

Shielding Considerations

- **DIAGNOSTIC RADIATION SHIELDING CONSIDERATIONS**

Per the current NCRP Report #147(2004)1.5 General Concepts, states: "The term "qualified expert" used in this report is defined as a medical physicist or medical health physicist who is competent to design radiation shielding for medical x-ray imaging facilities. The qualified expert is a person who is certified by the American Board of Radiology, American Board of Health Physics, or the Canadian College of Physicists in Medicine.

Radiation shielding shall be designed by a qualified expert to ensure the required degree of protection is achieved.

The qualified expert should be consulted during the early planning stages since the shielding requirements may affect the choice of location of radiation facilities and type of building construction. The qualified expert should be provided with all pertinent information regarding the proposed radiation equipment and its use, type of building construction, and occupancy of nearby areas. It may be necessary to submit the final shielding drawings and specifications to pertinent regulatory agencies for review prior to construction".

LEAD SHIELDING REQUIREMENTS SHOULD BE CALCULATED AND DETERMINED BY A CERTIFIED RADIATION HEALTH PHYSICIST BASED ON THE FOLLOWING FACTORS:

- 1) **ENERGY**: HOW POWERFUL IS THE X-RAY UNIT(S) OUTPUT IN kVp?
TYPICALLY, THE HIGHER THE OUTPUT, THE HIGHER THE SHIELDING REQUIREMENT.
 - 2) **WORKLOAD**: HOW MANY EXPOSURES PER WEEK / MONTH / YEAR? MAXIMUM PATIENT VOLUME GROWTH SHOULD BE PROJECTED IN, AS RADIATION IS CUMULATIVE AND OVEREXPOSURE CAUSES BIOLOGICAL DAMAGE ON THE CELLULAR LEVEL. AS AN EXAMPLE, IN CALIFORNIA, IT IS LIMITED TO A MAXIMUM PERMISSIBLE EXPOSURE LEVEL OF 100 mrem PER YEAR, IN ADDITION TO THE 360 mrem OF RADIATION THE AVERAGE PERSON IS EXPOSED TO PER YEAR DUE TO ENVIRONMENTAL FACTORS (I.E.: ULTRA VIOLET, SOLAR, RADON GAS AND ATMOSPHERIC RADIATION). ALWAYS CHECK WITH ALL LOCAL HEALTH AND SAFETY LAWS AND CODES FOR CURRENT COMPLIANCE REQUIREMENTS.
 - 3) **ORIENTATION**: EACH WALL SECTION WILL BE CALCULATED BY YOUR PHYSICIST IN RELATION TO THE DIRECTION OF THE PRIMARY BEAM TARGET (WHERE IT WILL BE AIMED) AND SCATTER (SECONDARY) RADIATION OF THE X-RAY UNIT, AS WELL AS FLOOR OR WALL BUCKY CASSETTE HOLDER (TARGET AREA).
 - 4) **DISTANCE**: RADIATION DISSIPATES AS DISTANCE INCREASES. TYPICALLY, THE CLOSER A PARTITION IS TO THE RADIATION / X-RAY SOURCE, THE HIGHER THE LEAD SHIELDING REQUIREMENT.
 - 5) **OCCUPANCY**: ONE OF THE MOST IMPORTANT FACTORS OF CALCULATION IS HOW MUCH TIME IN A DAY THAT A SURROUNDING ROOM COMMON TO THE X-RAY ROOM WILL BE OCCUPIED BY YOUR PERSONNEL OR THE PUBLIC. (I.E.: A STORAGE ROOM WOULD HAVE A LOWER OCCUPANCY FACTOR AND A WAITING ROOM OR OFFICE MAY BE HIGH). THEREFORE, IT IS CALCULATED ROOM BY ROOM FOR ALL ROOMS CONNECTED (OR COMMON) TO THE X-RAY ROOM. IF THERE IS NO OCCUPANCY POTENTIAL, THEN TYPICALLY NO SHIELDING WILL BE REQUIRED (I.E.: FLOOR OR ROOF OF A SINGLE STORY BUILDING).
 - 6) **MATERIAL**: SOMETIMES A PHYSICIST WILL TAKE INTO CONSIDERATION THE EXISTING OR PROPOSED CONSTRUCTION MATERIAL OF THE WALL PARTITION OR FLOORING MATERIAL, AS HEAVY DENSITY MATERIALS CAN ATTENUATE (SHIELD) RADIATION TO A CERTAIN DEGREE, SUCH AS CONCRETE, STEEL, PLASTER, BLOCK OR MULTIPLE LAYERS OF DRYWALL. THIS MAY REDUCE, OR IN SOME CASES, ELIMINATE YOUR LEAD SHIELDING REQUIREMENTS, DEPENDING ON THE VALUES OF THE PREVIOUS FIVE FACTORS TO BE CONSIDERED. ALWAYS SELECT HIGH QUALITY SHIELDING MATERIALS AND PRODUCTS BY ONLY PURCHASING FROM EXPERIENCED, KNOWLEDGEABLE SUPPLIERS WITH AN ESTABLISHED GOOD REPUTATION SUCH AS RAY-BAR ENGINEERING CORPORATION AT 1(800)444-XRAY
- THERE MAY ALSO BE OTHER CONSIDERATIONS, SUCH AS X-RAY FILM TO BE PROTECTED FROM RADIATION EXPOSURE TO PREVENT "FOGGING" AND THE SHIELDING OF VARIOUS RADIATION SENSITIVE EQUIPMENT, OR DESIGNATIONS OF PERIMETER OCCUPANCIES AS "CONTROLLED" OR "UNCONTROLLED"

"There is nothing more expensive than cheap radiation shielding"

IMPORTANT NOTES:

- **ALL PENETRATIONS WITHIN A SHIELDED WALL PARTITION MUST BE SHIELDED WITH LEAD OR OTHER MATERIAL OF EQUAL OR GREATER PROTECTIVE VALUE.**
- **MINIMUM HEIGHT OF WALL SHIELDING IS 7'0" A.F.F. PER NCRP REPORT #49 (NATIONAL STANDARD)**
- **LEAD SHIELDING FOR PARTITIONS MUST BE BONDED TO RIGID PANELS (I.E.: RAY-BAR DRYWALL, PLYWOOD, OR PANELING) FOR STRUCTURAL STRENGTH.**
- **SHIELDING REQUIREMENTS MAY CHANGE IF ANY ONE OF THE FIVE BASIC FACTORS CHANGE.**
- **ALL RADIATION PRODUCING SOURCES MUST BE LICENSED AND REGISTERED.**
- **TYPICAL DIAGNOSTIC ROOMS: X-RAY, RADIOGRAPHIC, FLUOROSCOPIC, C.T. SCAN, CATH LAB, ANGIOGRAPHY, CAT SCAN, PET SCAN, MAMMOGRAPHY, ETC.**
- **RADIATION THERAPY ROOM CALCULATIONS ARE MUCH MORE INVOLVED THAN DIAGNOSTIC DUE TO THE MUCH HIGHER RADIATION ENERGY LEVELS AND OTHER IMPORTANT CONSIDERATIONS TO FACTOR IN.**
- **END USER SHOULD ALWAYS HAVE ALL SHIELDING PROJECTS COMPLETELY TESTED AND SURVEYED BY A QUALIFIED RADIATION HEALTH PHYSICIST AFTER INSTALLATION AND PRIOR TO ANY OCCUPANCY OR USE.**

- **Please contact Ray-Bar directly for additional technical assistance in designing and providing the x-ray protective materials and radiation shielding products your unique radiation room shielding needs: Phone# 1(800)444-XRAY(9729) or e-mail at sales@raybar.com or go to our [CONTACT US](#) page on this website.**

"When protection is required, there is no substitute for skill and experience"