REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA-0406-S-219-S (Supercedes MA0476S108S) DATE: August 6, 2001

SEALED SOURCE TYPE: X-Ray Fluorescence Source

MODEL:

NER-372
NER-465 with three capsule designations – LE66, LE66A, and LE66B
NER-465S with three capsule designations – LE316, LE316A, and LE316B
NER-467 with three capsule designations – LE66, LE66A, and LE66B
NER-472 with three capsule designations – LE316, LE316A, and LE316B

MANUFACTURER/DISTRIBUTOR:

Isotope Products Laboratories (IPL)
24574 Avenue Tibbitts Avenue
Valencia, CA 91355
Phone: (818) 843-7000
Fax: (818) 843-6168

ISOTOPE: Cobalt-57 and Cedmium-109

Model Number:	Isotope:	Maximum Activity
NER-372	Cobalt-57	100 millicuries (3.7GBq)
NER-465	Cadmium-109(R)*	300 millicuries (11.1 GBq)
NER-465S	Cadmium-109(R)*	300 millicuries (11.1 GBq)
NER-467	Cadmium-109(A)*	100 millicuries (3.7 GBq)
NER-472	Cobalt-57	1000 millicuries (37 GBq)

* note: (R) denotes reactor grade and (A) denotes accelerator grade

LEAK TEST FREQUENCY: Six (6) months

PRINCIPAL USE: (U) X-Ray Fluorescence Source

CUSTOM SOURCE: _____ YES __X__ NO

NMSS/2

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

SEALED SOURCE TYPE: X-Ray Fluorescence Source

DESCRIPTION:

The NER-372 source consists of Co-57 as cobalt metal that is electroplated onto a 2 mil thick copper foil. The foil is then melted to form a 0.04" dia. bead, and the bead is inserted into a stainless steel capsule. A stainless steel plug is T.I.G. (Tungsten Inert Gas) welded to the capsule to form a hermetic seal. The cylindrical source capsule is 0.12" in diameter, and 0.20" in height.

The NER-465S consists of Cd-109(R) as cadmium metal that is electroplated onto 2 mil thick silver foil. The active foil is placed inside a stainless steel capsule with a 10 mil thick "window". A tungsten alloy disc is placed behind the active foil and a stainless steel cover is press fit into the capsule. The capsule and cover are T.I. G. welded together to form a hermetic seal. The capsule has three sizes having designations LE316, LE316A, and LE316B.

The NER-472 source consists of Co-57 as cobalt metal that is electroplated onto 2 mil thick nickel foil. The active foil is placed inside a stainless steel capsule with a 10 mil thick "window". A tungsten alloy disc is placed behind the active foil and a stainless steel cover is press fit into the capsule. The capsule and cover are T.I.G. welded together to form a hermetic seal. The capsule has three sizes having designations LE316, LE316A, and LE316B.

Capsule Designation	Capsule Diameter	Capsule Height
LE316	0.31"	0.20"
LE316A	0.45"	0.25"
LE316B	0.60"	0.33"

The NER-465 source consists of Cd-109(R) as cadmium metal that is electroplated onto 2 mil thick silver foil. The active foil is placed inside an aluminum capsule with a 6 mil thick "window". A silver disc is placed behind the active foil and an aluminum cover is press fit into the capsule. The capsule and cover are T.I.G. welded together to form a hermetic seal. The capsule has three sizes having designations LE66, LE66A, LE66B.

The NER-467 source consists of Cd-109(A) as cadmium metal that is electroplated onto 2 mil thick silver foil. The active foil is placed inside an aluminum capsule with a 6 mil thick "window". A silver disc is placed behind the active foil ad an aluminum cover is press fit into the capsule. The capsule and cover are T.I.G. welded together to form a hermetic seal . The capsule has three sizes having designations LE66, LE66A, and LE66B.

SEALED SOURCE TYPE: X-Ray Fluorescence Source

Capsule Designation	Capsule Diameter	Capsule Height
LE66	0.31"	0.20"
LE66A	0.45"	0.25"
LE66B	0.60"	0.33"

LABELING:

The model NER-372 is permanently marked by engraving with the source model number. A self-adhesive identification label showing the isotope, activity, date of measurement, model number and serial number, as well as the words "Caution Radioactive Material", is affixed to the outside of the lead shield storage container.

The NER-465, NER-465S, and NER-467 sources are permanently marked by engraving with "Cd-109", serial number, model number, and trefoil symbol. A source identification label which contains the trefoil and the words "Caution Radioactive Material" is affixed to the outside of the source shield.

The NER-472 source is permanently marked by engraving with "Co-57", serial number, model number, and trefoil symbol. A source identification label which contains the trefoil and the words "Caution Radioactive Material" is affixed to the outside of the source shield.

DIAGRAM:

NER-372: Refer to drawing numbers B002790 (Attachment 1).
NER-465: Refer to drawing numbers 313-407 and B002606 (Attachments 2 and 3).
NER-465S: Refer to drawing numbers 33A-047 (Attachment 4).
NER-467: Refer to drawing numbers 313-36 (Attachment 5).
NER-472: Refer to drawing numbers 313-37 (Attachment 6).

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

SEALED SOURCE TYPE: X-Ray Fluorescence Source

CONDITIONS OF NORMAL USE:

The NER-372 point source and the NER-465, NER-465S, NER-467, and NER-472 disc sources are designed for low energy (<200 keV) gamma photon emission applications such as X-ray fluorescence. These sources are usually affixed inside portable instruments which perform X-ray fluorescence analysis. The environmental conditions are not expected to exceed conditions where electronic instruments can be safely operated.

PROTOTYPE TESTING:

The NER-372 X-ray fluorescence source has been designed and tested to qualify for ANSI N542-1977 performance classification 77C43333.

The NER-465S and NER-472 X-ray fluorescence sources have been designed and tested to qualify for ANSI N542-1977 performance classification 77C66544.

The NER-465 and NER-467 X-ray fluorescence sources have been designed and tested to qualify for ANSI N542-1977 performance classification 77C43343.

EXTERNAL RADIATION LEVELS:

NER-372

Contact to source surface	580 mR/hr/mCi
At 5 cm. from source surface	12 mR/hr/mCi
At 30 cm. from source surface	0.8 mR/hr/mCi
At 100 cm. from source surface	0.15 mR/hr/mCi

Dose rates were obtained using a calibrated Victoreen 450B ion chamber survey meter.

NER-465

Contact to source surface	23 mR/hr/mCi

SEALED SOURCE TYPE: X-Ray Fluorescence Source

At 5 cm. from source surface	7 mR/hr/mCi
At 30 cm. from source surface	0.3 mR/hr/mCi
At 100 cm. from source surface	<0.1 mR/hr/mCi

NER-465S

Contact to source surface	6.7 mR/hr/mCi
At 5 cm. from source surface	0.5 mR/hr/mCi
At 30 cm. from source surface	<0.1 mR/hr/mCi
At 100 cm. from source surface	<0.1 mR/hr/mCi

NER-467

Contact to source surface	23 mR/hr/mCi
At 5 cm. from source surface	7 mR/hr/mCi
At 30 cm. from source surface	0.3 mR/hr/mCi
At 100 cm. from source surface	<0.1 mR/hr/mCi

NER-472

Contact to source surface	24.6 mR/hr/mCi
At 5 cm. from source surface	28 mR/hr/mCi
At 30 cm. from source surface	0.7 mR/hr/mCi
At 100 cm. from source surface	0.16 mR/hr/mCi

Dose rates were measured by TLD chip exposure.

QUALITY ASSURANCE AND CONTROL:

Source construction and assembly design details are maintained by conformance to drawings 313-36, 313-37, 313-407, 33A-047, B0022606 and B002790. All components and labels are subjected to incoming inspection and testing per written procedures. Quality Control provides test data verification and/or review for the following tests: nominal activity measurement, smear

test measurement, visible defects caused by improper assembly, and inspection to ensure proper labeling of source and storage container. The sources are manufactured and distributed under the guidelines of Isotope Products Laboratories' quality assurance and control program. The California Department of Health Services has deemed the program acceptable for licensing purposes. A copy of the program is on file with the California Department of Health Services.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- The NER-372, NER-465, NER-465S, NER-467, and NER-472 X-ray fluorescence sources are capable of withstanding normal conditions of use and they shall not be subjected to environmental conditions which exceed their ANSI N542-1977 performance classifications.

- The sources shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 microcuries (185 Bq) of removable contamination.

- This registration certificate and the information contained within the references shall not be changed without the written consent of the California Department of Health Services.

- The source shall be distributed to persons specifically licensed by the U.S. Nuclear Regulatory Commission, a Licensing State or an Agreement State.

- Handling, storage, use, transfer, and disposal to be determined by the licensing authority but should be, at a minimum, in accordance with the product information pamphlet provided by the distributor.

SAFETY ANALYSIS SUMMARY:

Based on review of the Model NER-372, NER-465, NER-465S, NER-467, and NER-472 X-ray fluorescence sources, their ANSI N542-1977 classifications, and the information and test data cited below, we conclude that the sources are acceptable for specific licensing purposes.

Furthermore, we conclude that these sealed sources would be expected to maintain their containment integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

SEALED SOURCE TYPE: X-Ray Fluorescence Source

REFERENCES:

The following supporting documents for the NER-372, NER-465, NER-465S, NER-467, and NER-472 X-ray fluorescence sources are hereby incorporated by reference and are made a part of this registry document.

- DuPont Pharmaceuticals' letters dated July 29, 1999, and September 10, 1999, with enclosures thereto, and their fax dated September 2, 1999.
- DuPont Pharmaceuticals' letter dated April 30, 1999.
- DuPont Pharmaceuticals' letter dated February 15, 1999, with enclosures thereto.
- DuPont Pharmaceuticals' application dated January 16, 1997, with enclosures thereto.
- DuPont Pharmaceuticals' letters dated March 24, 1995, October 6, 1994, September 17, 1993, January 24, 1989, October 28, 1988, and September 19, 1988.
- Isotope Products Laboratories' letter July 26, 2000 with enclosures thereto.

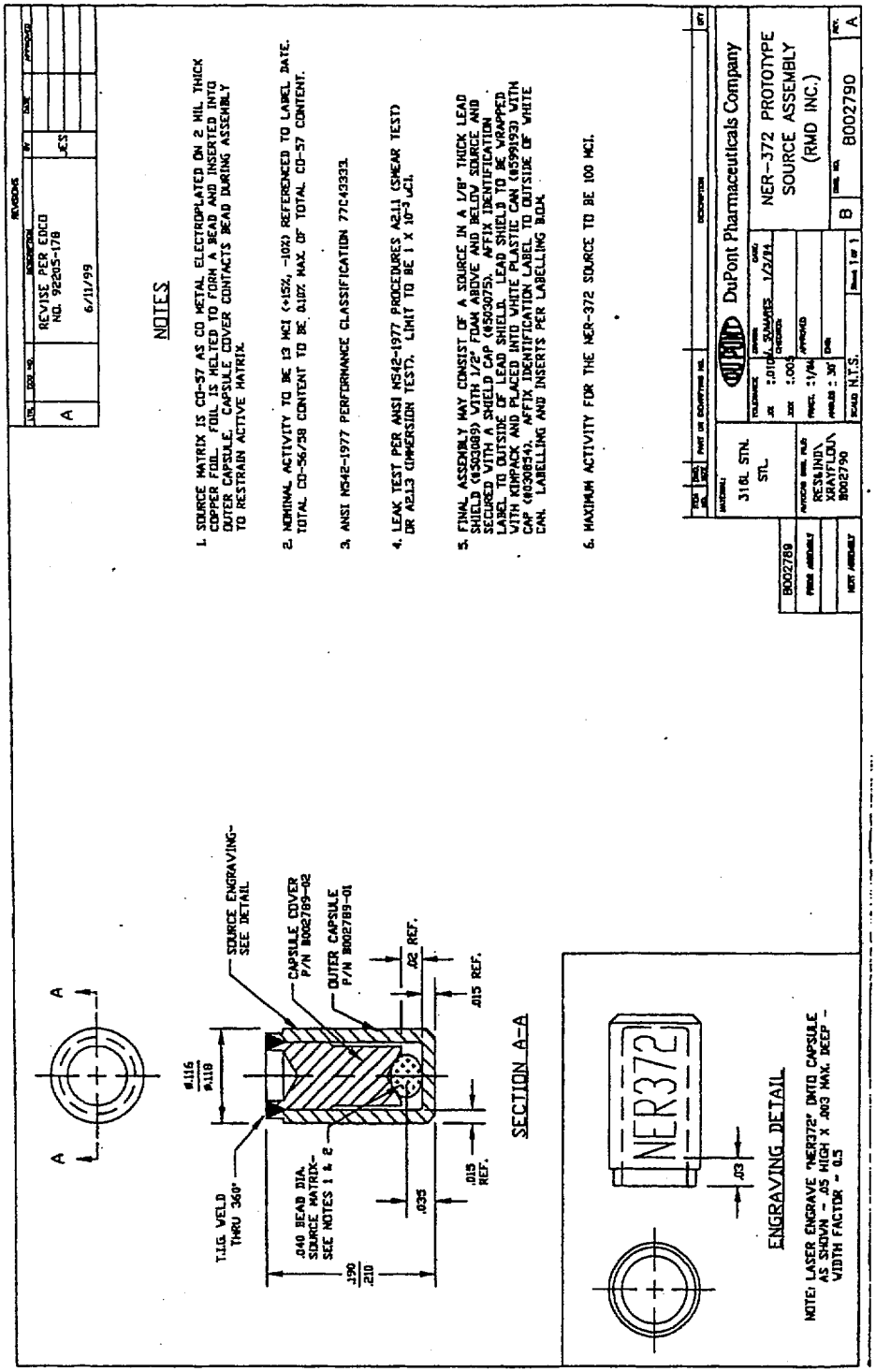
DATE: August 6, 2001 REVIEWED BY: John Rexroth

DATE: August 6, 2001 CONCURRED BY: Xiaosong Yin

ISSUING AGENCY: California Department of Health Service

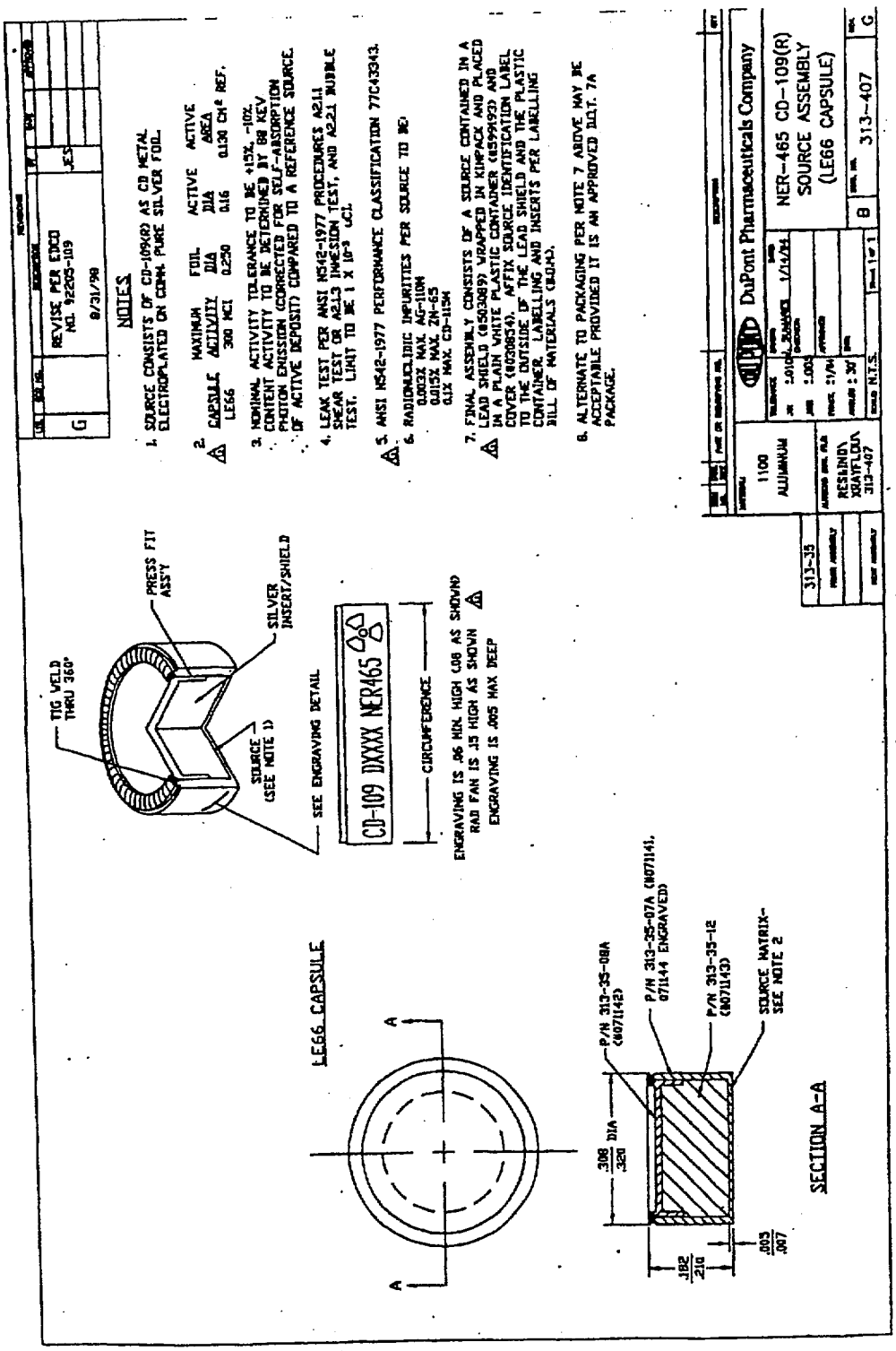
REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA-0406-S-219-S (Supercedes MA0476S108S) DATE: August 6, 2001 ATTACHMENT: 1



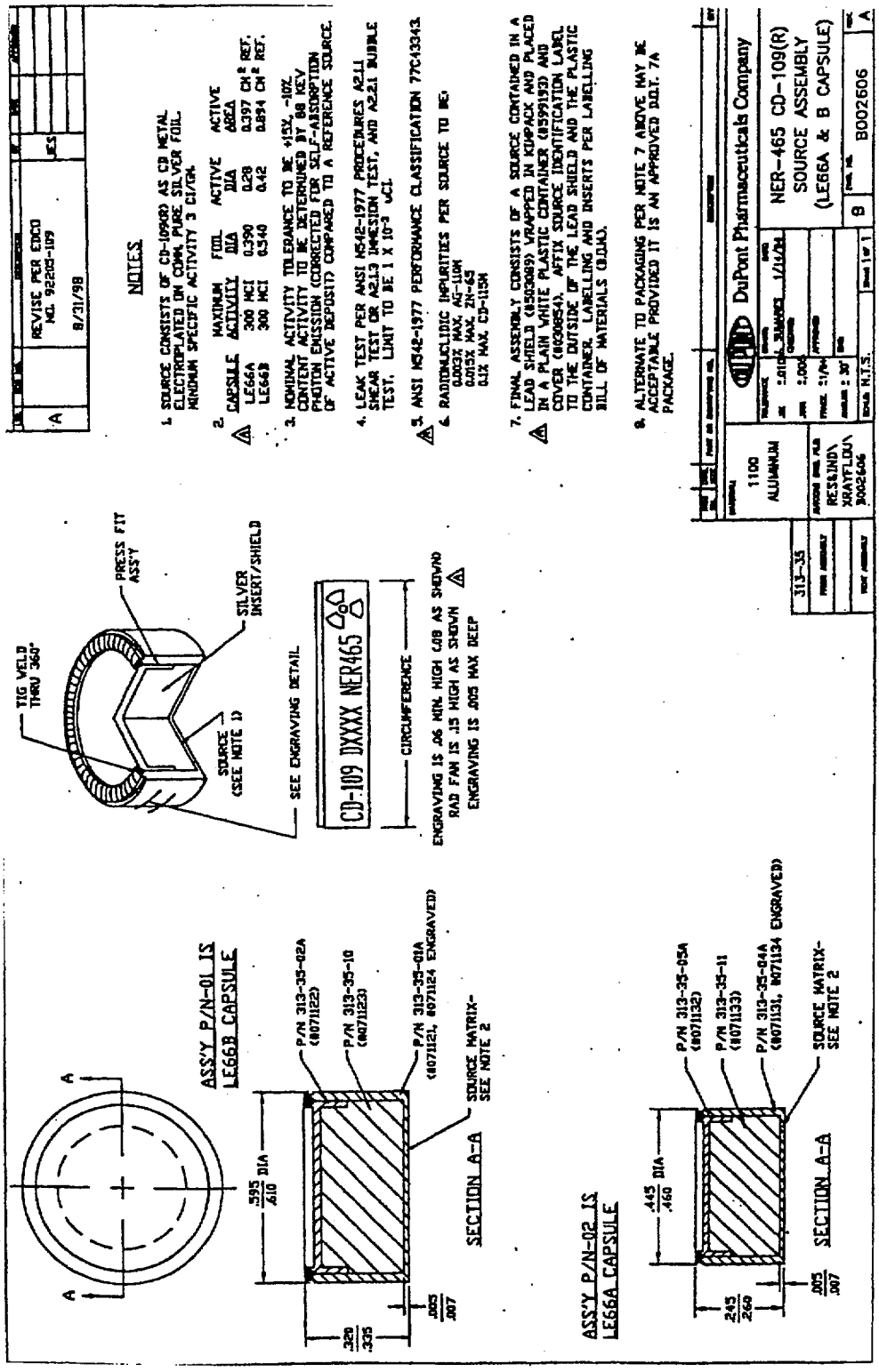
REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA-0406-S-219-S (Supercedes MA0476S108) DATE: August 6, 2001 ATTACHMENT: 2



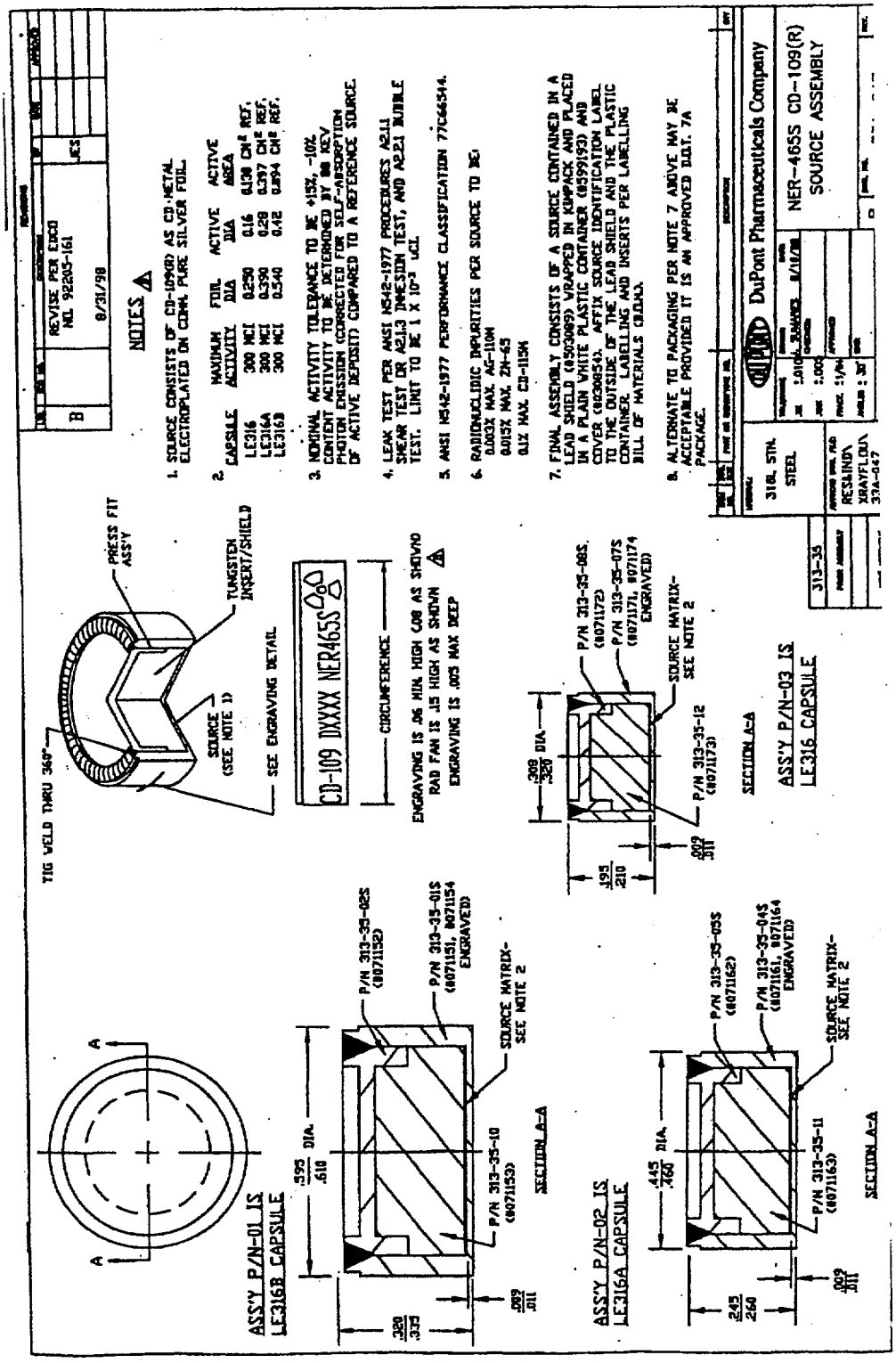
REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA-0406-S-219-S (Supercedes MA0476S108) DATE: August 6, 2001 ATTACHMENT: 3



REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA0406S219S (Supercedes MA0476S108) DATE: August 6, 2001 ATTACHMENT: 4

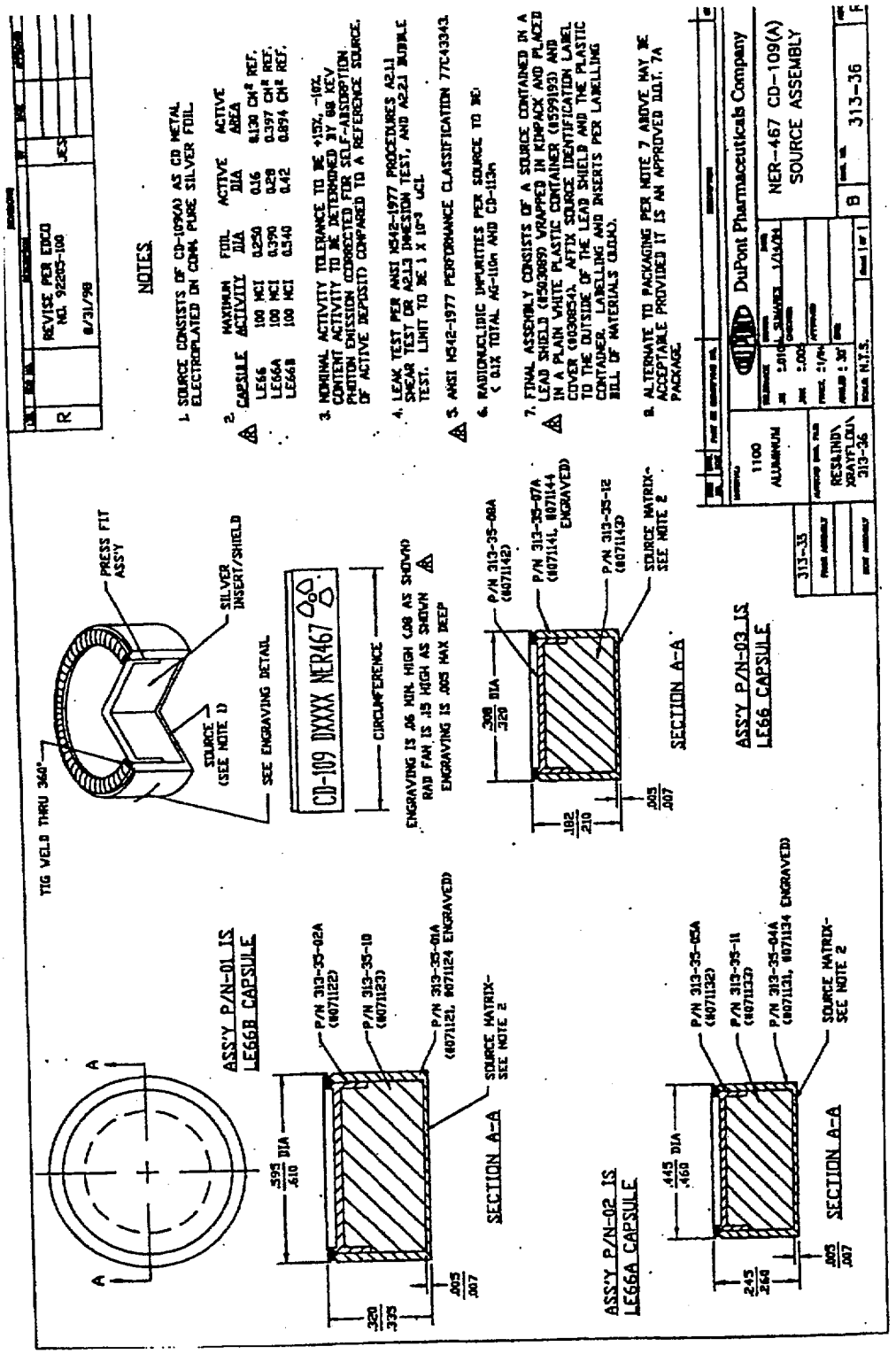


REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA0406S219S (Supercedes MA0476S108)

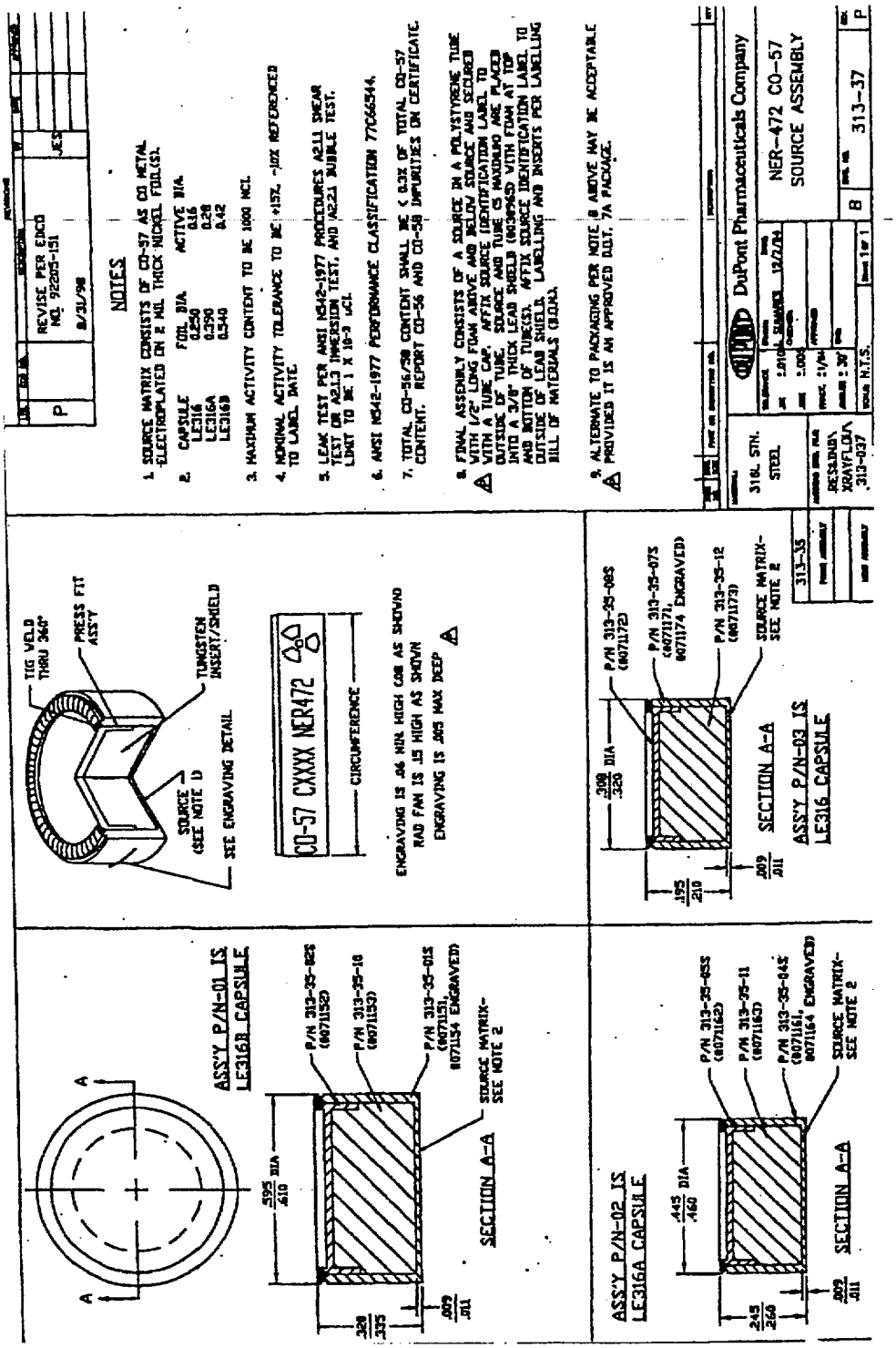
DATE: August 6, 2001

ATTACHMENT: 5



REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO.: CA0406S219S (Supercedes MA0476S108) DATE: August 6, 2001 ATTACHMENT: 6



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