

APPENDIX

Sent 02/26/79

Form AEC-313 (2-73) 10 CFR 30	UNITED STATES ATOMIC ENERGY COMMISSION APPLICATION FOR BYPRODUCT MATERIAL LICENSE		Form approved Budget Bureau No. 38-30037
<p>INSTRUCTIONS.—Complete Items 1 through 18 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 18 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Materials Branch, Directorate of Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 18 and the appropriate fee enclosed. (See Note in Instruction Sheet).</p>			
<p>1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital person, etc. include ZIP Code and telephone number.)</p> <p>North Star Steel Company 3000 East Front Street Monroe, Michigan 48161</p>		<p>(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from 1(a), include ZIP Code.)</p> <p>Same as 1a.</p>	
<p>2. DEPARTMENT TO USE BYPRODUCT MATERIAL</p> <p>Continuous Casting Department</p>		<p>3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)</p> <p>None</p>	
<p>4. INDIVIDUAL USER(S). (Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)</p> <p>Robert A. Jakse, Maintenance Supt. Frank Sikula, Maintenance Gnl. Supvrsr.</p>		<p>5. RADIATION PROTECTION OFFICER. (Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)</p> <p>Frank Sikula, Maint. Gnl. Supvrsr.</p>	
<p>6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.)</p> <p>Cesium 137</p>		<p>(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. (If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)</p> <p>Five (5) Sealed Source units, none to exceed 1000 millicuries of cesium 137; K-Ray Source Holder model No. 7060 Sd. Source Manufacturer;</p> <ol style="list-style-type: none"> 1. New England Nuclear, Boston, Ma. Mod. #NER570 or, 2. Gamma Industries, Houston, Tx Mod. #VD or, 3. General Radiosotopes Prods, SanRamon, Ca Mod. #850233 or, 4. 3M Company, Minneapolis, Mn Mod #4P6M or, 5. Amercham Searle, Mod. #X.8, X.9, X.19 or, 6. Other NRC authorized equivalent 	
<p>7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. (If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)</p> <p>The source heads are manufactured by Kay-Ray, Inc., Arlington Heights, Ill. (Source holder Model No. 7060SD) Information describing this equipment has been supplied by Kay-Ray to the NRC for specific licensing. The source heads will be used in level measuring of steel in a mold.</p>			
<p>Applicant... 0785</p> <p>Check No. 110 (3L)</p> <p>Amount/Fee Category... APPLICATION</p> <p>Type of Fee... APPLICATION</p> <p>Date Check Made... FEB 12 1979</p> <p>Received By... Brown</p>			
<p>COPIES SENT TO OFF. OF INSPECTION AND ENFORCEMENT</p>			

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TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)

B. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	See attachment		Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. (Actual use of radioisotopes or equivalent experience.)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		See attachment resume of Frank Sikula		

10. RADIATION DETECTION INSTRUMENTS. (Use supplemental sheets if necessary.)

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm ²)	USE (Monitoring, surveying, measuring)
To be purchased: Nuclear Chicago Model 2650 Gieger Mueller Survey Meter or Equal	1	Alpha Beta Gamma	.1 MR/Hr. to 100 MR/Hr.	30 Mg/CM ²	Surveying

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

Factory calibrated with gamma rays from a Cesium 137 source, field calibrated with check sources

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)

Film badges, or other personnel monitoring equipment are not required for installation area. Please refer to item 14 for justification. Leak test HPC 12 for Kay Ray Model 7060 Source Units

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes ☒ No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source. See attached radiation safety program

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See attachment

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, 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.

License Fee Category 3L
Fee Enclosed \$ 110.00

North Star Steel Company

Applicant named in item 1

By:

Maintenance Superintendent

Title of certifying official

Date February 7, 1979

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.

RECEIVED

U.S. GPO: 1973-543-126/513

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Item 8 and 9

Robert A. Jakse, Plant Maintenance Superintendent. No previous radiological training or experience. At the time of system installation and start-up, Kay-Ray will provide training required in the safe utilization of the equipment.

The training will follow the following outline:

- 1) A discussion of the worst case dosage that an operator will receive versus the allowable limits.
- 2) Explain any special posting requirements or restricted access area requirements to the guage if applicable to the application.
- 3) Provide instruction on the limitations of the specific license that was granted for the equipment.
- 4) Discuss the emergency procedure to be followed in the event of damage to the source head.
- 5) Describe the structure of the source holder. This shall include a discussion of where the beam exists and the mechanical aspects of the shutter mechanism.
- 6) Describe the ruggedness of the source capsule and the source holder itself.
- 7) Fully evaluate the lockout procedure, if applicable, to ensure conformance to the procedures submitted for licensing of this equipment.

A copy of this outline is provided in the instruction manual supplied with the guage and will be followed in the operation of the guage.

Frank Sikula, General Maintenance Supervisor, Resume of Radiological Training and Experience.

Mr. Sikula attended a five day radiation safety training course conducted by Kay-Ray, Inc. in November 1978. This course covered the following:

Principles and practices of radiation protection; radioactivity measurement standardization and monitoring techniques and instruments, mathematics and calculations basic to the use and measurement of radioactivity, radiation safety and the biological effects of radiation.

Mr. Sikula received on the job training under the guidance of Mr. J. E. Yarrington at North Star Steel Company, St. Paul, Minnesota where K-Ray level detectors are used in steel level measurement in molds. (See attached resume of Mr. J. E. Yarrington.) Mr. Sikula has had two years on the job experience in the safe handling, testing and monitoring of K-Ray level detection devices. Mr. Sikula is a graduate electrical engineer.

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Item 8 & 9

J. E. Yarrington, Safety Manager Resume of Radiological Training and Experience.

As Safety Manager at North Star Steel (1975 to Present) Mr. Yarrington received on-the-job training under the guidance of John Smythe, Radiation Officer of North Star Steel.

Training included the principles and practices of radiation protection; radioactivity measurement standardization and monitoring techniques and instruments, mathematics and calculation basic to the use and measurement of radioactivity, and the biological effects of radiation.

Formal training includes the following:

A. Kay-Ray, Inc., March 1976

Special three day radiation course that included radiation theory and principles; radiation safety, installations, maintenance and repair fundamentals of source holders; leak test procedures; waste disposal; emergency procedures and notifications; and survey techniques.

B. American Iron and Steel Institute, November 1977

Special three day radiation course that included radiation theory and principles; radiation safety; installations, maintenance and repair fundamentals of source holders; leak test procedures; waste disposal; emergency procedures and notifications; and survey techniques.

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Item 14

I. Drawings of Installation

The enclosed drawings give the specifics of the installation. All equipment will be located and mounted in accordance with the recommendations of the manufacturers.

II. Installation, Maintenance, Radiation Survey, Servicing

The source holder assemblies will be installed by K-Ray, Inc. Initial radiation survey, servicing and maintenance and repair of the source holders will be performed by K-Ray, Inc. or other persons specifically authorized by the Commission or an Agreement State to perform such services. The initial radiation survey will be used to confirm the calculations shown in Section VI of this item. A copy of the radiation survey will be kept on file for future reference.

The source holder assemblies, containing by-product material will be removed from its mountings whenever deemed necessary and authorized by the Plant Radiation Protection Officer (s). Relocation and replacement of and the radiation surveying of said devices shall be performed by North Star Steel personnel under the direction and supervision of Plant Radiation Safety Officer(s). (See attached resume of Frank Sikula) This would include the relocation of source holders to other plant locations within our division (St. Paul, Minnesota; Wilton, Iowa; Monroe, Michigan)

A. Radiation surveys and records: In addition to periodic wipe tests, radiation surveys will be conducted prior, during and after all installations, relocation and replacement of source holders containing by product material.

B. Installation, Relocation and Replacement Procedure:

- 1) The closing of the shutter mechanism on the source holder in concern.
- 2) General radiation survey of the area and source holders.
- 3) Removal of mold cover.
- 4) Removal of source holder from the casting machine.
- 5) Attachment of padlock to shutter locking device.
- 6) If item is to be shipped to manufacturer for repair to another plant, the locked source holder is to be installed in the necessary shipping crate, and shipped according to DOT Regulations (including radiation surveys and wipe tests if necessary).
- 7) If a source holder is to be received, the above procedure will be reversed.

All installation relocation and replacement procedures shall be under the guidance and supervision of the Plant Radiation Officer.

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III Control Measures

If maintenance is required inside vessels (molds) a safety procedure will be employed to prevent personnel access with the source in the "measure" position. This procedure will consist of closing a shutter on the source head to the store position before the mold cover is removed. This will be done automatically by external push button activation and will be observable through a portal in the mold cover. Only after visual inspection reveals that the source head is in the "store" position, will the mold cover be removed so that maintenance can be performed. No personnel would be allowed inside the mold housing before the source heads are in the store position.

When maintenance inside the housing is completed, the mold cover will be installed and the source head shutter will be automatically opened to the "measure" position. If maintenance is required on the source head shutter or detector, the Plant Radiation Officer would be notified before the mold cover is removed. The Officer would then lock the source head shutter in the store position before any other personnel would be allowed access to the molds. The Radiation Officer would hold the only key to the lock and would remove the lock only after maintenance is complete and all personnel are removed from the area. The Officer would also perform any necessary radiation surveys, etc.

IV Leak Testing

Kay-Ray will perform the initial leak testing on the source holder. The leak test kit used by Kay-Ray is either the General Radio-isotope Products WT-4 kit or Kay-Ray, Ind. Model A kit which has been approved by the NRC for use in the source wiping of Kay-Ray source holders.

Periodic tests for leakage and/or contamination shall also be performed by the licensee Plant Radiation Officer, or by other persons specially authorized by the Commission to perform such tests. (See attached Leak Test Procedure)


We wish to have our license worded to allow a 3 year source wipe interval on the devices listed above. An extension has recently been granted to Kay-Ray allowing a three year interval for source wiping and we wish to have our license reflect this extended test period.

V Procedure to be followed in event of damage to source housing

In the event of an emergency involving the source or source holder, the gauge containing the sealed source will be immediately withdrawn from use and the Plant Radiation Officer will be notified. The officer will take steps to restrict the area in the vicinity of the source until proper evaluation of the situation can be made. The gauge manufacturer and the Director of the Region III AEC Regional Compliance Office will be notified. (See attached emergency procedure.)

VI Worst Case Personnel Radiation Expose Calculation

The attached calculation indicates a worse case operator exposure of 360 MR/yr. This exposure is based on nearest operator location to the source housing and is



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less than 500 MR/yr. which is well below the limits set in 10CFR20 for personnel monitoring equipment. The calculated radiation exposure rate one will receive at the detector is approximately .5 MR/hr. or less for level systems. These low levels drop off according to the square law and result in negligible operator exposure a few feet from the detector. These radiation exposures will be verified at the time of start-up. This will include the effects of radiation scattering along the vessel walls if applicable. These provisions will be taken to verify that no one will receive a worse case exposure of 500MR/yr. at the detector side of the vessel.

CALCULATION OF WORSE CASE RADIATION EXPOSURE TO OPERATING PERSONNEL

Step 1. From the sketch E-484-00575.00 showing relationship of gauge to the operating area, the minimum distance (D in feet) that any single person will be in the vicinity of the gauge is 2.25 ft. The maximum time (T in hrs/day) that any single person will be in the vicinity of the gauge is 8 hrs/day. Therefore, D=2.25 ft. and T=8 hrs/day.

Step 2. From the attached Table I is found a K value corresponding to a 7060B measurement head that is to be used in our application.

Step 3. The value of D is rounded down to 2' and the normalized value of K was found to be 0.18 MR/hr.

Step 4. The following formula was used to calculate X - the worse case operator exposure per year. $X = K \times S \times T \times .25$

Where

- X = worse case exposure in MR/yr.
- K = figure from Table I = 0.18 MR/hr.
- S = source size in millicuries that is used in source head in our application = 1000MC
- T = hours/day = 8 hrs/day
- .25 = normalizing factor which converts the MR/hr. figure to a yearly figure. This factor assumes a 40 hour work week, 50 weeks per year, and 1000MC source in each respective source head.
- D = 2.25 feet
- T = 8 hours/day
- K = 0.18 MR/hr. for a D of 2 feet
- S = 1000

Therefore: $X = (K)(S)(T)(0.25) = (0.18)(1000)(8)(0.25)$

X = 360 MR/yr.

-5-
VALUES OF D AND K FOR KAY-KAY SOURCE HOLDER

GAMMA SOURCE HEADS

TABLE I

KR Model No.	7056	7050B	7051B	7062	7063	7063P
	7057	7060B	7061B	7062P		
D (ft.)	K (mr/hr)	K (mr/hr)	K (mr/hr)	K (mr/hr)	K (mr/hr)	K (mr/hr)
0	0.63	12.5	3.0	500	50	15.0
1	0.05	0.59	0.17	11.22	2.3	0.82
2	0.02	0.18	0.06	3.31	0.74	0.26
3	0.009	0.09	0.03	1.56	0.34	0.12
4	0.006	0.05	0.02	0.90	0.20	0.07
5	0.004	0.03	0.01	0.59	0.14	0.05
6	0.003	0.02	0.008	0.41	0.09	0.03
7	0.002	0.02	0.006	0.31	0.08	0.03
8	0.002	0.01	0.005	0.24	0.06	0.02
9	0.001	0.01	0.004	0.19	0.06	0.02
10	0.001	0.009	0.003	0.15	0.03	0.01
11	0.0008	0.008	0.002	0.13	0.03	0.01
12	0.0007	0.006	0.002	0.11	0.02	0.009
13	0.0006	0.005	0.002	0.09	0.02	0.008
14	0.0005	0.005	0.002	0.08	0.02	0.007
15	0.0005	0.004	0.001	0.07	0.01	0.006
16	0.0004	0.004	0.001	0.06	0.01	0.005
17	0.0004	0.003	0.001	0.05	0.01	0.004
18	0.0003	0.003	0.001	0.05	0.01	0.004
19	0.0003	0.003	0.0009	0.04	0.01	0.004
20	0.0003	0.002	0.0008	0.04	0.008	0.003

KR Model No.	7064	7064P	7065	7067	7068
	7064	7064P	7065	7067P	7069
D (ft.)	K (mr/hr)	K (mr/hr)	K (mr/hr)	K (mr/hr)	K (mr/hr)
0	15	3.25	120	5	7.5
1	1.02	0.22	5.62	0.48	0.38
2	0.36	0.08	1.77	0.17	0.12
3	0.18	0.04	0.85	0.08	0.06
4	0.12	0.03	0.50	0.05	0.03
5	0.06	0.01	0.33	0.03	0.02
6	0.05	0.01	0.23	0.02	0.01
7	0.04	0.007	0.17	0.02	0.01
8	0.03	0.006	0.13	0.01	0.009
9	0.02	0.005	0.11	0.01	0.007
10	0.02	0.004	0.09	0.009	0.006
11	0.01	0.003	0.07	0.007	0.005
12	0.01	0.003	0.06	0.006	0.004
13	0.01	0.003	0.05	0.006	0.003
14	0.01	0.002	0.04	0.005	0.003
15	0.006	0.002	0.04	0.004	0.003
16	0.006	0.002	0.03	0.004	0.002
17	0.006	0.001	0.03	0.003	0.002
18	0.006	0.001	0.03	0.003	0.002
19	0.005	0.001	0.02	0.002	0.002
20	0.005	0.001	0.02	0.002	0.001

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Item 15 Waste Disposal

No waste disposal is involved. In the event the gauges are removed from use, the gauge(s) will be returned with shutter mechanisms in the locked "store" position to Kay-Ray Inc. or other persons specifically authorized by the Commission to receive such material.

EMERGENCY PROCEDURE TO BE FOLLOWED AFTER
DAMAGE TO KAY-RAY SOURCE HOLDERS

1. This procedure applies to all instances where damage is incurred by the source holder due to such action as fire, etc.
2. Immediately rope off the area around the source holder to a minimum of 10 feet in diameter.
3. Inform plant radiation safety officer or person responsible for the use of the source as to the situation.
4. Inform by 'phone or telegram the proper regional NRC office of the accident. (See below)
5. Notify Kay-Ray at (312) 259-5600 if their assistance is desired.
6. Limit access to source head until a radiation survey and source wipe can be performed by qualified personnel or a representative of Kay-Ray.



LEAK TEST HP-C12

HEALTH PHYSICS ASSOCIATES LTD. CONSULTANTS IN RADIATION SAFETY

2356 SKOKIE VALLEY ROAD / HIGHLAND PARK, ILL. 60035 / PHONE: AREA (312) 433-3330

LEAK TEST INSTRUCTIONS FOR KAY-RAY MODEL 3500 GAUGES CONTAINING 137 CESIUM SOURCES

Materials:

Three swab sticks in tubes.
Vial with wetting agent.
Plastic gloves in bag.
Set of wipe test instructions.
Information sheet.

Radiation Safety Precautions:

Operator should wear the disposable gloves provided while taking the wipes. They are removed, after the wipes are placed into the tins, by a sterile technique (by grasping inner surface at wrist). The gloves are placed in the bag provided and returned to HEALTH PHYSICS ASSOCIATES. Wash hands when through. Always ascertain the source is in "store" position before beginning tests. Handle swab stick by cap only. Do not handle stick or cotton tip.

Leak Testing Procedures:

1. Add water to test tube containing wetting agent until it is approximately half full. It will be used to wet swab sticks before making wipes.
2. Wet swab stick #1 in wetting agent furnished and wipe interface of source head and mounting surface, i.e., Hopper, Pipe, etc..
3. Wet swab stick #2 in wetting agent furnished and wipe around shaft of source actuating handle, that protrudes through source head.
4. Wet swab stick #3 in wetting agent furnished and wipe around bolt holes protruding through source head base plate.
5. Place all swab stick tubes in returnable mailing container, remove gloves per instructions above and place in bag provided for return to HEALTH PHYSICS ASSOCIATES.
6. Set survey meter to its most sensitive range in a low background area. Bring container with swabs to meter and note maximum deflection of meter above background.
7. If meter indication is 0.4 mR/hr or less, above background, place the return label provided on container and return to HEALTH PHYSICS ASSOCIATES, with completed information sheet enclosed.
8. If available survey meter is not a geiger counter type (e. g. ion chamber) and cannot read down to 0.4 mR/hr, determine that reading is less than 2.0 mR/hr on contact. Return container to HEALTH PHYSICS ASSOCIATES via REA express. Do not ship if indicated surface activity is greater than 2.0 mR/hr, and call HEALTH PHYSICS ASSOCIATES for further instructions.