

MAGNA ✓ CHEK ^M

2125 RIGGS STREET
WARREN, MICHIGAN 48091

(313) 756-4070

U.S.N.R.C., Region III
Materials Licensing Section
ATTN: John Madera
799 Roosevelt Road
Glen Ellyn, IL 60137

April 26, 1985

SUBJECT: Control Number 77973 - Additional information to Amendment to License Number 21-19111-02 per telephone request by John Madera, USNRC, on April 25, 1985.

Gentlemen:

In response to the above mentioned phone conversation between John Madera and David Cardwell of our office, the detailed radiation surveys of the external surfaces of the exposure cell when operating the Picker Model 590 exposure device are enclosed. Included are sketches showing 13 different placements of the Picker 590 exposure device and the results of surveys conducted during the exposures in those positions.

The surveys were conducted by David B. Cardwell, currently the Radiation Safety Officer at Magna Chek, Inc. Two instruments were used to obtain the radiation surveys - an Eberline Model E120-B (range: 0-1000 mR/hr), last calibrated on 2/6/85, and a Victoreen Model 592 (range: 0-10 R/hr), last calibrated on 3/12/85.

The Picker Model 590 exposure device is equipped with a lead collimator which limits the primary beam to an area of approximately 22" x 22" at a distance of 50". Common positions used are shown in Figures 1 - 7. It is primarily used in the vertical position with the primary beam facing the floor as shown in Figure 1. The height of the source from the floor is 50" to 105" under normal conditions when used in the vertical downward position. When making exposures other than straight down, the source is usually not at an angle exceeding 45 degrees, nor is it located higher than 40" from the floor. During the test surveys outlined below, the source was placed 110" from the floor when in the vertical downward position, and placed 60" from the floor when 90 degree angle exposures were made. At the time of the surveys, the cobalt 60 source was calculated to be approximately 217 curies. A factor of 1.06 was used to derive at calculated exposure rates for source strength of 1.06 curies.

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- Figure 1 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr.
- Figure 2 - Source positioned outside of the preferred exposure area. Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr, except at the surface of the exposure cell door where radiation levels were 20 mR/hr maximum. When levels of this intensity are present, the restricted area boundary is adjusted to reflect a 2 mR/hr intensity as shown in Figure 14.
- Figure 3 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr when the source was in this position.
- Figure 4 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr with the exception of the cell door and portions of the west wall which were 4 mR/hr and 3 mR/hr respectively.
- Figure 5 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr with the exception of the south wall directly in front of the source, which showed an intensity of 25 mR/hr. When levels of this intensity are present, the restricted area boundary is adjusted to reflect a 2 mR/hr intensity as shown in Figure 14.
- Figure 6 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr except for portions of the east wall, south wall and cell door. The intensity at the door was found to be 20 mR/hr, and the intensity at the south wall was 9 mR/hr. When levels of this intensity are present, the restricted area boundary is adjusted to reflect a 2 mR/hr intensity as shown in Figure 14. The intensity at the east wall was less than 2 mR/hr except in the area inside the X-ray exposure cell shown in Figure 14, where the intensity was 25 mR/hr. This x-ray exposure room is locked and posted as a radiation area at all times.
- Figure 7 - Surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr except for the exposure cell door which was 35 mR/hr. When levels of this intensity are present, the restricted area boundary is adjusted to reflect a 2 mR/hr intensity as shown in Figure 14.
- Figure 8 - With the source positioned in the downward position only 5 feet from the exposure cell door, radiation levels were found not to exceed 200 mR/hr at the door due to the effects of the collimator. The source is not used in this position.

Figure 9 - With the source positioned directly at the east wall at a distance of 4 feet, surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 3 mR/hr except at the east wall where the intensity was 250 mR/hr. The source is not used in this position.

Figure 10 - With the source positioned directly at the north wall at a distance of 31 feet, surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 3 mR/hr except at the north wall where the intensity was generally 15 mR/hr to 35 mR/hr, with one area measuring .25" x 6" showing an intensity of 200 mR/hr. The source is not used in this position. Note: the radiation intensity at 31 feet inside the exposure cell was 3.5 R/hr, indicating a source strength of approximately 235 curies.

Figure 11 - With the source positioned directly at the north wall at a distance of 19 feet, surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr except at the north wall where the intensity was generally 15 mR/hr to 20 mR/hr, with one area measuring .25" x 6" showing an intensity of 100 mR/hr. The source is not used in this position. Note: the radiation intensity at 19 feet inside the exposure cell was in excess of 10 R/hr.

Figure 12 - With the source positioned directly at the east wall at a distance of 3 feet, surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr except at the east wall where the intensity was 2 R/hr maximum inside the x-ray exposure cell, and 60 mR/hr at the door to the x-ray exposure cell. The source is not used in this position.

Figure 13 - With the source positioned directly at the south wall at a distance of 3 feet, surveys indicated that radiation levels at external surfaces of the exposure cell did not exceed 2 mR/hr except at the south wall where the intensity was generally 15 mR/hr to 50 mR/hr, with one area measuring .25" x 6" showing an intensity of 150 mR/hr. The source is not used in this position.

Radiation levels above the roof of the building directly over the exposure device were 10 mR/hr on all vertical downward exposures and 50 mR/hr on all 90 degree exposures. The roof is posted in accordance with Section IV of the Radiation Safety Program Manual. The maximum radiation intensity found in Positions 1 - 7 was 35 mR/hr, the intensity at the cell door in Figure 7. This calculates to be 161 mR/hr when using a source strength of 1,000 curies. The maximum worst case shown was 2 R/hr in Figure 12, which calculates to 9.2 R/hr with 1,000 curies.

The following precautions have been taken to keep the Picker Model 590 exposure device in positions deemed acceptable to the management at Magna Chek, Inc.:

1. The hoist on which the exposure device is mounted has been chained and locked so that the exposure device cannot be raised more than 110" from the floor of the exposure cell. *unacceptable - 9.2 ft. ht. shielding up to 10 ft only.*

2. The exposure device has been chained and locked so that it cannot be operated at any position except in the vertical downward position. When necessary to perform radiographic operations that require angled exposures, the Radiation Safety Officer will supervise the operations to ensure that safe radiation levels are maintained outside the exposure cell.

unacceptable
3. The exposure device has been chained and locked so that it cannot be operated at any angle higher than 90 degrees horizontally.

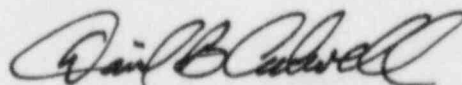
4. The Radiation Safety Training Program at Magna Chek, Inc., will reflect the policy of only operating the Picker Model 590 exposure device in the positions indicated in Figures 1 - 7.

5. The policy of maintaining constant surveillance of radiation areas and restricted boundaries, and performing surveys of the entire exposure cell boundary circumference will be continued as in the past.

It is the opinion of management at Magna Chek, Inc., that these precautions will prevent the occurrence of excessive radiation levels outside the exposure cell.

If I can be of further assistance or if additional information is required, please contact me at your earliest convenience.

Sincerely,



David B. Cardwell
Radiation Safety Officer

FIGURE 1
EXPOSURE CELL

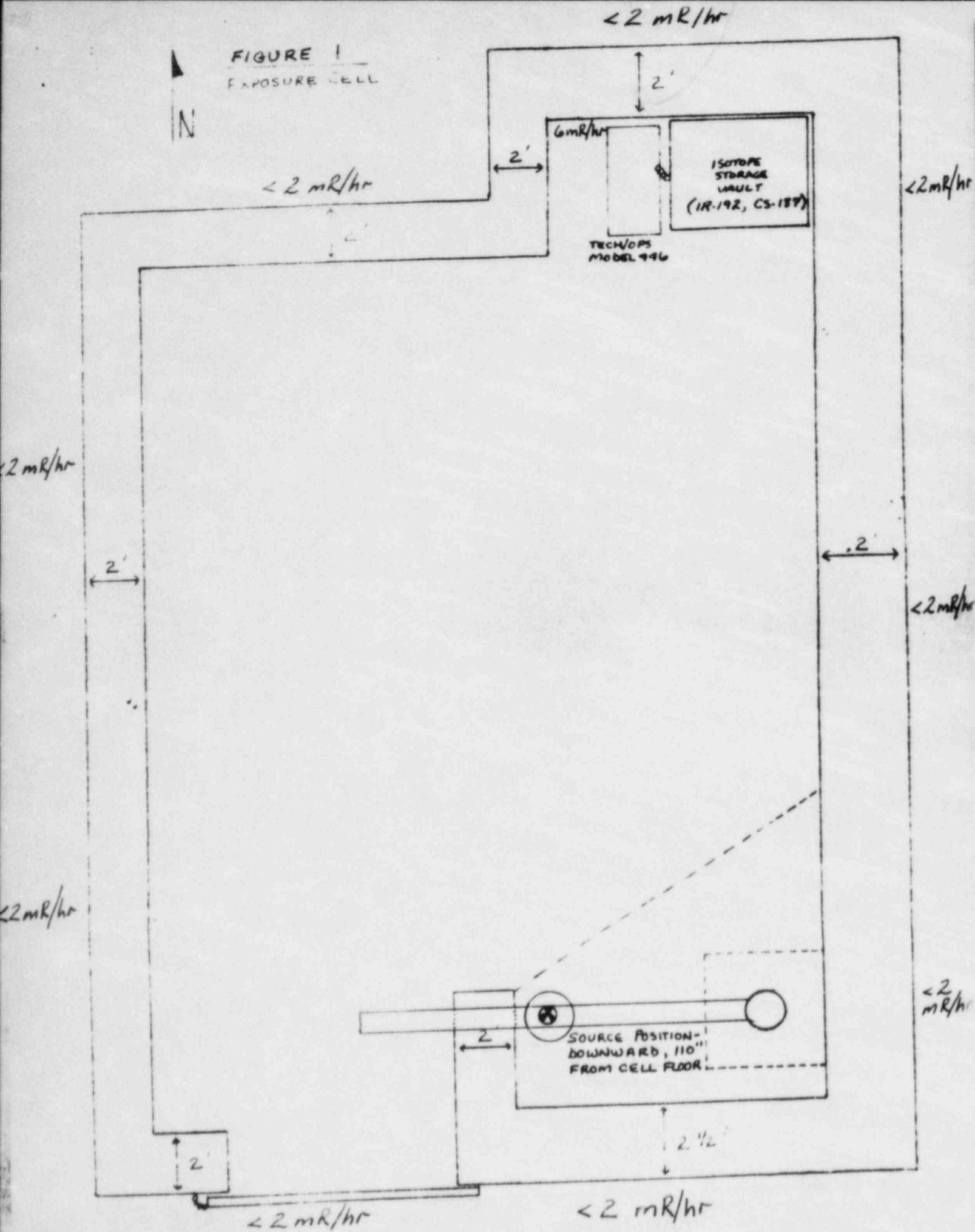
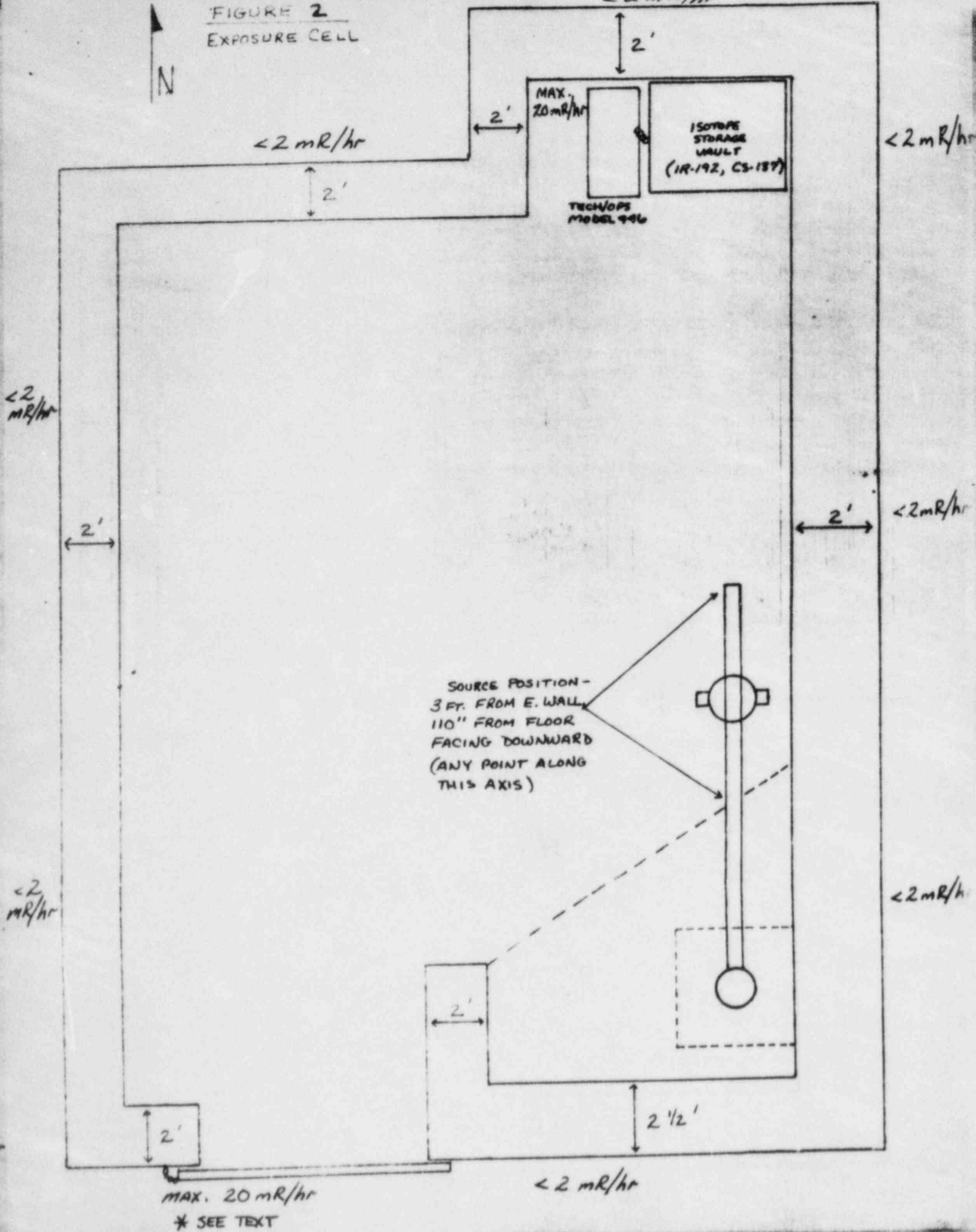
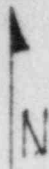


FIGURE 2
EXPOSURE CELL



SOURCE POSITION -
3 FT. FROM E. WALL
110" FROM FLOOR
FACING DOWNWARD
(ANY POINT ALONG
THIS AXIS)

MAX. 20 mR/hr

* SEE TEXT

FIGURE 3
EXPOSURE CELL

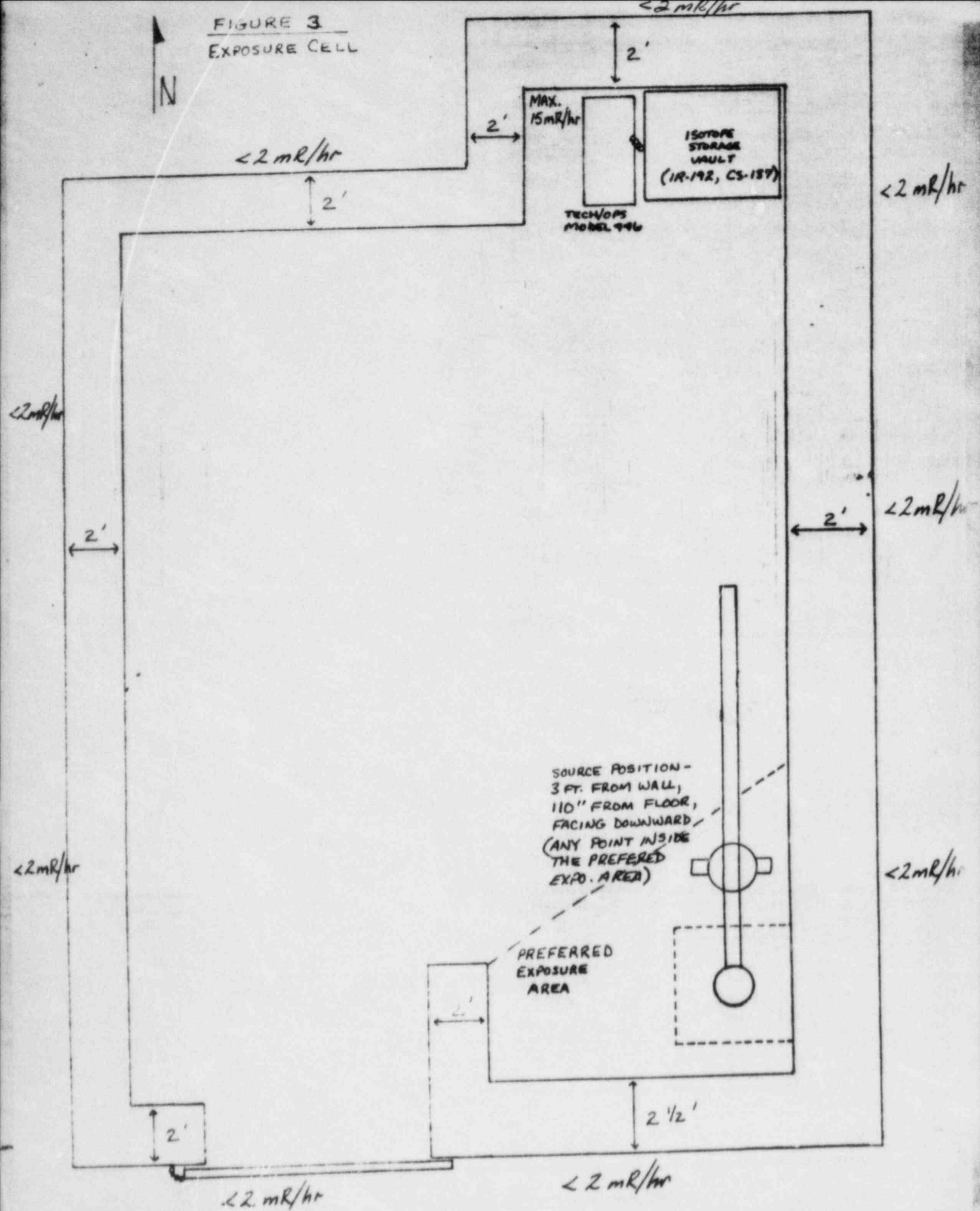
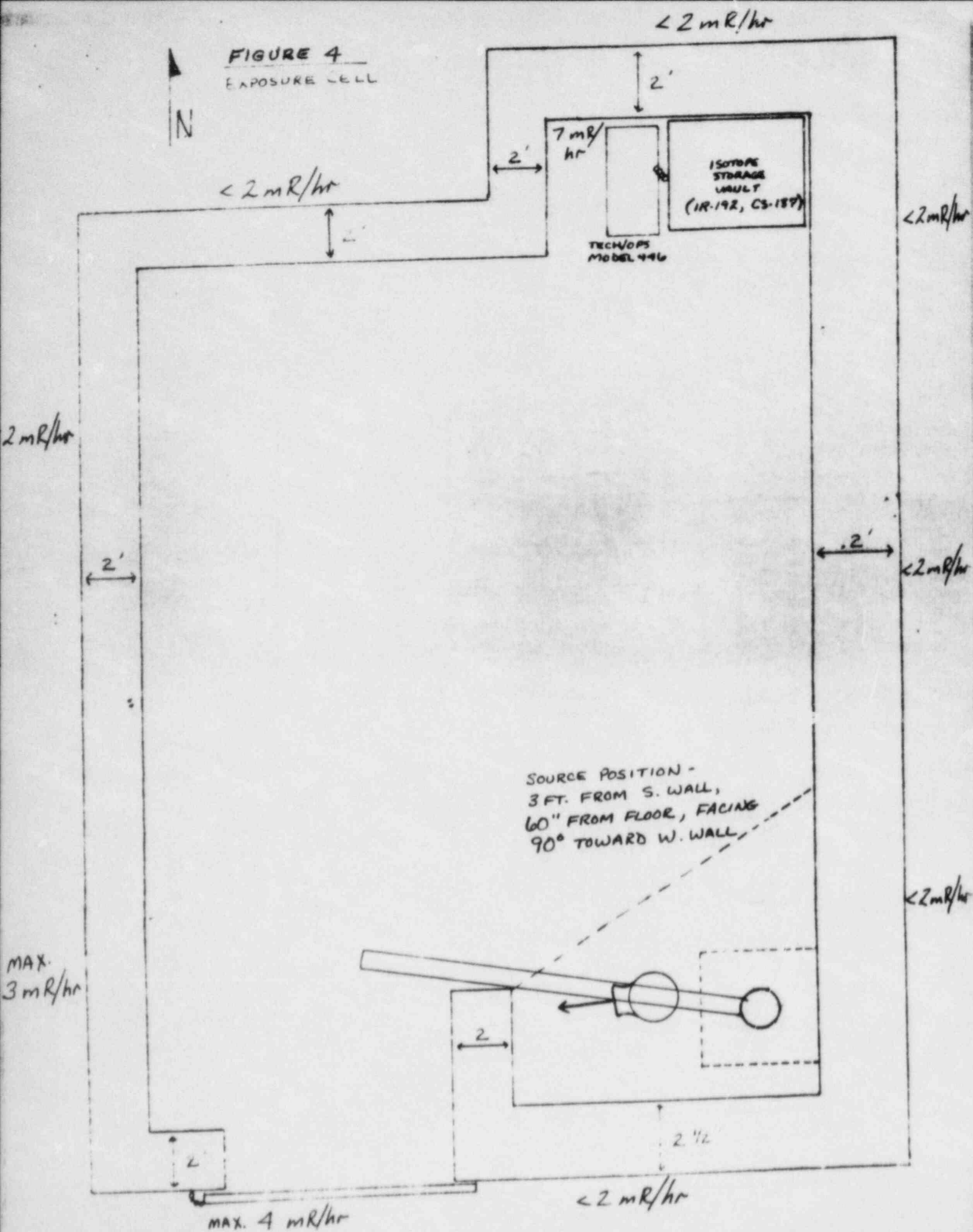
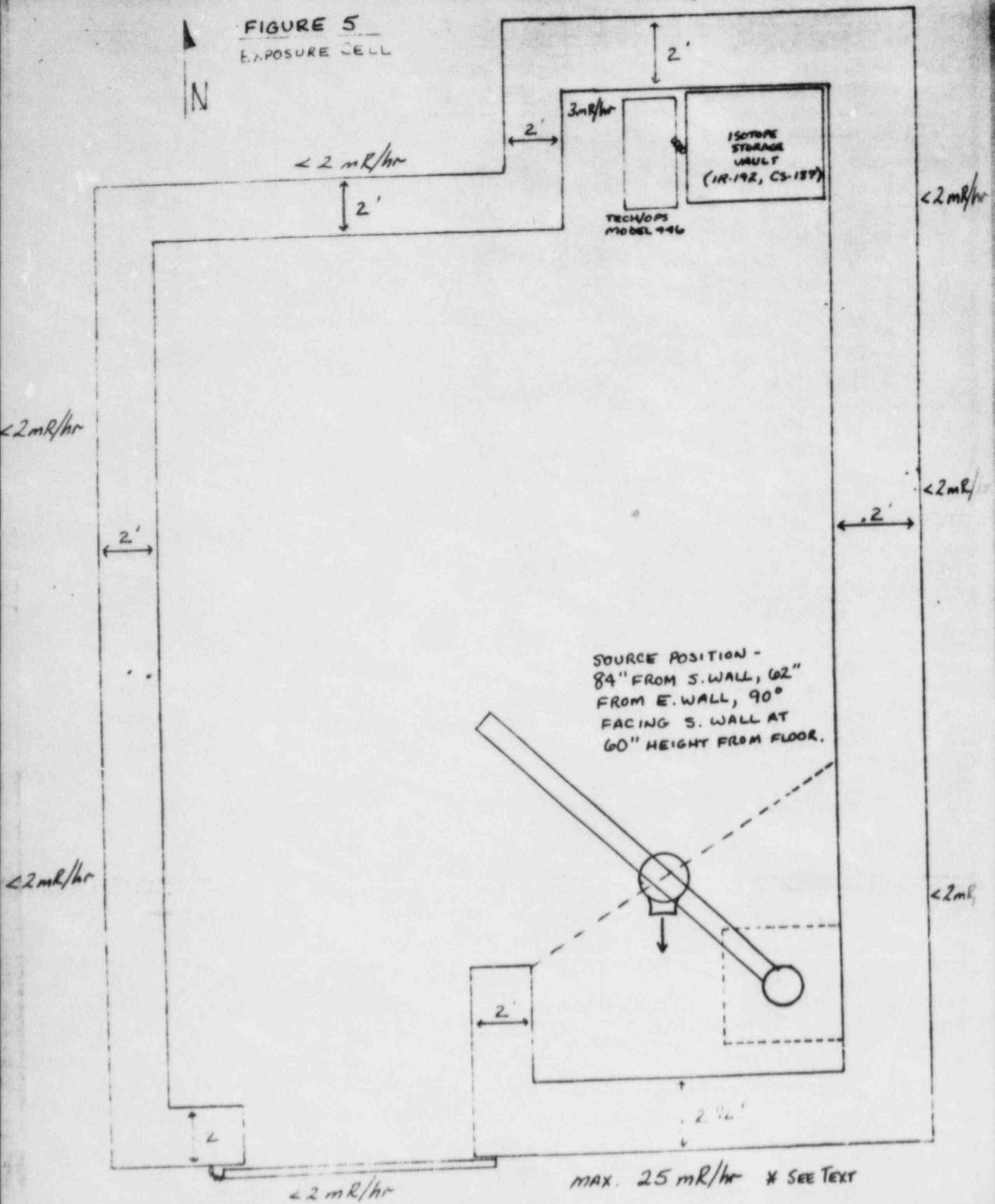


FIGURE 4
EXPOSURE CELL



$\leq 2 \text{ mK/hr}$ 

IN

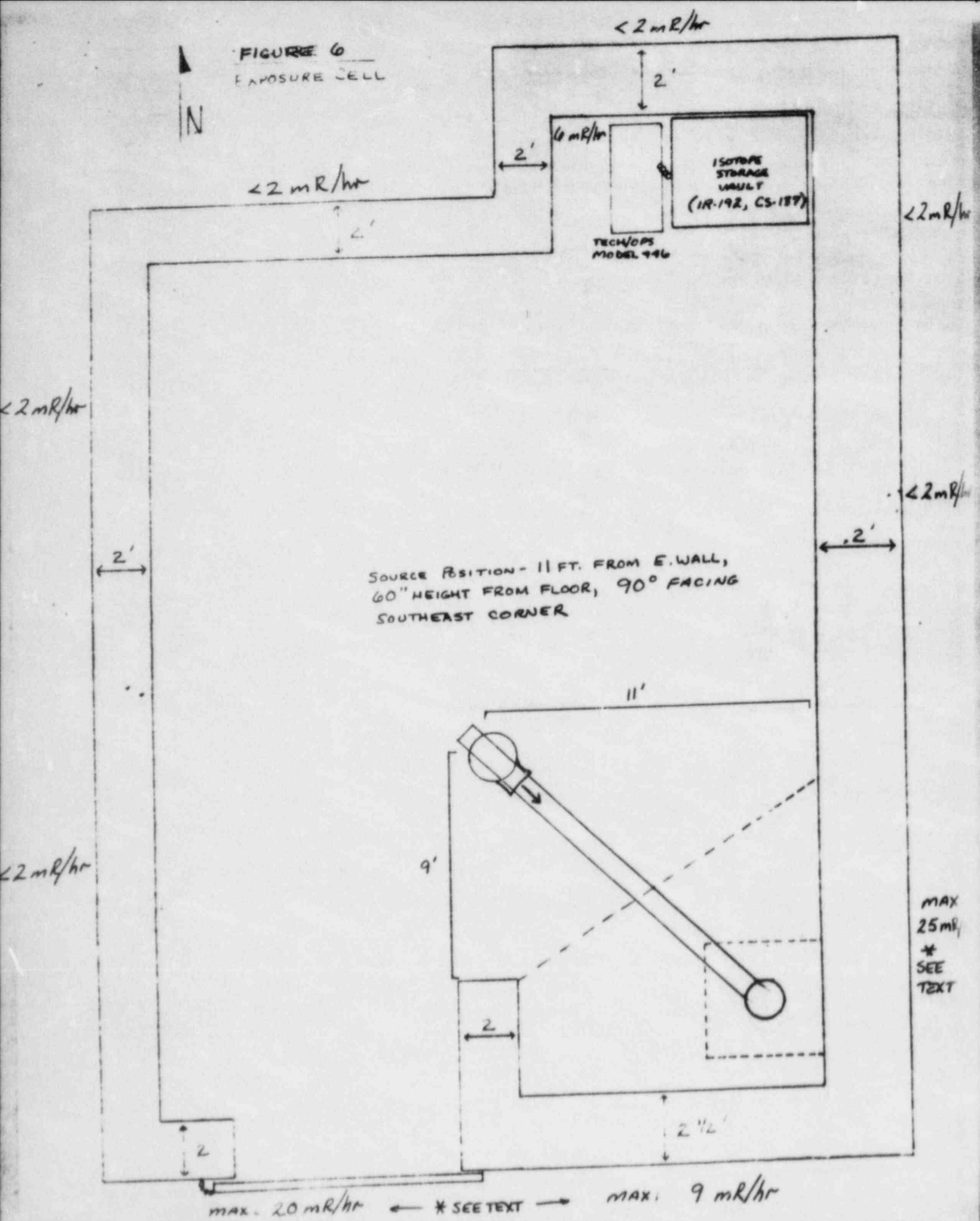


FIGURE 7
EXPOSURE CELL

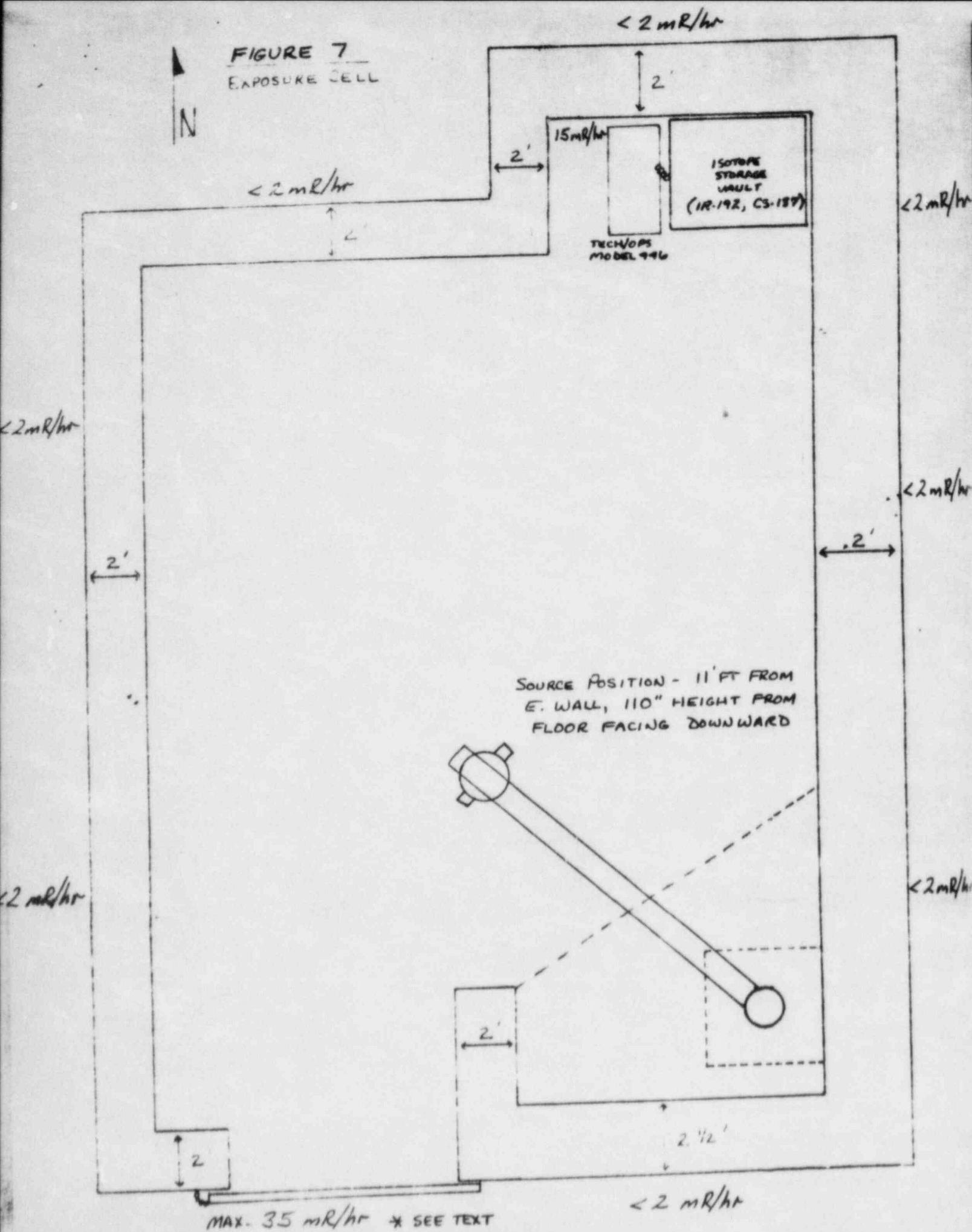


FIGURE 8
EXPOSURE CELL

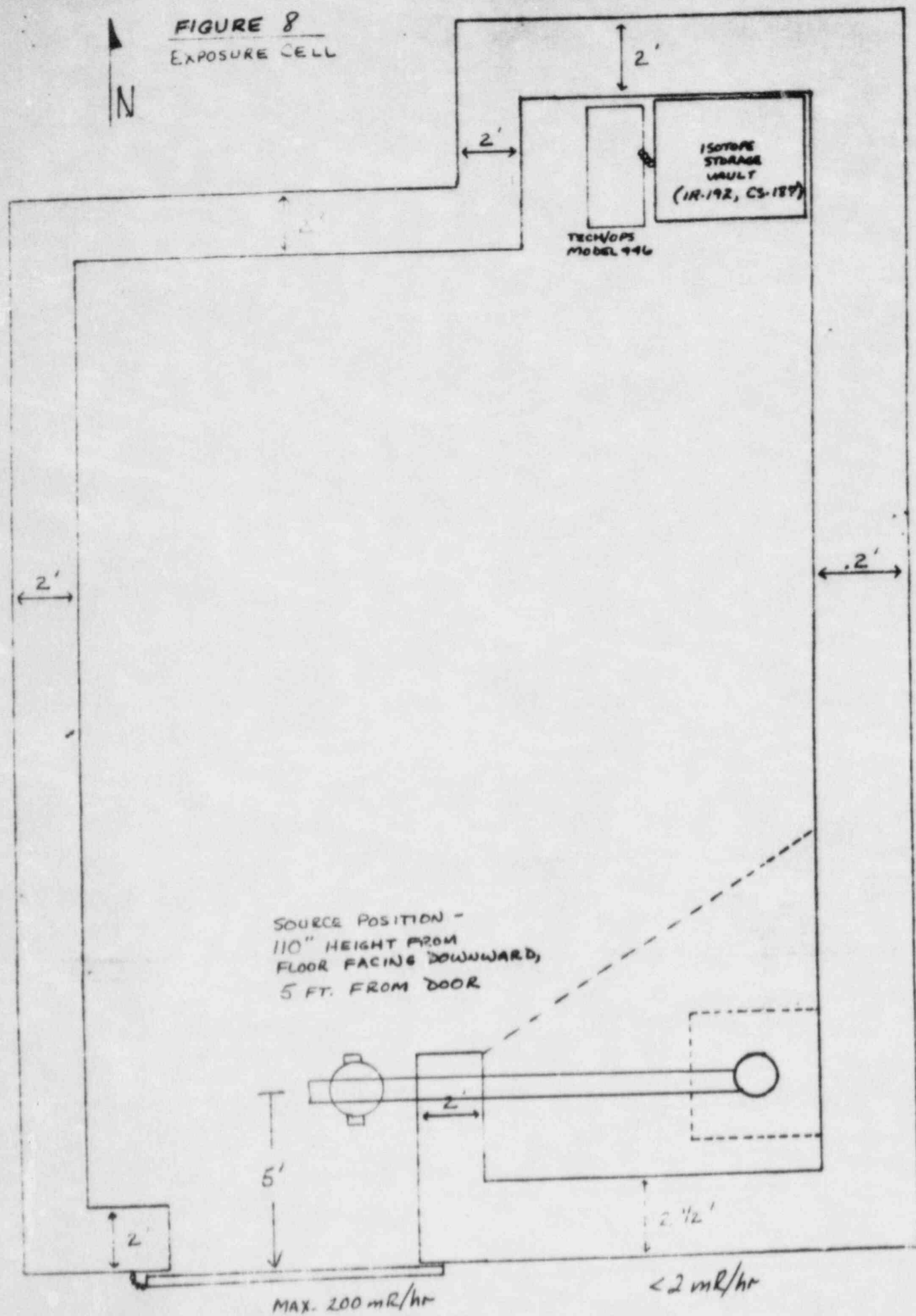
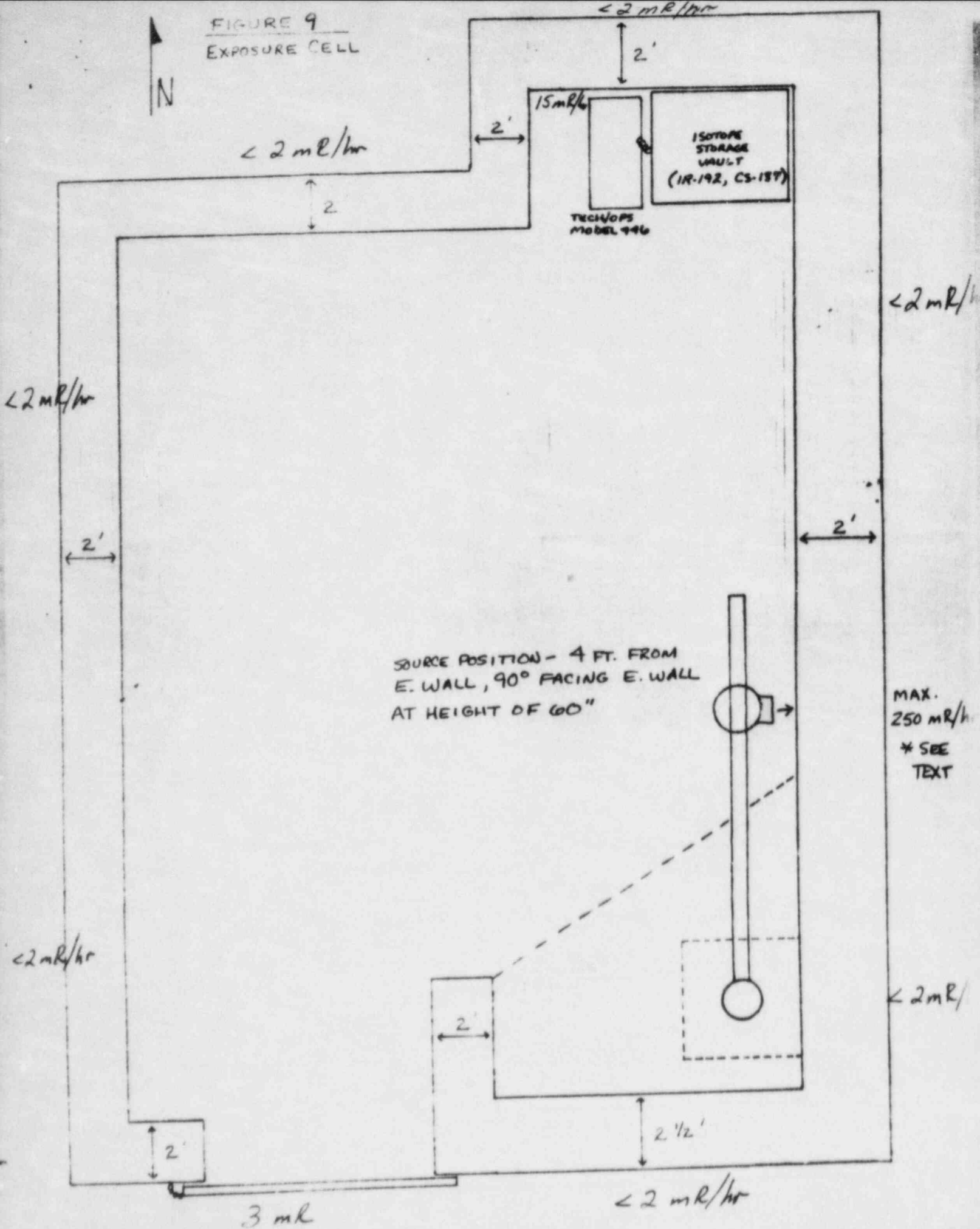
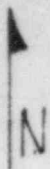


FIGURE 9
EXPOSURE CELL



SOURCE POSITION - 4 FT. FROM
E. WALL, 90° FACING E. WALL
AT HEIGHT OF 60"

MAX.
250 mR/h
* SEE
TEXT

$\approx 35 \text{ mL/hr}$,
MAX. 200 mL/hr * SEE TEXT

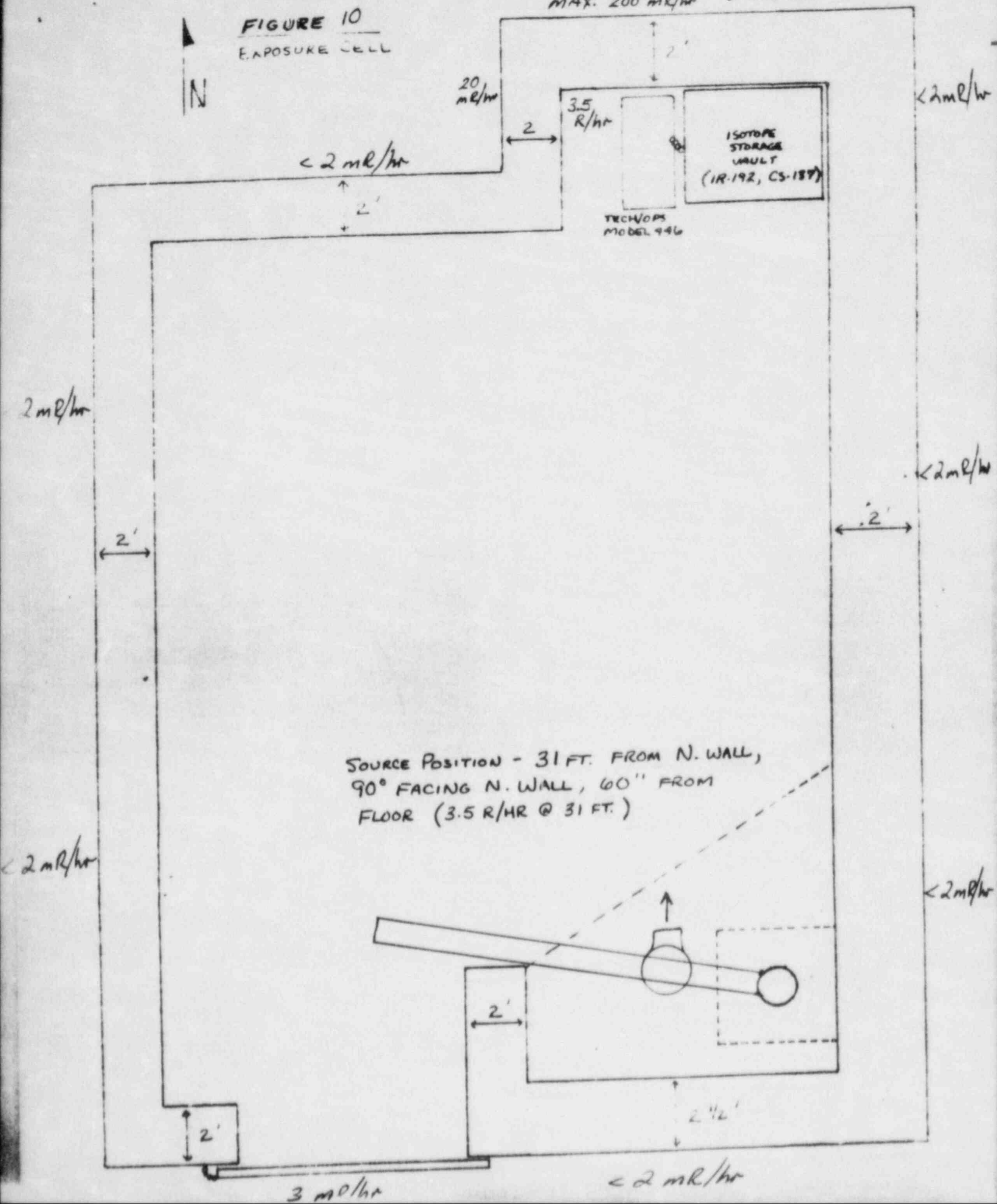
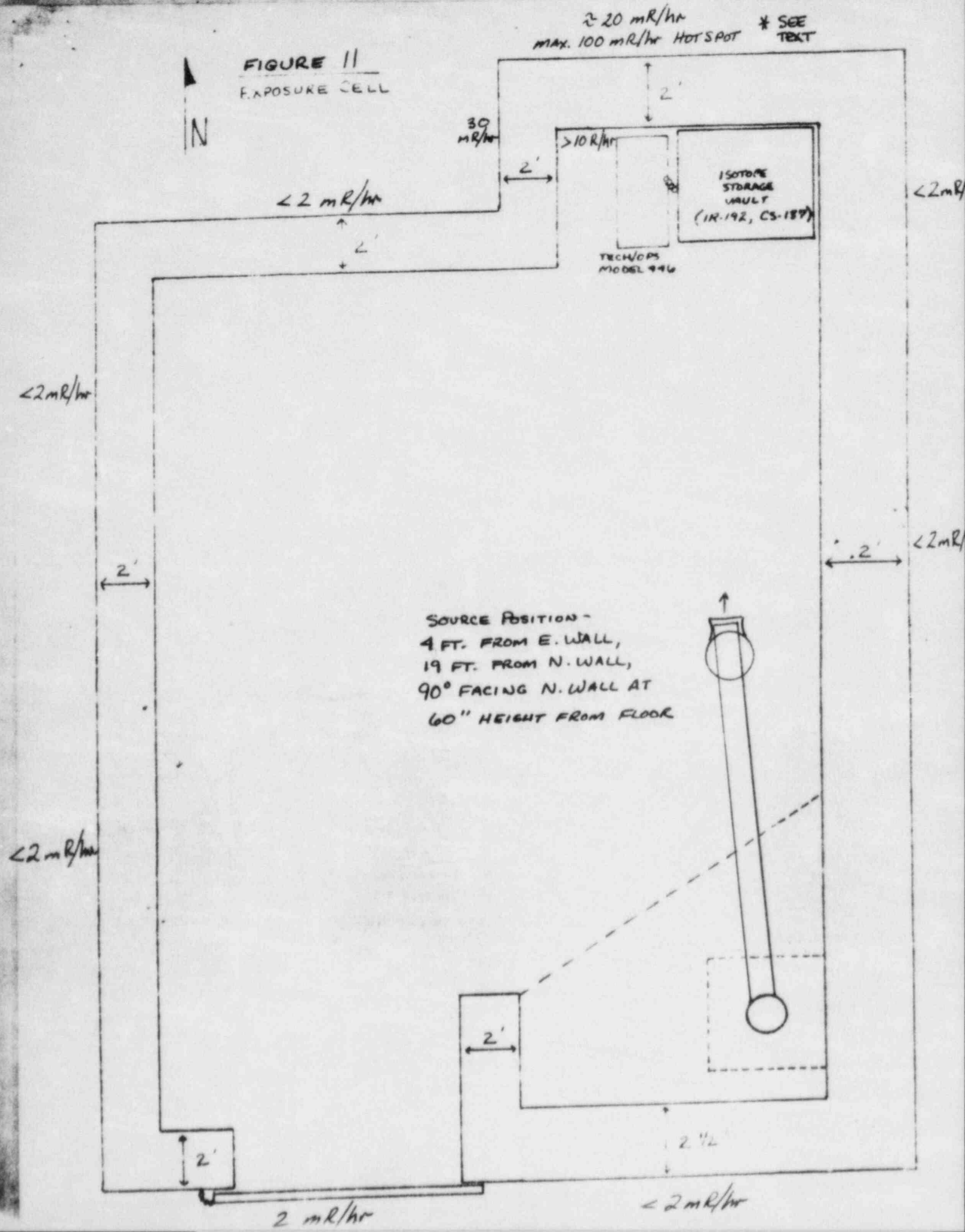
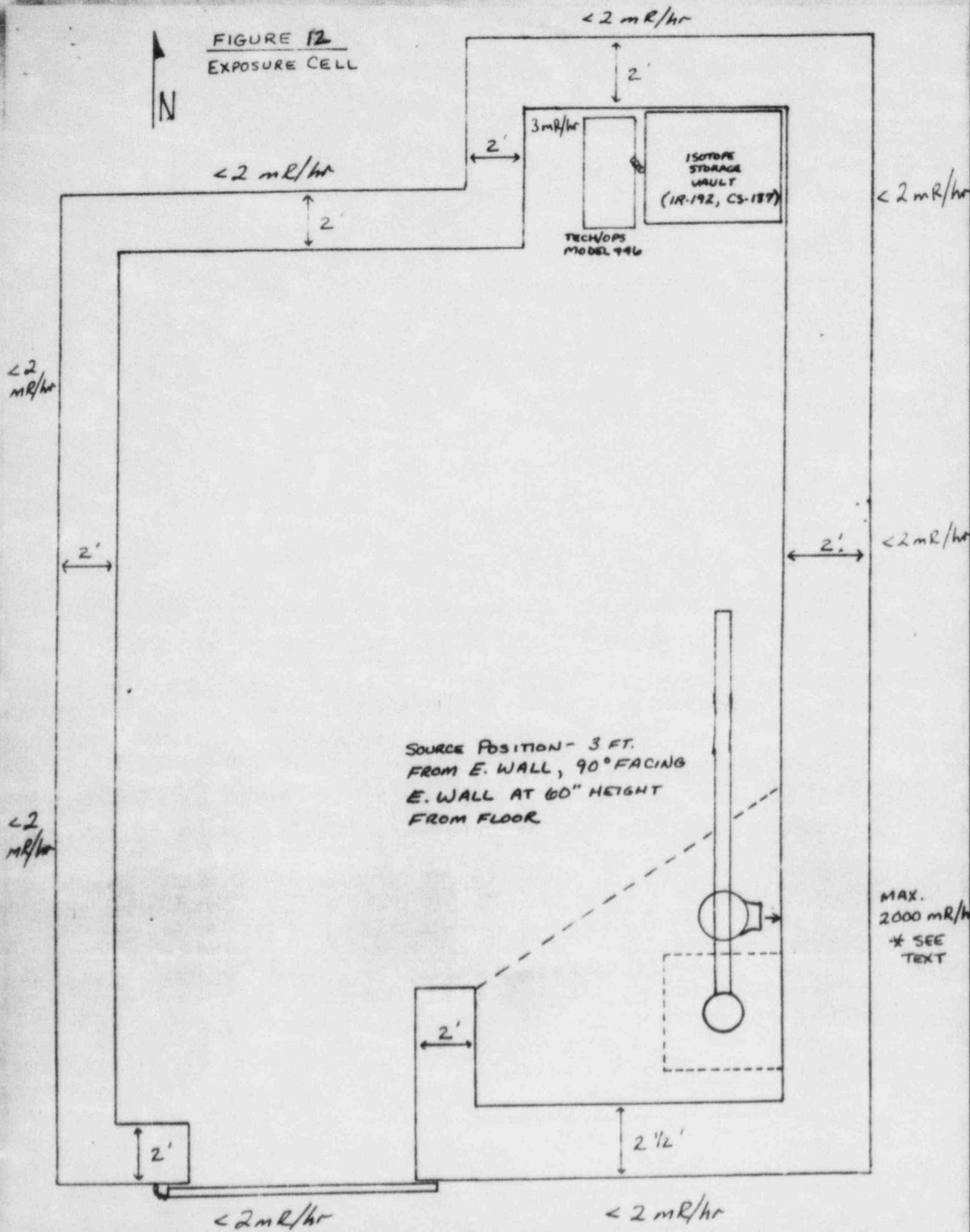


FIGURE 11
EXPOSURE CELL

~ 20 mR/hr
MAX. 100 mR/hr HOT SPOT * SEE TEXT





N

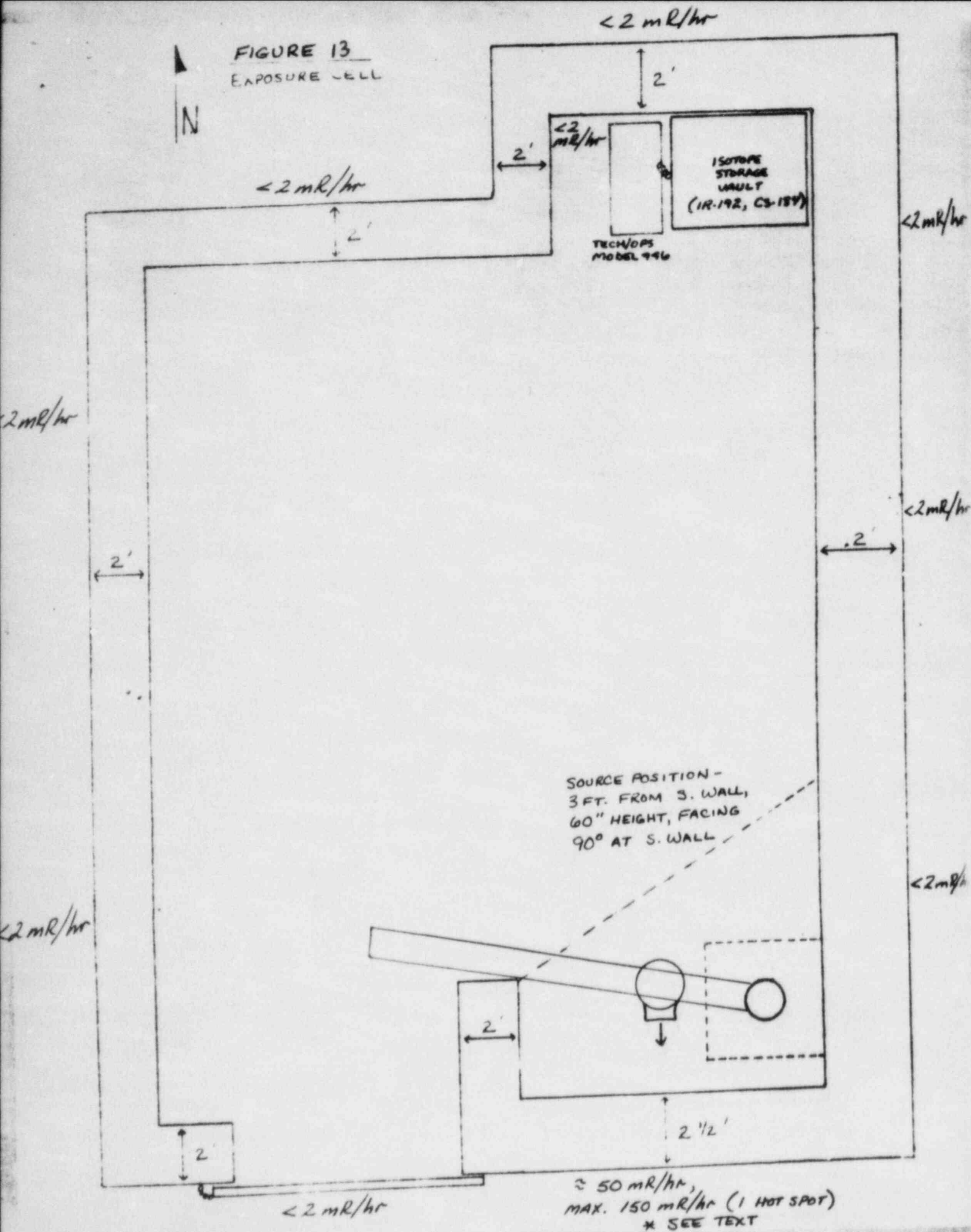
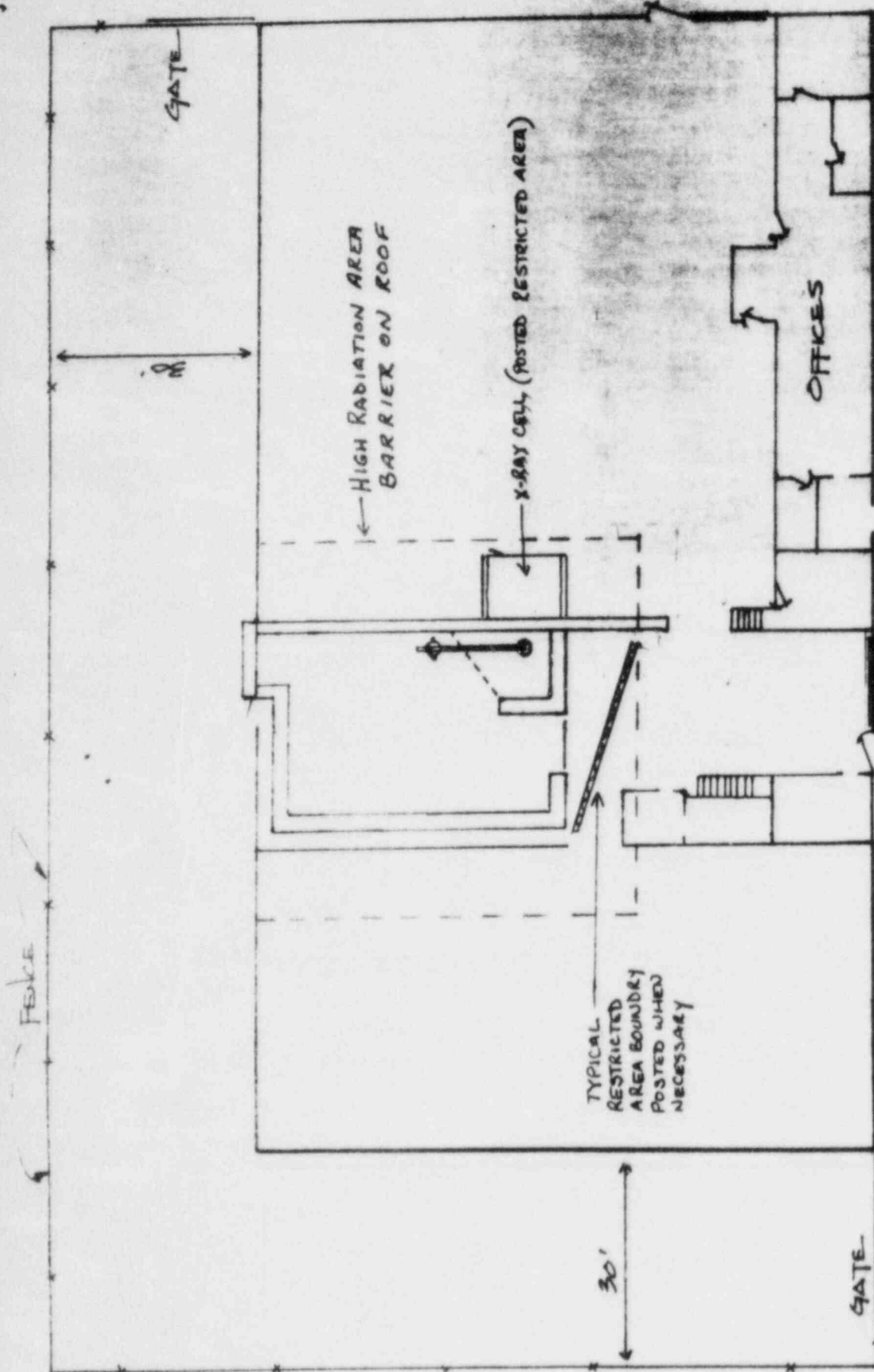


FIGURE 14



MAGNA CHEK, INC.
WARREN, MICHIGAN
MAGNA CHEK BUILDING AND
SURROUNDING FACILITIES
NO SCALE

PAGE STREET

CONVERSATION RECORD

TIME

1:00 P

DATE

4/25/85

TYPE

☐ VISIT

☐ CONFERENCE

☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU

David B. Cardwell, LSO

ORGANIZATION (Office, dept., bureau, etc.)

Magna Chek

TELEPHONE NO:

313/756-4070

SUBJECT

Picker Cyclops Model 590

ROUTING

NAME/SYMBOL

INT

SUMMARY

1. Picker Cyclops 590 with the 462 curies of Co-60 will be authorized for storage only.

2. In order to reactivate the unit you will have to submit a complete and detailed survey of the areas around the exposure cell in accordance with 4c No. 16 of your expired license and/or calculations of the expected exposures in unrestricted areas making all of the appropriate assumptions. (both for 462 Ci + 1,000 Ci)

a) area of beam at scatterer

b.) distance from scatterer (40"-60")

c.) Rotation of device head (up to 320°)

should only be up & down not rotational.

d.) types of mechanical or electrical stops used.

e.) If exposures in unrestricted areas don't

ACTION REQUIRED

meet with 10CFR 20.105(b)(1) and (2) you must discuss methods of reduction of exposures to those areas.

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

J.R. Maden

DATE

4/25/85

ACTION TAKEN

SIGNATURE

DATE

10/26/85

David Cardwell RSO -

- ① send survey report with all orientations of beam and beam limits by Monday.
- ② planned site visit toward end of week.
- ③ maintain all exposures in the interim to floor orientation.

CONVERSATION RECORD

TIME

2⁰⁰ (P)

DATE

4/24/85

TYPE

☐ VISIT☐ CONFERENCE☐ TELEPHONE☐ INCOMING☒ OUTGOING

ROUTING

NAME/SYMBOL

INT

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT
WITH YOU

Steve Baggett, HQ

ORGANIZATION (Office, dept., bureau,
etc.)

NRC HQ

TELEPHONE NO.

216/449-3000

SUBJECT

Joseph Zaitz, Engr.

Magna Check

Rm 278

Picker (Cyclops) 590

Advanced Med. Systems - Dr. Stine

216/692-3268

SUMMARY

(1) Is the 590 capable of handling 1,000 curies of Co-60

A. According to Steve Baggett it can hold up to 5,000 curies of Co-60. It was approved in 1959 - reworked Teletherapy unit.

(2) What type of rotation and verticle movement does the 590 head have?

A. According to Joseph Zaitz of Picker, it can rotate up to 320° and can move vertically (up + down) from 60" above the floor to 40" above the floor.

(3) What is the model no. of the sealed source for the 590 (1000 curies) of Co-60?

A. *AMS Model 3802 (2cm) or 3801 (1.5cm) or 3800 (1cm)

(4) What is the output (RHM) of the 1000 curie Co-60 from the 590 Cyclops unit? The 3802 (2cm) most common has ~ 1100 RHM (1.1 RHM/curie). According to Howard Drwin, RSO for Advanced Medical Systems.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

J.R. Made

DATE

4/25/85

ACTION TAKEN

SIGNATURE

TITLE

DATE