NRC FORM 313
(1-84)
10 CFR 30, 32, 33, 34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires: 5-31-87

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

FEDERAL AGENCIES FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIAL SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
MATERIAL RADIATION PROTECTION SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
MATERIAL RADIATION PROTECTION SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [X] C. RENEWAL OF LICENSE NUMBER 12-00088-08

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

University of Illinois at Chicago
Radiation Safety Office, 339CSN, M/C 932
Box 6998
Chicago, IL 60680

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.

The University of Illinois at Chicago, Rm. B2, Bldg. 917, located between the Biological Resources Laboratory, 1840 W. Taylor, and the Campus Health Service Building. The facility is below ground level and can be entered only through the campus tunnel system.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Raymond C. Barrall, Director, Radiation Protection

TELEPHONE NUMBER: 312/996-7429

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY: Exempt

AMOUNT ENCLOSED: $

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE–CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Raymond C Barrall	Raymond C. Barrall	Director Radiation Protection	10-18-85

14. VOLUNTARY ECONOMIC DATA

a. ANNUAL RECEIPTS

- [ ] <$250K
- [ ] $250K–500K
- [ ] $500K–750K
- [ ] $750K–1M
- [ ] $1M–3.5M
- [ ] $3.5M–7M
- [ ] $7M–10M
- [ ] >$10M

b. NUMBER OF EMPLOYEES *(Total for entire facility excluding outside contractors)*

c. NUMBER OF BEDS

d. WOULD YOU BE WILLING TO FURNISH COST INFORMATION *(dollar and/or staff hours)* ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? *(NRC regulations permit it to protect confidential commercial or financial–proprietary–information furnished to the agency in confidence)*

- [ ] YES
- [ ] NO

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
			8602240395 851125 REG3 LIC30 12-00088-08 PDR	
AMOUNT RECEIVED	CHECK NUMBER			DATE

PRIVACY ACT STATEMENT ON THE REVERSE

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on NRC Form 313. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

1. **AUTHORITY**: Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).

2. **PRINCIPAL PURPOSE(S)**: The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30, 32, 33, 34, 35 and 40 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.

3. **ROUTINE USES**: The information may be (a) provided to State health departments for their information and use; and (b) provided to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for an NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION**: Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed. A request that information be held from public inspection must be in accordance with the provisions of 10 CFR 2.790. Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned need to inspect the document.

5. **SYSTEM MANAGER(S) AND ADDRESS**: U.S. Nuclear Regulatory Commission
Director, Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
Washington, D.C. 20555

EXPERIENCE

(1956-Present)

Consultant, Management of Radiation Programs, Radiological Physics, Radiation Protection.

Director, Radiation Research and Services, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia. Conceived, planned and supervised construction of 140,000-square-foot applied radiation center. Managed departments of Health Physics, Medical Physics, Radionuclide Production, Cyclotron Operations, Computer Services, Gamma Irradiation Services, Administration, Cancer and Radiation Biology Research.

Director, Health Physics, Safety and Health, Stanford University, Stanford, California. Responsible for Health Physics, Safety and Health for all campus departments and radiation protection at the Palo Alto V.A. Hospital. Taught course: Radiation Protection in Nuclear Medicine and Biomedical Research.

Chief Health Physicist, IIT Research Foundation of Illinois Institute of Technology. Administered health physics program, served as licensed senior reactor operator, was responsible for dosimetry for life sciences research, ran activation analysis service, performed neutron spectrum measurements in nuclear reactor and weapons bursts.

Supervisory Health Physicist, Mare Island Naval Shipyard, Vallejo, California. Supervised health physics program for construction, testing and repair of nuclear powered submarines.

AEC Radiological Physics Fellow, University of Rochester and Brookhaven National Laboratory.

ACCOMPLISHMENTS (Continued)

- **DEVELOP AND LEAD RESEARCH PROGRAMS**

Devised iterative method of data reduction and cross section library for deriving neutron spectra. Served as Project Director for neutron measurements of high altitude nuclear weapons bursts.

Directed Program 7, Operation HENRE (High Energy Neutron Reaction Experiment). Conducted program at Nevada Test Site.

Directed health physics research program at Stanford University over a ten-year period.

Planned and developed research program for applied radiation research center in Saudi Arabia.

- **SELECT AND PROCURE EQUIPMENT**

Selected and integrated with building construction a 7-beam-line cyclotron and a high level gamma irradiation facility designed for 2,000,000 Curies of cobalt-60. Planned and directed installation of several other accelerators, computer center, animal facility, computer controlled air monitoring system, hot laboratory, counting rooms, isotope production facility, positron camera, cancer and radiation biology research labs.

Designed unique gamma calibration facility, whole body counter, and established new counting laboratory for Stanford University.

- **PROVIDE CONSULTATION TO TOP MANAGEMENT**

Advised and consulted to top executive of most modern hospital and research center in Middle East. Defended programs to appropriate ministers, obtaining budget approval.

Consulted to International Nutronics, General Electric, Siliconix, Varian Associates, Santa Clara Valley Medical Center (and five other hospitals), American Health Facilities International of American Hospital Supply, Organization of American States.

ACCOMPLISHMENTS

• ADMINISTER RADIATION SAFETY PROGRAMS

Trained and supervised 26 persons in health physics group at a naval shipyard for construction, testing and repair of nuclear powered submarines. Monitored industrial radiographers, conducted environmental survey program. Established personnel dosimetry system and laboratory. Annual budget $300,000.

Directed Department of Health Physics, IIT Research Foundation of Illinois Institute of Technology. Administered broad license for research in life sciences, engineering, reactor operations, nuclear and chemical physics. Supervised three physicists and three technicians with annual budget of $150,000.

Directed Department of Health Physics, Safety and Health at Stanford University. Administered broad license for campus which included two hospitals, major accelerators, a research reactor, about 550 laboratories using radionuclides and over 100 radiation-producing machines. Supervised staff of 16 (9 physicists), with annual budget of $500,000.

• CONCEIVE AND PLAN FACILITIES

Served as a consultant to The Royal Cabinet Office, King Faisal Specialist Hospital and Research Centre. Conceived applied radiation research center. Related it to other facilities and programs. Administered program through planning, construction, and start-up. Managed routine operation with budget of $150,000,000 over eight years. Employed and supervised 55 professionals and 15 technical and clerical staff.

Played major role in conception and design of several high level gamma irradiation facilities. One design included simultaneous batch and continuous process irradiation capability. It is world's only full-size facility for combined effect of heat and radiation.

Raymond C. Barrall

RADIATION PROTECTION MANAGEMENT

Twenty-seven years experience in managing radiation projects, including all aspects of facilities and equipment planning and management, research, directing professional and technical staff, administration of radiation safety, education, and training. Author or co-author of more than fifty presentations, reports and publications.

EDUCATION

Master of Science in Radiation Biology, University of Rochester, as U.S. Atomic Energy Commission Radiological Physics Fellow. Bachelor of Science in Education with majors in General Science and Chemistry, Western New Mexico University. One year of graduate work in Educational Administration, also at WNMU.

P.O. Box 9996
Stanford, CA 94305

(415) 968-1869

ATTACHMENT A

THE UNIVERSITY OF ILLINIOS AT CHICAGO

SUPPLEMENT TO LICENSE AMENDMENT REQUEST, 12-00088-08
DATED OCTOBER 18,1985

SUPPLEMENT TO LICENSE AMENDMENT REQUEST

Item 5 Radioactive Material

a) Cobalt 60
b) Teletherapy sealed sources, AECL Model C146 or C151
c) 16,000 curies, 2 sources of no more than 8000 curies each.

Item 6 Purpose of Use

One source is to be used in an AECL Theratron 80 teletherapy unit for the irradiation of anything except living human beings, explosives, or quantities of flammable liquids or corrosives exceeding 100 ml. Uses will include but not be limited to research and development as defined in 10 CFR Part 30, education and training, and irradiation of samples including blood components. One source is for possession in its shipping container as necessary for the replacement of the source in the teletherapy unit only. Removal of the source from the unit will be performed only by an authorized licensee.

Item 7 Individual(s) Responsible for the Radiation Safety Program

Raymond C. Barrall, Director, Radiation Protection
(See attached curriculum vitae, Attachment B)

Item 8 Training for Individuals Working in or Frequenting Restricted Areas

Operators of the teletherapy irradiator will be under the supervision of an individual approved as an Authorized User by the Radiation Safety Committee. Currently, Dr. E. Liebner, Director of Radiation Therapy, is the only individual authorized to use the teletherapy unit as an irradiator by the committee and he intends to use only radiation therapy technicians as operators. Details concerning the committee and methods used to authorize users can be found in the current license application for License Number 12-00088-06.

All operators will have a college degree at the bachelor level in the physical or biological sciences or engineering, or the equivalent in training and experience. They will also attend the six hour Basic Radiation Protection class offered by the Radiation Safety Office if previous courses have not covered this subject material. An outline of the current course content is attached. Technologists licensed by the State of Illinois in radiation therapy will be considered to have the proper combination of training and experience. In addition, operators will be provided with specific training regarding the operating and emergency procedures, design and operation of the teletherapy unit, applicable NRC regulations and the conditions of this

irradiator license by the Radiation Safety Office or by the Radiation Therapy Section's medical physicist (currently Richard Haas, curriculum vitae in Attachment B). The duration of this training will be at least two hours. Individuals who have not operated a teletherapy unit or an irradiator before will be given one month of on the job training in the actual operation of the unit by a qualified operator. Records of training will be maintained for at least three years.

Item 9 Facilities and Equipment

This facility was in operation as a teletherapy treatment center from about 1970 thru 1983. Attachment C includes drawings of the facility and surrounding areas, and a description that addresses the requirements of 20.203(c)(6). Because the source has recently been changed, a radiation survey is also included as Attachment E to comply with condition 18 of the current license.

Item 10 Radiation Protection Program

Most of the operational radiation protection program for the teletherapy irradiator is embodied in Attachment D, Operating and Emergency Procedures. These procedures will be provided to all operators and will be posted near the control panel. Film badges are replaced monthly and are currently obtained from R. S. Landauer Jr., but may be obtained from any NVLAP approved supplier. The Radiation Safety Office maintains many annually calibrated survey meters, some of which read at least one roentgen per hour. The Radiation Safety Office also will perform semiannual leak tests. Survey meter calibration procedures and leak testing procedures can be found in the 12-00088-06 license application.

Item 11 Waste Management

Radioactive sources will be transferred to an authorized licensee for disposal as specified in 10 CFR 20.301(a).

BASIC RADIATION PROTECTION CLASS

TOPICS CURRENTLY PRESENTED

A. Interation of Radiation With Matter

Ionization
Radioactivity
Modes of Decay
Atomic Number
Mass number
Isotope
Particles and Photons
Alpha Particles
Beta Particles
Gamma Rays
X Rays
Photoelectric Effect
Compton Scattering
Pair Production
Bremsstrahlung
Radiation Shielding - Alpha, Beta, Gamma
Radioactivity
Curie
Becquerel
Equations of Decay
Half Life
Exposure and Dose
Roentgen
Rad
RBE
LET
Rem
Inverse Square Law

B. Radiation Detection and Measurement

G.M. Counters
Ionization Survey Meters
Liquid Scintillation Counters
Gamma Ray Spectroscopy
Thermoluminescent Dosimeters
Film Badges
Contamination Detection

C. Biological Effects of Radiation

Acute Radiation Syndrome
Lethality, CNS, GI, Blood Erythema
Low Dose Acute: Blood

Basic Radiation Protection Class Topics (cont'd)

D. Internal Dosimetry

ICRP 2 Model Body Burden, MPCa Occupational & Non-occupational
MPCa Occupational & Non-occupational

Federal Code
ICRP 26 Model
ALI Stochastic & Non Stochastic
Dose Commitment
Cancer
Example 1 -
Example 2 -
Example 3 -

E. Prespective: Other Radiation Sources

Natural Background
Consumer Products
Medical Radiation
Other Risks

F. Regulations & Practical Protection Techniques

10 CFR 19
10 CFR 20
Maximum Permissible Levels in Unrestricted Areas
Posting and Labeling
When Personnel Monitoring is Required
Waste Disposal
Disposal to Sewer
Surveys
Records of Surveys
Report of Theft of Loss of Radioactive Material
Notification of Incidents
Transfer to Others
General Rules for Radioisotope Labs
Practical Shields
Internal and External Exposure
Time, Distance Shielding, Contamination Control
ALARA

ATTACHMENT B

CURRICULUM VITAE, RAYMOND C. BARRALL AND RICHARD HAAS

CURRICULUM VITAE

Richard E. Haas
5137 Center Street
Lisle, IL 60532
Home (312) 969-1579
Office (312) 996-3629
Married - born 1936

ACADEMIC

Bachelor of Arts June 1958	Physics, Math Majors	North Central College Naperville, Illinois
Graduate Study June 1959	Radiological Physics AEC Fellowship	Vanderbilt University Nashville, Tenn.
Summer Training 1959	Health Physics AEC Fellowship	ORNL Oak Ridge, Tenn

MEMBERSHIPS AND OFFICES

American Association of Physicists in Medicine, 1964 - present.

Membership Committee - 1974 to 1977

Midwest Chapter, AAPM, 1960 to present.

Secretary-Treasurer 1969-71
Program Chairman 1971-73
President 1973-75
Board Member 1975-83

Health Physics Society - 1960 to present.

Midwest Chapter, HPS - 1961 to present, charter member.

Illinois Radiological Society 1983 to present.

American Society of Therapeutic Radiology 1983 to present.

PROFESSIONAL EXPERIENCE

-Instructor and Radiation Safety Office, University of Illinois Abraham Lincoln School of Medicine and Medical Center Campus, Sept. 1959 to Sept. 1966. Responsible for safety program for all medical and research uses of radioisotopes under an AEC board medical license and x-ray safety.

-Assistant Professor, Abraham Lincoln School of Medicine Sept. 1966 to present.

PROFESSIONAL EXPERIENCE Cont'd

-Radiation Safety Officer, Medical Center Campus, Sept. 1966 to March 1974. Same responsibilities as above with the addition of 2 other AEC Cobalt licenses.

-Radiation Physicist of Radiation Therapy Section of Radiology Dept. 1968 to present. Sole physicist in the section, responsible for the treatment planning and dosimetry in the section.

-Radiation Safety Officer, University of Illinois Circle Campus 1973 to 1976. Responsible for their radiation safety program with radioisotopes and x-ray machines and devices.

-Consultant Medical Physicist (Diagnostic) West Side VA Hospital, 1976 to present.

-Certified in Therapeutic Radiological Physics by the American Board of Radiology, June, 1982.

-Qualified x-ray Inspector of Therapeutic, diagnostic and other x-ray devices by the State of Illinois, April, 1983.

SPECIAL EXPERIENCE

A. Active participation in the design of a Radiotherapy Section of a new hospital including the layout and shielding thicknesses.

B. Prepartion and printing of detailed equipment specifications for high (24 Mv) and low energy (6 Mv) accelerators, a simulator and a treatment planning computer, for bidding purposes.

C. Active participation in the choice of the equipment to be purchased for a new hospital including a Clinac 6/100 accelerator, an Oldelft simulator with analog tomography (the first unit installed in this country), an AECL TPII Computer System with tumor registry capabilities and a Clinac 2500 Accelerator, serial No. 2, with dual photon energies 6 and 24 Mv and six electron energies from 6 to 22 MEV.

D. Acceptance testing of all of the above pieces of equipment.

PRESENTATIONS

"The Use of Extruded LiF Ribbons as a Personnel Monitor," Health Physics Society, 1968.

"Management of Radioactive Wastes at A Medical Center,", Health Physics Society, Midwest Chapter, 1970.

"Treatment Planning at the U. of Illinois Hospital," Midwest Chapter of HPS and AAPM, Symposium, 1971.

PRESENTATIONS Cont'd

"Analog Tomography Using the Oldelft Simulator, Midwest Chapter AAPM, Feb. 1982.

"Operating Characteristics of the Clinac 2500", Midwest Chapter AAPM, Jan. 1983.

Scientific Exhibit "Analog Tomography", AAPM, Aug. 1982, ASTR, Oct. 1982.

ARTICLES

W.S. Moos, R.E. Haas, et al: Variations in x-ray barrier efficiencies. Oral Surg., Oral Med., & Oral Path., 14: 569-573, 1961.

Liebner, E.J., Haas, R., et al: Experimental therapeutic intralymphatic studies. Cancer, 18, 827-842, 1965.

Mantravadi, R., Liebner, E., Ginde, J., Haas, R.: Orthogonal xeroradiography for ^{125}I Seed Implantation, Radiology, 127, No. 3, p. 832, 1978.

Mantravadi, R., Katz, A., Haas, R., et al: Radiation Therapy for Subclinical Carcinoma in Cervical Lymph Nodes. Arch. of Otolaryngology, 108, 108-111, 1982.

Applebaum, E., Mantravadi, R., Haas, R.: Lymphoepithelioma of the Nasopharynx. Laryngoscope, 92, No. 5, 510-514, 1982.

Mantravadi, R., Phatak, R., Bellur, S., Liebner, E., Haas, R.: Brain Stem Gliomas, An Autopsy Study of 25 Cases, Cancer 49: 1294-1296, 1982.

Mantravadi, R., et al, "Patterns of Cancer Recurrence in Postoperatively Irradiated Neck", Arch. of Otolaryngology, Sept. 1983.

ATTACHMENT C

DESCRIPTION OF THE TELETHERAPY IRRADIATOR FACILITY

DESCRIPTION OF THE TELETHERAPY IRRADIATOR FACILITY

BASIC DESIGN AND CONSTRUCTION

Attached are drawings of the teletherapy facility and the surrounding areas. These scale drawings show the materials of construction, thickness of shielding barriers, distances to the surrounding areas, the one entrance to the irradiator room, and the location of control devices, alarms and signals. The facility is located below ground level and is accessible only from the campus tunnel system. The area directly above the facility is fenced off with a 6 ft tall chain link fence topped with barbed wire. Nothing but earth exists below the facility.

BEAM RESTRICTIONS

Mercury switch interlocks are provided to prevent the beam from switching "ON" unless the beam is directed to within 3 degrees of the center of the primary beam stop except when the beam is directed toward the floor. The beam can be switched "ON" without being directed toward the the primary beam stop when the beam is between 0 degrees (down) and about 13 degrees counter clockwise. The primary beam will not strike any wall with these restrictions. As a result of the survey included as Attachment E, the beam will be further restricted by the use of mercury switch interlocks so that the beam cannot be switched "ON" when directed above the horizontal plane (90 thru 270 degrees). In the future additional shielding may be added to the roof of the facility so that these rotational restrictions may be removed. The NRC will be notified if this is done and will be provided with pertinent survey results.

ENTRANCE CONTROL DEVICES

The primary control device required by 10 CFR 20.203(c)(6)(i) will be a locked door with an entry interlock key switch system. The door key and the entry interlock key will be physically attached to each other by welding or placing them on a sealed chain loop. Only one set of keys will be available to operators. When the door to the irradiator room is unlocked the key will be captured in the lock cylinder. The entry control interlock key switch, located at the control console, will capture the key when in the "IRRADIATE" position. This will prevent the door from being opened while the beam can be switched "ON" and will prevent the completion of the interlock circuit while the door is unlocked. As required, the door lock can be opened from the inside of the irradiator room at all times so that no individual will be prevented from leaving. The primary control system will be tested when in use as required by 20.203(c)(6)(vii).

The secondary entry control device required by 20.203(c)(6)(ii) will be a door interlock. This will prevent the beam from being switched "ON" when the door is open and will turn the beam "OFF" if the door is opened during irradiation. If the beam is interrupted by the activation of this interlock, the door must be closed and the reset bar must be pressed on the control console before the beam can be reactivated.

The walls are considered permanent structural components and are therefore exempt from the requirements of 203(c)(6)(iii). The irradiator room door has been professionally installed with the hinges inaccessible from outside of the room. Because of this we feel that failure or removal of the door while the irradiator is in use is not credible, therefore the door is also a structural component exempt from this regulation. No other means of entry into the irradiator room is possible.

WARNING SYSTEM, EMERGENCY OFF SWITCHES AND RADIATION MONITOR

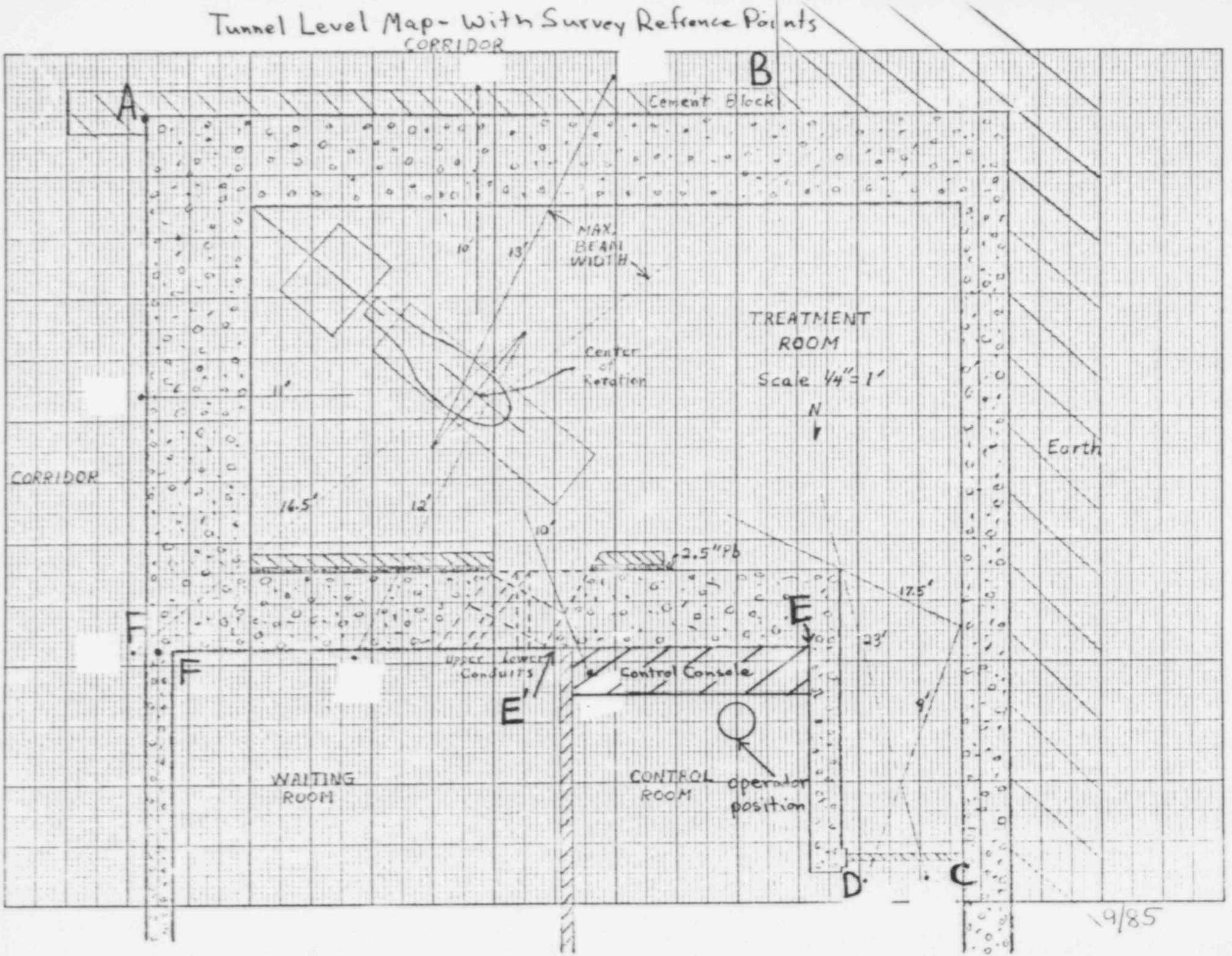
As required by 20.203(c)(6)(iii), a time delay system is being installed that prevents the beam from being activated until about 15 seconds have elapsed from when the irradiator room door is closed. During the delay interval a visible and audible signal will be activated in the irradiator room and at the control console. Clearly identified emergency "OFF" switches are provided in the irradiator room and at the control console.

A radiation monitor is permanently mounted in the irradiator room that provides an audible and visible alarm if the radiation level exceeds a predetermined level with the door open. This monitor has been provided to satisfy the requirements in 20.203(c)(6)(vi).

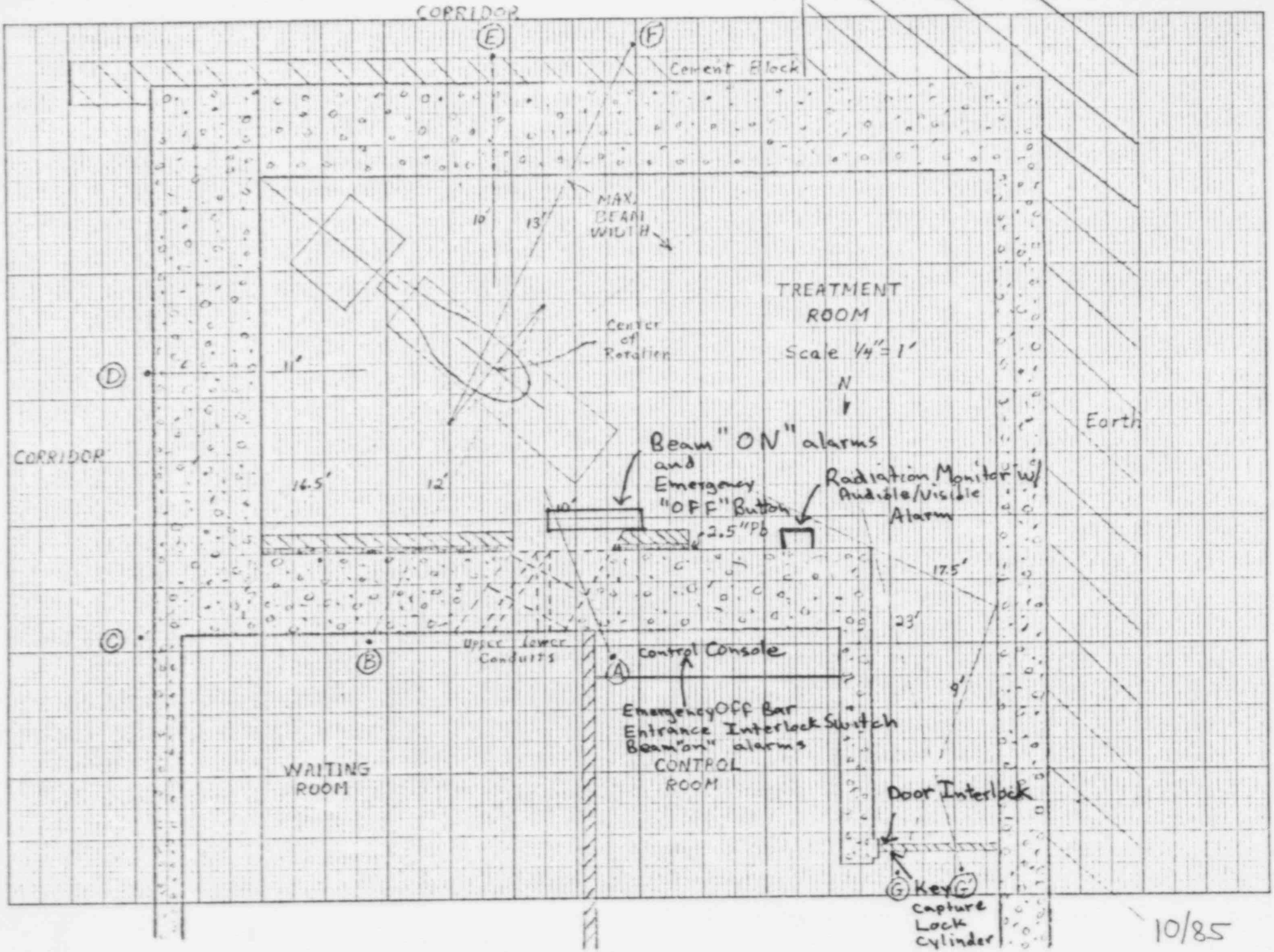
ADMINISTRATIVE CONTROLS

The "Operating and Emergency Procedures" in Attachment B describe most of the administrative controls that will be employed. In addition, a "High Radiation Area" sign will be posted at the entrance to the irradiator room as required by 20.203(c)(1).

Tunnel Level Map - With Survey Refrence Points



9/85


CORRIDOR
E
F
Cement Block
MAX. BEAM WIDTH
10'
13"
TREATMENT ROOM
Scale 1/4" = 1'
Center of Rotation
11"
N
D
CORRIDOR
Earth
Beam "ON" alarms and Emergency "OFF" Button
Radiation Monitor w/ Audible/Visible Alarm
16.5'
12'
2.5" Pb
17.5'
23'
C
B
Upper Lower Conduits
A
Control Console
Emergency OFF Bar
Entrance Interlock Switch
Beam "on" alarms
CONTROL ROOM
9'
WAITING ROOM
Door Interlock
G
Key capture Lock Cylinder
10/85

VERTICAL CROSS-SECTION

SCALE 1/4" = 1'

(H)

VENT

WINDOW

WAITING ROOM

CONDUITS

CENTER OF ROTATION

TREATMENT ROOM

NEW FLOOR

Earth

(B)

GROUND LEVEL VIEW OF SURROUNDING AREA

SCALE 1/4" = 5'

Campus Health Service

TWO-STORY

ASPHALT

Fence

Ceiling Treatment Room

SERVICE DRIVE

3 ft DROPOFF

Fence

ASPHALT

ONE-STORY BUILDING UNDER CONSTRUCTION

10/85

ATTACHMENT D

OPERATING AND EMERGENCY PROCEDURES

THERATRON 80 OPERATING AND EMERGENCY PROCEDURES

OPERATING INSTRUCTIONS

The key that opens the irradiator room door has been secured to the master interlock key. This key system prevents the beam from switching "ON" until the door to the irradiator room has been locked in the closed position. Do not attempt to defeat this system.

1. Turn the master key switch fully clockwise to "START" and release. Depress the white "RESET" bar to silence the buzzer. The reset bar should now be lighted. The timer switch should be in the "OFF" position and the green "BEAM OFF" indicator should be lighted.

2. Unlock and open the irradiator room door and enter the room*. Adjust the arm, source head and table if necessary, and place the object to be irradiated in position. The door key should be captured in the lock cylinder while unlocked.

3. Visually check the irradiator room when leaving to be certain no one is present in the room. Immediately close and lock the irradiator room door and remove the key from the lock to prevent inadvertent entry.

4. Turn the master interlock key switch on the control panel to the "IRRADIATE" position. The interlock key should be captured in the lock cylinder while the switch is in the "IRRADIATE" position.

5. Depress the reset bar which should then extinguish, set the timer and rotation selectors, and switch the timer switch to the "ON" position. A safety delay will be encountered before the beam switches "ON" during which an audible and visible warning alarm will signal in the irradiator room and on the control console. The red beam "ON" indicator will light when the source is in the irradiate position.

6. When the irradiation has been completed switch the master interlock to the "SAFE" position and remove the key. The irradiator room door may now be opened and the samples removed.

7. Lock the irradiator room and the control room doors when the facility is not in use and return the keys to the designated storage area. Do not leave the keys in the control room or adjoining areas to prevent unauthorized use of the irradiator.

* If the area radiation monitor alarms when the irradiator room door is opened, a dangerous condition may be indicated. **Do not allow entry into the room and follow the Emergency Procedures.**

SAFETY PRECAUTIONS

It is the responsibility of the operator to enforce all safety rules. Visitors and assistants are to follow the operator's instructions regarding radiation safety.

1. All operators and operator's assistants entering the irradiator room **must** wear whole body film badges issued by the Radiation Safety Office.

2. Interlock testing **must** be completed prior to the first use on each day the irradiator is used. Consult with the Radiation Safety Office to determine the testing schedule if overnight irradiations will be performed.

3. Do **not** use the irradiator if the interlocks, safety devices or monitor are malfunctioning. Report malfunctions to the Radiation Safety Office immediately.

4. Only personnel authorized by the Radiation Safety Office may operate the irradiator.

5. If the radiation monitor alarms when the door is opened, it may indicate the source has failed to return to the safe position within the shielding due to mechanical or electrical failures. This may create very high radiation fields within the irradiator room. For this reason, should the monitor alarm when the door is opened, **follow the emergency procedures.**

6. If the source drawer fails to close (ie: the beam condition indicating rod protrudes from the teletherapy head when the beam should be "OFF") **clear the irradiator room of all personnel at once and follow the Emergency Procedures.**

7. Do not leave the control room unattended while the irradiator is in use unless the control room entrance door is locked in the closed position.

EMERGENCY PROCEDURES

If for any reason the source fails to return to the "OFF" position as expected or if the radiation alarm sounds when the door is opened, follow these steps:

1. **Do not enter or allow entry to the irradiation room. Do not attempt to retrieve samples.**

2. Close and lock the door to the irradiator room.

3. Press the red "EMERGENCY OFF" bar on the control console.

4. Call the Radiation Safety Office immediately and request assistance (6-7429). After normal working hours, contact the University Police (6-6777), explain that there is a radiation emergency and request that a member of the Radiation Safety Office be contacted.

5. Do not allow anyone to enter the irradiator room until authorized by a representative of the Radiation Safety Office, AFCL (the manufacturer) or the Nuclear Regulatory Commission.

ATTACHMENT E

TELETHERAPY SURVEY REPORT

TELETHERAPY SURVEY REPORT

UNIT DESCRIPTION

The Model Theratron 80 teletherapy irradiator, Serial No. 231 was manufactured by Atomic Energy of Canada Limited. The unit contains a Type C146 source containing 5119 curies of cobalt 60 calibrated for February, 1985. The source output was measured by AECL as 90.6 Rmm on February 20, 1985. Because the unit will not be used for human use, the beam output has not been measured after installation of the new source. The unit is owned and operated exclusively by personnel from the University of Illinois at Chicago.

DATES OF SURVEY

The survey of the teletherapy facility was conducted on September 26 and 27, and October 2 and 3, 1985. At the time of the survey the source contained approximately 4741 curies of cobalt 60.

CONDUCTED BY

Dave Derenzo, Health Physicist, University of Illinois at Chicago
and
Joseph Alappattu, Safety Officer III, University of Illinois at Chicago

PURPOSE OF SURVEY

The survey was conducted to satisfy condition 18 of license 12-00088-08 after a source change was performed by AECL personnel on July 10, 1985. Attached are documents provided by AECL, some of which are misdated June 10, 1985, concerning disposal of the old source, installation of the new source, inspection and service of the unit, and survey of the head.

SURVEY INSTRUMENTS

The survey was conducted using two Eberline E-120 geiger counters with Model HP-190 detectors and a Health Physics Instruments Model 1010 (HPI 1010) tissue equivalent survey meter (calibration certificates attached). The Eberline E-120 meters were used only for detection purposes. All readings below 0.06 mR/h were considered background for purposes of this survey and no HPI 1010 measurements were made at these locations. When readings greater than 0.06 mR/h were detected using an E-120, a measurement was made with the HPI 1010. The E-120 instruments were also used to detect the location and relative strength of radiation fields around the facility prior to measurements with the HPI 1010.

PHANTOM USED

During the survey, a cylindrical lucite phantom measuring 30 cm in diameter by 22 cm in height was centered at the beam's isocenter, oriented with its axis on the centerline of the arm's

rotation. The isocenter is a point in space 80 cm from the source around which the beam rotates. The largest field size was used during the survey which measured 36 cm by 36 cm at a distance of 80 cm from the source.

health physics instruments, inc.
124 Santa Felicia Drive
Goleta, California 93017
Telephone (805) 685-2612

MODEL 1010 INSTRUMENT CALIBRATION

INSTRUMENT OWNED BY: University of Illinois

DATE: 8/23/83

MODEL: 1010 B

TYPE: MULTIPLYING ION CHAMBER SURVEY METER

SERIAL NO: 325

CALIBRATION SOURCE DATA

S 1.866 mrad/h @ 1 meter

W 0.117 mrad/h @ 1 meter

DISTANCE		SCALE READING				
C M	mrad/h	X1000	X100	X10	X1	X0.1
S T1	360	360				
T2	98		94			
14.3	90		90			
30.6	22		22			
45.5	9			9		
96.6	2			2.2		
143.9	0.9				.95	
W 76.5	0.2				.22	
153	0.05					.06
CM time	mrad	X1	X.1	X.01		
S 58 9 min	.83	.85				
58 1 min	.092		.092			
W 49.9 1 min	.0078			.0076		

COMMENTS

High Voltage: 1340

Chamber Number: 524 Beta

CALIBRATION BY: John Handloser

THE UNIVERSITY OF ILLINOIS AT CHICAGO

(#17

Radiation Safety Office
Room 339 General Hospital
Box 6998, Chicago, Illinois 60680
(312) 996-7429

MONITORING INSTRUMENT CALIBRATION AND REPAIR REPORT

Instrument Owner RSO Loaned To _____

Date Picked Up _____ Date Returned _____

Make Eberline Model E-120 Ser. # 5784

Location - Room(s) No. 339 Bldg. CSN (GH)

CALIBRATION

Calibration Source ^{137}Cs Activity (For x0.1)-1.239 / (For x1 / x10)-22.33 mCi

Date 10-30-84

Range	Meter Reading	Distance(cm)	Exposure Rate(mR/hr)	Ratio = Exposure Rate / Meter Reading	% variation = (ratio/ratio - 1)
x0.1	0.18	156.5	0.167	0.928	7.76
	0.34	110.8	0.333	0.979	2.15
x1	1.7	210	1.67	0.982	1.83
	3.1	148.8	3.33	1.074	6.89
x10	15.0	66.4	16.7	0.928	7.76
	32.0	47	33.3	1.041	-3.94

Check Source ^{137}Cs (ER Serial #16609-1) Activity 9.91 uCi Date 10-30-84 *

Check Source Reading: At Calibration ~8.0 mR/hr at 1cm.

Comments regarding instrument: All 3 potentiometers were adjusted.

Meter D.K.

Rec'd *-Ao = 11.2 uCi as of 7-1-83 Date 10-31-84 W. M. Hutchinson

Calibration Performed By:

THE UNIVERSITY OF ILLINOIS AT CHICAGO

#22

Radiation Safety Office
Room 339 General Hospital
Box 6998, Chicago, Illinois 60680
(312) 996-7429

MONITORING INSTRUMENT CALIBRATION AND REPAIR REPORT

Instrument Owner RSO Loaned To _____

Date Picked Up _____ Date Returned _____

Make Victoreen Model E-120 Ser. # 6266

Location - Room(s) No. 351 Bldg. CSN (C-H)

CALIBRATION

Calibration Source ^{137}Cs Activity $\frac{(Fig \times 0.1) \cdot 1.259}{(Fig \times 1 / \times 10) \cdot 2253}$ mCi

Date 10-30-84

Range	Meter Reading	Distance(cm)	Exposure Rate(mR/hr)	Ratio = Exposure Rate / Meter Reading	% variation = (ratio - 1) x 100
x0.1	0.17	156.5	0.167	0.982	1.83
	0.90	116.8	0.333	1.11	9.91
x1	1.66	210	1.67	1.044	-4.21
	3.36	148.8	3.33	1.009	-0.89
x10	17.5	66.4	16.7	0.954	4.82
	34.0	47	33.4	0.979	2.15

Check Source ^{137}Cs (Serial #11609-1) Activity 9.91 uCi Date 10-30-84*

Check Source Reading: At Calibration 9.0 mR/hr at source surface

Comments regarding instrument: All 3 potentiometers were adjusted.

Meter O.K.

Rec'd *-40 = 16.2 mCi of 7.1.83 Date 11-31-84 W. A. Hibbs

Calibration Performed By:

SOP 6.1-2
r 14, 1984

TRSITY
LINOIS
ICAGO

Recalibration

Radiation Safety Office
333 Clinical Sciences North (CSN)
Box 6998, Chicago, Illinois 60680
(312) 996-2429

RADIATION SURVEY INSTRUMENT CALIBRATION REPORT

Instrument Owner: RSO Loaned To :

Date Picked Up: Location:(Room No. & Bldg) Date Returned:

Make: Eberline Model: E-120 Serial Number: 6206

Calibration Date: 2-20-85 By: W. M. Hickman

Calibration Source (mCi)	Distance (cm)	Exposure Rate (mR/h)	Range	Meter Reading	Meter Reading / Exposure Rate
1.2069	197.0	0.1	x0.1	0.11	1.10
	98.5	0.4		0.37	0.925
	62.3	1.0	x1	1.0	1.00
	31.1	4.0		3.8	0.95
19.346	78.9	10.0	x10	11	1.10
	39.4	40.0		42	1.05

Check Source ^{137}Cs (IPL #10609-1) Activity: 10.2 uCi Date: 7-1-83

Check Source Reading: At Calibration: ~10 mR/hr at source surface

Comments Regarding Instrument: Potentiometer adjusted for x0.1, x1, and x10 ranges. Meter face tinting yellow-green.

Atomic Energy of Canada Limited

SOURCE DISPOSAL CERTIFICATE

TO WHOM IT MAY CONCERN:

This is to certify that the following source has been removed from the unit described herein, and returned to Atomic Energy of Canada Limited, Commercial Products, Ottawa, Ontario, Canada for disposal:

COBALT 60 OR CAESIUM 137 SEALED SOURCE	SERIAL NO	DEPLETED URANIUM	UNIT	UNIT SERIAL NO
	2099	lb	T 80	231

LOCATION OF UNIT

University of IL.
912 S Paulina St
Chicago IL 60612

Date: 6-10-85 Signed: W Hughes
A.E.C.L. Service Representative

WHITE: CUSTOMER - ON SITE
GREEN: OTTAWA - UNIT HISTORY FILE
CANARY: OTTAWA - ISOTOPE LAB.
PINK: REGIONAL OFFICE
GOLDEN ROD: EXTRA COPY

MED-021-1

Atomic Energy of Canada Limited
Commercial Products

INSPECTION CERTIFICATE

AUTHORIZED INSPECTION AND SERVICING OF AECL TELETHERAPY UNIT

MODEL NO. T 80 SERIAL NO. 231

TELETHERAPY SOURCE SERIAL NO. 3717 CURIES 5119 DATE FEB 85

CUSTOMER UNIVERSITY OF ILL.

912 S PAULINA ST CHICAGO IL.

This teletherapy unit was inspected and serviced in accordance with Atomic Energy of Canada Limited USNRC License No. 54-00300-04.

Date of Inspection JULY 10 1985

This is to certify that the unit was inspected and serviced in accordance with the conditions of the License. Each teletherapy machine shall be fully inspected and serviced during source replacement or at intervals not to exceed five years.

By W Hughes 6-10-85

Authorized Source Handler (date)

WHITE	CUSTOMER - ON SITE
CANARY	OTTAWA - UNIT HISTORY FILE
PINK	OTTAWA E.P. UNIT HISTORY FILE
BLUE	REGIONAL OFFICE

MED-022

LEAK TEST CERTIFICATE
ATTESTATION D'ÉTANCHÉITÉ

ORDER No. 43434
Nº DE COMMANDE

DATE 1985 June 18

DESCRIPTION OF SOURCE TESTED
DESCRIPTION DES SOURCES VÉRIFIÉES

One Cobalt-60 Teletherapy Source 2.0 CM. Active Diameter, AECL Type C 146
Une source de téléthérapie au Cobalt-60, *CM de diamètre actif, ÉACL, Type C*

Serial No. S-3717 Other
Nº de série *Autre*

LEAK TESTS PERFORMED
ÉPREUVES D'ÉTANCHÉITÉ EFFECTUÉES

(See reverse for description of tests)
(Description des épreuves au verso)

RESULTS OF TESTS
RÉSULTATS DES ÉPREUVES

☑ 1. THE DRY WIPE TEST, PROCEDURE DG-0065
ÉPREUVE PAR FROTTEMENT A SEC, PROCÉDÉ DG-0065 — NEGATIVE

☐ 2. OTHER TESTS (AS DESCRIBED BELOW)
AUTRES ÉPREUVES (DÉCRITES CI-APRÈS)

DATE OF COMPLETION OF TESTS
ÉPREUVES TERMINÉES LE

1985 June 18

FOR THE COMPANY
POUR LA SOCIÉTÉ

Victor Boisvert

Source Production Department
Service de la production des sources

Atomic Energy of Canada Limited
Radiochemical Company
P.O. Box 13500
Kanata, Ontario
Canada
K2K 1X8

L'Énergie Atomique du Canada, Limitée
Société Radiochimique
C.P. 13500
Kanata, Ontario
Canada
K2K 1X8

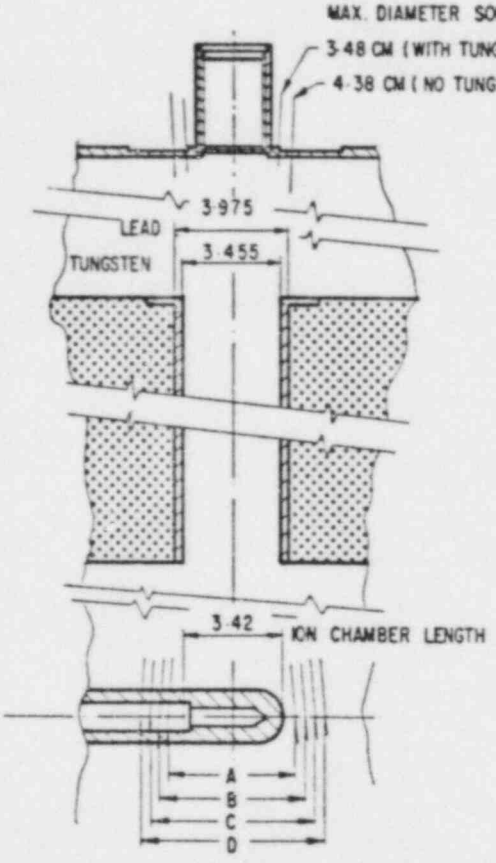
ISO-091

Pink/*Rose* — Central Records/*Richier Central*
Yellow/*Jaune* — Unit History File/*Dossier de l'historique des appareils*
Blue/*Bleu* — Industrial Products/*Produits industriels*
Green/*Vert* — Quality Assurance/*Assurance de la qualité*

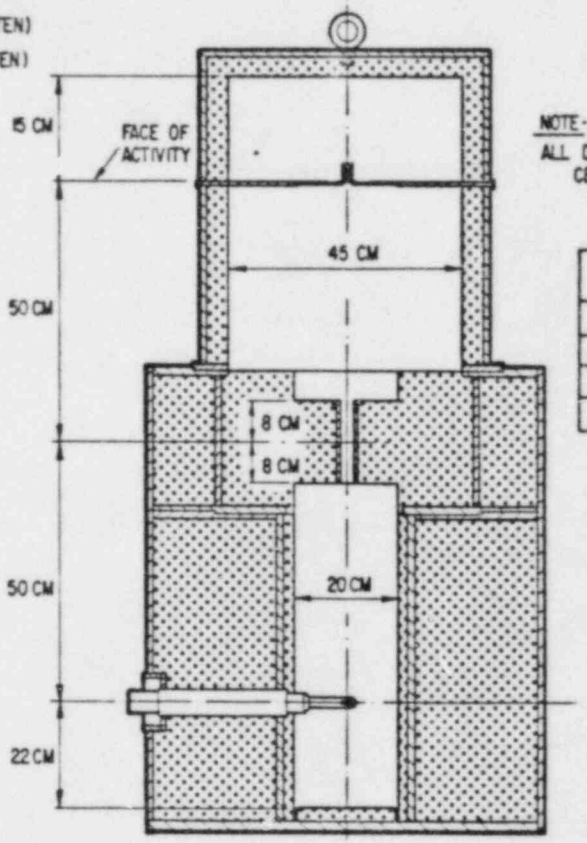
MEASUREMENT CELL FOR TELETHERAPY SOURCES

The exposure rates from these sources are measured in a cell designed and constructed for this purpose by Atomic Energy of Canada Limited and located in Kanata. It meets all the specifications laid down in report ICRU-18 (by the International Commission on Radiation Units and Measurements) issued in October, 1970. These specifications define a measurement cell contributing less than 1% additional scattered radiation to the actual radiation emitted by the source. The cell is intended for use remotely inside a hot cell. The sketches below depict the important features of the cell.

The source is placed on a light aluminum support in the upper compartment. The collimator is lead, 16 cm thick, situated midway between source and probe. The collimator may be reduced in diameter when measuring small diameter sources by inserting tungsten liners. A fixed holder is provided to locate the ion chamber in the lower compartment with its centre 1 meter below the face of the activity.



FIELD SIZES FOR SOURCE DIAMETERS
(SEE TABLE)



NOTE-
ALL DIMENSIONS IN CENTIMETRES

	SOURCE DIA.	FIELD SIZES
A	2·5	4·36
B	2·0	4·99
C	1·5	5·69
D	1·0	6·37

Details for this sketch are taken from drawing A10801.

Atomic Energy of Canada Limited • Radiochemical Company
Kanata • Ontario

EQUIPMENT CONVERSION RATIOS FOR AECL THERAPY UNITS

Equipment Conversion Ratio is the ratio of unit output at one metre to source output at one metre. It is a function of the field size setting of the collimator.

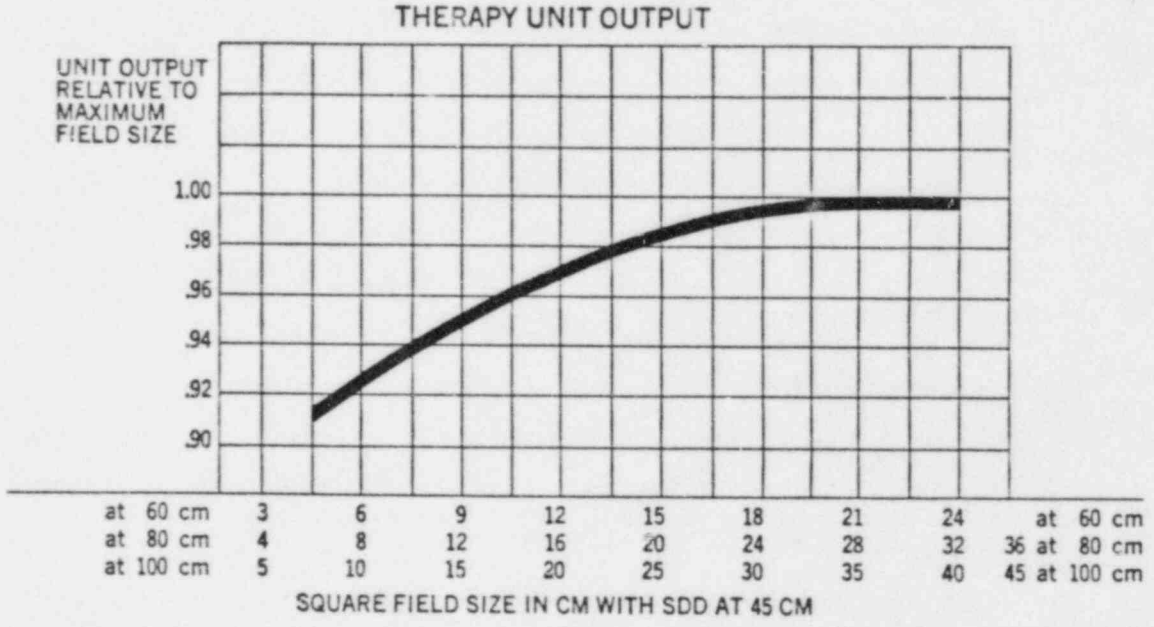
For AECL Units, Equipment Conversion Ratios are defined at maximum field size.

THERAPY UNIT	EQUIPMENT CONVERSION RATIO*
** ELDORADO A	1.15
** MODEL B, C, CII, F, G & SUPER G	1.09
***MODELS 6, 60, 8, 80, 76, 78, 765 & 780	1.15

* Equipment Conversion Ratio to convert certified source Rmm to unit output at one metre, and maximum field size.

** Older AECL units having a shutter and a source in a square drawer.

*** AECL units having an interleaved collimator and a source in a round drawer are related by the general unit output curve shown below. The square field sizes depicted for treatment distances of 100, 80 and 60 cm are geometrically related at a trimmer distance (SDD) of 45 cm.



EQUIPMENT CONVERSION RATIOS are slightly affected by active source dimensions. A correction which does not exceed ±2% will be applied to the exposure rate calculated for the customer's unit.

Atomic Energy of Canada Limited • Radiochemical Company

Kanata • Ontario

Atomic Energy of Canada Limited
Radiochemical Company

L'Energie Atomique du Canada, Limitée
Société radiochimique

RADIATION SURVEY REPORT

Teletherapy Head - Beam Off

P&S 43434

Customer UNIVERSITY OF ILLINOIS AT CHICAGO

Location CHICAGO, ILLINOIS 60612

Model THERATRON 80 Serial Number 231

SOURCE DATA

Serial No. S-3717 Diameter 2.0 CM Curies 5119 Co^{60}

Measured Output 90.6 (±3%) Rmm(ICRU) Measurement Date FEB 20 1985

Maximum Unit Output 102.9 (±5%) Rmm Rated Capacity 156.05 Rmm(ICRU)

Survey Meter RATO/F BERTHOLD Model RATO/F

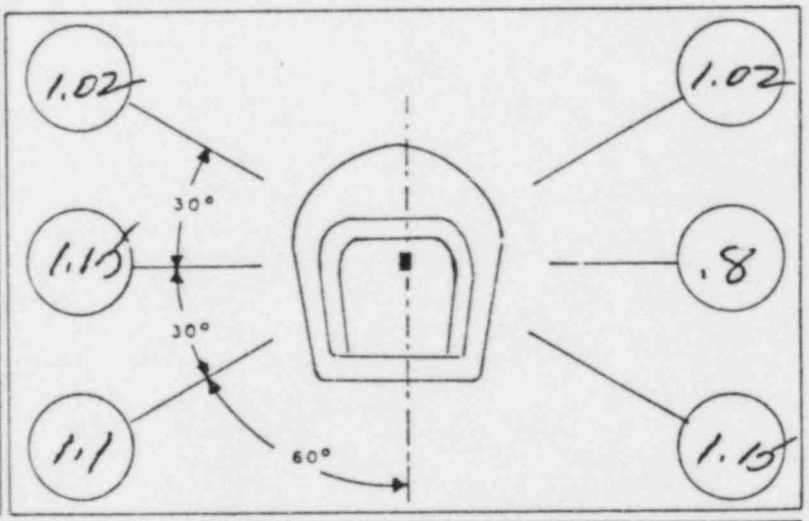
Serial No. 1716 Calibration Date 4-22-85

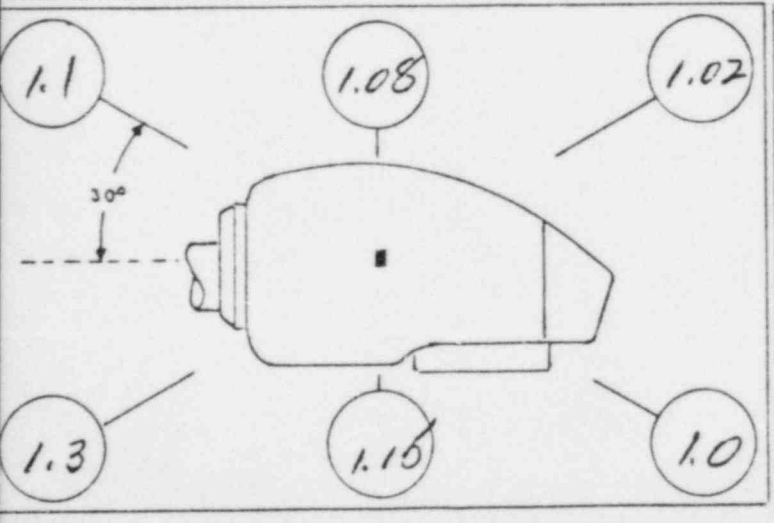
Supplementary Shielding: Donut ☐ Air Cylinder End ☒ Other ☐

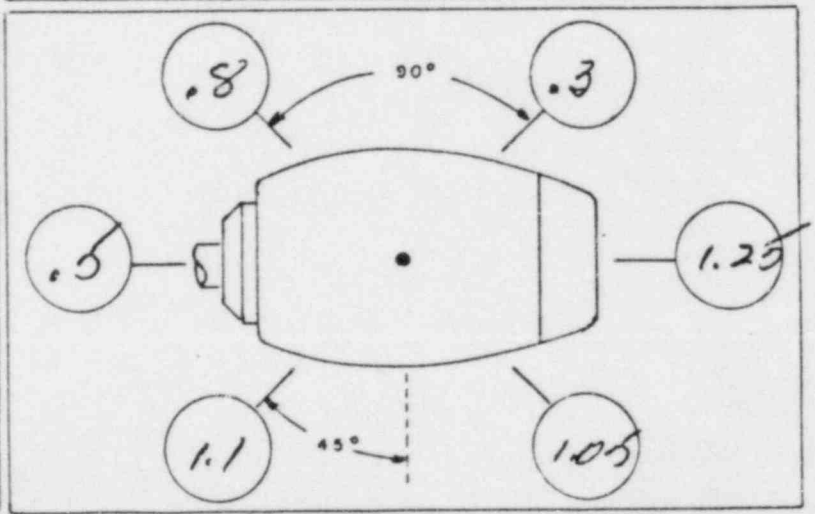
HEAD SURVEY PERFORMED BY W. HUGHES/D. TEGTMEYER Date 07/10/85

NOTES

1. Values at each point are averaged over a 100 square centimetre area in accord with recommendations NCRP Report 33.
2. Values are in mR/h at 1 metre from the source.
3. This report is based on values measured at 18 points and is it is for compliance verification only. Report is not to be used as a substitute for comprehensive 26 point survey originally performed under controlled conditions at the factory in accord with recommendations NCRP Report 33.
4. Average of values at all 26 points is equal to, or less than, 2 mR/h.
5. No measured value exceeds 10 mR/h.







QA-039-2

WHITE – CUSTOMER
CANARY – SERVICE CENTRE
PINK – C.P. UNIT HISTORY FILE

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION Wall AB

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	BG	All area of wall AB
15°	BG	
30°	BG	
45°	BG	
60°	BG	
75°	BG	
90°	BG	
105°	BG	
120°	BG	
135°	BG	
150°	BG	
165°	BG	
180°	BG	
195°	BG	
210°	BG	
225°	BG	
240°	BG	
255°	BG	
270°	BG	
285°	BG	
300°	BG	
315°	BG	
330°	BG	
345°	BG	

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Arenz

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION Wall C D

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	0.20	60 cm E of C, floor level
15°	0.25	At C, floor level
30°	0.20	
45°	0.24	
60°	0.22	
75°	0.35	
90°	0.34	
105°	0.34	
120°	0.34	
135°	0.34	
150°	0.30	
165°	0.24	
180°	0.24	
195°	0.18	
210°	0.16	
225°	0.14	
240°	0.08	
255°	0.14	
270°	0.12	
285°	0.10	
300°	0.10	
315°	0.10	
330°	0.12	
345°	0.07	

E of C = East of reference point C

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Drenz

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION E' F

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	0.090	35cm W of F, 243 cm above floor
15°	BG	All area of wall E' F
30°	BG	
45°	BG	
60°	BG	
75°	BG	
90°	BG	
105°	BG	
120°	BG	
135°	BG	
150°	BG	
165°	BG	
180°	BG	
195°	0.94	70cm W of F, at ceiling
210°	1.0	50cm W of F, at ceiling
225°	0.08	50cm W of F, at ceiling
240°	0.26	At E', 115 cm above floor
255°	0.55	88cm E of E', 148cm above floor
270°	0.80	70 cm W of E', at Ceiling
285°	0.70	80 cm W of E', at Ceiling
300°	1.8	At E', 100 cm above floor
315°	0.65	At E', 100 cm above floor
330°	0.20	At E', 110 cm above floor
345°	0.070	At E', 110 cm above floor

W of F = West of reference point F
E of E' = East of reference point E'

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Derenzo

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION E E'

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	0.065	30 cm E of E, 225 cm above floor
15°	0.18	45 cm E of E, at ceiling
30°	0.15	40 cm E of E, at ceiling
45°	0.16	40 cm E of E, at ceiling
60°	0.14	25 cm E of E, at ceiling
75°	0.20	25 cm E of E, at ceiling
90°	0.20	40 cm E of E, at ceiling
105°	0.34	30 cm E of E, at ceiling
120°	0.34	30 cm E of E, at ceiling
135°	0.46	40 cm E of E, at ceiling
150°	0.46	12 cm E of E, at ceiling
165°	0.44	30 cm E of E, at ceiling
180°	0.58	30 cm E of E at ceiling
195°	0.34	10 cm E of E, at ceiling
210°	0.34	40 cm E of E, at ceiling
225°	0.26	15 cm E of E, at ceiling
240°	0.24	15 cm E of E, at ceiling
255°	0.50	At E', 120 cm above floor
270°	0.90	At E', 120 cm above floor
285°	0.80	At E', 120 cm above floor
300°	0.60	At E', 120 cm above floor
315°	0.50	At E', 100 cm above floor
330°	0.24	At E', 100 cm above floor
345°	0.14	At E', 100 cm above floor

E of E = East of point E

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Derenzo

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION Wall AF

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	BG	All area of wall AF
15°	BG	
30°	BG	
45°	BG	
60°	BG	
75°	BG	
90°	BG	
105°	BG	
120°	BG	
135°	BG	
150°	BG	
165°	BG	
180°	BG	
195°	BG	
210°	BG	
225°	BG	
240°	BG	
255°	BG	
270°	BG	
285°	BG	
300°	BG	
315°	BG	
330°	BG	
345°	BG	

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Derenzo

UNIVERSITY OF ILLINOIS AT CHICAGO

TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION Operator Position

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	BG	At operator's chair, 3 ft. from floor
15°	BG	
30°	BG	
45°	BG	
60°	BG	
75°	BG	
90°	BG	
105°	BG	
120°	BG	
135°	BG	
150°	BG	
165°	BG	
180°	BG	
195°	0.040	
210°	0.060	
225°	0.030	
240°	0.034	
255°	0.030	
270°	0.050	
285°	0.040	
300°	0.030	
315°	0.030	
330°	BG	
345°	0.030	

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline Instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

Date of Survey 9/26-9/27/85 Surveyed By Dave Dorenzo

UNIVERSITY OF ILLINOIS AT CHICAGO

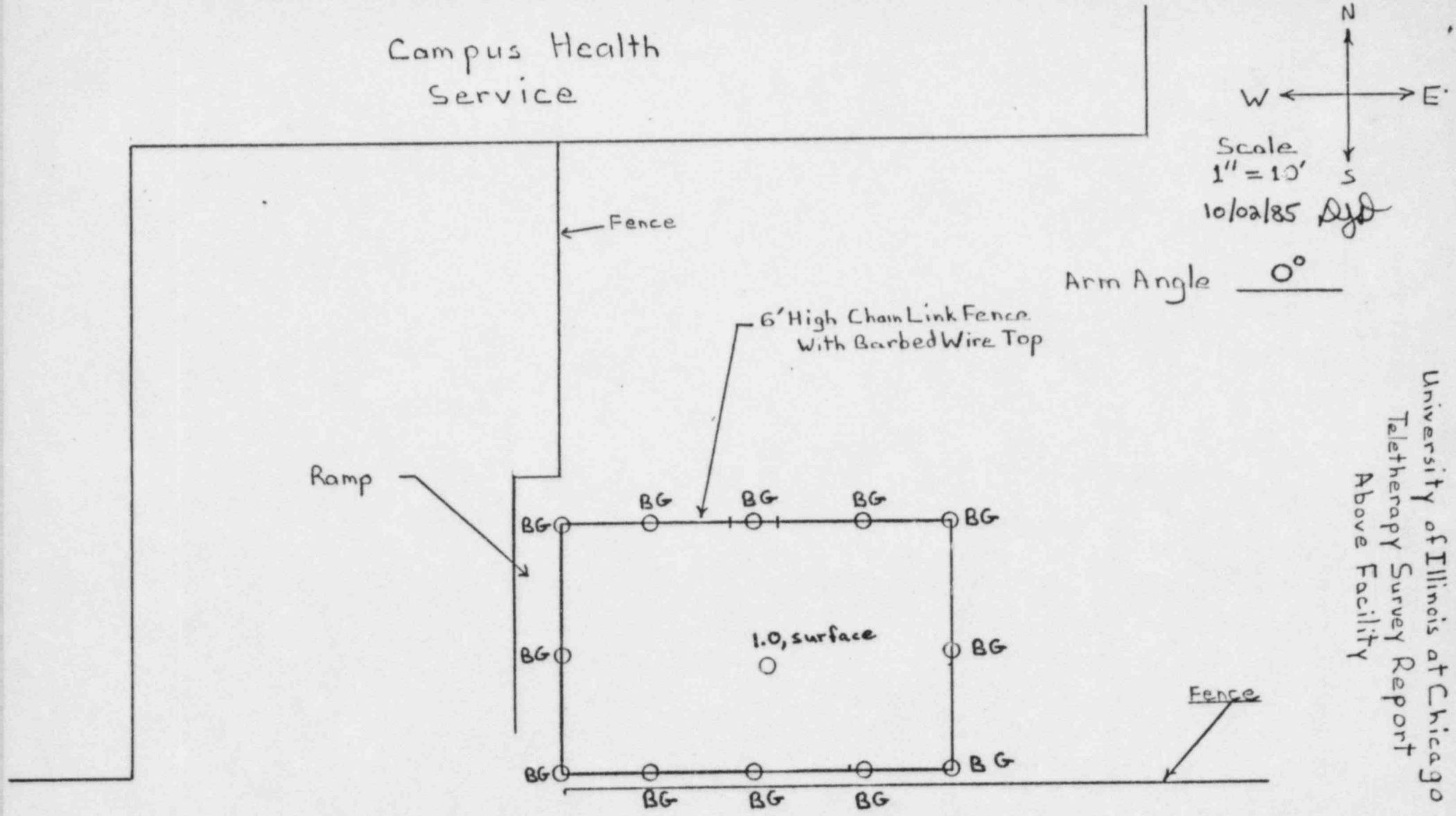
TELETHERAPY SURVEY REPORT

TUNNEL LEVEL
LOCATION Center of Control Room

ARM ANGLE	MAXIMUM LEVEL, mrad/h*	LOCATION OF MAXIMUM READING FROM REFERENCE POINTS
0°	BG	Center of room, 3 ft above Floor
15°	BG	
30°	BG	
45°	BG	
60°	BG	
75°	BG	
90°	BG	
105°	BG	
120°	BG	
135°	BG	
150°	BG	
165°	BG	
180°	BG	
195°	0.060	
210°	0.060	
225°	0.050	
240°	0.060	
255°	BG	
270°	0.035	
285°	0.050	
300°	0.060	
315°	0.030	
330°	0.035	
345°	0.040	

* All readings above background (BG) were taken with Health Physics Instruments, Inc. Model 1010, Serial No. 325. Background readings were taken with Eberline instruments Model E-120 Serial No. 5784 or 6206. BG means < 0.060 mR/h for purposes of this survey.

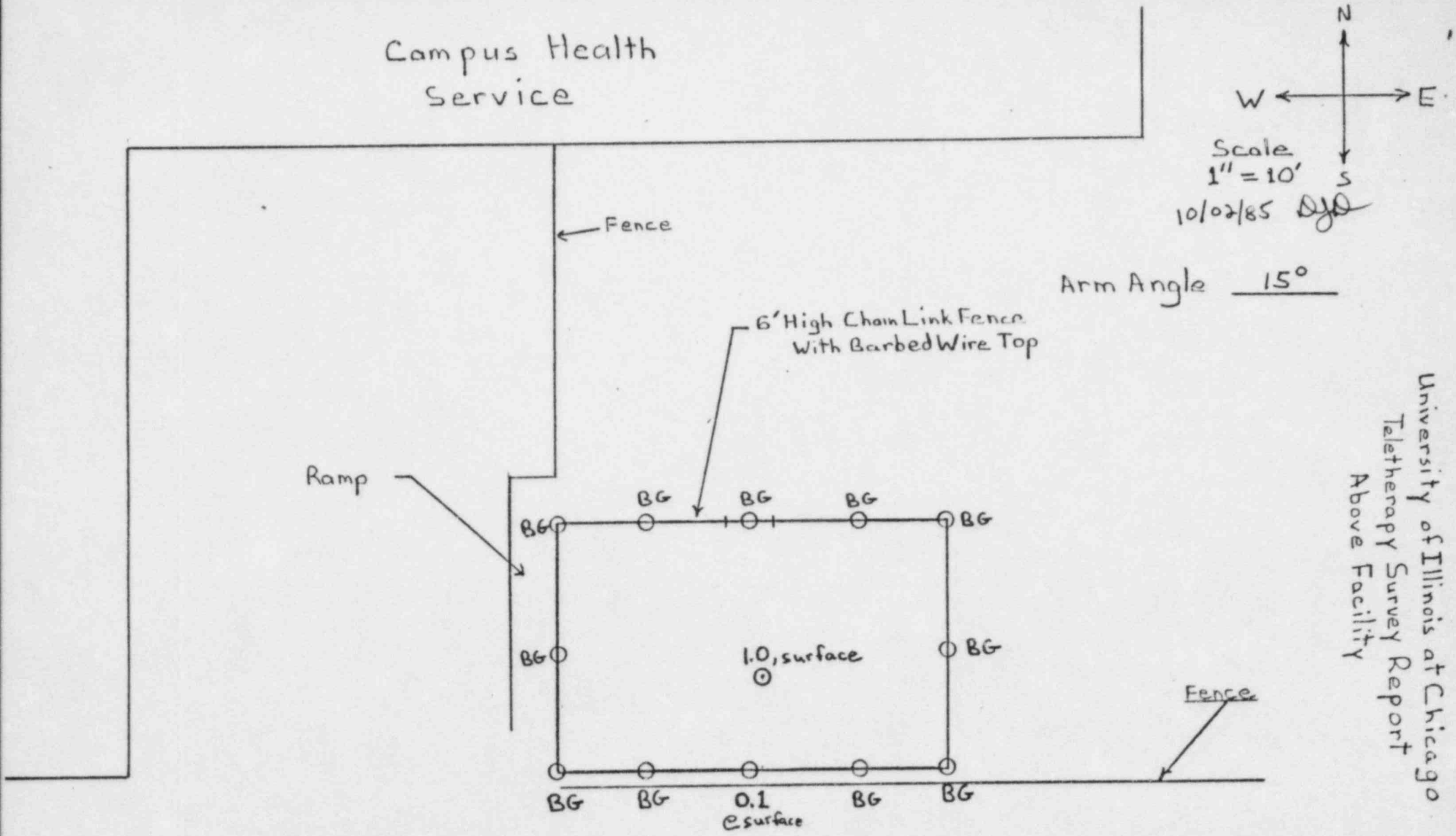
Date of Survey 9/26-9/27/85 Surveyed By Dave Dorenzo

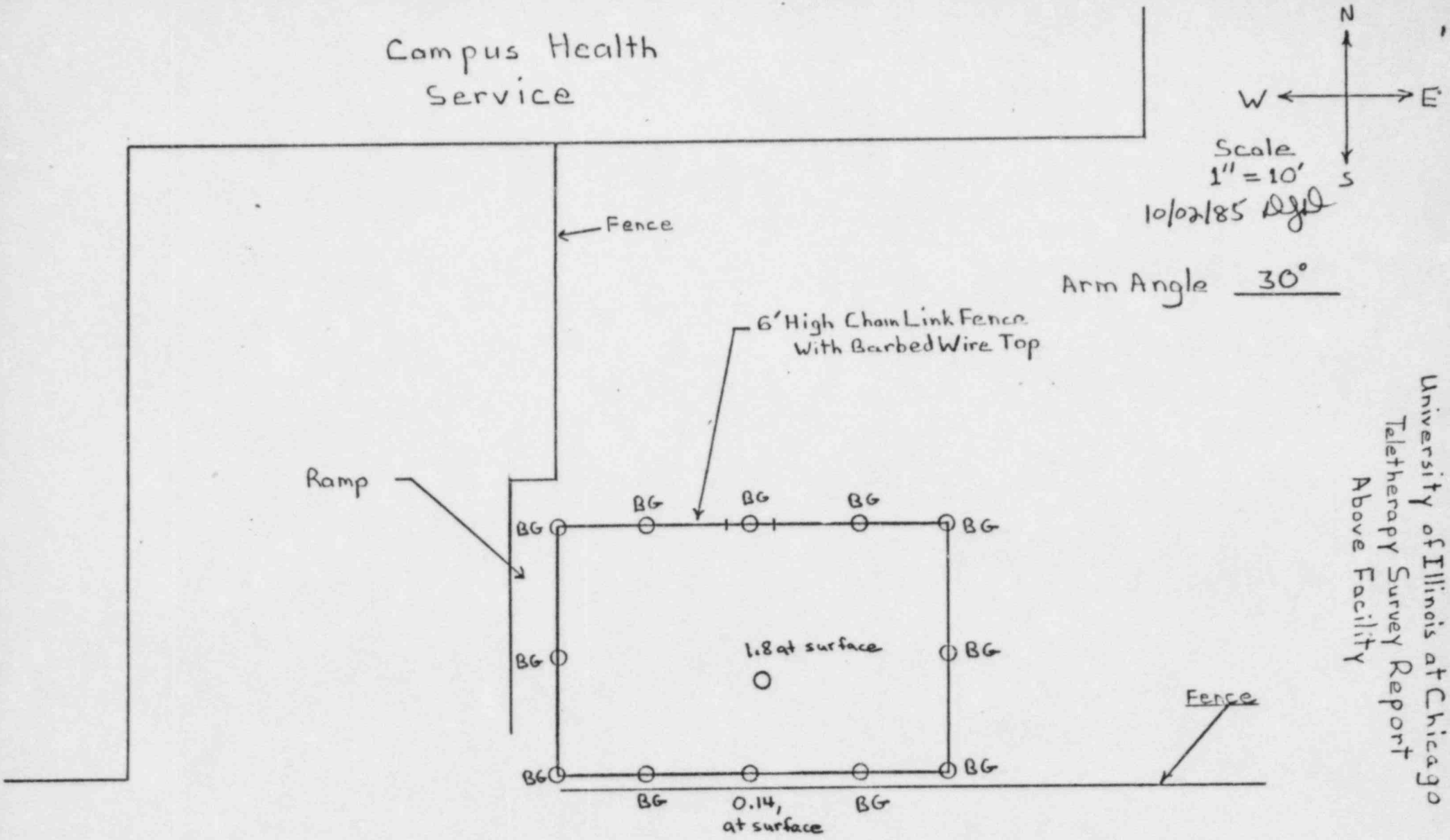


University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

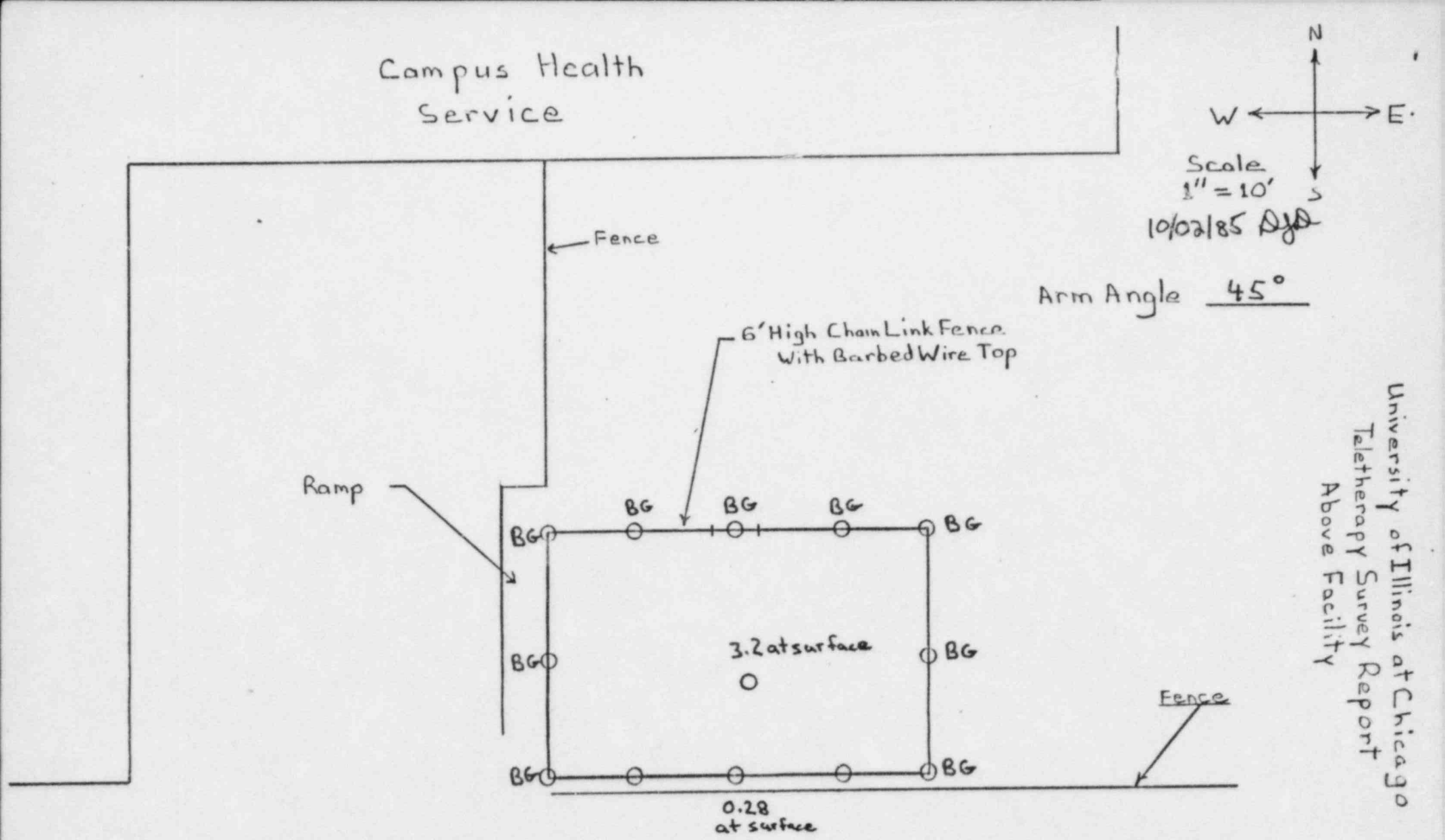
10/85

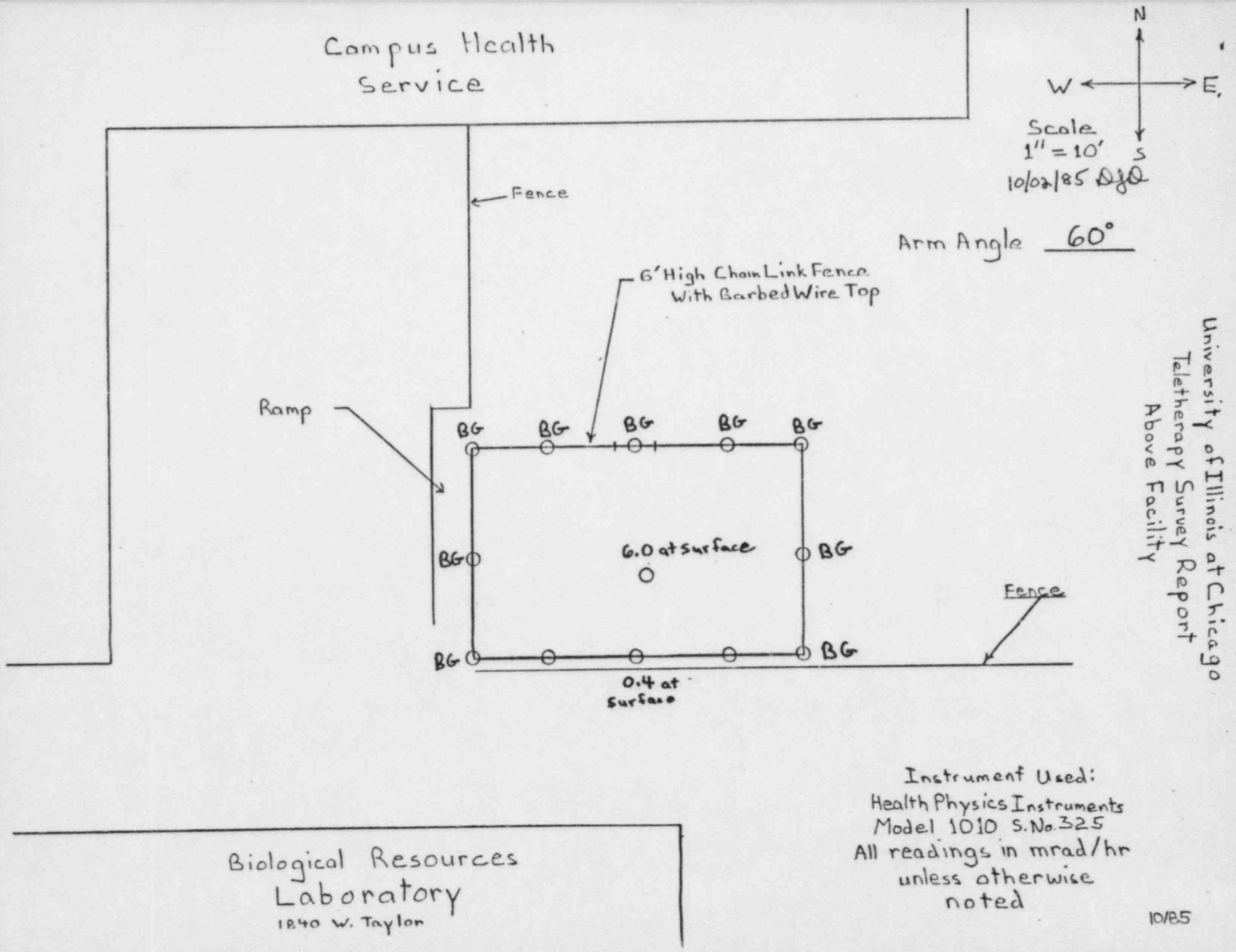

Campus Health Service
N
W
E
S
Scale
1" = 10'
10/02/85 DJO
Fence
Arm Angle 15°
6' High Chain Link Fence With Barbed Wire Top
Ramp
BG
BG
BG
BG
BG
BG
BG
1.0, surface
BG
Fence
BG
BG
0.1
@ surface
BG
BG
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
Biological Resources
Laboratory
1840 W. Taylor
10/85

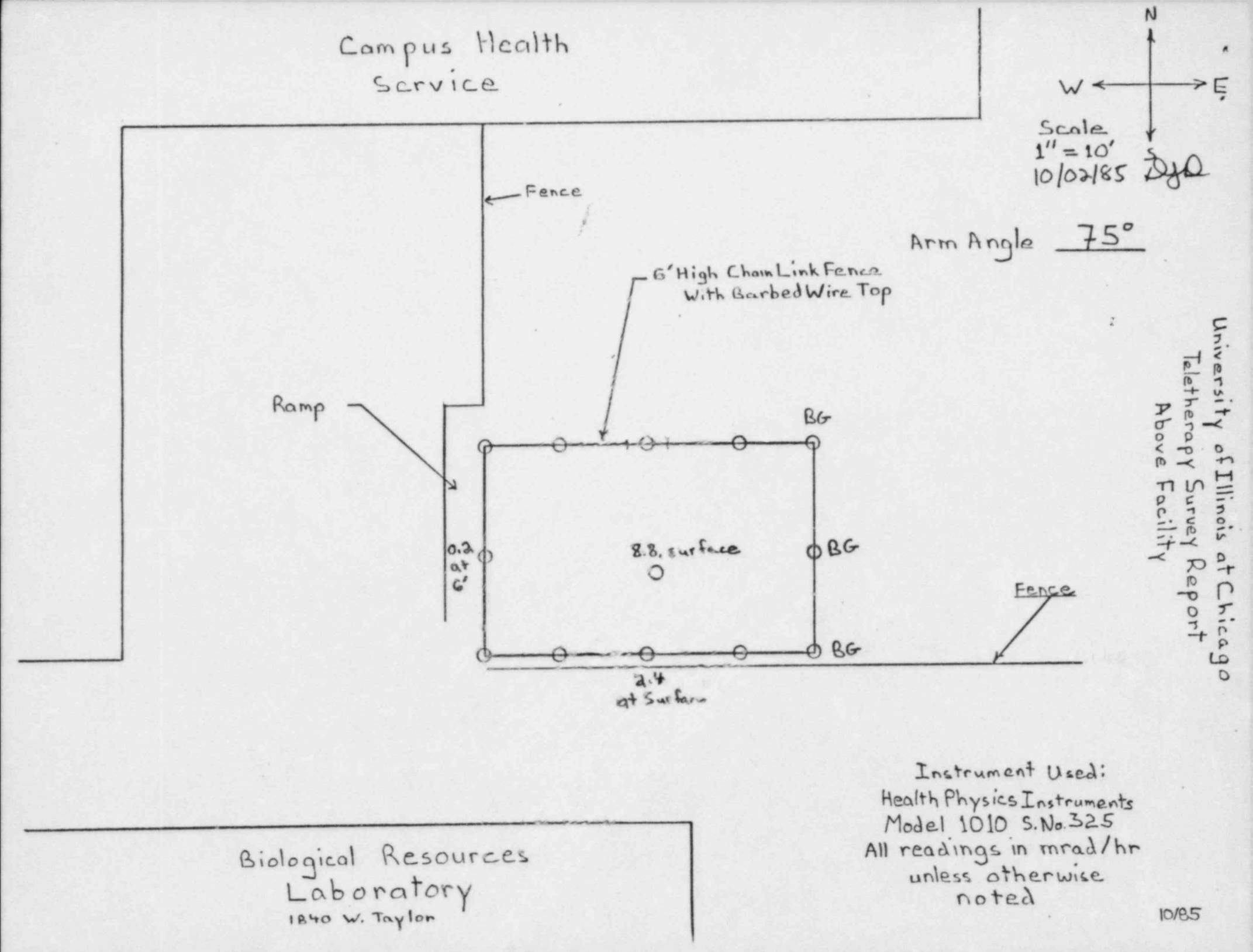


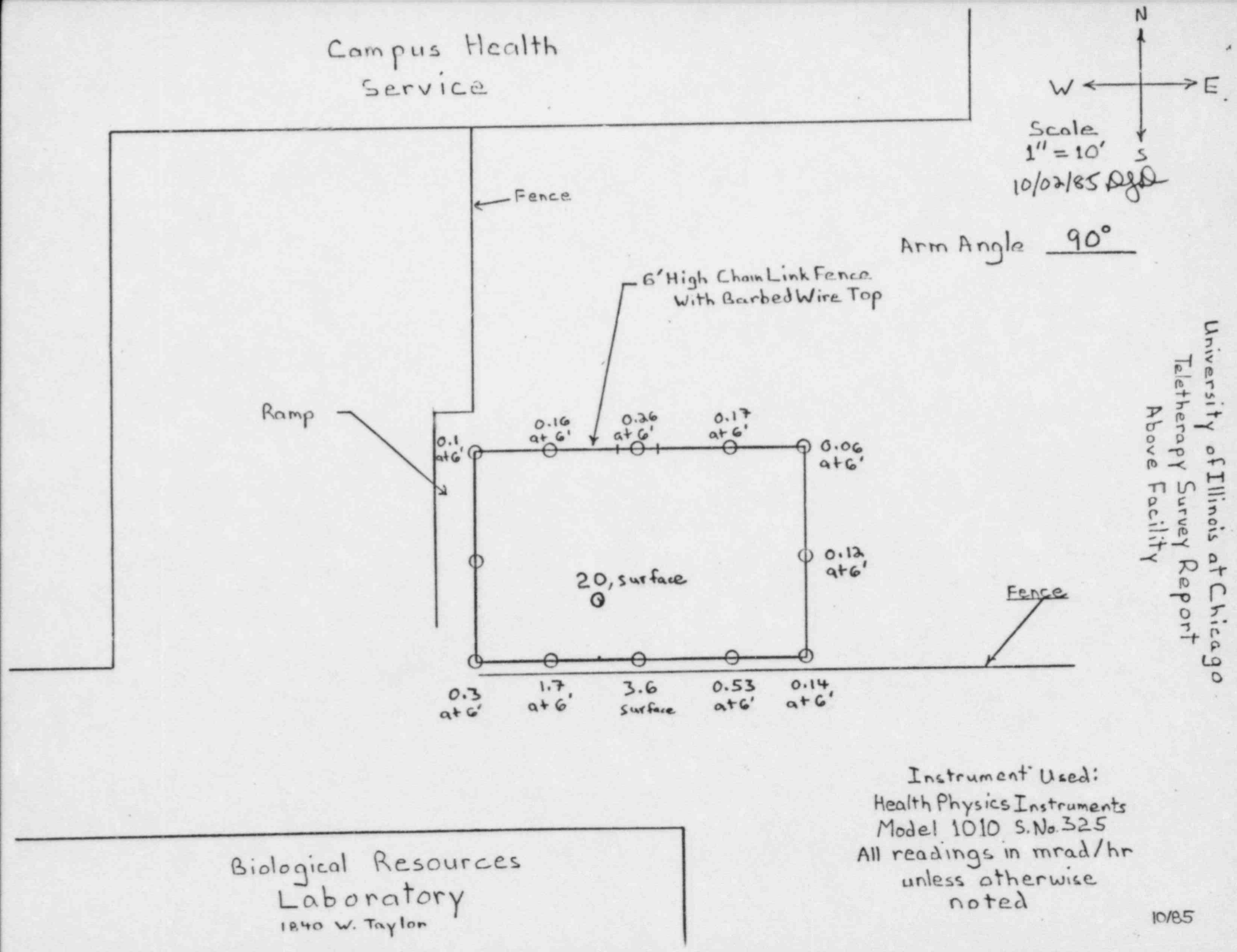
Instrument Used:
Health Physics Instruments
Model 1010 S.No 325
All readings in mrad/hr
unless otherwise
noted

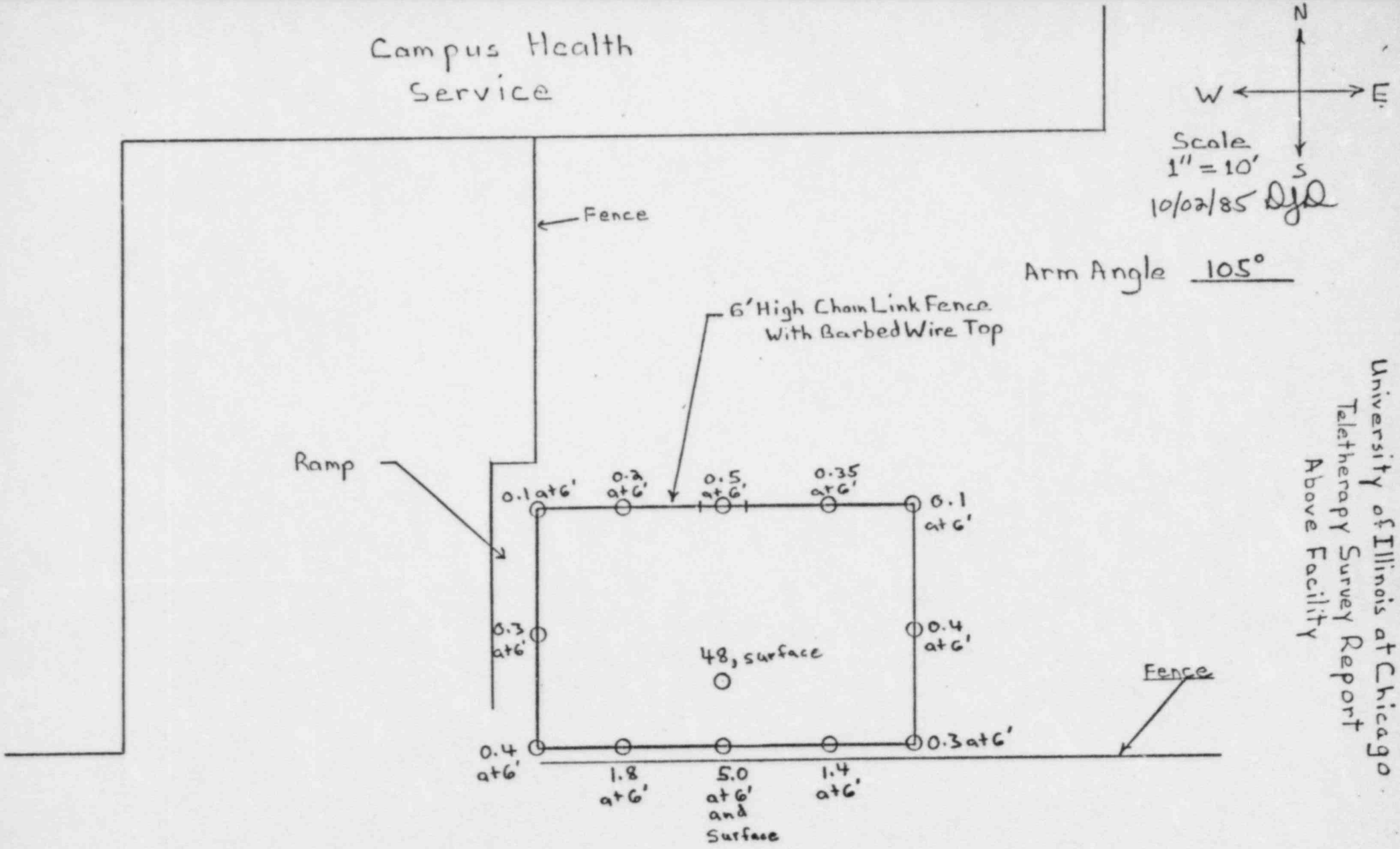
10/85

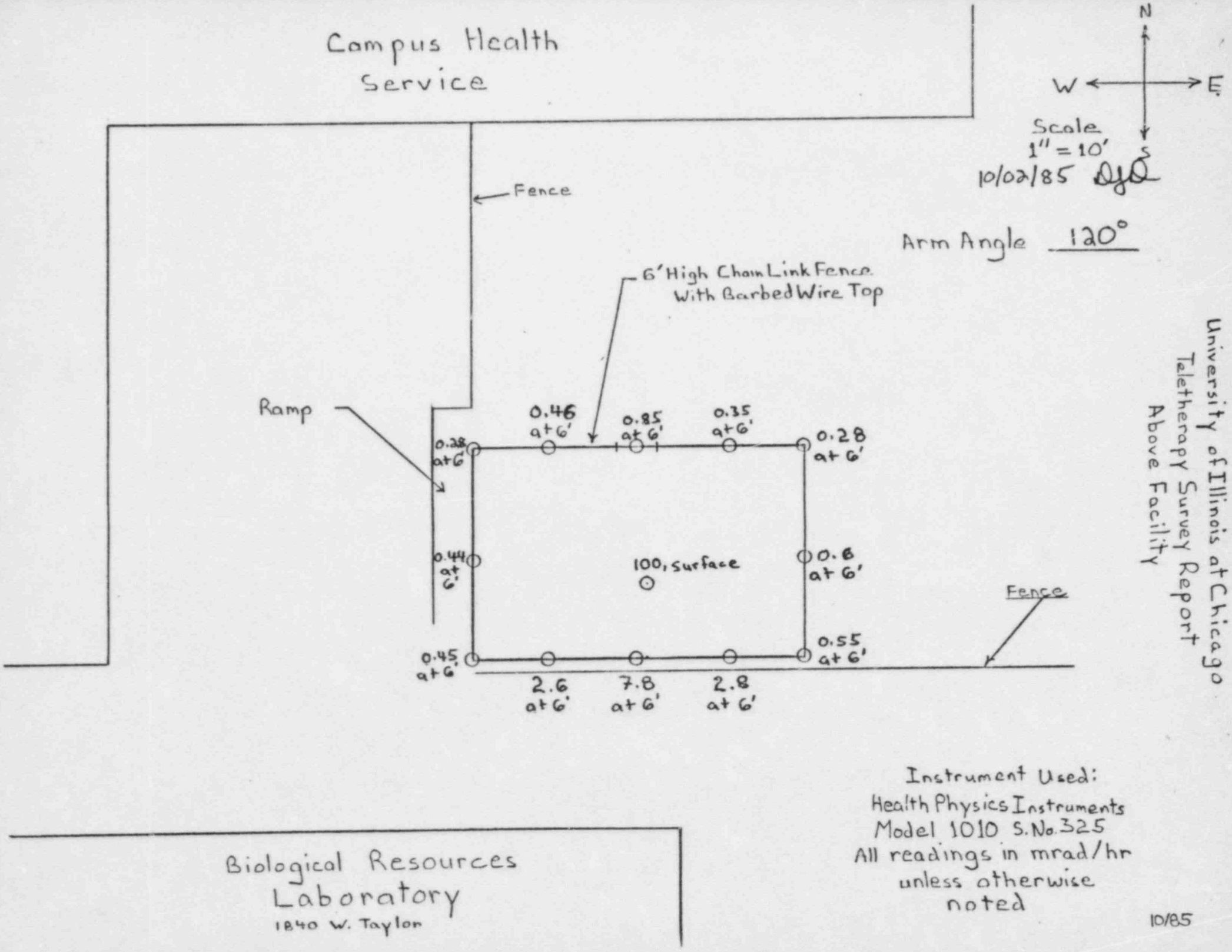

Campus Health Service
N
W
E
S
Scale 1" = 10'
10/02/85 DJD
Fence
Arm Angle 45°
6' High Chain Link Fence With Barbed Wire Top
Ramp
BG
BG
BG
BG
BG
BG
BG
BG
3.2 at surface
Fence
0.28 at surface
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Biological Resources Laboratory
1840 W. Taylor
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85

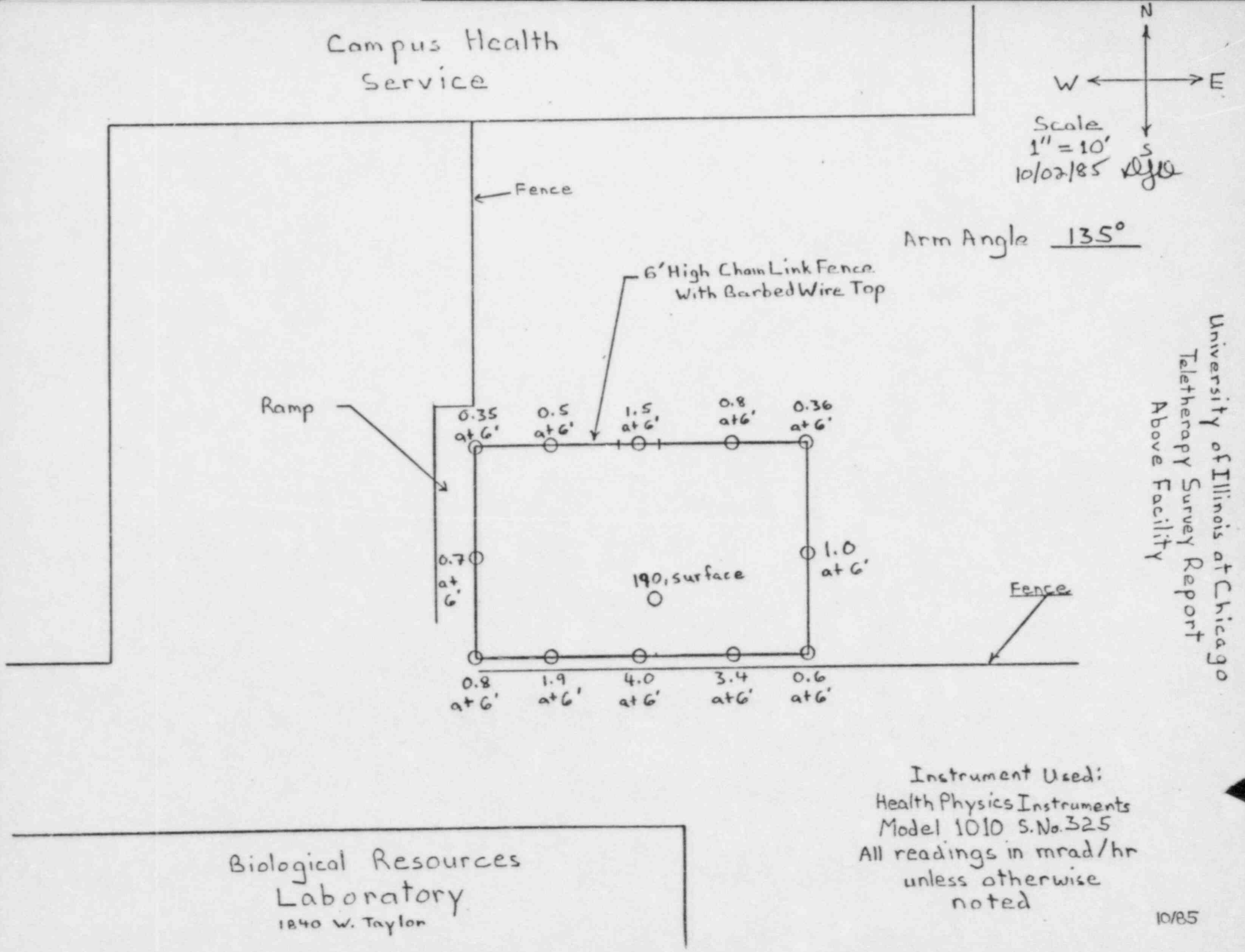

Campus Health Service
N
W
E
S
Scale
1" = 10'
10/02/85 DJQ
Fence
Arm Angle 60°
6' High Chain Link Fence With Barbed Wire Top
Ramp
BG
BG
BG
BG
BG
BG
6.0 at surface
BG
BG
BG
Fence
0.4 at surface
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Biological Resources Laboratory
1840 W. Taylor
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85

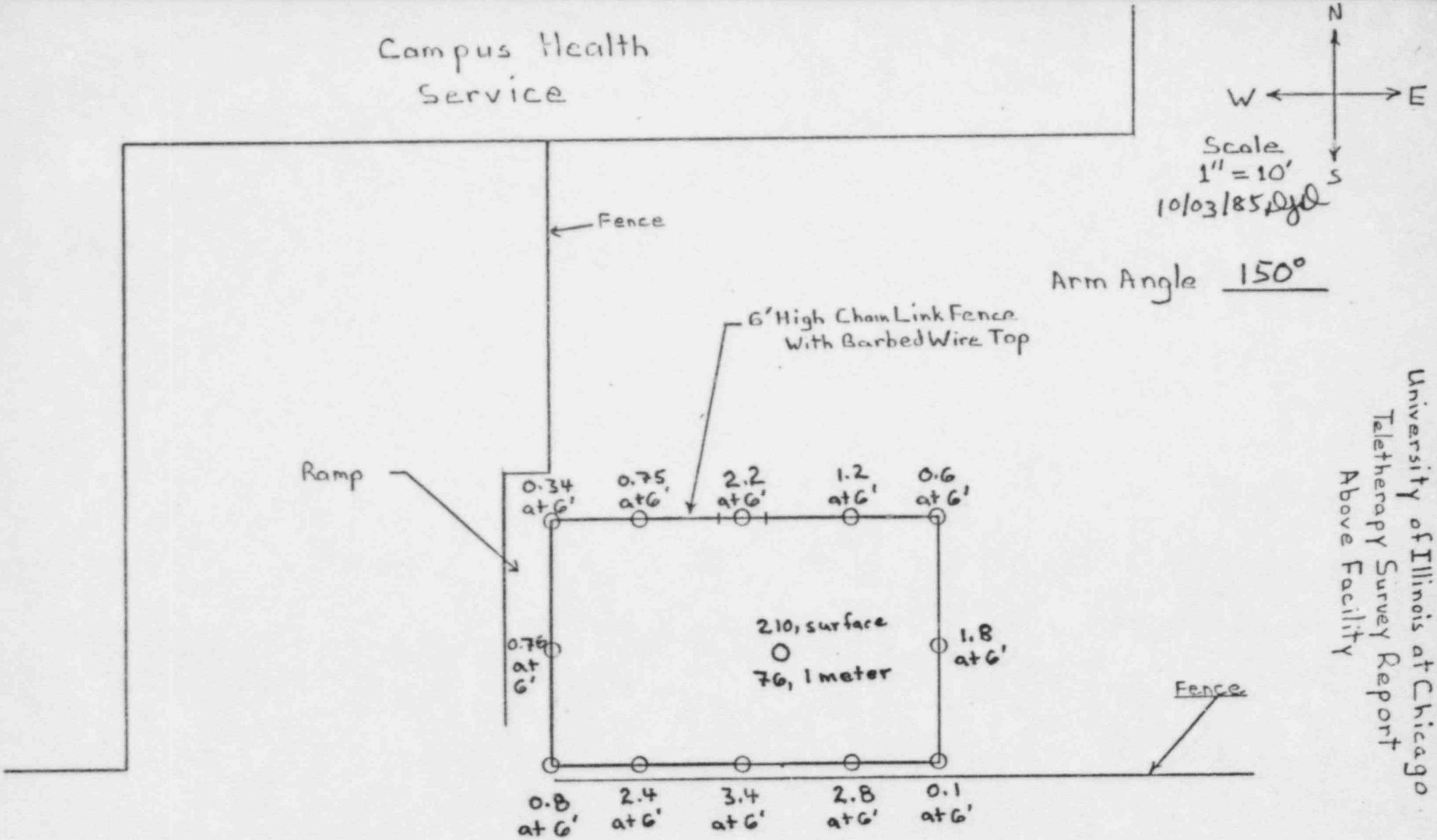

Campus Health
Service
N
W
E
S
Scale
1" = 10'
10/02/85
Fence
Arm Angle 75°
6' High Chain Link Fence
With Barbed Wire Top
Ramp
BG
0.2
at
6'
8.8. surface
BG
Fence
BG
2.4
at Surface
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
Biological Resources
Laboratory
1840 W. Taylor
10/85

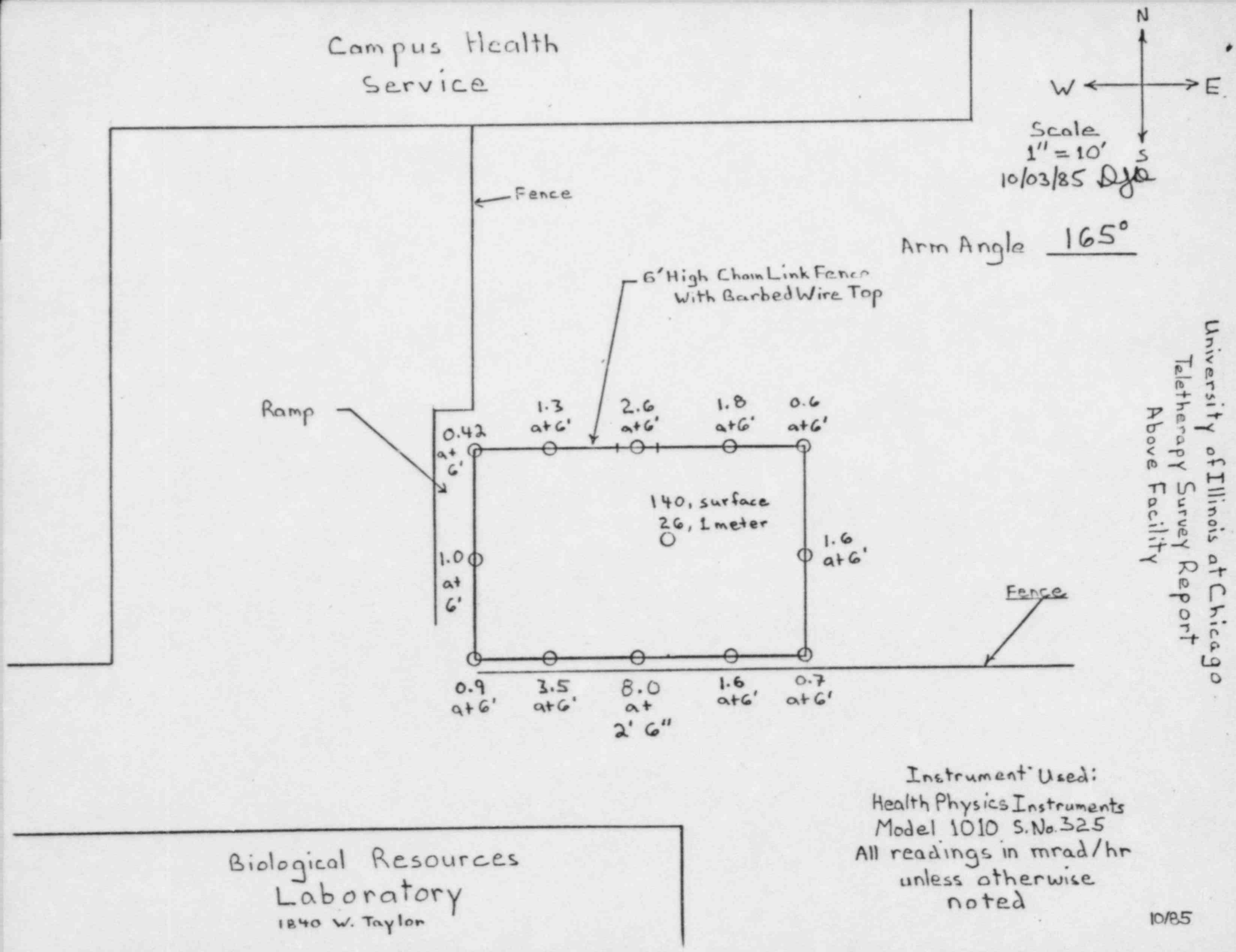

Campus Health Service
N
W
E
S
Scale 1" = 10'
10/02/85
Fence
Arm Angle 90°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.1 at 6'
0.16 at 6'
0.26 at 6'
0.17 at 6'
0.06 at 6'
0.12 at 6'
20, surface
Fence
0.3 at 6'
1.7 at 6'
3.6 surface
0.53 at 6'
0.14 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
Biological Resources Laboratory
1840 W. Taylor
10/85

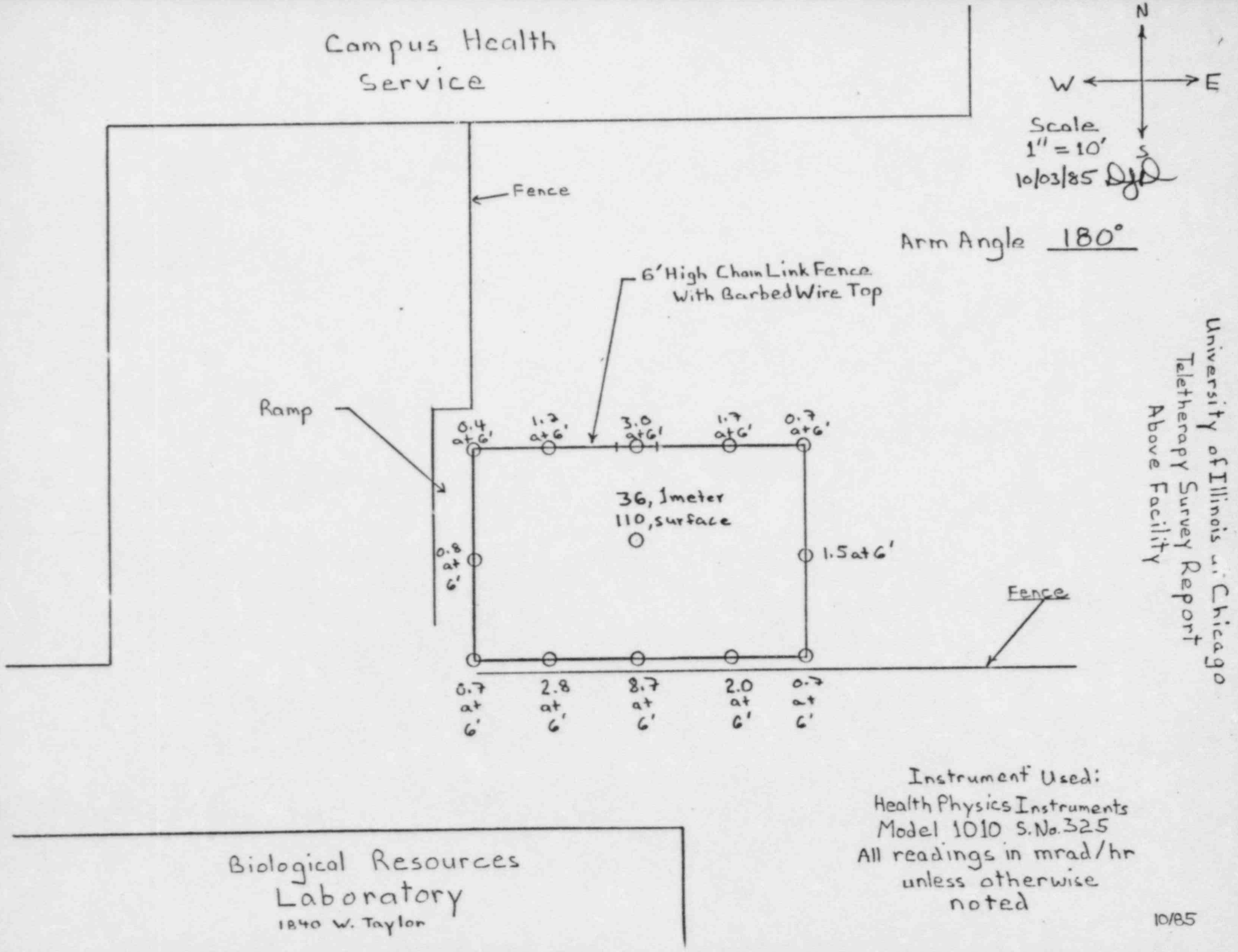

Campus Health Service
N
W
E
S
Scale
1" = 10'
10/02/85 DJQ
Fence
Arm Angle 105°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.1 at 6'
0.2 at 6'
0.5 at 6'
0.35 at 6'
0.1 at 6'
0.3 at 6'
0.4 at 6'
48, surface
Fence
0.4 at 6'
1.8 at 6'
5.0 at 6' and Surface
1.4 at 6'
0.3 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85
Biological Resources Laboratory
1840 W. Taylor

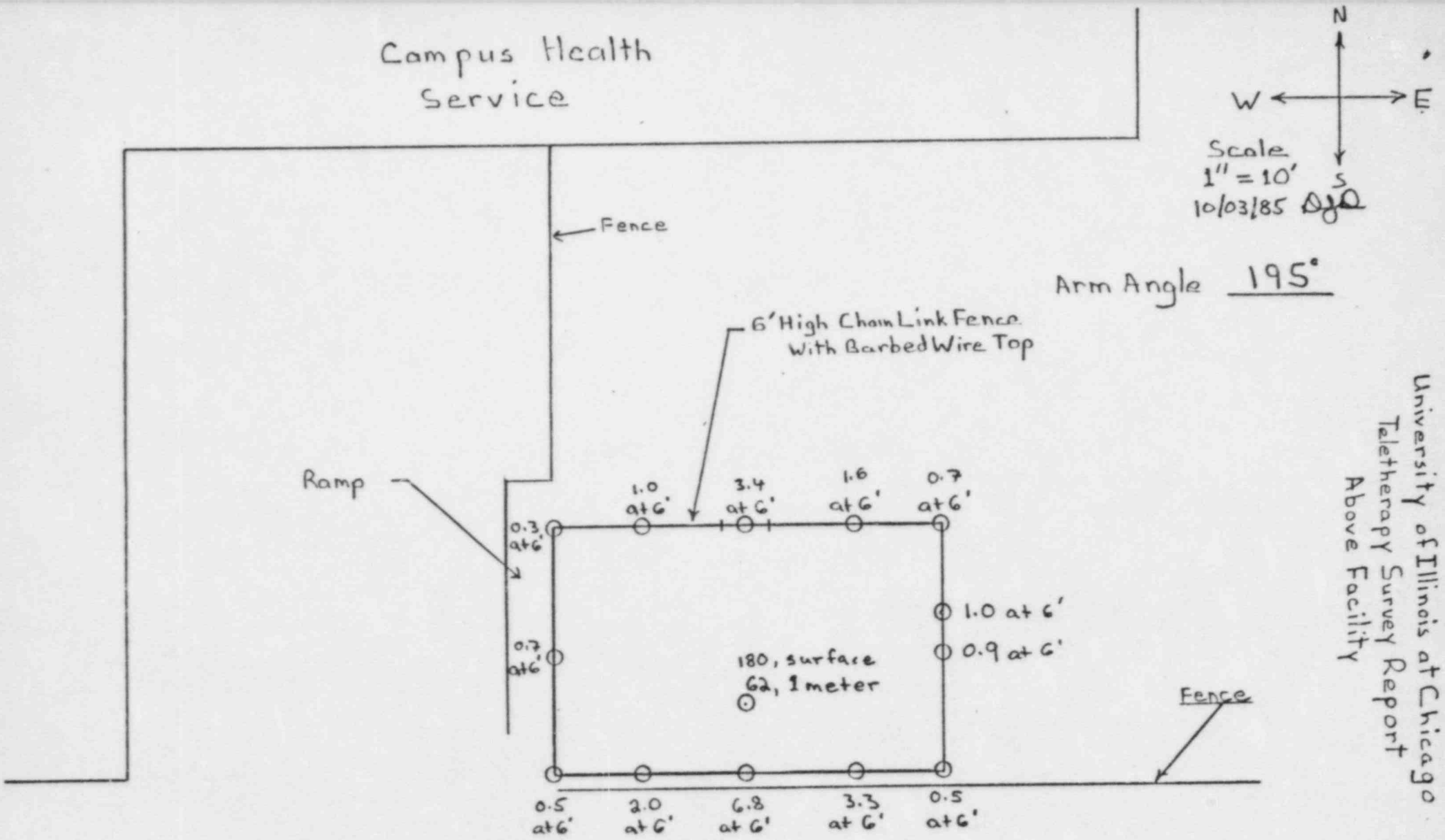

Campus Health Service
N
W
E
S
Scale 1" = 10'
10/02/85 DJO
Fence
Arm Angle 120°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.46 at 6'
0.85 at 6'
0.35 at 6'
0.28 at 6'
0.28 at 6'
0.44 at 6'
100, surface
0.6 at 6'
Fence
0.55 at 6'
0.45 at 6'
2.6 at 6'
7.8 at 6'
2.8 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85
Biological Resources Laboratory
1840 W. Taylor


Campus Health Service
N
W
E
S
Scale
1" = 10'
10/02/85
Fence
Arm Angle 135°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.35 at 6'
0.5 at 6'
1.5 at 6'
0.8 at 6'
0.36 at 6'
0.7 at 6'
1.0 at 6'
190, surface
Fence
0.8 at 6'
1.9 at 6'
4.0 at 6'
3.4 at 6'
0.6 at 6'
Biological Resources Laboratory
1840 W. Taylor
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85


Campus Health Service
N
W
E
S
Scale 1" = 10'
10/03/85
Fence
Arm Angle 150°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.34 at 6'
0.75 at 6'
2.2 at 6'
1.2 at 6'
0.6 at 6'
210, surface
76, 1 meter
0.76 at 6'
1.8 at 6'
Fence
0.8 at 6'
2.4 at 6'
3.4 at 6'
2.8 at 6'
0.1 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
Biological Resources Laboratory
1840 W. Taylor
10/85


Campus Health Service
N
W
E
S
Scale
1" = 10'
10/03/85 DJA
Fence
Arm Angle 165°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.42 at 6'
1.3 at 6'
2.6 at 6'
1.8 at 6'
0.6 at 6'
140, surface
26, 1 meter
1.0 at 6'
1.6 at 6'
Fence
0.9 at 6'
3.5 at 6'
8.0 at 2' 6"
1.6 at 6'
0.7 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85
Biological Resources Laboratory
1840 W. Taylor

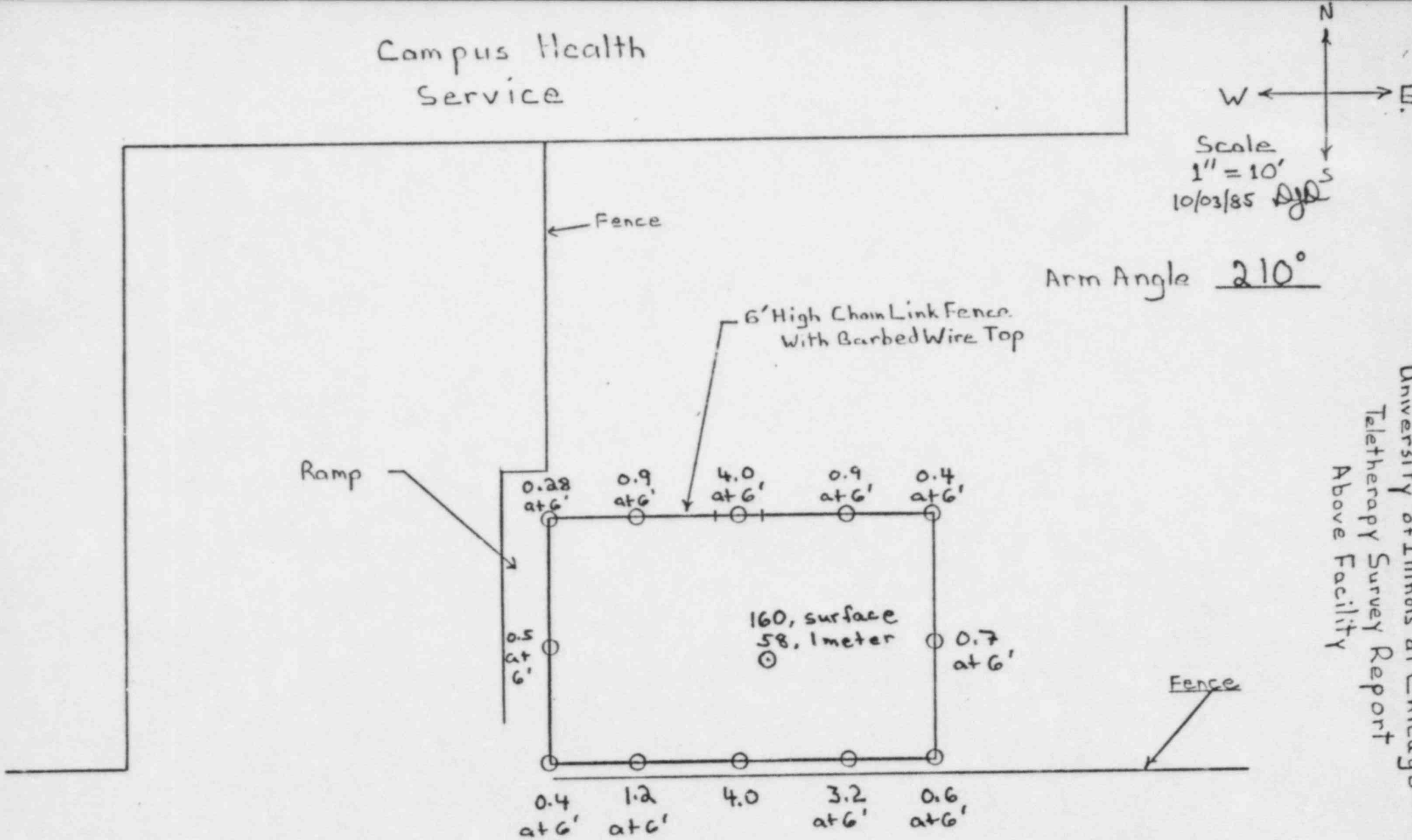

Campus Health Service
N
W
E
S
Scale 1" = 10'
10/03/85
Fence
Arm Angle 180°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.4 at 6'
1.7 at 6'
3.0 at 6'
1.7 at 6'
0.7 at 6'
36, 1meter
110, surface
0.8 at 6'
1.5 at 6'
Fence
0.7 at 6'
2.8 at 6'
8.7 at 6'
2.0 at 6'
0.7 at 6'
Biological Resources Laboratory
1840 W. Taylor
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85

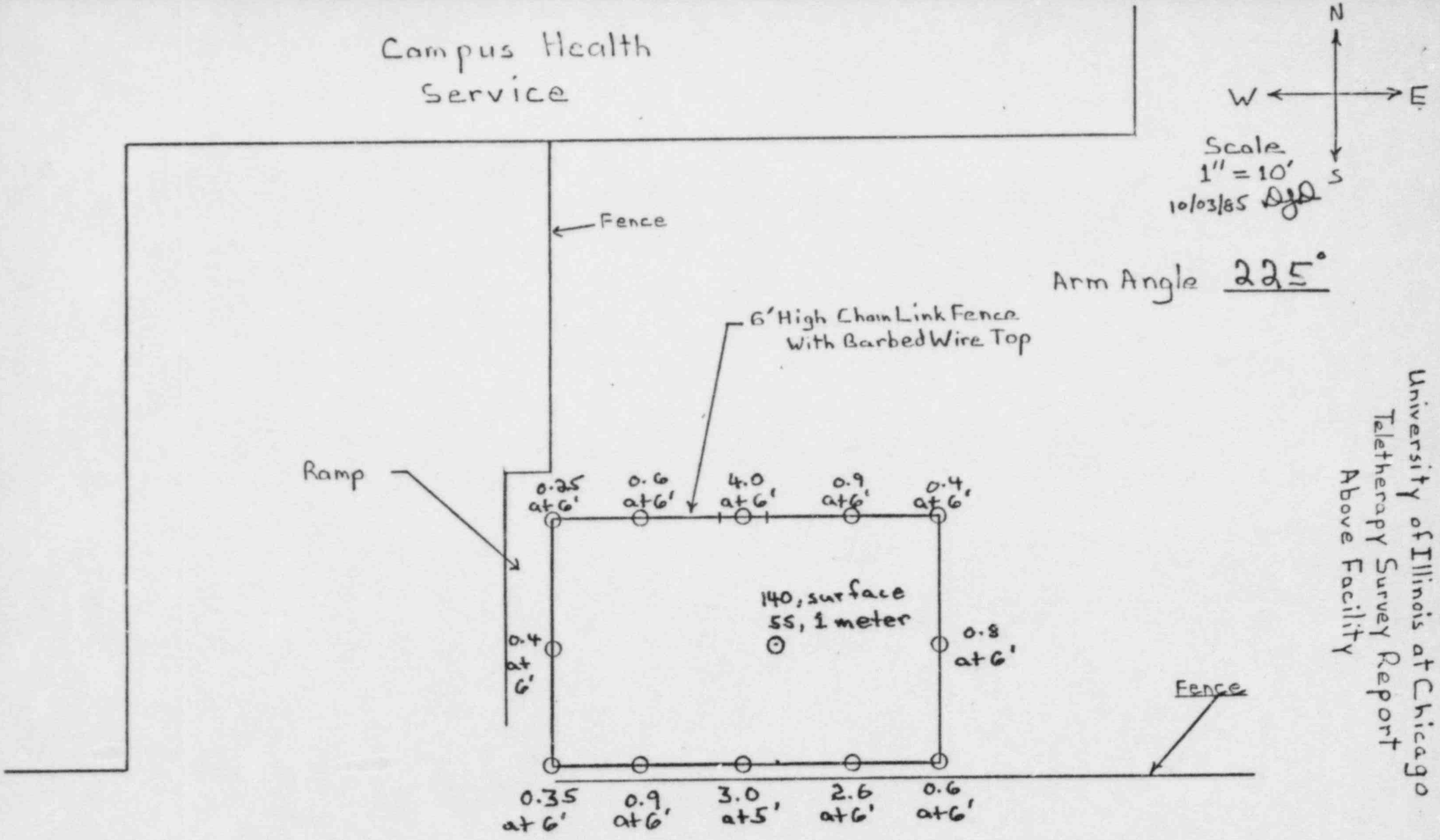


University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

10/85

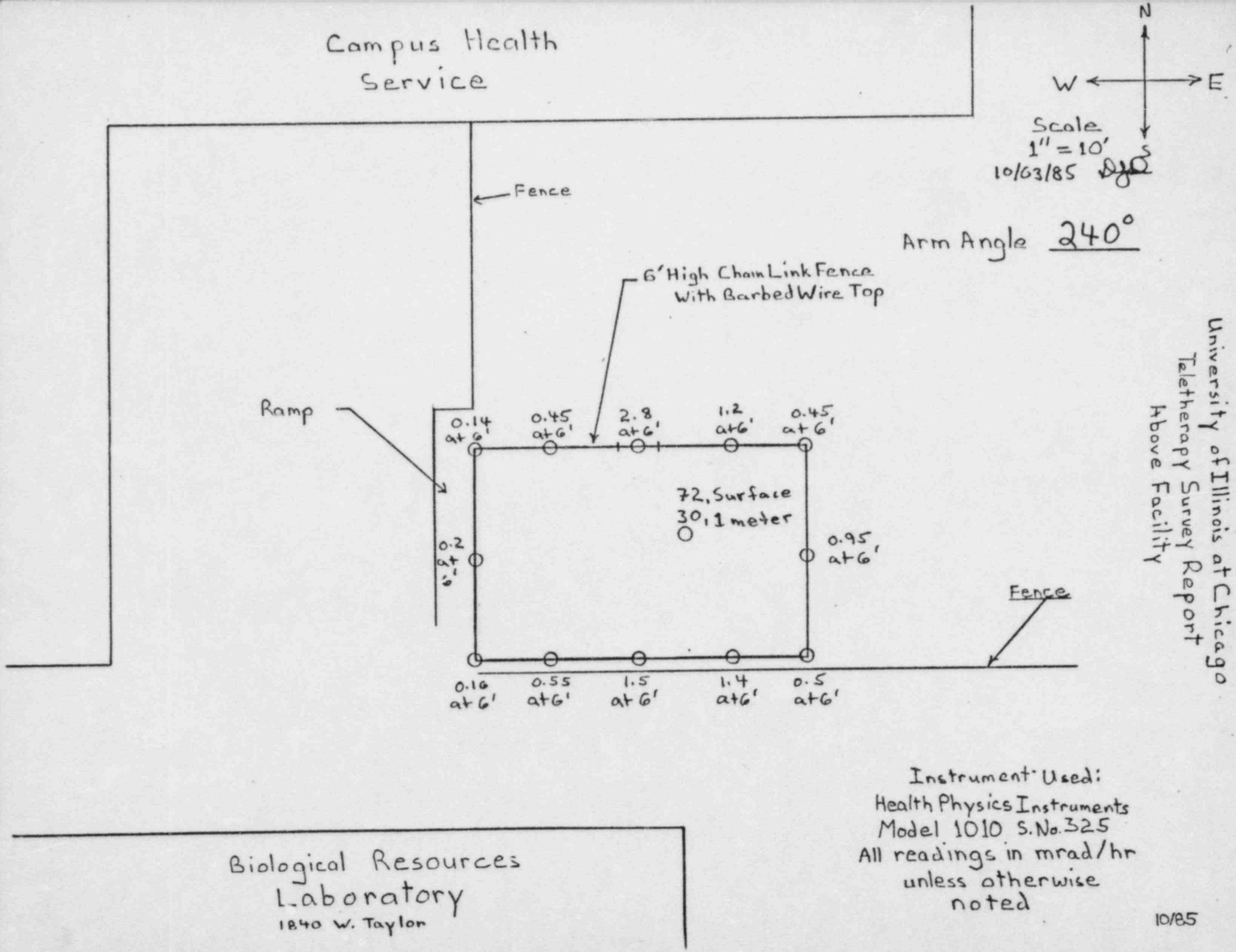

Campus Health Service
N
W
E
S
Scale
1" = 10'
10/03/85
Fence
Arm Angle 210°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.28 at 6'
0.9 at 6'
4.0 at 6'
0.9 at 6'
0.4 at 6'
0.5 at 6'
160, surface
58, 1 meter
0.7 at 6'
Fence
0.4 at 6'
1.2 at 6'
4.0
3.2 at 6'
0.6 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85
Biological Resources Laboratory
1840 W. Taylor



University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

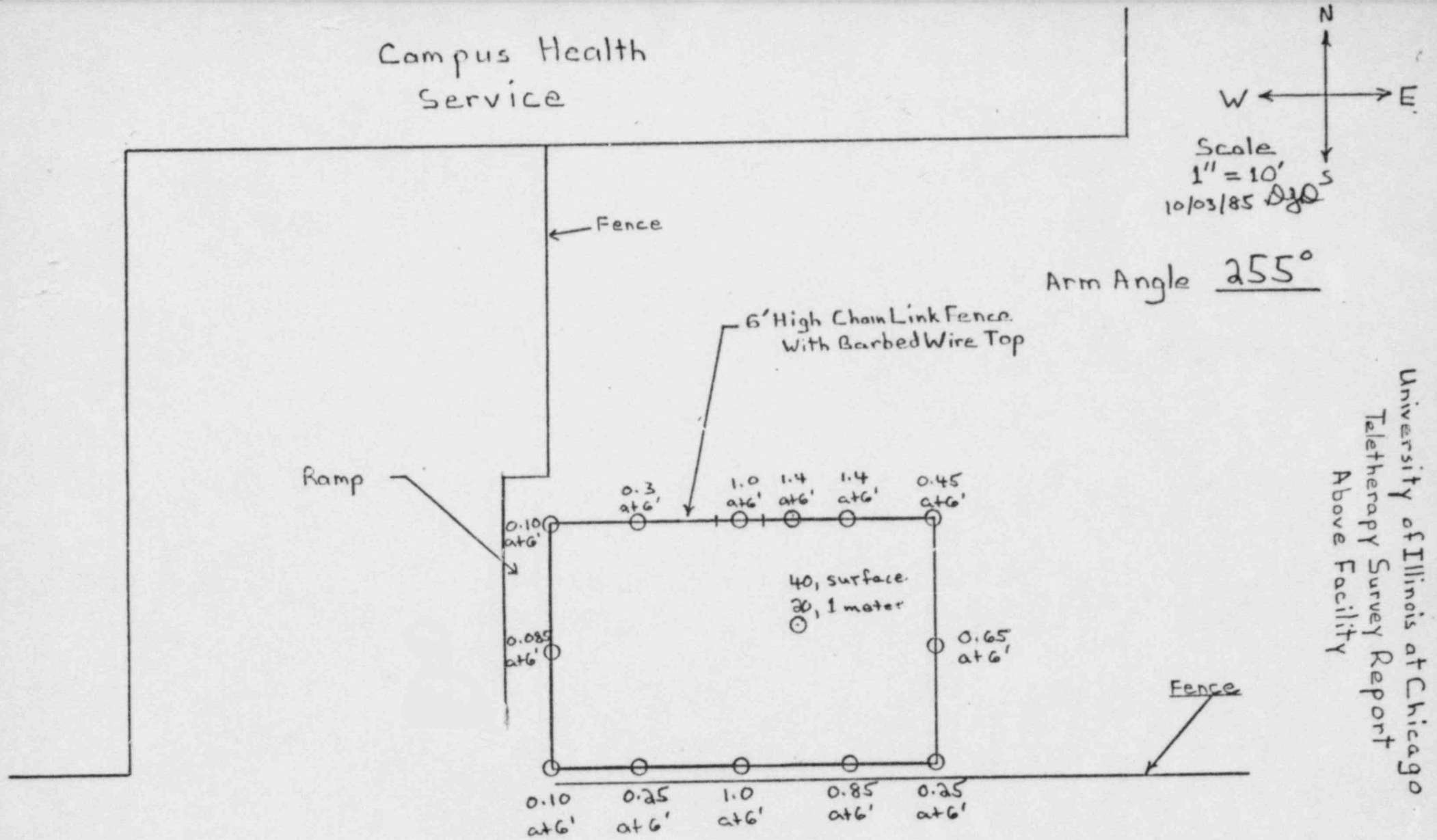
10/85



University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

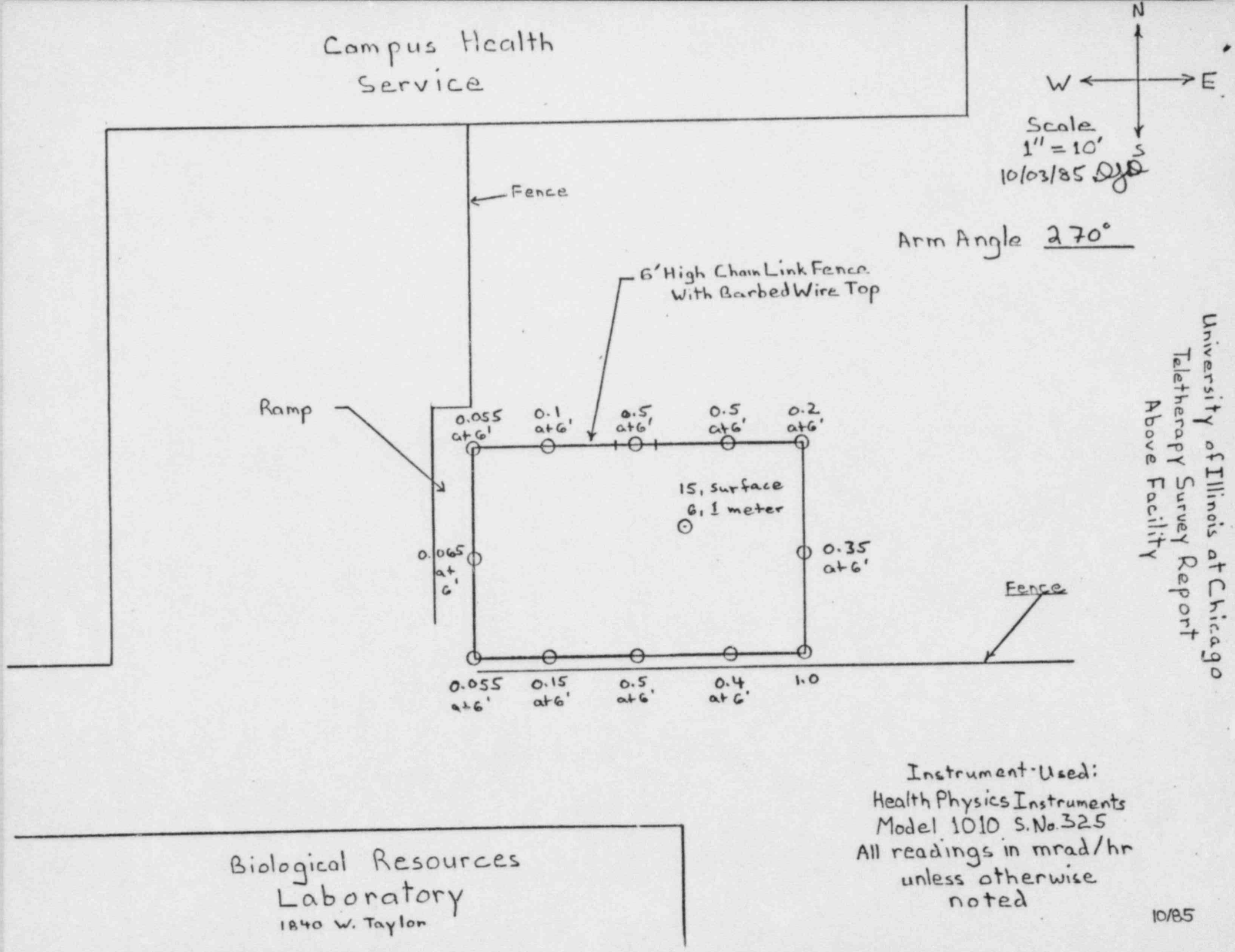
10/85

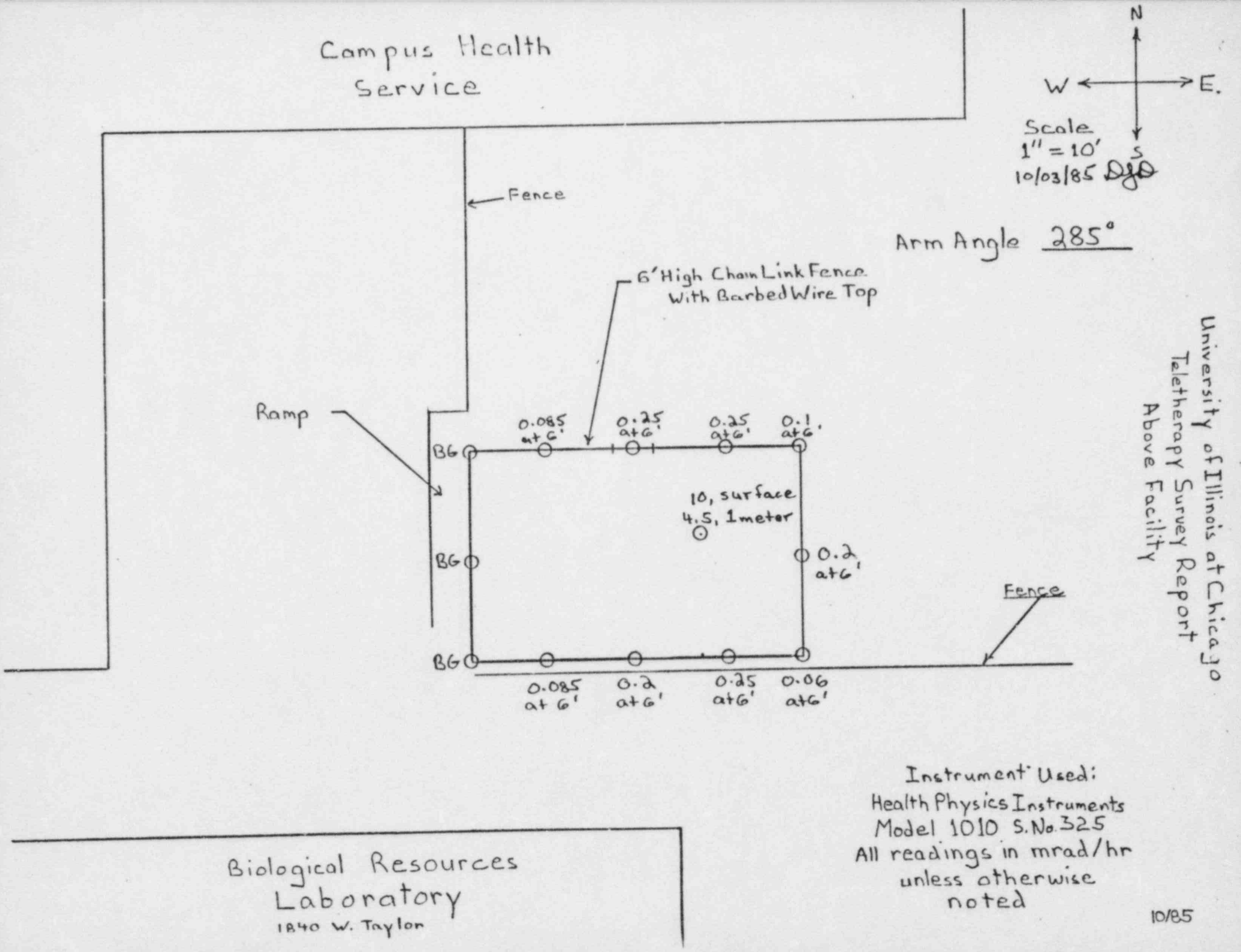


University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

10/85

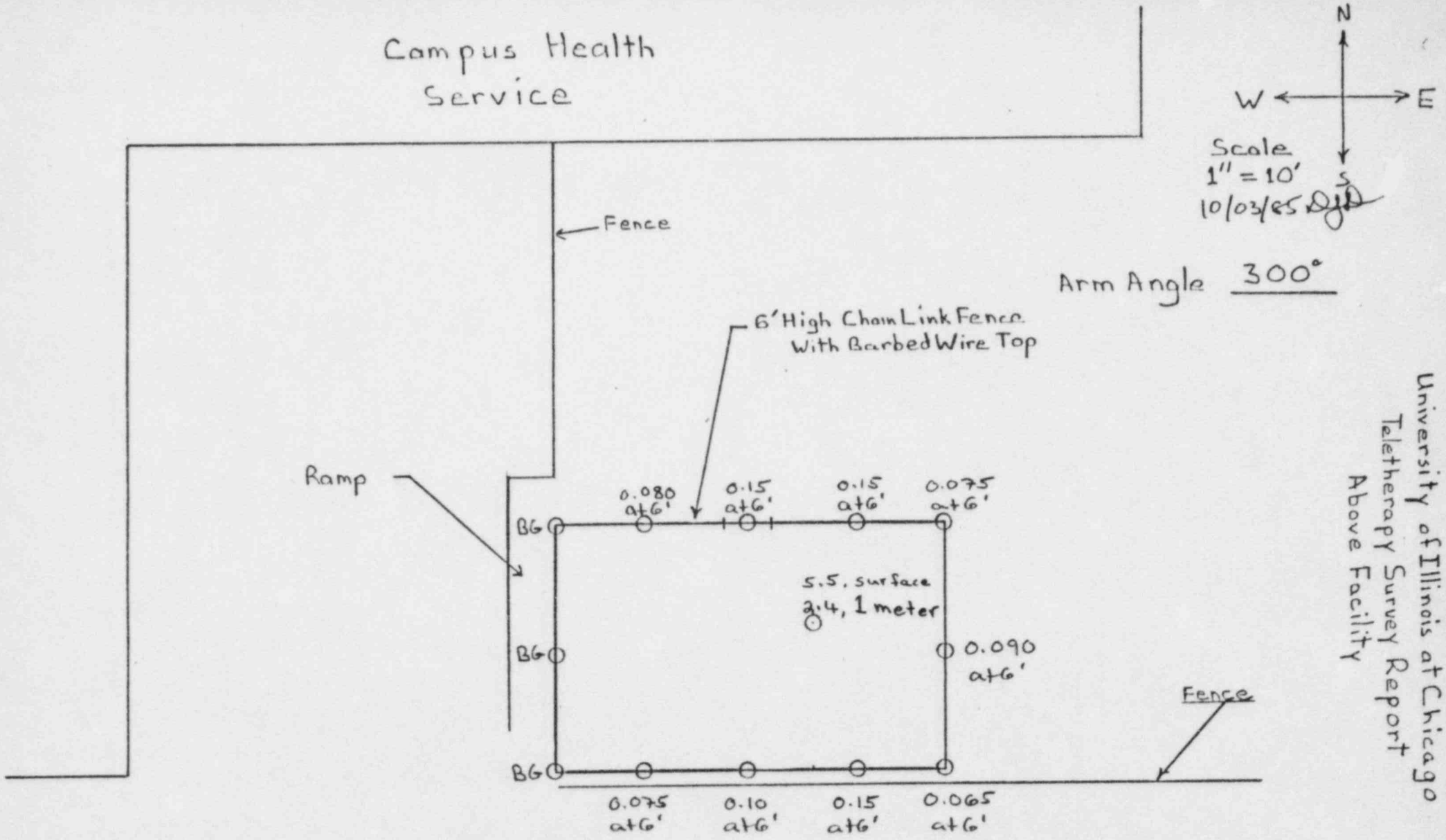

Campus Health Service
N
W
E
S
Scale
1" = 10'
10/03/85 DJD
Fence
Arm Angle 270°
6' High Chain Link Fence With Barbed Wire Top
Ramp
0.055 at 6'
0.1 at 6'
0.5 at 6'
0.5 at 6'
0.2 at 6'
15, surface
6, 1 meter
0.065 at 6'
0.35 at 6'
Fence
0.055 at 6'
0.15 at 6'
0.5 at 6'
0.4 at 6'
1.0
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85
Biological Resources Laboratory
1840 W. Taylor



University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

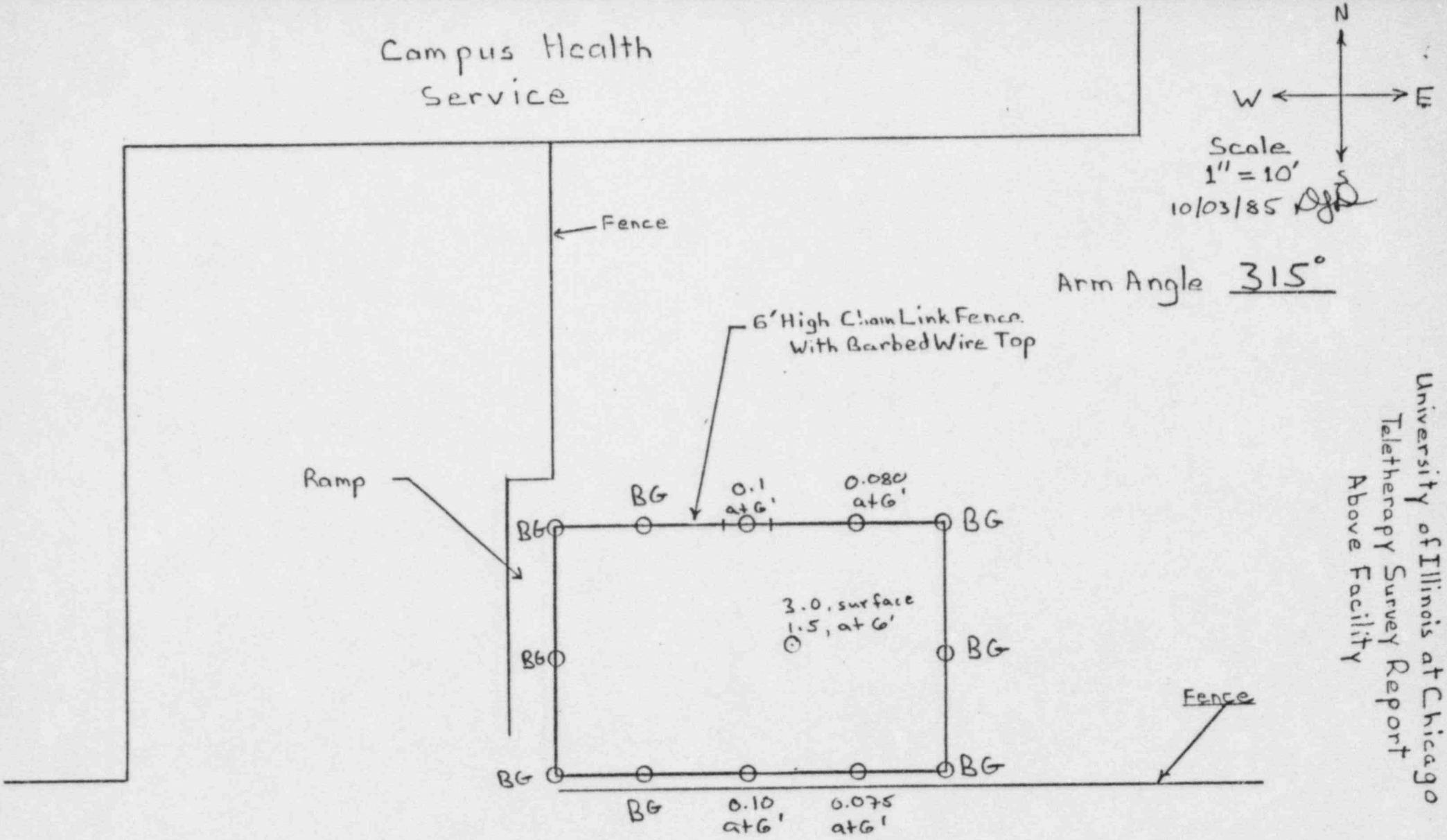
10/85



University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S. No. 325
All readings in mrad/hr
unless otherwise
noted

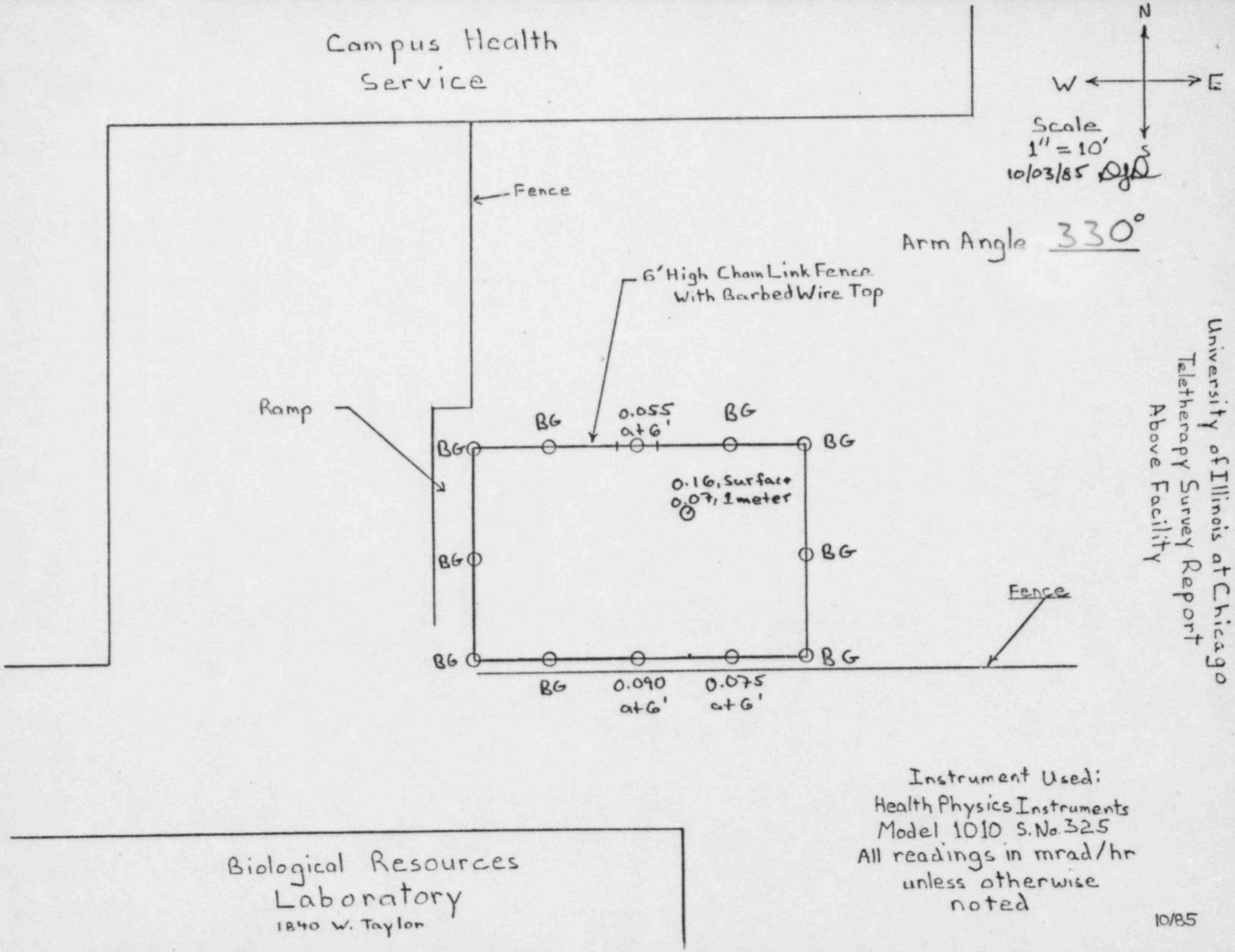
10/85

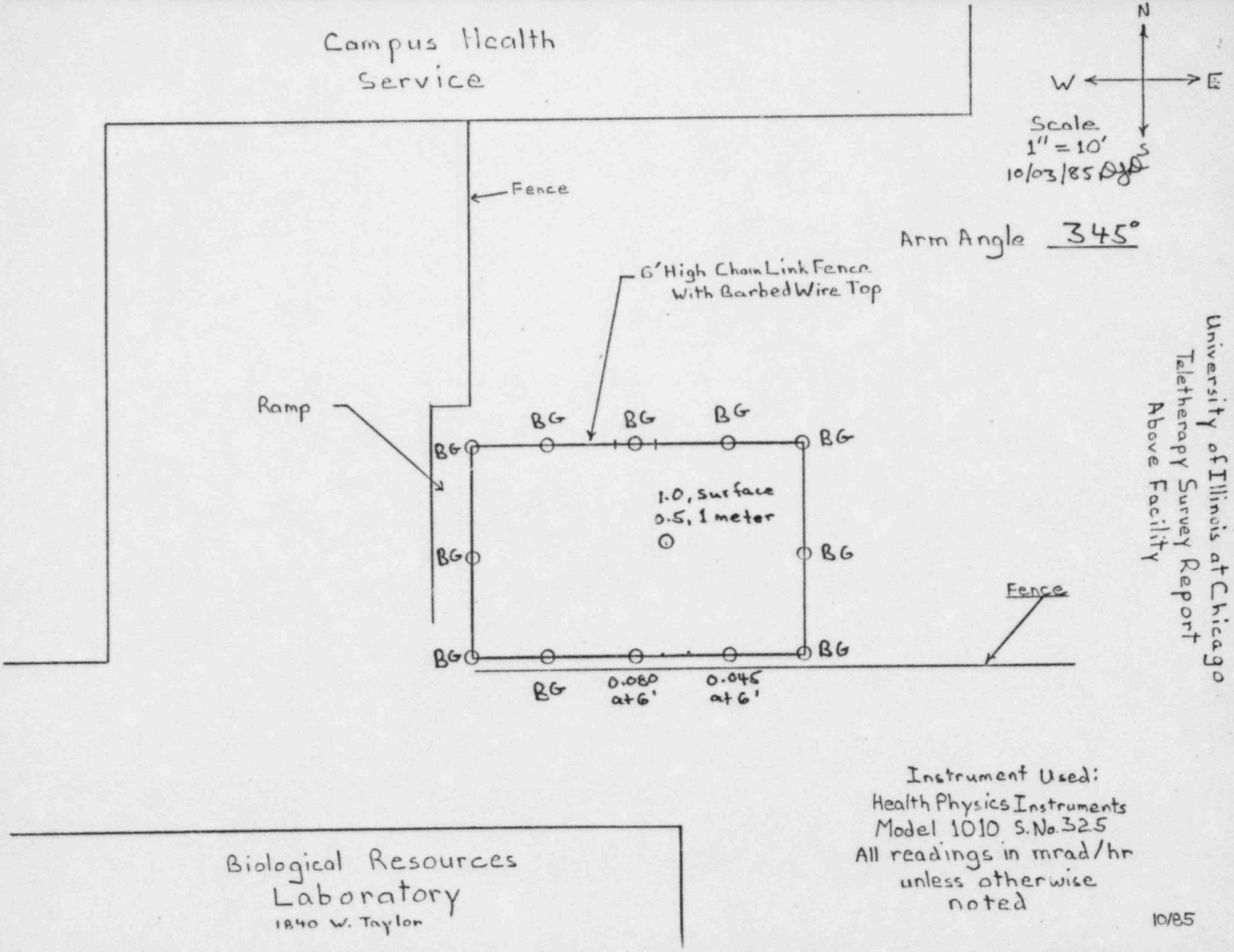


University of Illinois at Chicago
Teletherapy Survey Report
Above Facility

Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted

10/85


Campus Health Service
N
W
E
S
Scale
1" = 10'
10/03/85
Fence
Arm Angle 330°
6' High Chain Link Fence With Barbed Wire Top
Ramp
BG
0.055 at 6'
BG
BG
BG
0.16, Surface
0.07, 1 meter
BG
BG
Fence
BG
BG
BG
0.090 at 6'
0.075 at 6'
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Biological Resources Laboratory
1840 W. Taylor
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85


Campus Health Service
N
W
E
S
Scale
1" = 10'
10/03/85
Fence
Arm Angle 345°
6' High Chain Link Fence With Barbed Wire Top
Ramp
BG
1.0, surface
0.5, 1 meter
Fence
0.080 at 6'
0.045 at 6'
Biological Resources Laboratory
1840 W. Taylor
University of Illinois at Chicago
Teletherapy Survey Report
Above Facility
Instrument Used:
Health Physics Instruments
Model 1010 S.No. 325
All readings in mrad/hr
unless otherwise
noted
10/85

CONVERSATION RECORD

TIME 3:30 | DATE 8/22/85

TYPE: ☐ VISIT ☐ CONFERENCE ☑ TELEPHONE ☐ INCOMING ☑ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Dave Herenzo	University of Illinois Chicago	996-7424

SUBJECT: Control No. 18271

ROUTING	
NAME/SYMBOL	INT

SUMMARY

Dave informed me that the teletherapy/irradiator will not be under the supervision of the users named on License No. 12-00088-09. I suggested that he renew the -08 license instead of amending the -09 license. I forwarded him a copy of the radiation guide and requested 30 day response.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
	BJ Hott	8/22/85

ACTION TAKEN

SIGNATURE	TITLE	DATE