

Guidelines for shielding of x-ray installations

This guideline may be used to determine the shielding required for a new installation or when modifying an existing one. .

X-ray equipment must be installed in adequately shielded rooms to ensure that surrounding area of the x-ray installations are not excessively exposed to x-ray radiation. The adequacy of shielding depends on the material and thickness used for this purpose. Different materials can be used for shielding. However, brick or concrete are considered one of the best materials, as they are easily available, economical, and have good structural strength, and should have adequate shielding from radiation that would prevent the radiation from exposing to the surrounding.

1. Planning layout of diagnostic radiology facility:

- a) Suitable room for housing an X-ray unit to facilitate the easy movement of staff and patient positioning and minimize radiation exposure.
- b) Room should have one entrance door, window if present, should be above 2m from the finished floor level outside the x-ray room.
- c) Door should have a hydraulic mechanism to ensure that door is properly closed during procedure.
- d) Door should have overlapping at the joints to avoid streaming.

2. Position the location of the equipment as follows:

- a) ***Radiography and Fluoroscopy equipment:*** Couch, Control console and chest stand
 - In such a way that chest stand is on the opposite wall of the entrance door and the control console.
 - Mobile protective barrier with lead equivalent glass viewing window should be positioned in such a manner that the operator is completely shielded during the exposure.
 - Control console to position as far away as possible from the x-ray tube.
- b) ***Computed Tomography and Interventional radiology equipment:*** Gantry / C-Arm, Couch, Separate control console room, viewing window,
 - Position the gantry and couch such that the patient is completely visible from the control console, during the scanning
 - The entrance door to the gantry room from the control console shall have similar requirements as the patient entrance door.

- c) *Mammography/ OPG/ CBCT*: Control console, Equipment and Protective barrier positioning of equipment should be as far as possible from the door and the control console.
3. Decide on the material and thickness of walls and door by referring to equipment specific table.
 4. Measure the distances of all the walls, doors, windows from the centre of the couch
 5. Note that the required shielding of any material shall be provided at least up to the height of 2m from external finished floor of x-ray room.

PLEASE NOTE:

The final assessment of the adequacy of the design and construction of structural shielding is based on the radiation survey of the completed installation to be carried out at the time of commissioning after installation by supplier of the equipment. If the assessment survey shows deficiencies, additional shielding or modification of equipment and procedures are required.

REFERENCE DATA ON SHIELDING OF X-RAY INSTALLATION ROOM

Radiography and Fluoroscopy

Shielding Material	Distance from center of patient Table		
	1.5 m	2.0 m	Primary wall of dedicated chest x-ray installation at 2 m
Brick (cm)	23	20	20
Concrete (cm)	15	12	12
Steel (cm)	2.3	2.0	2.0
Lead (cm)	0.17	0.15	0.15
**Any other material	2.0 TVT	1.8 TVT	1.8 TVT
Floor (if installation is not on ground floor) and ceiling thickness of 6-8 inch concrete is adequate			

Computed Tomography

Shielding Material	Distance from iso-centre			
	1.5m	2.0 m	2.5 m	3.0
Brick (cm)	27	25	23	20
Concrete (cm)	18	15	13	12
Steel (cm)	2.7	2.5	2.0	1.8
Lead (cm)	0.21	0.18	0.15	0.14
**Any other material	3.0 TVT	2.8 TVT	2.6 TVT	2.5 TVT
Floor (if installation is not on ground floor) and ceiling thickness of 6-8 inch concrete is adequate				

Interventional Radiology (Cardiac Angiography)

Shielding Material	Distance from center of Patient Table			
	1.5m	2.0 m	2.5 m	3.0 m
Brick (cm)	25	23	20	18
Concrete (cm)	18	15	12	11
Steel (cm)	2.5	2.05	1.5	1.3
Lead (cm)	0.2	0.18	0.16	0.15
**Any other material	2.35 TVT	2.0 TVT	1.95 TVT	1.8 TVT
Floor (if installation is not on ground floor) and ceiling thickness of 6-8 inch concrete is adequate				

Mammography

Shielding Material	Distance from center of Patient Table		<ul style="list-style-type: none"> Standard gypsum wallboard construction is usually adequate to shield the walls of mammography facility (as per thickness given below) Solid core wooden door (5 cm thick) leading to corridors outside a mammography room provide adequate shielding. Standard wooden doors may not be sufficient if the shielded area has significant
	1.0m	1.5 m	
Gypsum Wallboard (cm)	1.5	1.0	
Plate Glass (cm)	1.0	1.0	
Concrete (cm)	1.0	1.0	

Brick (cm)	1.5	1.0	occupancy.
**Any other material	2 TVT	1.68 TVT	<ul style="list-style-type: none"> • Standard concrete construction provides adequate barriers above and below mammographic facilities • Lead lined walls and doors are usually not required

Done mineral Densitometry

Dose rate 1m is less than allowed dose limit for public hence no structural shielding is needed even with the smallest room.

Dental CBCT/OPG (Ref:- Report of HPA working party on dental CBCT (HPA-RPD-065))

Shielding Material	Distance from center of Patient Table			
	0.5m*	1.0m	1.5m	2.0 m
Brick (cm)	22	17	15	12
Concrete (cm)	15	11	9.5	8
Baryte Plaster (cm)	1.5	1.0	--	--
Lead (cm)	0.22	0.17	0.15	0.12
**Any other material	2.6 TVT	2 TVT	1.72 TVT	1.4TVT

*Consider at this distance as the foot print of this equipment is small 100cm × 150cm
Floor (if installation is not on ground floor) and ceiling thickness of 6-8 inch concrete is adequate



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SCOPE OF WORK.

Name of the Project: LEAD SHIELDING (CATHLAB)

#	Description	Qty	Rate	Total
1	Supply and Installation of Lead Shielding up to ceiling level at walls of DSA room 1- Thickness greater than or 2mm lead sheet 2- Should pass radiation safety evaluation of (MOH – Cath lab Standard), if not, the supplier must conduct corrective measure to comply the requirement of the (MOH – Cath lab Standard) 3- Supplier should supply all the materials needed and proper installation of the lead shielding including marine plywood board (or equivalent) for the base and cover of the lead sheet. 3 - Must have certificate of product registration or equivalent stating the quality and standard use for the lead/material	748.71 ft ²		
	Supply and Installation of hygienic wall cladding (ALTRO WHITEROCK SATINS – LRV 64 / Clarity for operation theaters, wards, Disinfectant resistant) or similar. Shall have ISO and CE certifications of product.	748.71 ft ²		
	Fabricating and Installation of Led Glass (1200 x 900)mm, 6mm Thick with wooden frame	1 Item		
	TOTAL			

Note: Contractor should include GST and other relevant charges.

Dental – intra oral radiography (Recommendatory)

Shielding Material	Distance from center of Patient Table					
	1.0		1.0m		4.0 m	
	Primary Wall	Secondary Wall	Primary Wall	Secondary Wall	Primary Wall	Secondary Wall
Brick (cm)	12	5	10	5	8	--
Concrete (cm)	9	4	7	2	5.0	--
Lead (cm)	0.1	0.04	0.08	0.02	0.06	--

C-Arm and Lithotripsy X-ray Equipment:

Mobile C-arm and lithotripsy equipment should be used in operation Theater with Normal Wall thickness of 9”brick/6” concrete and should have 1.0 mm lead lined doors/windows.



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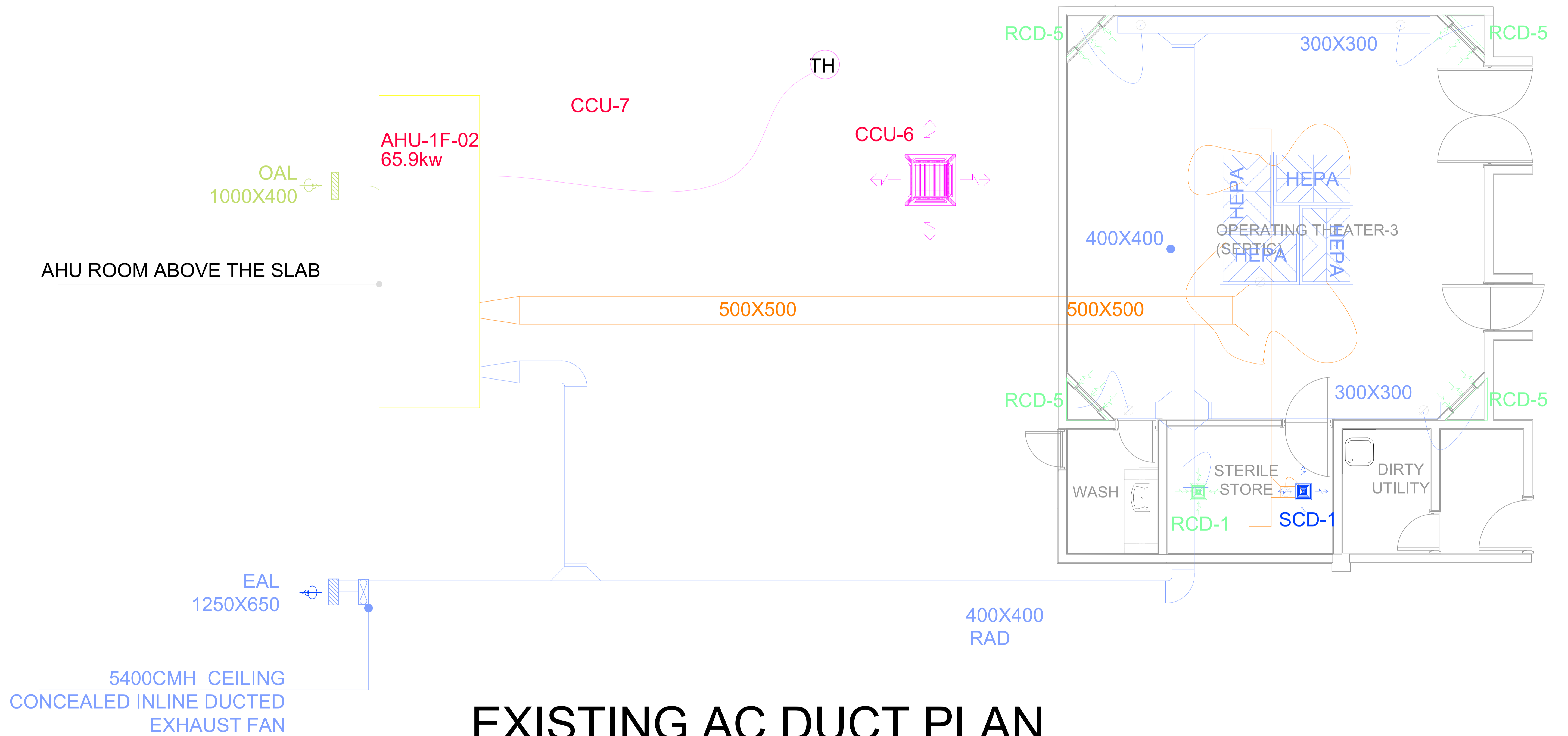
Category 2

SCOPE OF WORK.

Name of the Project: Supply ,installation of DUCT SYSTEM and AHU Duct Modification

#	Description	Qty	Rate	Total
1	Supply and Complete Installation of (LG/Hitachi) Duct Unit system with top throw Outdoor unit for UPS Room & Equipment Room 1 - Duct Unit 32000BTU x 2pcs 2 - Outdoor unit 8HP top throw 1 unit 3 - Dehumidifier controller	1 Item		
	Existing AHU Modification of Duct Grills to change Septic OT to Cath Lab as per drawing - Use existing Laminar Flow Diffusers and Return Air diffuser.	1 Item		
	TOTAL			

Note: Contractor should include GST and other relevant charges.



EXISTING AC DUCT PLAN

PROPOSED DSA ROOM PLAN – ADDU EQUATORIAL HOSPITAL

(POWER AND AIR CONDITION)

