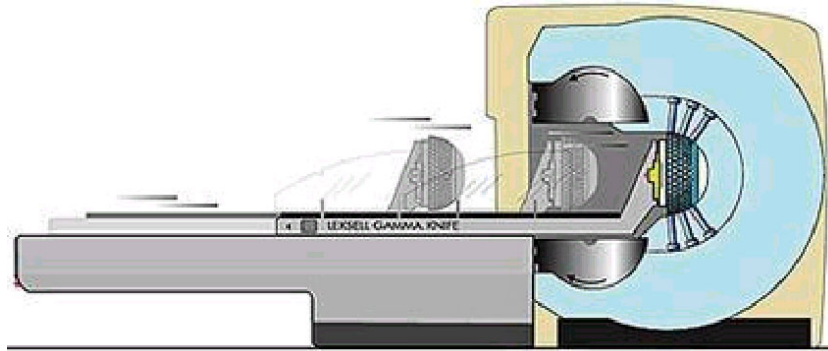
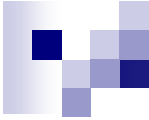




# Gamma Knife Room Design

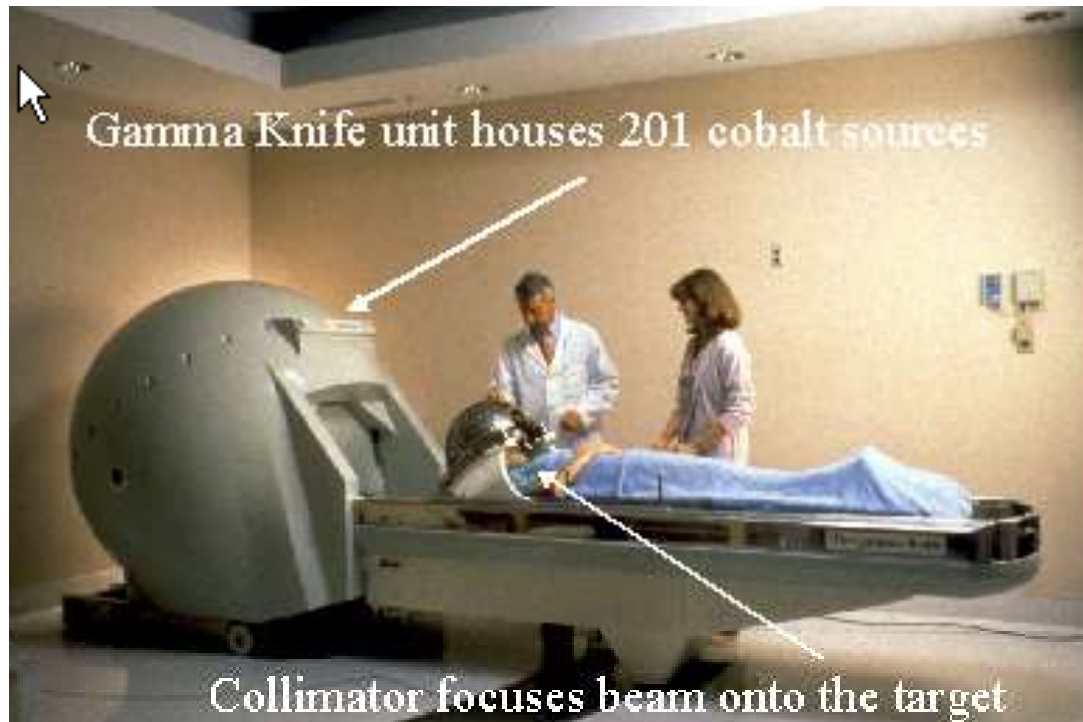


When applying for a license approval for a gamma knife the facility must submit an annotated drawing of the room or adjacent areas in which byproduct material will be received, used, and stored.



Radiation safety for adjacent rooms is figured using standard formulas for number of patients treated per day or workload which is:

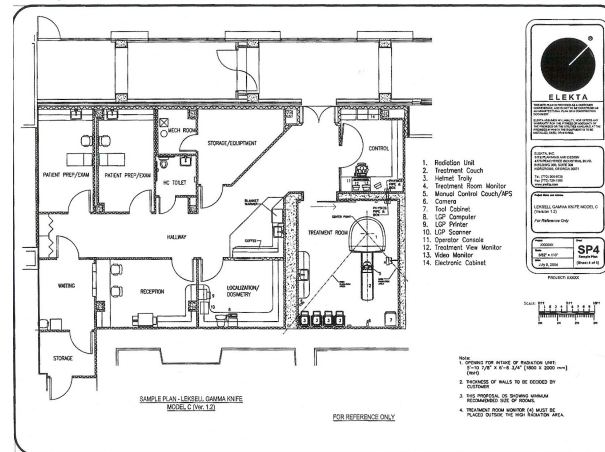
- output produced by the unit per week at 1 m
- occupancy of the rooms adjacent to the gamma knife
- the use factor or the percentage of time the radiation is directed at the barrier under consideration
- leakage radiation
- the distance from the gamma knife to the wall.



The walls, ceiling and floor must be considered. The gamma knife must be in a restricted area, but many facilities shield their units to comply with the requirements for an unrestricted area.



The unit is designed with a console area that has visual and audio communication with the patient. An interlocking door is required to prevent entry into the room to minimize exposure by interrupting the irradiation when the treatment is in progress.



When applying for a license approval for a gamma knife the facility must submit an annotated drawing of the room or rooms and adjacent areas in which byproduct material will be received, used, administered, and stored. This includes rooms used to confine patients awaiting treatments and patients undergoing in-patient therapy procedures.

A facility diagram is required using a preferred scale of 1/4 inch = 1



## The facility drawing will indicate the following:

- Direction of North
- Location, room numbers and principal use of each adjacent room (office, file, toilet, closet, hallway) including areas above and below therapy treatment rooms. Note that areas should be described as restricted or unrestricted as defined in 10CFR 20.1003.
- Type, thickness, and density of the shielding materials used on all sides of the treatment room, including the walls, floor, and ceiling
- Locations of doors, windows, conduits, and other penetrations and voids in the shielding materials.



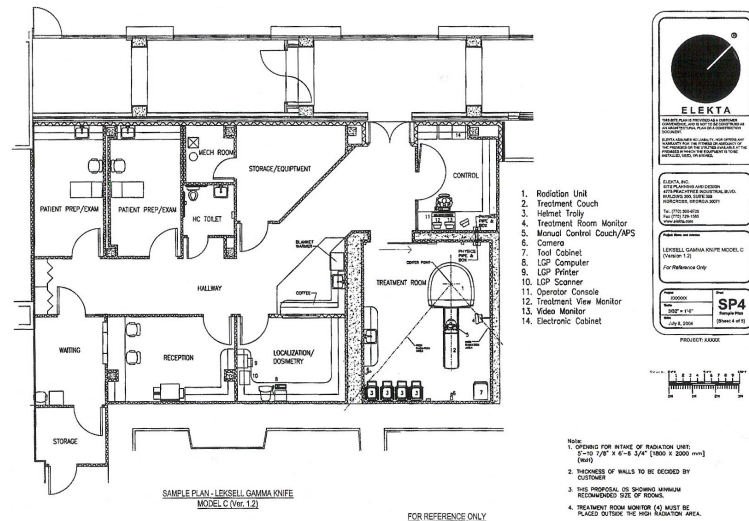
## The facility drawing will indicate the following:

- Nature and distances to all areas adjacent to therapy patient treatment rooms (including above and below) with an indication of whether the areas are restricted or unrestricted. Note that plans and elevation drawings are particularly helpful in showing the relationship among the treatment room, the roof, and the rest of the building, location of the treatment unit and source within the treatment room.
- Directions of the plane of beam rotation in an isocentric unit.
- Height of earth against outside walls, as applicable.



# The facility must provide:

A copy of the manufacturers calculation of the source(s) intensity.  
Calculations of the maximum radiation levels expected in each adjacent area.

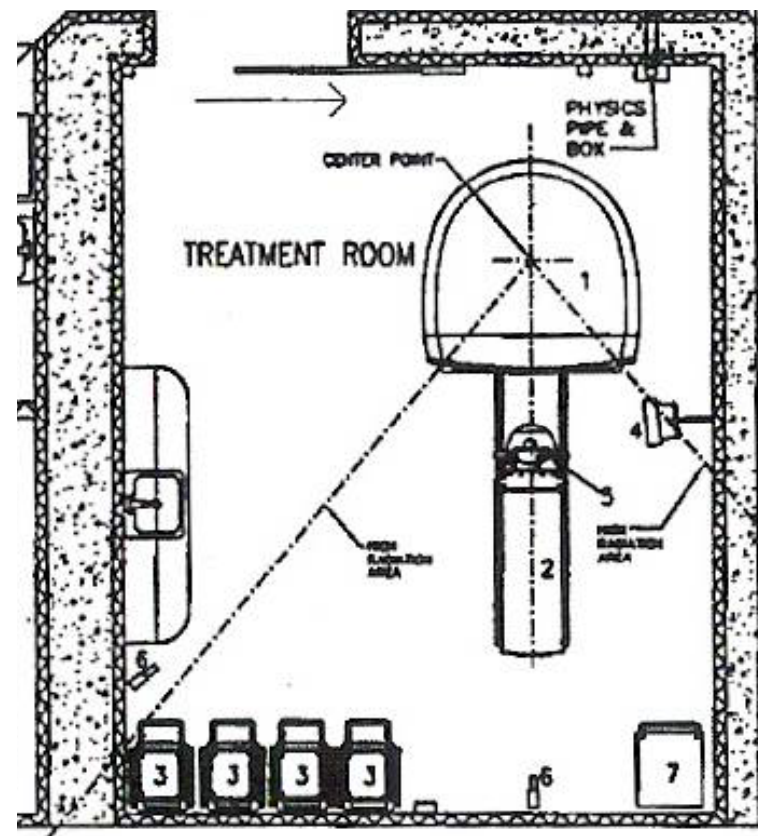


These calculations should include the following:

- maximum anticipated workload data - maximum number of patients treated per hour and per week
- maximum dose and treatment time per patient maximum (on-time per hour and per week) the value of each parameter used in the calculations.

These parameters include such factors as:

- Beam orientation
- Maximum field size
- Scatter angle
- Scatter ratio
- Distance to scatterer
- Distance to area of concern



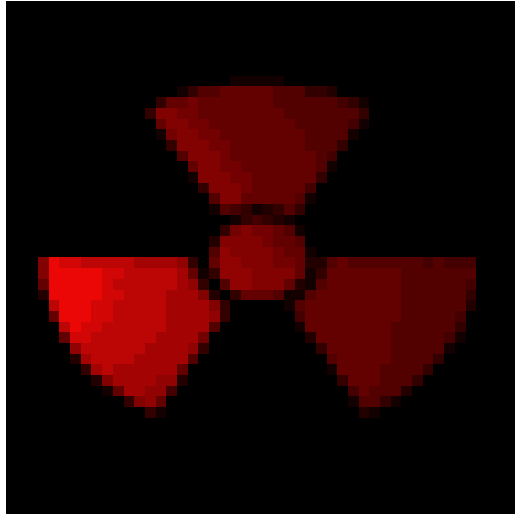


CONTINUED

These parameters include such factors as:

- Type and thickness of materials used in barrier
- Transmission factor of barrier
- Contributions from primary, leakage (with the source in the on position) and scattered radiation.
- Worst case situations (use of maximum beam size, all patients treated in 1 hour using the critical orientation that produces high radiation levels in an adjacent area)
- The dose received by individuals present in unrestricted areas.

For each unrestricted area, a statement of how the requirements of 10 CFR 20.1301 (a)(1) and (2) will be met.

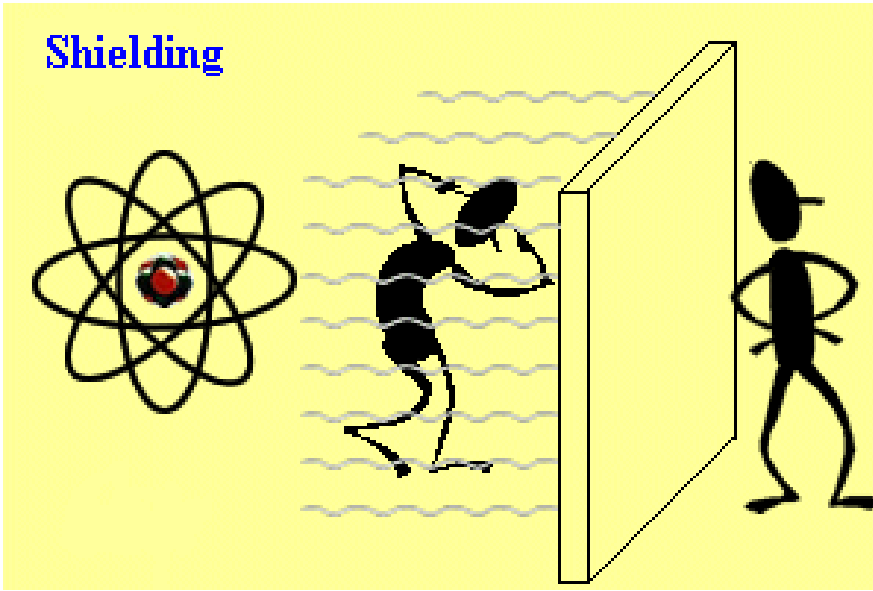


The facility must require that any individual entering the treatment room of the gamma knife ensure through the use of appropriate radiation monitors, that radiation levels have returned to ambient levels.



The facility shall have a system, required by 10 CFR 35.615(d), used to view and communicate with the patient continuously while the patient is in the treatment room. If a shielded viewing window is used, the thickness, density, and type of material used shall be specified. If a close-circuit television system (or some other electronic system) will be used for viewing the patient, the backup system or procedure used in case the electronic system malfunctions shall be specified or a commitment must be made to suspend all treatments until the electronic system is repaired and functioning again. The communication system must allow the patient to communicate with the unit operator in the event of any medical difficulties. An open microphone system is recommended to allow communication without requiring the patient to move to activate buttons.

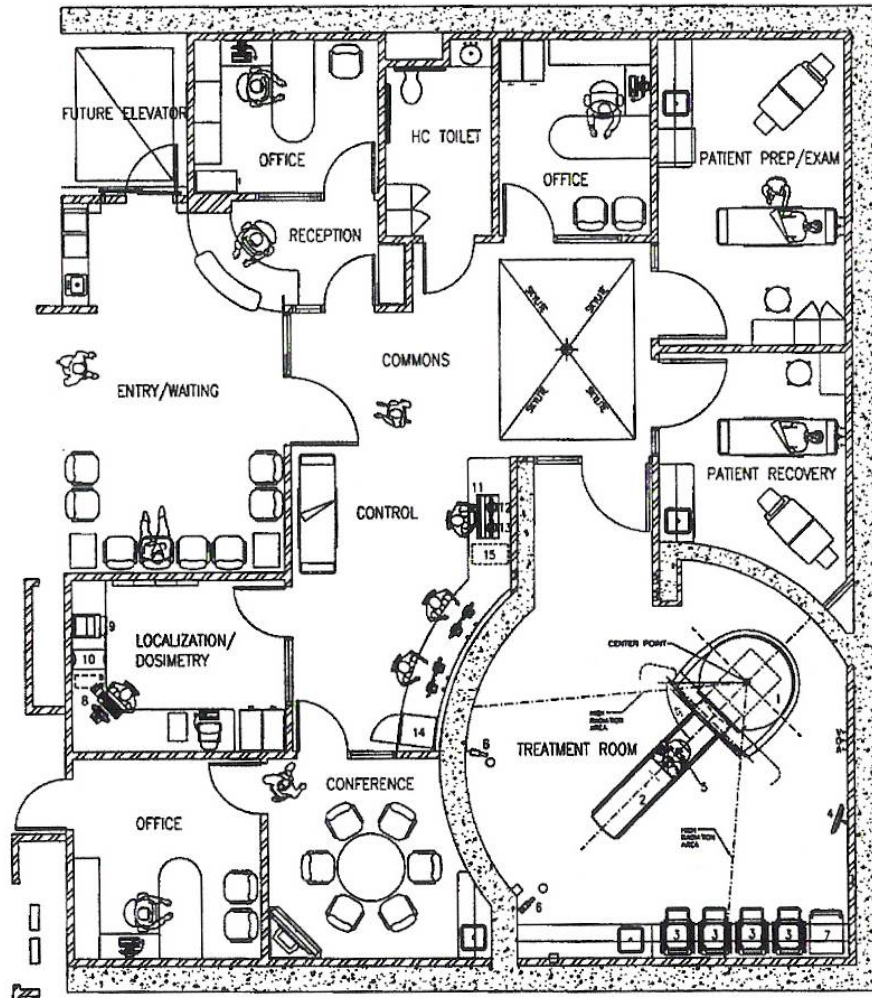
## Shielding



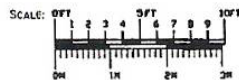
The facility must also provide adequate equipment and controls to maintain exposures of radiation to workers ALARA and within regulatory limits, 10 CFR 35.615(b), in part, requires that each door leading into the treatment room be provided with an interlock to control the on-off mechanism of the therapy unit.



The interlock must cause the source to move to the off condition or shield the source(s) if the door to the treatment room is opened when the source is exposed. The interlock system must prevent the operator from initiating a treatment cycle unless the treatment room entrance door is closed. Additionally, the interlock must be wired so that the source(s) cannot be returned to the on condition after interlock interruption until the treatment room door is closed and the system is reset at the control panel.



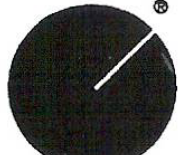
SAMPLE PLAN - LEKSELL GAMMA KNIFE  
MODEL C (Ver. 1.2)



FOR REFERENCE ONLY

1. Radiation Unit
2. Treatment Couch
3. Helmet Trolley
4. Treatment Room Monitor
5. Manual Control Couch/APS
6. Camera
7. Tool Cabinet
8. LGP Computer
9. LGP Printer
10. LGP Scanner
11. Operator Console
12. Treatment View Monitor
13. Video Monitor
14. Electronic Cabinet
15. Operator PC Box (located under table)

- Note:
1. OPENING FOR INTAKE OF RADIATION UNIT:  
5'-10 7/8" X 6'-6 3/4" [1800 X 2000 mm]  
(W64)
  2. THICKNESS OF WALLS TO BE DECIDED BY CUSTOMER
  3. THIS PROPOSAL IS SHOWING MINIMUM RECOMMENDED SIZE OF ROOMS.
  4. TREATMENT ROOM MONITOR (4) MUST BE PLACED OUTSIDE THE HIGH RADIATION AREA.



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Project Name and Address

LEKSELL GAMMA KNIFE MODEL C  
(Version 1.2)  
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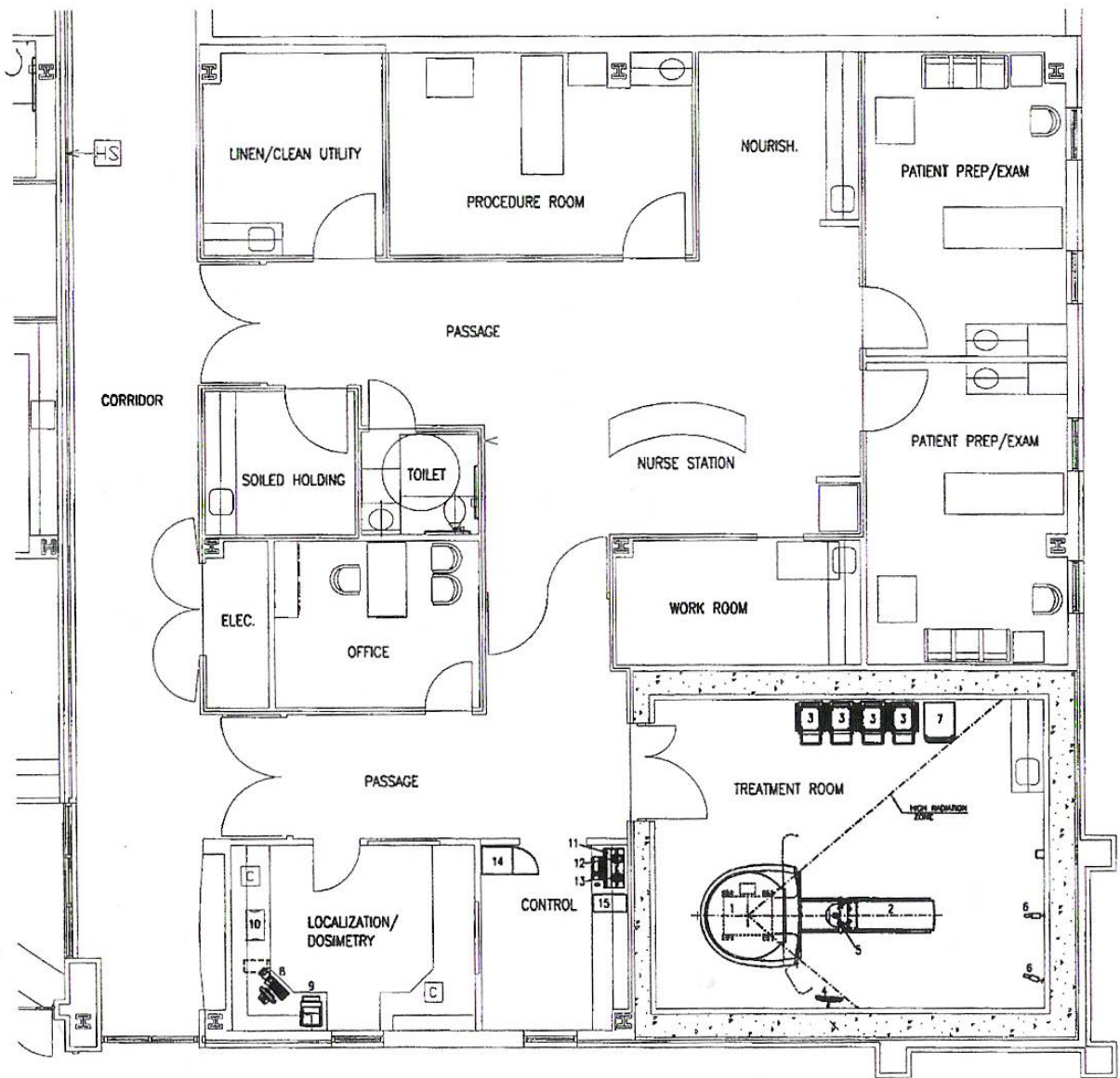
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Project: XXXXXX	Sheet: <b>SP1</b>
Scale: 3/32" = 1'-0"	Sample Plan
Date: July 8, 2004	(Sheet 1 of 5)

PROJECT: XXXXXX

PROJECT: XXXXXX



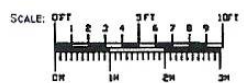



SAMPLE PLAN - LEKSELL GAMMA KNIFE  
MODEL C (Ver. 1.2)

1. Radiation Unit
2. Treatment Couch
3. Helmet Trolley
4. Treatment Room Monitor
5. Manual Control Couch/APS
6. Camera
7. Tool Cabinet
8. LGP Computer
9. LGP Printer
10. LGP Scanner
11. Operator Console
12. Treatment View Monitor
13. Video Monitor
14. Electronic Cabinet
15. Operator PC Box (located under table)

- Note:
1. OPENING FOR INTAKE OF RADIATION UNIT:  
5'-10 7/8" X 6'-6 3/4" [1800 X 2000 mm]  
(WxH)
  2. THICKNESS OF WALLS TO BE DECIDED BY CUSTOMER
  3. THIS PROPOSAL IS SHOWING MINIMUM RECOMMENDED SIZE OF ROOMS.
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FOR REFERENCE ONLY





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Project Name and Address

LEKSELL GAMMA KNIFE MODEL C  
(Version 1.2)

For Reference Only

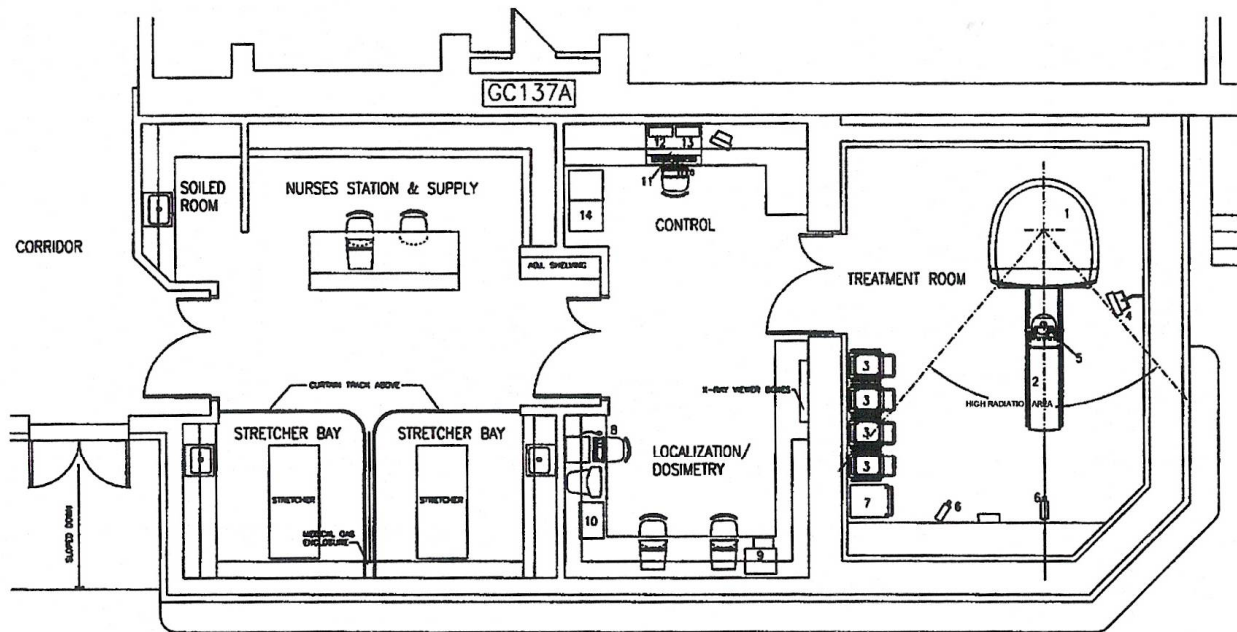
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Project	XXXXXX	Sheet	<b>SP2</b> Sample Plan (Sheet 2 of 5)
Scale	3/32" = 1'-0"		
Date	July 8, 2004		

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PROJECT: XXXXXX

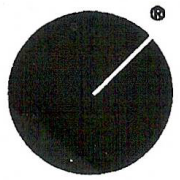
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SAMPLE PLAN - LEKSELL GAMMA KNIFE  
MODEL C (Ver. 1.2)

- Note:
1. OPENING FOR INTAKE OF RADIATION UNIT:  
5'-10 7/8" X 6'-6 3/4" [1800 X 2000 mm]  
(Width)
  2. THICKNESS OF WALLS TO BE DECIDED BY CUSTOMER
  3. THIS PROPOSAL IS SHOWING MINIMUM RECOMMENDED SIZE OF ROOMS.
  4. TREATMENT ROOM MONITOR (4) MUST BE PLACED OUTSIDE THE HIGH RADIATION AREA.

1. Radiation Unit
2. Treatment Couch
3. Helmet Trolley
4. Treatment Room Monitor
5. Manual Control Couch/APS
6. Camera
7. Tool Cabinet
8. LGP Computer
9. LGP Printer
10. LGP Scanner
11. Operator Console
12. Treatment View Monitor
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14. Electronic Cabinet



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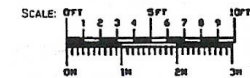
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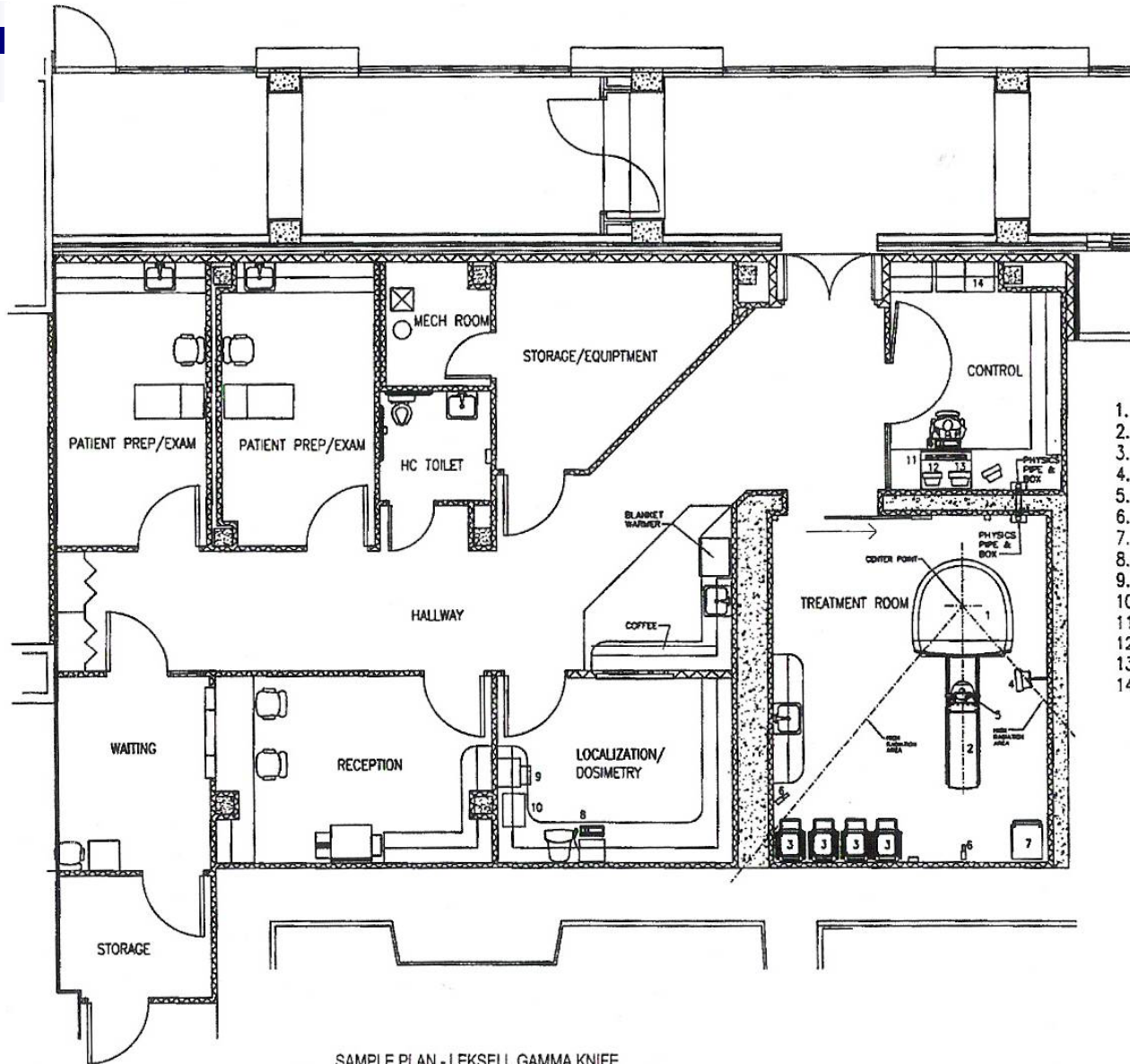
Project Name and Address  
LEKSELL GAMMA KNIFE MODEL C  
(Version 1.2)  
For Reference Only

Project X0000X	Sheet <b>SP3</b>
Date 3/32" = 1'-0"	Sample Plan
Date July 8, 2004	(Sheet 3 of 5)

PROJECT: X0000X




FOR REFERENCE ONLY



SAMPLE PLAN - LEKSELL GAMMA KNIFE  
MODEL C (Ver. 1.2)

FOR REFERENCE ONLY

1. Radiation Unit
2. Treatment Couch
3. Helmet Trolley
4. Treatment Room Monitor
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9. LGP Printer
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14. Electronic Cabinet



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Project Name and Number

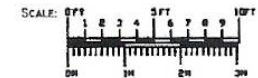
LEKSELL GAMMA KNIFE MODEL C  
(Version 1.2)

For Reference Only

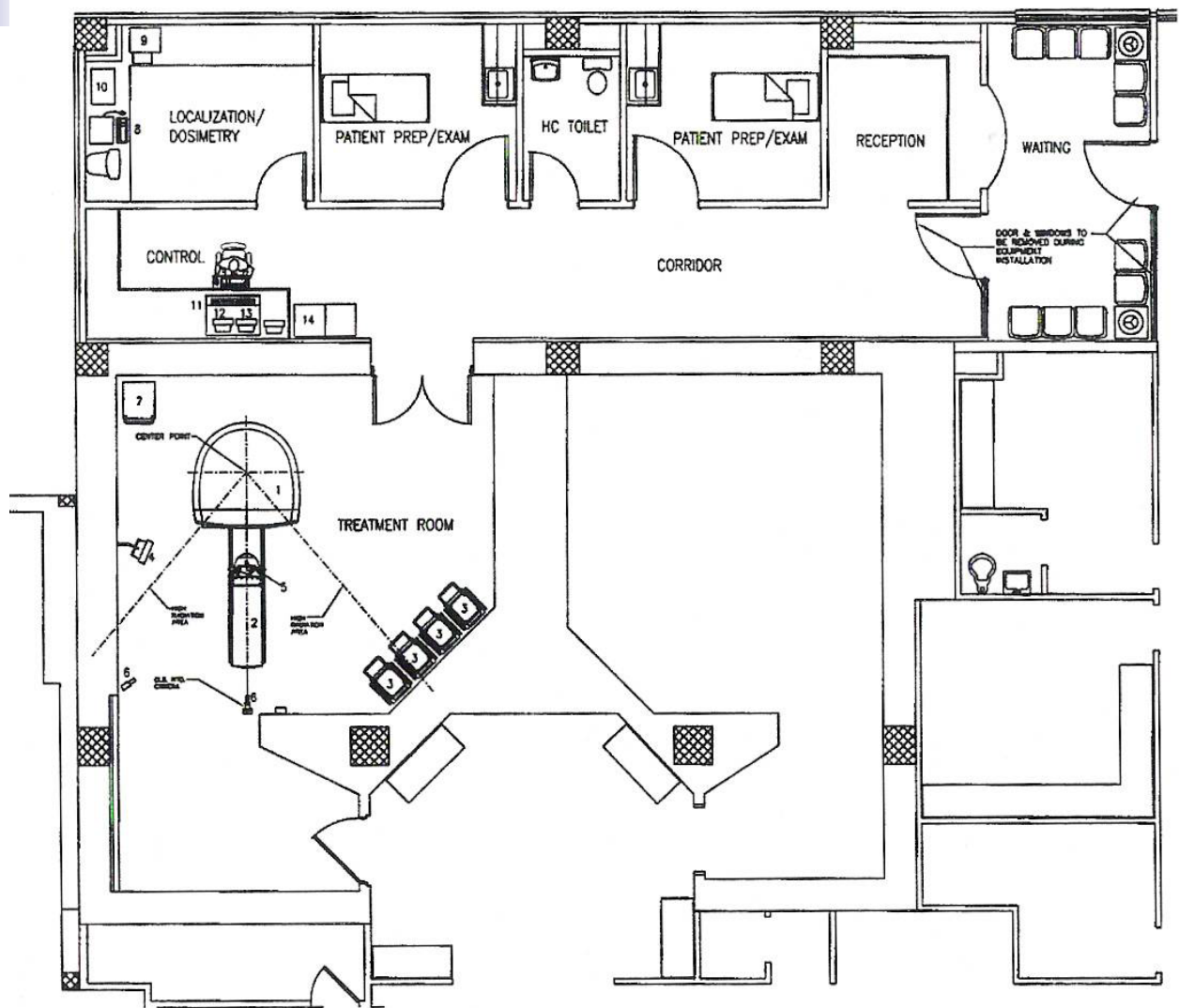
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Project: X0000X	Sheet: <b>SP4</b>
Scale: 3/8" = 1'-0"	Sample Plan
Date: July 8, 2004	(Sheet 4 of 5)

PROJECT: X000X



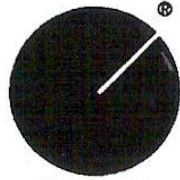
- Note:
1. OPENING FOR INTAKE OF RADIATION UNIT:  
5'-10 7/8" X 6'-6 3/4" [1800 X 2000 mm]  
(WxH)
  2. THICKNESS OF WALLS TO BE DECIDED BY CUSTOMER
  3. THIS PROPOSAL IS SHOWING MINIMUM RECOMMENDED SIZE OF ROOMS.
  4. TREATMENT ROOM MONITOR (4) MUST BE PLACED OUTSIDE THE HIGH RADIATION AREA.



SAMPLE PLAN - LEKSELL GAMMA KNIFE  
MODEL C (Ver. 1.2)

FOR REFERENCE ONLY

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Project Name and Address

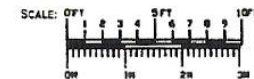
LEKSELL GAMMA KNIFE MODEL C  
(Version 1.2)

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Project: XXXXXX	Sheet: <b>SP5</b>
Date: 3/31/04	Sample Plan
Date: July 8, 2004	(Sheet 5 of 5)

PROJECT: XXXXX



- Note:
1. OPENING FOR INTAKE OF RADIATION UNIT:  
5'-10 7/8" X 5'-6 3/4" [1800 X 2000 mm]  
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PROJECT: XXXXX