Kurdistan Engineering union

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Construction of X-ray Room

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This research for reach consultant in civil engineering

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Introduction:

- The importance of any project in terms of architectural design, beauty and use depends on the structural design and implementation and how economical and safe the project is implemented in a short time.
- Radiology is one of the broad fields that every individual in society needs, so it should be given special attention in order to protect everyone.
- In this paper we explain the role of civil engineering in the implementation of projects and in the field of radiology, especially because if not implemented according to standards, it will cause problems and the spread of many diseases such as cancer.

Abstract :

In this study, we will focus on the most important parts of the radiology department (X-ray).

- We will also try to briefly discuss about X-ray Description of the section
- The importance of the department in medical processes.
- Architectural design
- construction design

Concept of medical imaging :

Before we start our article about the design and implementation of radiation rooms in hospitals and health centers, we must first know an explanation about radiation and its use in medicine, then all the needs which must be considered for this purpose.

Medical imaging is an extremely important element in medical practice in this day and age, but have you ever stopped to consider its true importance? Medical imaging has changed the face of the healthcare industry and allowed practitioners and scientists to learn more about the human body than ever before.

In diagnosing an ailment or illness, physicians frequently order diagnostic scans such as an x-ray, CT scan, or MRI. While medical knowledge and discernment forms the basis of health practitioner diagnoses and decisions, medical imaging is a vital part of confirming any diagnosis. Medical imaging can also assist in decisions regarding treatment and future care of the issue. As

technology advances, medical imaging can inform the doctor of internal problems that a basic external examination would fail to detect. Medical imaging is absolutely necessary when tracking the progress of an ongoing illness. MRI's and CT scans allow the physician to monitor the effectiveness of treatment and adjust protocols as necessary. The detailed information generated by medical imaging provides patients with better, more comprehensive care.

The use of ultrasound imaging is extremely important for expectant mothers. Ultrasound technology has advanced significantly over the past decade, and sonogram images are now produced with a much higher resolution, creating finely detailed images. This gives obstetricians a vastly improved picture of the baby's health and progress in the womb, allowing them to ascertain any issues of concern much earlier on in the pregnancy. As well as obstetrics, ultrasound is extensively used on other parts of the body including the soft tissues of the neck, breasts, abdomen, pelvis, and soft tissues of the extremities. It is also used as a guide for biopsies of soft tissues and for some treatments.

One further benefit of medical imaging is its function in preventative care. Recommended evaluations such as mammography can help detect early signs of breast cancer. An increase in the use of mammograms has been suggested to account for a 30% decrease in breast cancer fatalities since 1990.

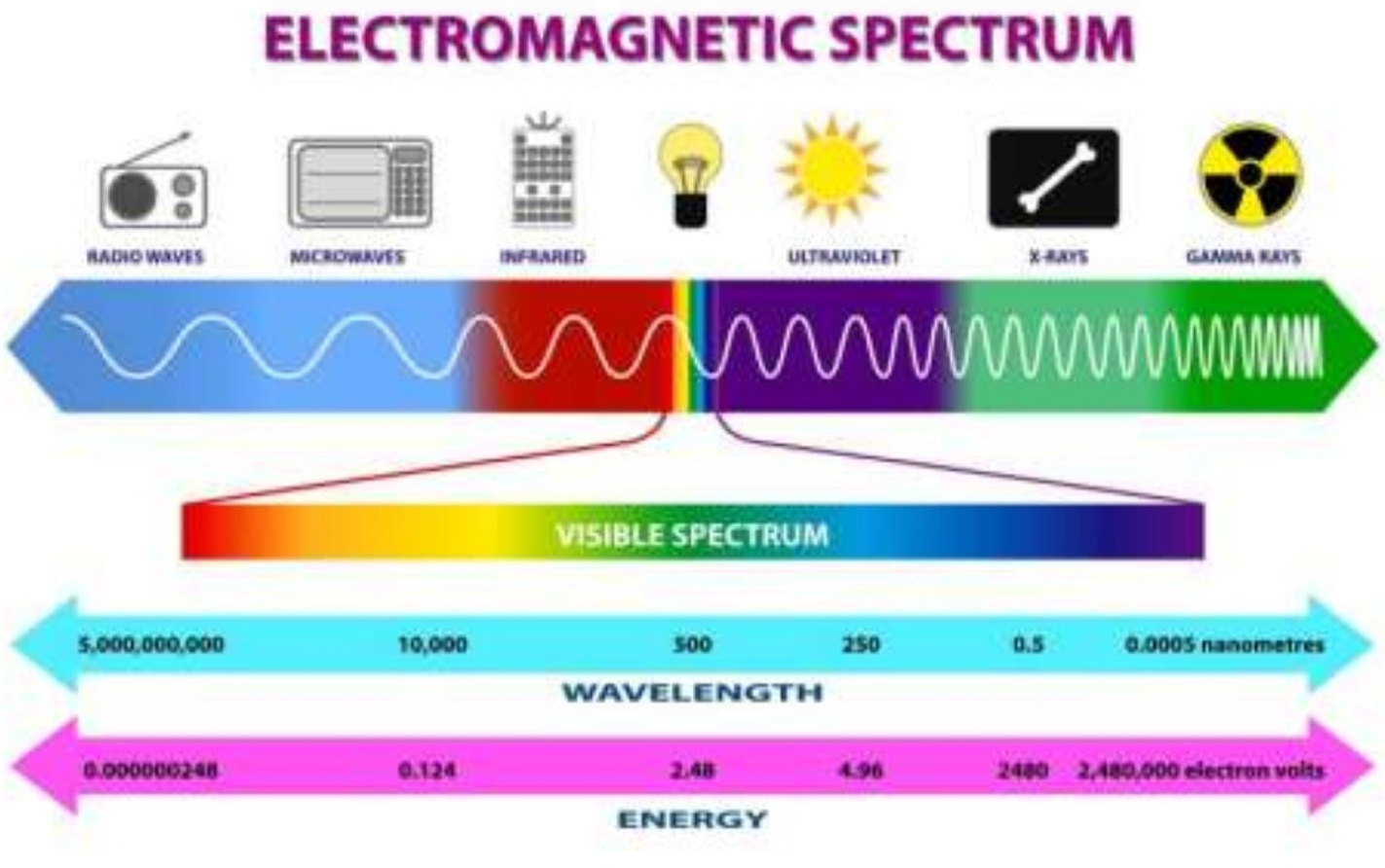
Medical imaging also is used by surgeons as an aid in surgical procedures. One example of medical imaging as an effective surgical tool is in the case of endoscopic sinus surgery. The extensive network of the sinus can be examined closely prior to the procedure through study of a CT scan. CT scans can provide 3D images of various cross-sections of the body—images which are of absolute

necessity when preparing to operate on such an area. CT scans are also being utilized more frequently during surgical procedures, for a similar purpose of guiding physicians throughout a delicate internal operation.

Medical imaging is truly a vital element of the healthcare world–an essential tool for physicians to assist with diagnostics, treatment, and prevention. As technology continues to advance at a rapid rate, we will see growth in medical imaging technology as well. With scientific advancement and a continued effective use, medical imaging will continue to help with earlier detection of health issues, aid in easier treatment, and provide increased preventative care.

X-ray and properties :

X-ray, electromagnetic radiation of extremely short wavelength and high frequency, with wavelengths ranging from about 10−8 to 10−12 meter and corresponding frequencies from about 1016 to 1020 hertz (Hz).



X-rays are a form of ionizing radiation—when interacting with matter, they are energetic enough to cause neutral atoms to eject electrons. Through this ionization process the energy of the X-rays is deposited in the matter. When passing through living tissue, X-rays can cause harmful biochemical changes in genes, chromosomes, and other cell components. The biological effects of ionizing radiation, which are complex and highly dependent on the length and intensity of exposure, are still under active study (see radiation injury). X-ray radiation therapies take advantage of these effects to combat the growth of malignant tumors.

Lead and properties that used in Shielding :

Lead is a chemical element with the symbol Pb (from the Latin plumbum) and atomic number 82. It is a heavy metal that is denser than most common materials. Lead is soft and malleable, and also has a relatively low melting point.

Lead also causes long-term harm in adults, including increased risk of high blood pressure, cardiovascular problems and kidney damage. Exposure of pregnant women to high levels of lead can cause miscarriage, stillbirth, premature birth and low birth weight.٢٠٢٣/٠٨/١١

Lead barriers are excellent for imaging procedures using ionizing radiation such as fluoroscopy, x-ray, mammography and CT. The use of shielding provides a barrier between you and the source of the radiation. Some examples of shielding are lead aprons, lead glasses, thyroid shields and portable or mobile lead shields.

How to construction an x-ray room :

Whether you're looking for an upgrade to your current x-ray room or are starting from scratch, the process can be overwhelming if you don't know where to start. This article will walk you through how to create an x-ray room that is functional and meets compliance requirements.

Orthopedics and Fractures facilities tend to utilize a wall stand only, a tube stand, and have an area required for the operator to take the x-rays. The operator area will be a lead-lined area that you stand behind to protect yourself from radiation where you can have the generator, the operator console, and if using a digital x-ray, the computer and monitor as well.

Orthopedics and Fractures facilities don't require as much space compared to an urgent care facility, imaging center or hospital as normally these facilities also use a table. When using a table you'll need more space to place it in the room as well as making sure you have enough room to be Americans with Disabilities Act (ADA) compliant. ADA is a regulation that makes sure you are compliant with being able to give access to those who are disabled. As part of this requirement access ways will need to be at least 36 inches wide for a patient to move in and out in a wheelchair.

In Orthopedics and Fractures facilities, depending on room orientation, walls, and windows, you'll be looking for at least one wall that will be a minimum length of 11 feet. This is because you need 3 feet minimum for the operator area as well as at least 8 feet of room for the wall stand and tube stand. This much space is required when taking an x-ray at 72 SID.

Larger rooms are better, having more space can provide improved flexibility. In a larger space you may not necessarily put the x-ray

machine and control area on one wall, the operator area may be in a different space as well.

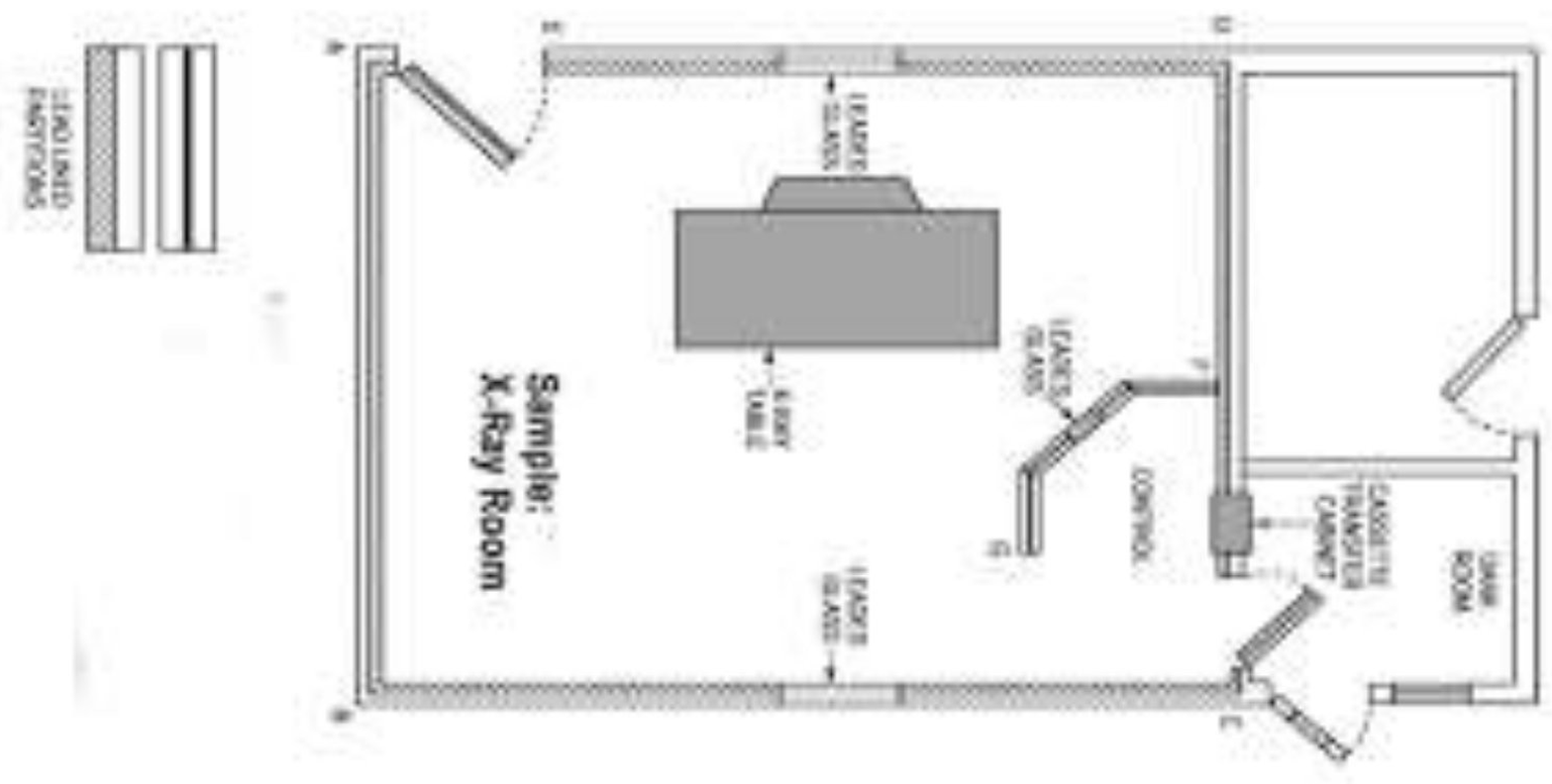
Urgent care x-ray rooms will require more space to be able to place a table. A 12 foot by 14 foot room would be a good sized room. We can provide you with an equipment room drawing that outlines all the possible layouts and schematics.

X-RAY ROOM SIZE :

The general radiology room size should be approximately 16 m2. The design layout should be spacious for setting up an easy workflow. The wall thickness should be at the level of the shielding standards defined. The doors must be sliding and wide for the easy movement of the patients.
The radiology room size of radiology should be approximately 16 m2. The design layout should be spacious for setting up an easy workflow.

- The wall thickness should be at the level of the shielding standards defined.
- The doors must be sliding and wide for the easy movement of the patients.
- The windows are avoided to reduce the penetration of radiation in the surrounding area.
- The x-ray machines must be installed in the corner so that there is enough moving space.
- The flooring should be able to bear a load of heavy machines especially if the lab is built on top floors.

Note: The recommended construction should be done on the ground floor.



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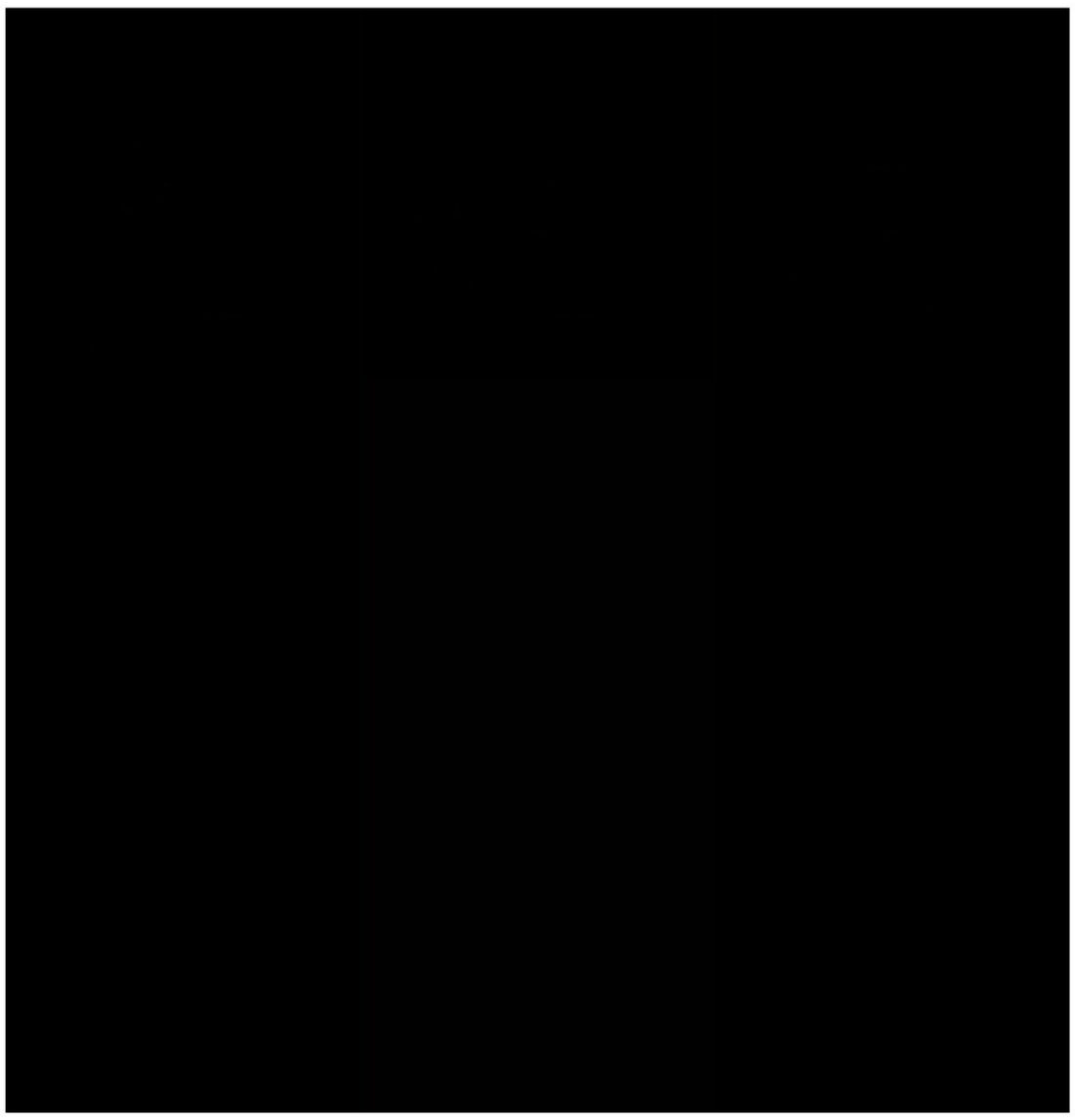


ELECTRICAL COMPONENTS OF AN X-RAY ROOM

Once you've considered room size, you need to consider the electrical components. The generator you get will depend on the electrical components you need for incoming power. Electricity will come from the main breaker to a disconnect switch inside the x-ray room. This disconnect switch is typically placed close to the operator room in case of emergency to eliminate the power going into the x-ray generator.

There are lots of different generators from 30kw - 60kw+, however it is important to note that having more power puts more demand on the electrical current. Traditional chiropractic rooms or even urgent care facilities should have 100 amps dedicated to that room. Reach out to us for schematics about the exact electrical requirements for your generator.

There is another type of generator, called the stored energy generator, if you don't have the right electrical levels in your facility for a traditional generator. The stored energy generator works on a standard 110 outlet with 20 amps dedicated to that room. It doesn't require a lot of power and doesn't require you to upgrade your panel. The stored energy generator has minimal requirements from an electrical standpoint, and should be considered when building out your x-ray room.

LEAD REQUIREMENTS OF AN X-RAY ROOM:

When we provide you with an equipment room drawing we try to minimize the lead requirements. For example, if your x-ray is shooting to an external brick wall it may not require lead. Similarly, if your x-ray is on a second story and shooting outside and there's nothing outside within a certain radius to receive radiation we may point it in a certain direction to minimize lead requirements.

Once the equipment room drawing is complete you'll fill out an intake form which will say how many x-rays you take per day, how you'll be shooting them e.g. cross table shots. This intake form will then be sent to a physicist. The physicist will provide a very detailed document that provides the exact amount of lead and how thick it's required to be.

Lead-lining will have varying thicknesses depending on both the material of the existing room and whether it's an exterior or interior wall. For example, concrete wall outside vs. interior drywall will change how thick the lead will need to be.

LEAD LINING THE OPERATOR AREA:

The operator area itself also needs to be lead-lined. There are two options to lead-line an operator area;

Create a wall and purchase a lead-lined window which will give you the amount of protection required by the physicist to put lead drywall or lead sheets onto the operator area.

Once we know how much lead is required, we will get involved with your contractor and electrician to let them know where and how to install the lead shielding in accordance with the physicist report.

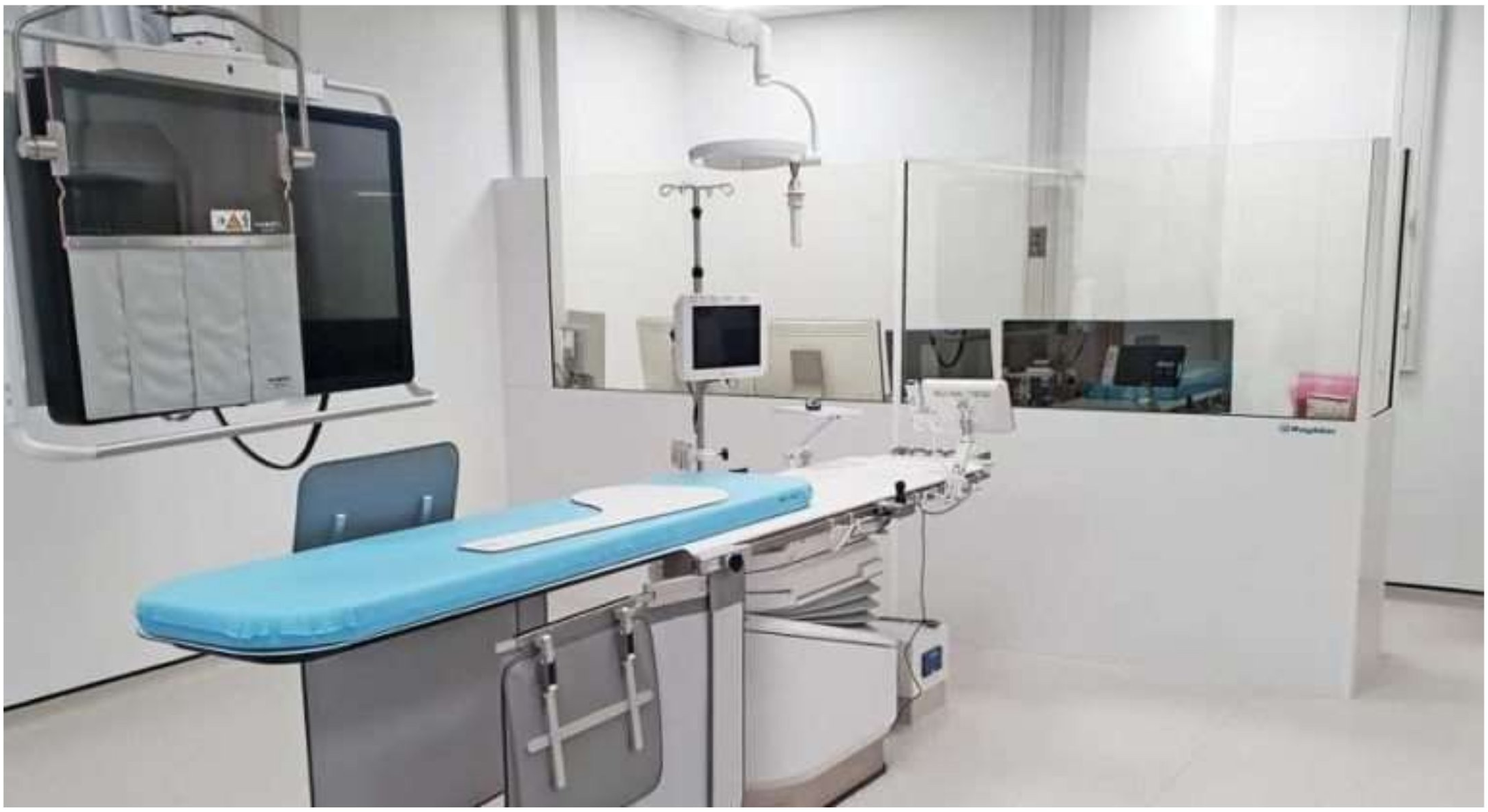
INSTALLATION:

Once build out is complete we'll deliver the equipment to your facility which will come in multiple crates (depending on the size). Our team will then provide installation training, depending on the equipment and the different options you've selected will determine how long the install will be. Installs can range from 2 days for chiropractic facilities to 3 days for urgent care. We will then train your staff on how to utilize the system.

IN CONCLUSION

If you are considering building an x-ray room for your Orthopedics and Fractures, urgent care or hospital facility, it is important to know how much lead and other requirements will be required. Maven can help specify the exact amount of lead needed by undertaking a thorough equipment room drawing that takes into consideration all factors including shooting direction, window placement and existing materials in the space. Once this information has been collected we'll provide quotes on what needs to be shipped from our suppliers which includes prefabricated manufactured walls with windows as

well as drywall sheets if they are not available locally. We also offer installation training so that staff members may operate the equipment safely once installed according to manufacturer specifications.



Thank you