the voltage used.

9.07. In installations having movable and easily accessible
high-tension leads, precaution shall be taken that such leads
are never at a distance from X-rays beyond two feet.
III. X-RAY EQUIPMENT IN ANESTHETIC

Protection against accidental breakage. In structures where the equipment is used, all pipelines and control devices that are subject to pressure shall be insulated electrically or grounded. Transformers, motors, controls, etc., shall be designed to be permanently grounded. Each X-ray apparatus, such as those stands, working voltage to be grounded.

When using X-ray tubes having any exposed high-voltage leads, the patient's head shall also be surrounded by a grounded metal sheath, also to be shielded by a suitable guard or insulating material. The high-voltage leads to the tube shall be shielded by a suitable guard or insulating material, also to be grounded. The tube is to be held or kept at a distance of at least 40 inches from the patient, and the table is to be moved or raised to provide the necessary distance. The high-voltage leads shall be kept free from all metal objects, and the patient's body shall be kept clear of all ground metal, and at least 40 inches from the X-ray tube when in use. When using X-ray tubes having any exposed high-voltage leads, the patient's head shall also be shielded by a grounded metal sheath, also to be shielded by a suitable guard or insulating material. The high-voltage leads to the tube shall be shielded by a suitable guard or insulating material, also to be grounded. The tube is to be held or kept at a distance of at least 40 inches from the patient, and the table is to be moved or raised to provide the necessary distance. The high-voltage leads shall be kept free from all metal objects, and the patient's body shall be kept clear of all ground metal, and at least 40 inches from the X-ray tube when in use. When using X-ray tubes having any exposed high-voltage leads, the patient's head shall also be shielded by a grounded metal sheath, also to be shielded by a suitable guard or insulating material. The high-voltage leads to the tube shall be shielded by a suitable guard or insulating material, also to be grounded. The tube is to be held or kept at a distance of at least 40 inches from the patient, and the table is to be moved or raised to provide the necessary distance. The high-voltage leads shall be kept free from all metal objects, and the patient's body shall be kept clear of all ground metal, and at least 40 inches from the X-ray tube when in use.
11. GENERAL REMARKS

11.01. Regulations of the National Board of Fire Underwriters for the Storage and Handling of Photographic and X-ray Nitrocellulose Films, of July 16, 1930, shall be adhered to in detail.

11.02. The committee gives its unqualified endorsement to the sole use of film of slow-burning or safety-base (cellulose acetate) type. It is specifically pointed out that such film constitutes no greater fire hazard than ordinary newspaper paper in the same form.

11.03. The regulations of the Board of Underwriters as given below apply only to the use of nitrocellulose film.

11.04. The following paragraphs are extracted from the regulations cited in Paragraph 11.01.1. Film of a slow burning or safety base (cellulose acetate) does not have a fire hazard characteristic of nitrocellulose film. The use of film of slow burning or safety base (cellulose acetate) is recommended for hospitals and similar institutions, doctors’ offices, X-ray laboratories, and the like. The cellulose acetate film (safety film) is in a class with ordinary newspaper paper in similar form and quantity in respect to the hazard to life of its smoke and fumes in a fire. Where large amounts are stored at the same location, these requirements for nitrocellulose film shall apply, based on available knowledge and field experience, prescribe such methods for protection.

11.06. Where both kinds of film are used or stored at the same location, in any building the requirements for nitrocellulose film shall apply, based on available knowledge and field experience, prescribe such methods for protection.

11.07. These regulations, based on available knowledge and field experience, prescribe such methods for protection.

*These paragraphs have been reprinted by permission of the National Board of Fire Underwriters. The numbering of the paragraphs has, however, been altered so as to conform to the system used in these recommendations.*
12.01. Storage of unpackaged films shall be in unopened containers.

12.04. In an outside storage house in accordance with sections 12.2 of the General. Storage of films in storage vaults in accordance with sections 12.2 of the General. Storage vaults shall be in a ventilated and fireproof vaults exceeding 15 cubic feet. Storage vaults shall be open at one time. Where the total 5 square feet or outside storage house, only one C.O. Shipping container of 5 cubic feet or outside storage vaults on outside storage house.

13.01. C.O. Shipping containers in approved containers at temperature

13.02. Storage of unpackaged films shall be in unopened containers for hospitals and similar institutions.

10.09. These regulations do not apply to: that where it is of the safety acceptor or sensitive film reel.

10.08. Safely photographic and X-ray film (cellophane acetate base) and dental X-ray film.

10.07. In the X-ray film and the protection taken in the handling of radiation to the remains of Josh as is its combination may be stored in the generation of films as its combination, and the decomposition of such hazard as the hazards of handling and storage of photographic
NOTE—Under extreme conditions of storage of film, in movement and situation.

19.06 AII cabinets shall be of approved insulated con-
cabine.t

Not over 250 pounds of films shall be kept in any single
19.06. No single cabinet shall exceed 10 cubic feet capacity.

Ventilated Cabinets.

Within the building, cabinets may be located on the floor. AII cabinets shall not be located
house in accordance with sections 19.28 to 19.34. Storage
cease of 500 pounds of film shall be in an outside storage
content to X-ray rooms for current use. Storage in ex-
outside storage houses. Approved cabinets shall be provided
in accordance with section 19.06 to 19.11, or in
19.04. All film cabinets shall be stored in approved ventilated.

and X-ray Laboratories.

Hospitals and Similar Institutions, Doctors' Offices,

Portals and Commercial Studios.

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17
The supports shall extend at least four hours projection as
the supports from steel columns, or walls, on either of masonry
or steel girders. Beams shall rest at both ends of steel
to carry the load steadily. Beams shall be supported by masonry or steel of sufficient strength to carry
the requirements given above. Walls shall be
insulated in accordance with the requirements given above.

12.7. The door and walls of every vault shall be made of
brick at least 8 inches thick or of reinforced concrete at least
36 square inches, including recesses.

12.7.3. No vault shall exceed 720 cubic feet in actual stor-

Veered Storey Vaults (Inside)

material

not nearer than 9 inches to any combustible
shall be covered with at least 1 inch of approved heat insulation
then upper than No. 18. S. Gauge; if inside the building, they
shall be covered with at least 4 inches of approved material
not less than 1 inch thick or of approved sheathing.

12.7.4. Vent hoods shall be of construction equivalent to
the exterior.

12.7.5. The outlet of each vent shall be above roof and at
least 25 feet from doors, windows, other openings, or fire
pipes.

12.7.6. The vent shall be vented to prevent escape of steam
upon a vent for a pipe length of 10 feet. For longer lengths
the vent area of less than 1/4 square inches, the vent shall have a
portion of the volume, except that no cabinet shall have a
portion of the building, For a cabinet of 10 cubic feet inside
outside of the building. For a cabinet of 10 cubic feet inside
12.8. Each cabinet shall be provided with a vent to the
ceiling which is equipped with at least one auto-

vent, closed, and opened by hand work, in each compartment (unit) unless specified.
The cabinet shall be equipped with a vent to the
ceiling. cabinets shall be designed to operate without automatic sprinklers.
18.14. The roof of vault or vaults shall be of reinforced concrete or equivalent, installed in the vault, and have a thickness of 6 inches. Vault walls shall be of reinforced concrete, or equivalent, at least 8 inches thick. A depth of 10 feet shall be provided for each 100 cubic feet of vault space.

18.15. Vaults shall not be provided with skylights or glass windows other than as specified under vents.

18.16. Proximity to boilers, stacks, or other sources of heat shall be avoided. Where heating is necessary, it shall be so screened that it does not come within 2 feet of the vault.

18.17. Door openings in vault shall be protected by an approved fire door of 4-hour or longer classification. It shall be kept closed except when in use.

18.18. In lieu of the above, door openings may be protected on each side by an approved fire door suitable for use in B classifications. The interior door shall be of the swing type and close into an approved frame. It shall be arranged to close automatically in case of fire originating in or out of vault.
13.22. Each sprinkler head shall be equipped with a sparger through which water shall be distributed with distribution of water.

13.23. The area to be covered by each sprinkler head shall not exceed 75 square feet or 1,000 square feet in any one sprinkler head. The area to be covered by each sprinkler head shall be equivalent to that of smokestacks.

13.24. All horizontal or vertical flues inside of the building shall be of a construction equivalent to that of chimneys.

13.25. The outlet of each vent shall be above roof and at least 20 feet from doors, windows, other openings, or the escape of the stairwell.

13.26. The outlet of each vent shall be above roof and at least 100 square feet for each 100 square feet of floor area.

13.27. The vent shall be insulated except in the immediate area of the sprinklers and the sprinkler heads shall be protected from freezing.

13.28. Substantial metal edges of approximately 2-inch provided between heads.

13.29. No area of floor area, properly protected, need not exceed 75 square feet or 1,000 square feet in any one sprinkler head. The area to be covered by each sprinkler head shall be equivalent to that of smokestacks.

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13.36. All horizontal or vertical flues inside of the building shall be of a construction equivalent to that of chimneys.
vide in accordance with sections 13.20 and 13.21. Other buildings, automatic sprinkler protection shall be pro-

section 13.17.

13.32. Health shall be in accordance with section 13.16.

Building, building with no direct communication between the room and the exterior of the building, shall be in accordance with the standard for the types of construction entitled to the required exterior access to the outside storage rooms shall be

13.33. Buildings exceeding 750 cubic feet capacity shall be

13.34. Buildings exceeding sections of not over 750 cubic feet shall be

13.35. Buildings exceeding sections of not over 750 cubic feet shall be

13.36. Buildings exceeding sections of not over 750 cubic feet shall be

13.37. Buildings exceeding sections of not over 750 cubic feet shall be

"Outside Storage House"

equal to that called for under paragraph 13.22. shall not have a mesh of less than 4 inches, shall be located inside the light wire screen, and shall give a net opening of

13.27. A light wire screen not coarser than one-eighth-inch

200 square inches.

the vent opening. No pane of glass shall be smaller than

The area of the glass shall be the effective sectional area of the opening. In cases of the use of an

13.26, Each vent opening shall be protected by a steel plate. Painted a dark color or by glass (one-sixteenth inch thick), partially a plate trimming in a such thickness shall be provided against the weather by single-thickness wire

X-RAY PROTECTION
V. OPERATING RULES

Same manner as other items until removed from the premises. 
14.09. Disposed, items shall be stored and handled in the
same manner as other items until removed from the premises.

14.08. First-aid, the application of types using water or
radiators, by physicians, of other sources of heat, shall be
handy to patients in prompt and proficient fashion.

14.07. Fire, if used, shall be of approved types.

14.06. No flame shall be stored within 2 feet of steam pipes,
shall be stored in prominent place.

14.05. Smoking shall be prohibited in rooms where
stoves, or other sources of heat, do not become overheated.

14.04. Illuminators shall be so built that the distilling
process room, or parts thereof, shall be protected.

14.03. The use of portable lights, no extension cords in any

NATIONAL ELECTRICAL CODE. See article 32, Hazards to the
Apparatus, to both unexposed items and live equipment.

A. GENERAL

13.33. Venas shall be in accordance with sections 13.22 and

PREFERENCE OF STANDARDS
in actual use.

The operation of the X-ray work, or when the machine is not

12.8. The main switch should be opened immediately upon

the purpose should be checked daily before commencing

12.9. Any accidental or optical signal system for operation

a return signal received from the equipment, and a

some disturbance noticed, or visible signal shall be given by

12.11. When the machine operation depends upon two per-

disconnected.

12.10. There are several applications for the equipment or examining-

12.9. If the transformer and controls are located in a

high-voltage part in another room.

12.8. In the case of equipment having high-voltage con-

12.7. Before touching any X-ray apparatus or high-

12.6. The commission of any protective devices for the sake

so that the can see without actuation.

12.5. The radiographic or radioscopic work should be performed for the sake

radiographic, and radioscopic. This test should be made

not to expose the body unnecessarily to radiation.

12.4. Lead rubber becomes hard and brittle with age, and

12.3. Properly folded and applied, even though in com-

12.2. Properly folded and applied, even though in com-

- X-RAY PROTECTION
20. 1928.


(See Fig. 1.)

1. With arms held straight, spine forward shown, so that the weight of your body is primarily brought to bear upon the heels of the patient. The shoulder should be directly over the heel of the patient. The patient's head is tilted backward, the knees are bent, and the hands are placed on the small of the back, with the fingers resting on the ribs, little fingers just touching the back, palms of the hands on the small of the back, and the backs of the hands on the small of the back, with the fingers just touching the small of the back.

2. Kneel, standing the patient's head, with your knees, nose and mouth the knee for breathing. (See Fig. 1.)

3. Lay the patient on his belly, one arm extended directly above the head.

How to give artificial respiration by the phone press.

When the telephone phone pressure method of resuscitation in each main room. Above the description of the method should be passed the instruction phone pressure used the method of resuscitation in each main room.
Figure 2—Resuscitation position 9
Regular rhythm is kept up.

7. In carrying out resuscitation it may be necessary to

at once at the time of change of operator and a

change in the rhythm of respiration. By this procedure on

breathing bag. The patient must be watched, and if after

breathing, the patient, after a temporary recovery, stops

breathing, the rhythm of respiration, Not important

indication for stopping the resuscitation. Not a certain

of natural respiration is not a certain

that he is being moved

not

normally, resuscitation should be carried on during the time

The patient should be warned that the patient before he is breathing

condition, etc., to move the patient before he is breathing

should be necessary, due to extreme weather

position. Should it be necessary, due to extreme weather

moving only in a lying

move from this point until he is breathing

point to where the patient received this injury. He should

should be carried on at the nearest


9. Resuscitation should be carried on during the time

should be kept warm


8. To avoid strain on the heart when the patient

by mouth until the patient is fully conscious.

If the doctor has not satisfied the patient

he should be kept lying down and not allowed to stand or sit

he should be kept lying down and not allowed to stand or sit


5. Continue artificial respiration without interruption.

The rescuer, and release a complete respiration in four or.

debreathing. To 15 times a minute, the double movement of

progress completed. (See Fig. 2)

Do not bend your elbows. This operation should take about

X-RAY PROTECTION
For the Committee:

ensuring radiologic work
is advisable that all persons be carefully examined before
tests and examinations should be permanently recorded. The
results of all
blood counts should be made periodically. The results of all
examinations for general radiation injuries should be
recorded.

I.04 All persons occupied in radiologic work should be
exposed to a minimum of 2 weeks of this continuous and during the summer months,
examinations at least once a week, examination of the chest at least once a month,
examinations of the chest in absence of susceptible conditions

I.05. Whereby assistant, technician, and operator should be
examined for any disease and susceptibility to
chest sprue, eye, and sinusitis.

I.06. Portable working conditions shall include
exposure to the workers in so far as conditions permit.

I.07. It is the duty of the physician in charge of the

I.08. Personal working conditions

I.09. Certain that the operator is

I.06. Contact breakers should be examined monthly to be

eliminated, the cause thereof shall be investigated and
applicable instructions on the exposed part of the chest is
abnormal, for those working days, the chest is
examinations with a dental X-ray film, and covered with lead
should be worn on the breast consistently, with the

1603. At least every four months, the X-ray protection for the

1602. For the purpose of providing safety for the work-

hazards and be remedied.

1601. The equipment of X-ray protection and procedure

I.01. The Bureau of Standards