FORM NRC-313 I (1-79) 10 CFR 30 — U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

1. APPLICATION FOR: *(Check and/or complete as appropriate)*

X	a. NEW LICENSE
	b. AMENDMENT TO: LICENSE NUMBER
	c. RENEWAL OF: LICENSE NUMBER

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*

DELTA LIGHTING CORP.

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION

356-9797 203

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION

VINCENT CLARK

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION

356-9797 203

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*

200 Henry Street
P. O. Box 270
Stamford, Conn. 06904

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*

200 Henry Street
P. O. Box 270
Stamford, Conn 06904

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	VINCENT CLARK	MANAGER
b.		
c.		

7. RADIATION PROTECTION OFFICER

VINCENT CLARK

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

SEE ATTACHMENT NO. 7

8. LICENSED MATERIAL

LINE NO.	A ELEMENT AND MASS NUMBER	B CHEMICAL AND/OR PHYSICAL FORM	C NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)*	D MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
(1)	HYDROGEN 3	Sealed Source (Gas)	See Attachment 1	See Attachment 1
(2)				
(3)				
(4)				

	E DESCRIBE USE OF LICENSED MATERIAL
(1)	TO FULFILL REQUIREMENTS OF ARMY ORDINANCE FIRE CONTROL CONTRACTS.
(2)	DEVELOP NEW APPLICATIONS THRU RESEARCH AND DEVELOPMENT.
(3)	
(4)	

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	See Attachment 2	N/A	N/A
(2)			
(3)			
(4)			

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	Liquid Scint. Counter	Packard	2211	1	Beta	
(2)	Triton	Johnston Lab., Inc.	955B	1	Beta	10^{+} Ci/m^3
(3)	Triton Calibrator	Johnston Lab., Inc.	CL-1	1	N/A	N/A
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☐ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

N/A

☒ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

See Attachment #3

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
☐ (1) FILM BADGE		☐ MONTHLY
☐ (2) THERMOLUMINESCENCE DOSIMETER (TLD)		☐ QUARTERLY
☒ (3) OTHER (Specify): BIOASSAY - URINE	IN-HOUSE See Attachment #4	☒ OTHER (Specify): Weekly

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS *(Include filtration, if any)*, ETC. See attached drawing.

☐ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING *(fixed and/or temporary)*, ETC.

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC. See Attachment #6

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

NUCLEAR DIAGNOSTIC LABORATORIES (NDL) OR RADIAC IF NECESSARY

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

FORM NRC-313 I (1-79)

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

See Attachments #7, 7B, 8, and 9

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if ~~leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit~~.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

    c. Mathematics and calculations basic to the use and measurement of radioactivity.

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our 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.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)* $ 460.00	b. CERTIFYING OFFICIAL *(Signature)* Vincent Clark
	c. NAME *(Type or print)* VINCENT CLARK
(1) LICENSE FEE CATEGORY: 10CFR 170.31 (3) (A)	d. TITLE MANAGER
(2) LICENSE FEE ENCLOSED: $ 460.00	e. DATE March 25, 1980

FORM NRC-313 I (1-79)

ATTACHMENT NO. 1 DELTA LIGHTING CORP.

NAME OF MANUFACTURER AND MODEL NUMBER

1. Manufacturer

Sealed sources will be manufactured by one or more of the following companies:

Saunders-Roe	United Kingdom
Brandhurst	United Kingdom
Merz & Benteli	Switzerland
Self-Powered Lighting	U. S. A.
U.S. Radium	U. S. A.

2. Type and Model Number

The type and model number of sealed sources used will vary depending on application, therefore, a range of activity will be required. The first source, for commercial application, that we may use will be a Type XPC-39. This unit manufactured by Saunders-Roe and Self-Powered Lighting. Contents approx. 3Ci.

3. Maximums

a. The maximum activity of a single source will not exceed 15 Ci.

b. The maximum total plant storage activity in sealed sources will not exceed 75,000 Ci.

ATTACHMENT NO. 2 DELTA LIGHTING CORP.

STORAGE OF SEALED SOURCES

A. Sealed sources will be stored in a vented storage cabinet as shown in Attachment No. 10 "Laboratory Facility."

B. Sealed sources will be used in various devices. The first of which will be acrylic sign housings. These units are not yet fully designed but will be somewhat like a Self-Powered Lighting Aircraft Sign Model AC 4N manufactured under New York State License GL1406-1611.

ATTACHMENT No. 3 DELTA LIGHTING CORP.

CALIBRATION

METHOD, FREQUENCY AND STANDARDS

Each time a wipe-test is required, a New England Nuclear Standard No. SK-5 will be counted with the samples to be measured. The activity of the samples that are being measured will be determined by the efficiency of the Liquid Scintillation Counter (LSC). The efficiency of the LSC will be determined based on the ratio of the recorded cpm of the standard to the actual cpm of the standard as recorded by New England Nuclear. The accuracy of the standard is traceable to a NBS calibration standard.

$$\frac{\text{measured cpm of standard - background}}{\text{recorded dpm of standard - background}} = \text{efficiency}$$

$$\frac{\text{dpm of measured sample}}{\text{efficiency}} = \text{actual dpm}$$

$$\frac{\text{actual dpm}}{2.22 \times 10^{-2} \frac{\text{dpm}}{\mu\text{Ci}}} = \mu\text{Ci}$$

ATTACHMENT NO. 4 DELTA LIGHTING CORP.

BIOASSAYS

Since Curie quantities of H-3 are to be used in the form of sealed sources, weekly bioassays of the urine will be performed on all individuals working in the area. Tritium H-3 is rapidly and uniformly distributed in the body water, urine samples will be collected on Friday morning. On Friday afternoon, 1 ml of the sample will be placed in 10 ml of liquid scintillation fluid and counted for ten minutes. The sample will be cooled and kept in a dark area prior to counting.

CALCULATION OF TRITIUM DOSE

Eav = 5.7 keV — mean energy

Q = 1

$T_{b\ 1/2}$ = 12 days — Biological Half-Life

$T_{p\ 1/2}$ = 12.26 years — Physical Half-Life

μCi ^{3}H per ml urine x 12.15 x 1.5 = tissue dose in mrads/h

absorbed dose-rate ($\dot{D}$) to tissue is the sum of the absorbed dose rates from the tritiated body water and the tritiated tissue organic constituents.

$\dot{D}$ = (μCi/ml urine x 0.7 = Ci/ml urine x 0.20 x 0.3) 12.14

$\dot{D}$ = mrad/h

0.7 = fraction of water in soft tissue

0.2 = fraction of ^{3}H in organic constituents relative to water

0.3 = fraction of organic solids in soft tissue

$$12.14 = \frac{\text{mrads}}{\mu\text{ Ci/g}} \quad \text{soft tissue}$$

$\therefore$ if the ^{3}H concentration in urine is 1 μci/ml, then

$\dot{D}$ = 9.2 mrads/h

With a continuous concentration of 1 μCi/ml of urine, the annual tissue dose would be 80.6 rads/y.

For a 5 rem/y annual tissue dose the ^{3}H concentration in urine is 0.06 μCi/ml, which is equivalent to approximately 3 Ci total body burden.

Since the fractional turnover of water per day is 0.057, a maximum total body burden of 2 m Ci would be maintained by an intake of 0.11 m Ci ^{3}H per day. These levels are easily detectable using liquid scintillation techniques.

ATTACHMENT NO. 5 DELTA LIGHTING CORP.

RADIATION PROTECTION PROGRAM

1. Monthly surveys using wipe tests of benches, tables, floors and equipment will be taken using standard wipe test procedures (100 sq. cm per wipe) and counted as previously specified in a LSC.

2. Area breathing zone surveys will be performed using the continuous air monitor (Triton Model 955B) and weekly urine bioassays. (See Attachment No. 4)

3. In the event of any release of radioactive material see procedure specified in Item No. 13 (Attachment No. 6).

4. Dose calculation will be performed in accordance with information given in Attachments No. 3 and 4 in order to comply with 10 CFR 20.

5. The Radiation Safety Officer will keep all records of receipt, disposal, survey, bioassays and personnel monitoring.

6. The Radiation Safety Officer shall perform all leak tests upon receipt and prior to transferring of sources to another authorized licensee, otherwise all sealed sources will be leak tested semi-annually unless designated as storage sources only.

   a. Qualification of individual performing leak tests (See Attachment No. 7)

   b. Procedure to be used in taking wipes. Alcohol wipes of 100 cm^2 will be placed in 10 ml of LS counting fluid. These vials will then be counted in LSC. (See Attachment No. 3)

   c. Type, manufacturer's name, model no., radiation detected, etc. (See Item 10 (1) of this application.)

   d. Calibration - See Attachment No. 3.

   e. Method - See Attachment No. 3.

7. Instruction to Personnel

Since only one or possible two individuals, with prior training, will be involved in using the sealed sources of radioactive materials, no formal instructions is anticipated. However each individual will be required to be current with the contents of NBS Handbook No. 80 "A Manual of Radioactivity Procedures", NCRP Report No. 39 - "Basic Radiation Protection Criteria" and Title 10 CFR 20.

Applicable emergency and evacuation procedures will be posted in the controlled area.

ATTACHMENT NO. 6 DELTA LIGHTING CORP.

Personnel monitoring equipment will not be used, since sealed sources of H^3 do not present an external exposure problem. Although we are working with sealed sources, we have considered using bioassay techniques for personnel monitoring as a general monitoring procedure. No special laboratory handling and shielding facilities are required for working with sealed sources of tritium.

A Triton room air monitor Model 955B will be set up as an area monitor. The alarm level will be set at some reasonable level after initiation of ambient level and in the event of a room evacuation alarm, a circulating type fan with a silica gel filter will be started so that several room air changes will occur in a reasonable time. The room volume is approximately 60 m^3 and a face velocity of about 200-300 lfm using a 18 inch circulating fan will give several room air changes in 10-15 minutes. Note - we are recirculating the room air through the silica gel filter in order to remove tritium. We are not exhausting contaminated air into the environment.

In addition the area monitor will be used as a sniffer to check the integrity of incoming shipments.

ATTACHMENT NO. 7 DELTA LIGHTING CORP.

ITEM NO. 17 - NRC 313

VINCENT CLARK
TRAINING AND EXPERIENCE

TRAINING:

University of Conn. - Formal classroom instruction Physics and Math
USAF - Formal classroom instruction Electronics

EXPERIENCE:

Self-Powered Lighting Ltd., Elmsford, New York

Five years experience as Production Manager. This position involved handling raw Tritium Gas, sealed Tritium sources and assemblies containing sealed Tritium sources. In addition to production, I was in charge of Quality Control. Quality Control included performing tests to the following specifications: ANSI 540, Military SQAP'S and special tests directed by State of New York, Department of Labor, Division of Industrial Hygiene Radiological Health Unit.

While at Self-Powered Lighting I received on-the-job training in "The Biological Effects of Radiation" and "The Principles and Practices of Radiation Protection." I became proficient in the setting up and calibration of Scintillation Counters and Room Air Monitors.

I performed contamination wipe tests on Tritium sources, work areas and personnel.

In addition I performed soak testing and urine bioassays. In all three cases I made the required mathematical calculations to find the amount of Tritium removed.

ATTACHMENT NO. 7B DELTA LIGHTING CORP.

CURRICULUM VITAE

PHILIP M. LORIO

Residence: [redacted]

Date of Birth:

Place of Birth:

Professional Title: *University Health Physics Officer*

Business Address: *Columbia University*
Health Physics Office
116th Street and Broadway
New York, N.Y. 10027
(212) 280-4442

Educational Background: *B.A.(Physics) 1950, Brooklyn College*
Graduate Courses; Radiologic Physics, Bio-Statistics and Radiation Biology Columbia University, College of P & S.

Experience:

For 3-1/2 years I was the Health Physicist for an AEC contract at Columbia University. After that period of time, I was appointed the University Health Physics Officer. I initiated and developed the Health Physics program at Columbia University. This program includes authorizing isotope users, procurement of all radioactive material, supervision of all personnel monitoring and surveying, management of waste disposal, maintenance of all records, and giving all orientation and safety lectures. This responsibility includes three accelerators, a TRIGA 250 kilowatt research reactor, two sub-critical training reactors, and all the isotope laboratories in physics, chemistry, and the biological sciences. It also includes the surveillance of all X-ray equipment and to non-ionizing radiation. As of May, 1975, I have taken over the Radiation Safety Office of the Columbia-Presbyterian Medical Center which includes two Co-60 therapy units, a 4 MeV LINAC, a 22 MeV Betatron, a Nuclear Medicine department, 3 CAT Scanners, a large diagnostic X-ray department, a large number of medical and biological research laboratories.

I've worked as a consultant for the Consumer's Union in evaluating the X-ray hazards of color television sets and smoke detectors utilizing radioactive materials.

During the summer of 1971, I was hired by the AEC as a consultant to the National Accelerator Laboratory to provide the health physics assistance for dismantling the University of Chicago cyclotron.

I was a consultant for Landis & Gyr, Inc., Elmsford, N.Y. This company manufactured and distributed thickness gauges utilizing radioactive sources. I provided the necessary health physics services and the necessary information for license procurements and amendments as required.

In 1974, I evaluated for TWA, at LaGuardia Airport, the radiation profile at the hangar and in their passenger carrying aircraft.

From November of 1974 to February of 1975, I worked on a contract for the U.S. AEC for the Evaluation of Radiation Exposures to Cargo Handlers at the New York airports. This study was being done simultaneously at 6 different airports in the United States by the University personnel. The results of this study were published in the U.S. Nuclear Regulatory Commission's publication NUREG-0154 (1977).

I am the technical consultant for the Utility Workers Union of America, AFL-CIO Local 1-2. The members of this Union work at the nuclear power reactors operated by Consolidated Edison-Indian Point. I am a non-voting member of the Utility 's management level Radiation Safety Sub-Committee.

In August of 1977, acting as a consultant for Hittman Nuclear Developement Corporation of Columbia, Maryland, I provided the Health Physics Supervision and training necessary for performing the dismantling of the Illinois Institute of Technology's research reactor.

Professional Associations;

Charter Member of the National Health Physics Society
Member of the Greater New York Chapter of the Health Physics Society (GNYCHPS)
Secretary of the Greater New York Chapter, H.P.S., 1968-69, 1970-71.
President Elect of the Greater New York Chapter, H.P.S., 1971-72.
President of the Greater New York Chapter, H.P.S., 1973-74.
Permanent Executive Secretary of the Greater New York Chapter, H.P.S.
Chairman of the Executive Council of the GNYCHPS, 1976-77, 1977-78.

I was appointed by the Board of Directors of the National Health Physics Society at the Houston, Texas meeting in July of 1974, as a consultant for their newly formed "ad hoc" committee on Transportation of Radioactive Materials on Passenger Carrying Aircraft.

I was a member of the Subcommittee on Applied Health Physics Aspects of Medical and Educational Uses of Radioactive Materials. This is a sub-committee of the New York City Mayor's Advisory Committee on Radiation.

Certified Radiation Equipment Safety Officer, (CRESO) by the New York State Health Department.

I was a co-director of a Health Physics Certification Course sponsored by the Greater New York Chapter of the Health Physics Society in 1971 and 1978.

I give the Accelerator and non-ionizing radiation safety lectures at the New York Certification review courses.

In 1978, I gave the University Health Physics lecture at the review course sponsored by the Baltimore Washington Chapter.

ATTACHMENT NO. 8

DELTA LIGHTING CORP.

ITEM NO. 15 - NRC 313

SEE ATTACHMENT NO. 5

"RADIATION PROTECTION PROGRAM"

ATTACHMENT NO. 9 DELTA LIGHTING CORP.

ITEM NO. 16 - NRC 313

VINCENT CLARK

Formal training in Radiation Safety.
Type Radioisotope Tritium H-3 (Gas Form).

a. Received on-the-job training in the Principles and Practices of Radiation Protection at Self-Powered Lighting Ltd.

b. Radioactivity measurement standardization and monitoring techniques and instruments at Self-Powered Lighting Ltd.

c. Mathematics and calculations basic to the use and measurement of Radioactivity, at University of Connecticut and USAF Electronics Schools. Learned how to use mathematics relative to Radioactivity at Self-Powered Lighting Ltd.

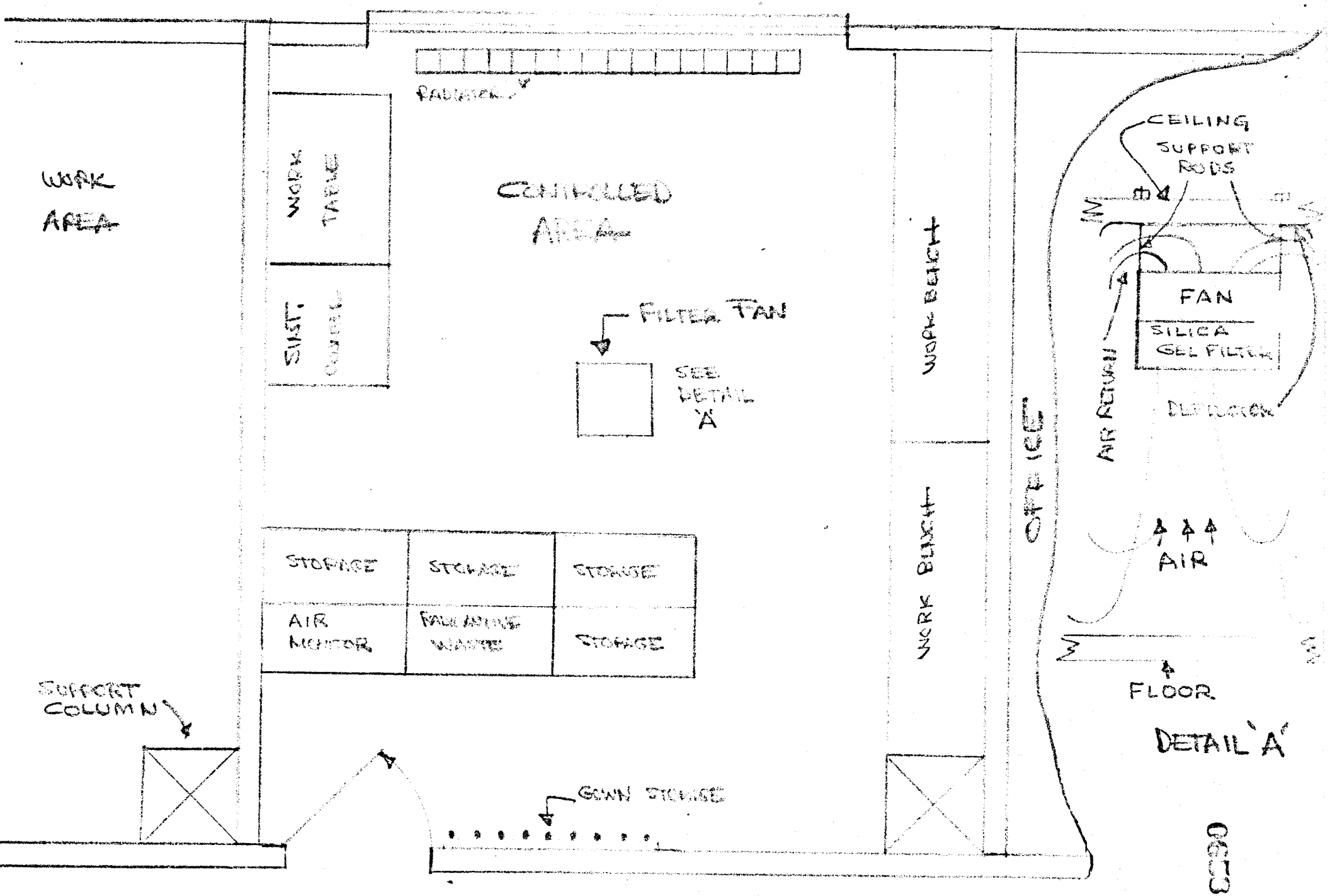

EXHIBIT 10

DELTA LIGHTING CORP