

Office Memorandum • UNITED STATES GOVERNMENT

JAN 7 1959

TO : Lyall Johnson, Chief, Licensing Branch
Division of Licensing and Regulation

DATE:

FROM : Lester R. Rogers, Chief, Radiation Safety Branch
Division of Licensing and Regulation *L.R. Rogers*

SUBJECT: INSPECTION REPORT DATED AUGUST 18-19, 1958, MALLINCKRODT CHEMICAL
WORKS, ST. LOUIS 7, MISSOURI - LICENSE NO'S C-2734 AND SNM-33

SYMBOL: DLR:CMF

Conclusion:

Our review of the above report indicates that there were no items of noncompliance. This review did not include the criticality aspects of the operations.

Attorney Work Product
Prepared in Anticipation of Litigation

Curtis A. Nelson, Director, Division of
Inspection, Washington, D. C.

S. R. Sapirie, Manager
Oak Ridge Operations Office

COMPLIANCE INSPECTION REPORTS

SYMBOL: HI:DCH

Enclosed are two initial inspection reports covering the program conducted by Mallinckrodt Chemical Works at its Hematite, Missouri, plant under Source Material License No. C-2734 and Special Nuclear Material License No. SNM-33. Both reports are considered "clear" cases.

Several weak points in the licensee's nuclear safety program were noted and discussed with responsible licensee personnel who stated that measures will be taken where reasonably possible to improve their operation situation. No specific recommendations were made by Division of Inspection personnel.

Additional information concerning the results of radiation surveys and effluent monitoring is considered desirable and this item was discussed with the supervisor of the radiological safety program who stated that future records will reflect a more complete program. This item is not considered sufficient at this time to support a noncompliance citation against the licensee for inadequate surveys.

Company confidential information is contained in Exhibits A and B and in Section VII of the details. This information consists of organization and production data that the licensee prefers not to make available to the general public and competitors.

Original Signed By
Leo Dubinski

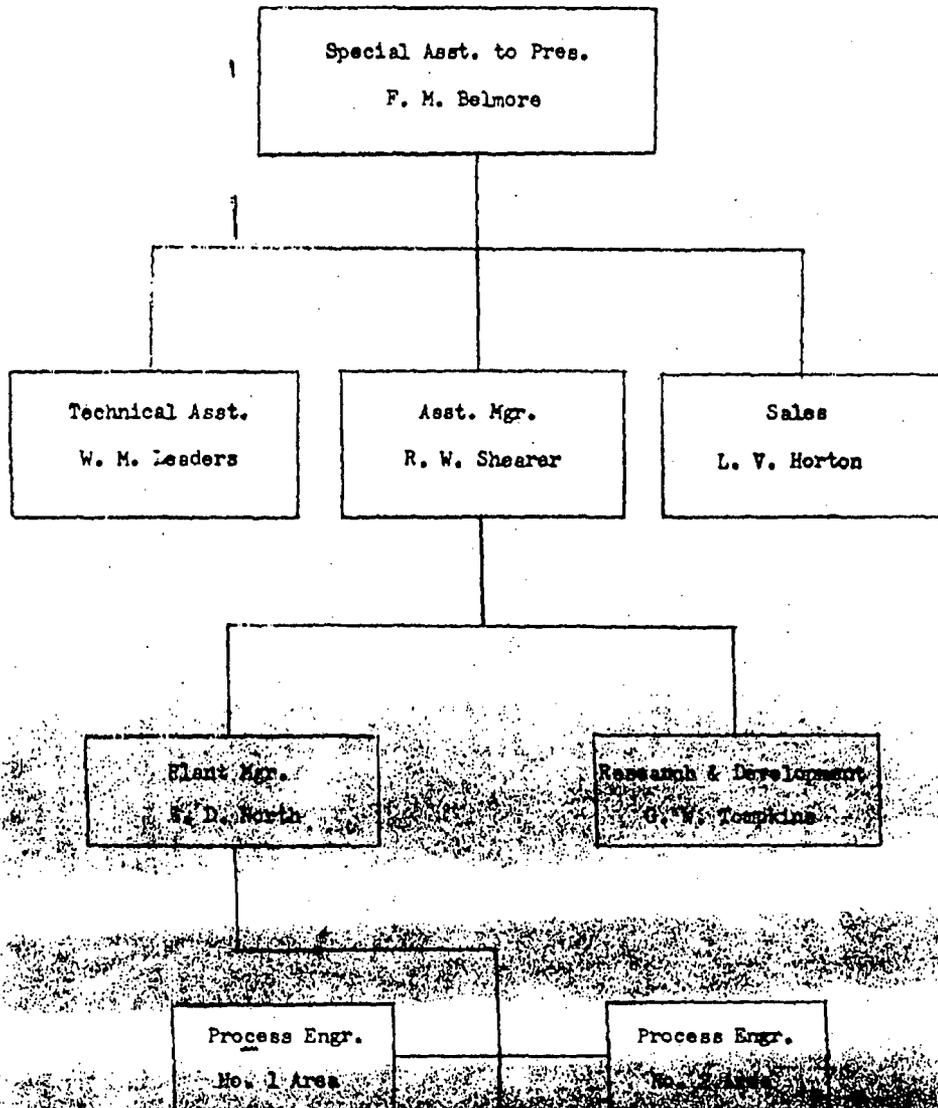
for S. R. Sapirie

Inspection Report as Listed (in copy)

RECEIVED
DIVISION OF INSPECTION
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

Organization Chart
Special Metals Division
of
Mallinckrodt Chemical Works

August 1958



COMPLIANCE INSPECTION REPORT

1. Name and address of licensee Mallinckrodt Chemical Works Second & Mallinckrodt Streets St. Louis 7, Missouri	2. Date of inspection August 18 and 19, 1958 3. Type of inspection Initial 4. 10 CFR Part(s) applicable 20 and 40
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5. License number(s), issue and expiration dates, scope and conditions (including amendments)

License No.	Date	Expiration	Scope and Conditions
SRM-33, as amended	4-28-58	7-1-61	(b)(4)

6. Inspection findings (and items of noncompliance)

(b)(4)

7. Date of last previous inspection: _____

8. Is "Company Confidential" information contained in this report? Yes No
 (Specify page(s) and paragraph(s)) _____



Information in this record was deleted in accordance with the Freedom of Information Act Exemptions 2010-0157

EX. 4

EX. 4

DETAILS

I. GENERAL INFORMATION

9. (b)(4)

10.

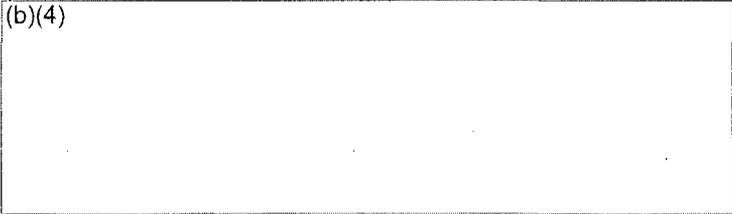
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FOIA/PA 2010-0157

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ET. 4

B. License No. SNM-33

(1) (b)(4)

(2)

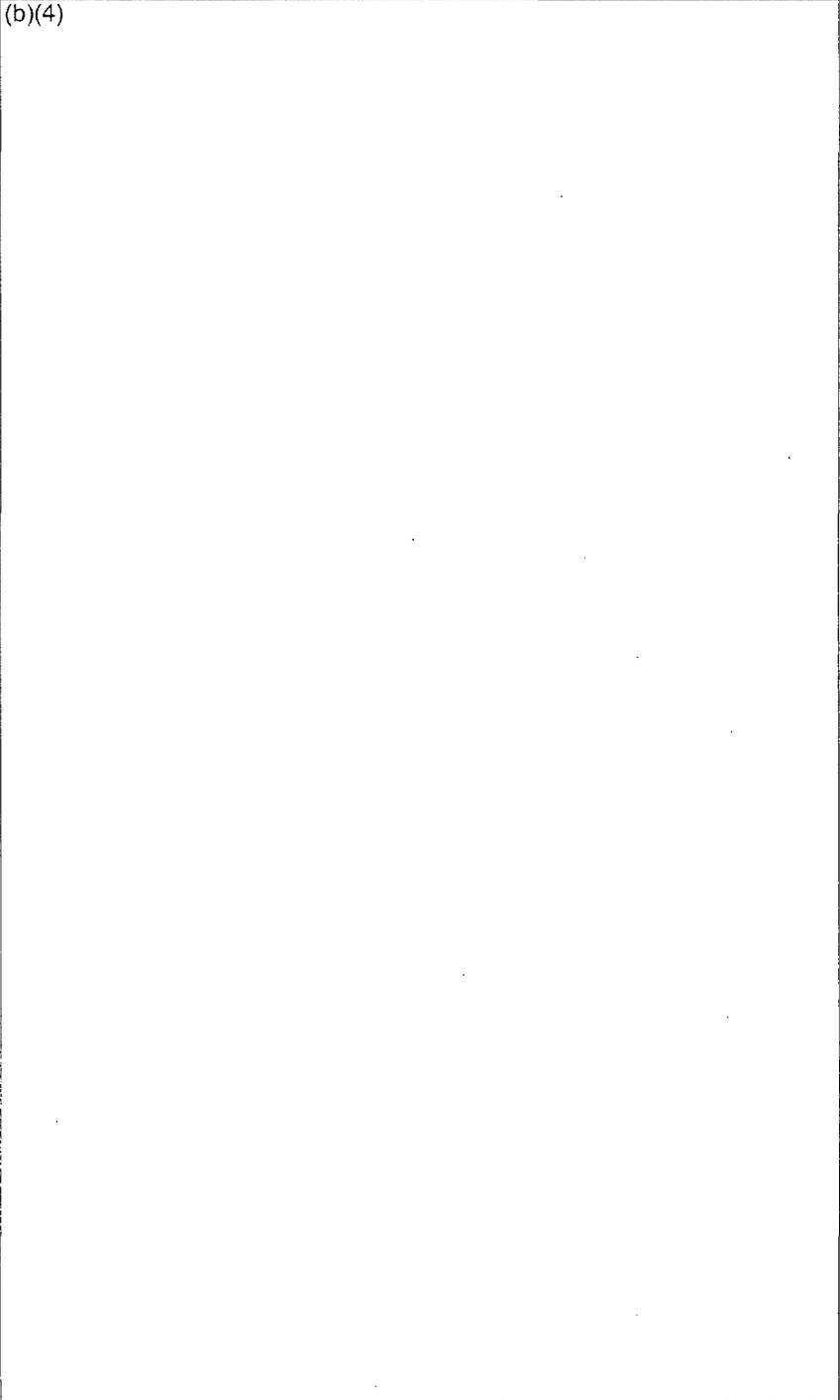
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12.

13.

14.

II. LICENSEE BACKGROUND

15. (b)(4)

III. ORGANIZATION

16. (b)(4)

17.

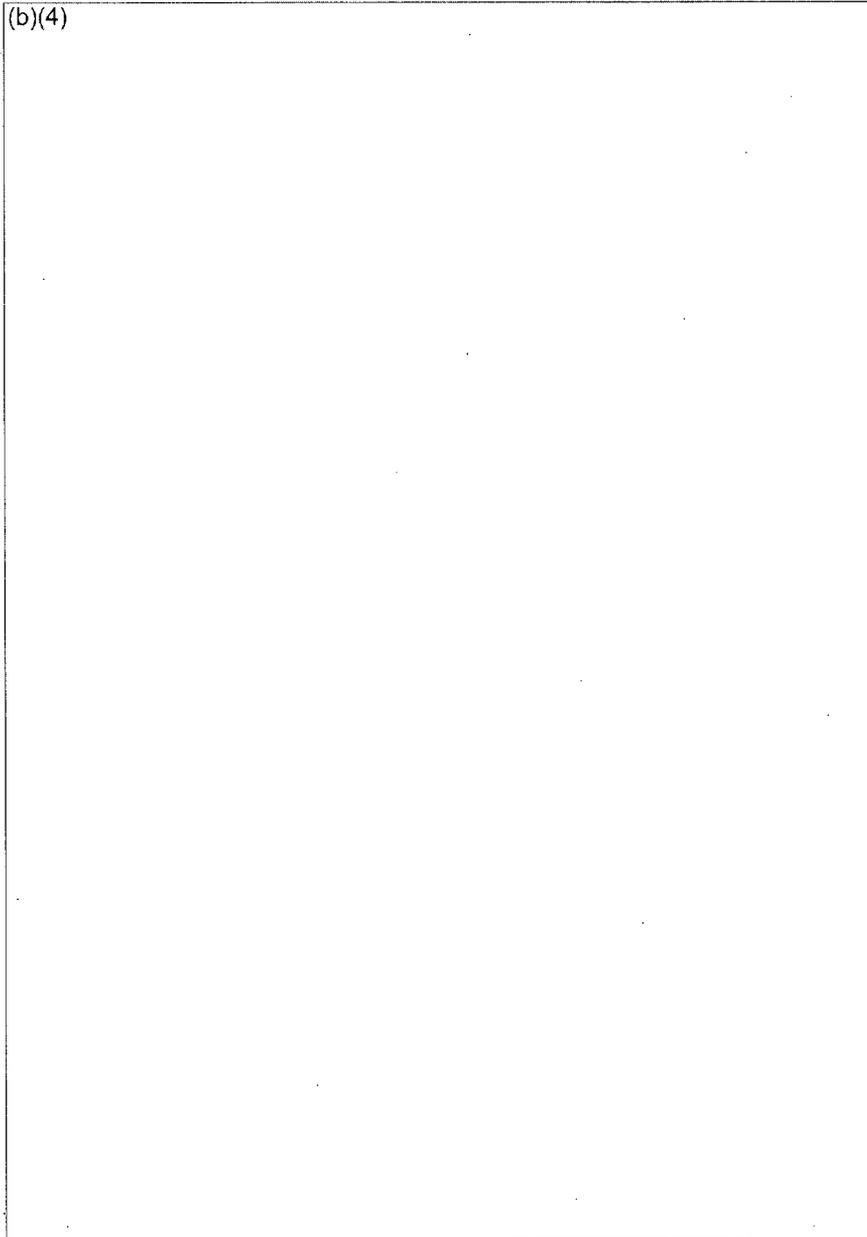
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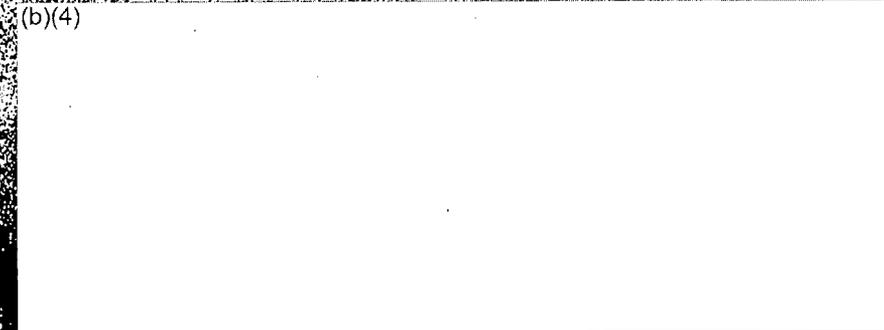
16.

(b)(4)



FACILITIES

17. (b)(4)



EX 4

EX 4

(b)(4)

20.

21. (b)(3):42 U.S.C. 2167,(b)(4)

22. (b)(4)

EX. 4

EX. 3, 4

EX. 4

(b)(4)

23.

V. RADIOLOGICAL SAFETY PROGRAM

24. The over-all radiological safety program of the Hematite plant is under the direct supervision of J. W. Miller, Supervisor of the Industrial Hygiene Department, who reports to Mr. J. G. Moore, Vice-President in charge of Operations. Mr. Miller holds a B.S. degree in chemistry and has had several years' experience in the licensee's Uranium Division's Health Division covering similar normal uranium operations. He is by training both a Health Physicist and Industrial Hygienist and is responsible for all of the licensee's commercial operations, including the Hematite plant. He is assisted by two technicians. Control of factors affecting criticality are not part of the radiological safety program but are handled separately by Dr. Leaders and Dr. North with Dr. Leaders having the prime responsibility.

25. Personnel monitoring is conducted by routine use of film badges, bio-assays, and physical examinations. Film badges are obtained from St. John X-Ray Laboratory in Califon, New Jersey, and are distributed to personnel on a frequency determined by individual job assignment. Permanent operating personnel at the Hematite plant are monitored on a weekly basis while rotating personnel are monitored monthly. Complete individual exposure records and summaries are maintained on all employees and were reviewed. The average exposure of Hematite plant personnel during the past year, as indicated by the records, was 80 mrad due to beta radiation and 36 mrad due to gamma radiation. The maximum single six months accumulative exposure recorded as due to beta was 2525 mrad while the maximum due to gammas was 380 mrad. No single weekly exposure in excess of the permissible weekly exposure was noted. Film badges are worn by all persons entering the Hematite plant and are distributed and collected by the guard at the door.

Clinical and radiological urinalyses are made routinely with the frequencies determined by individual job assignment. The minimum is one analysis per year while the maximum number of routine analysis per person is four per year. The radiological urinalyses are performed by a commercial organization, Nuclear Service and Engineering Corporation, located in Pittsburgh, Pennsylvania. This service was formerly supplied by the Tracerlab Corporation. Results are reported in disintegrations per minute per liter (~ 24 hour sample) with 46 d/m/l established as tolerance. The maximum single exposure, as indicated by the licensee's records, was 37.4 d/m/l while the average during the past year was of the order of 5 d/m/l. Pre-employment physicals are given all employees.

Protective clothing, including shoes, are provided and laundered by the company in their own laundry facility. A divided change room is used by employees to prevent street clothing from being soiled with areas where they are changing.

EX. 4

26. The licensee's airborne radioactivity control program operates on the philosophy that a correctly designed installation will control the material in such a manner that the material does not become a health hazard to the employee who operates the installation. Thus, maximum attention is given to adequate engineering design and to the development of standard operating procedures which will provide acceptable control. Dust studies (general and breathing zone) of individual jobs are made to determine an operator's exposure to airborne material while carrying out his normal duties. Based upon the dust studies, changes are made to achieve the lowest practical exposure. Concentrations greater than the plant's maximum permissible concentration ($70 \text{ } \mu\text{d}/\text{m}^3$) during some operations may be permitted provided the weighted average for the daily job does not exceed one M.P.C. In general, design and operation are aimed toward an upper limit of $1/10$ M.P.C. Once a job has been evaluated, it is assumed that the exposure of each operator on that job will be approximately the same. The exposure value for that operation is then charged to each person who performs the operation. A complete job history is maintained on each employee, and a re-study of each operation is made on a periodic basis to establish an up-to-date exposure value. High urinalysis results and film badge reports also require a re-evaluation of an operation.

Air samples have been taken on the roof of the main building with the maximum results noted being $1 \times 10^{-12} \text{ } \mu\text{c}/\text{ml}$ of air. Samples have not in the past been taken outside of the fence or at the outer edge of the property line, but plans are being developed to do so in the near future.

All dusty operations are enclosed in hoods equipped with double filters, and, in addition, all personnel are provided with face masks which are worn around the neck when working with a dust generating process even though the process is enclosed in a hood.

Complete air surveys are made of the entire plant at least twice a year and some sampling is done in the plant at least one week out of every month; however, no full-time Health Physicist is assigned to the Hematite plant.

27. Area monitoring of the entire plant, using survey meters, is done at least four times a year formally and more often informally. The smear technique for detecting contamination is not used. The results of the four formal surveys are recorded on floor plans which are filed in Mr. Miller's office. The records available were reviewed with no significant radiation levels noted; however, it was pointed out to Mr. Miller that both his area monitoring and air sampling survey records were considered to be close to marginal since they did not present a complete picture of the Hematite operation. He stated that the program would be expanded in the future in order to fill in the gaps noted in his present records. It was also pointed out that instrument surveys are not always adequate for revealing low level alpha contamination and that since he had counting equipment available he might want to evaluate the use of smears for that purpose.

28. Instrumentation for the radiological safety program consists of:

Medical Association, Vol. 3, June, 1954, p. 100

Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

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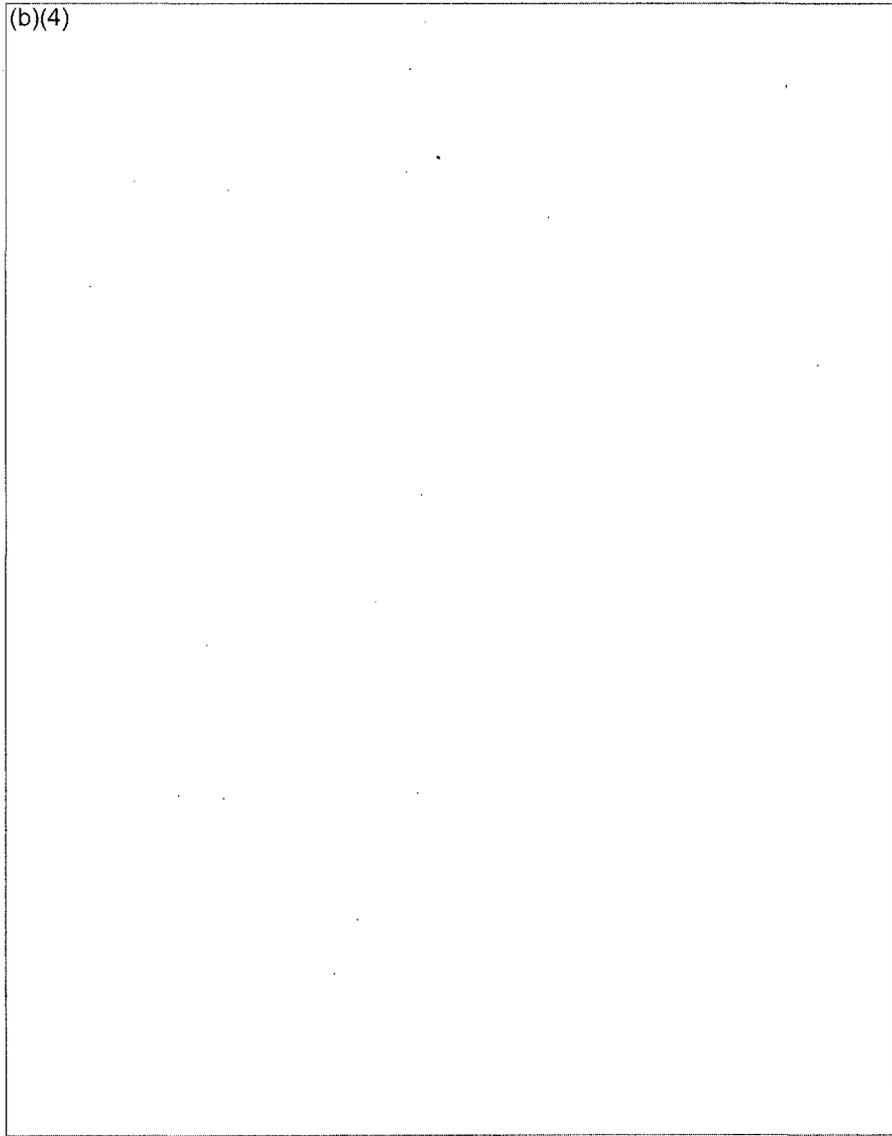
Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

Journal of the American Medical Association, Vol. 157, No. 1, July 1954, p. 100

29. (b)(4)



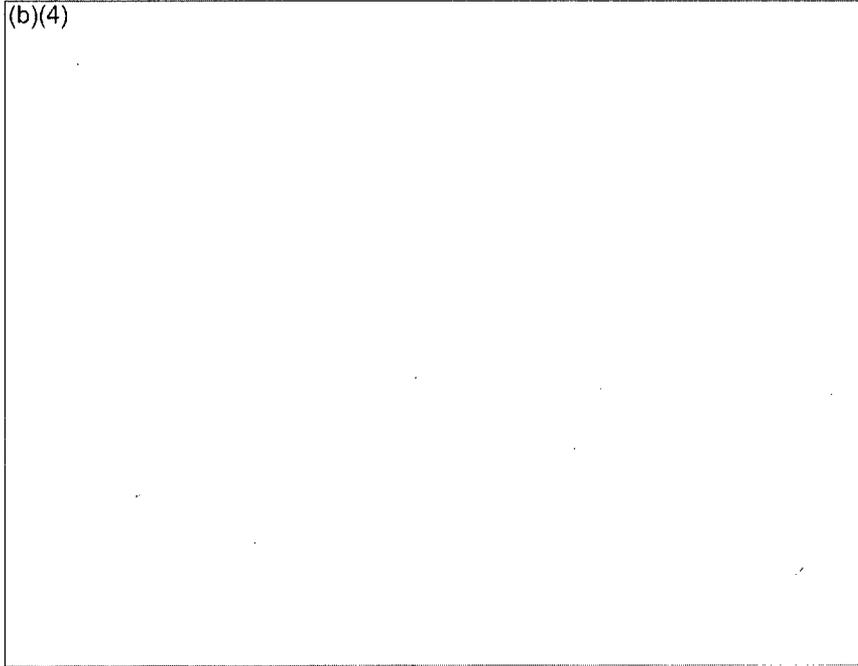
30. Shipping containers are monitored by a Health Physicist to assure compliance with ICC regulations and all containers are posted externally with ICC type labels.
31. Regulation type posting is in use throughout the plant including each individual container of material. A color coding system has been combined with container posting which identifies the enrichment of the material in the containers.
32. As a result of the Oak Ridge (Y-12) criticality incident, the licensee is now in the process of obtaining a radiation detection and alarm system that will be installed at several points throughout the plant. A system designed by the Radiation Control Laboratory is currently being tested.

EX 4

33. Radiological safety education and instruction of personnel has been conducted on a limited scale since most of the operating personnel now employed have worked either in the company's Uranium Division or the Euxenite Plant. Several lectures are said to have been given by Dr. North on a non-routine basis that were concerned with housekeeping items observed by him during tours through the plant. Written instructions consist of one four-page memorandum entitled "Health Procedures - Hematite Plant" written by Mr. Miller and distributed to top supervision. Copies were observed posted on bulletin boards located at several prominent points within the main building.

VI. PROCESSES

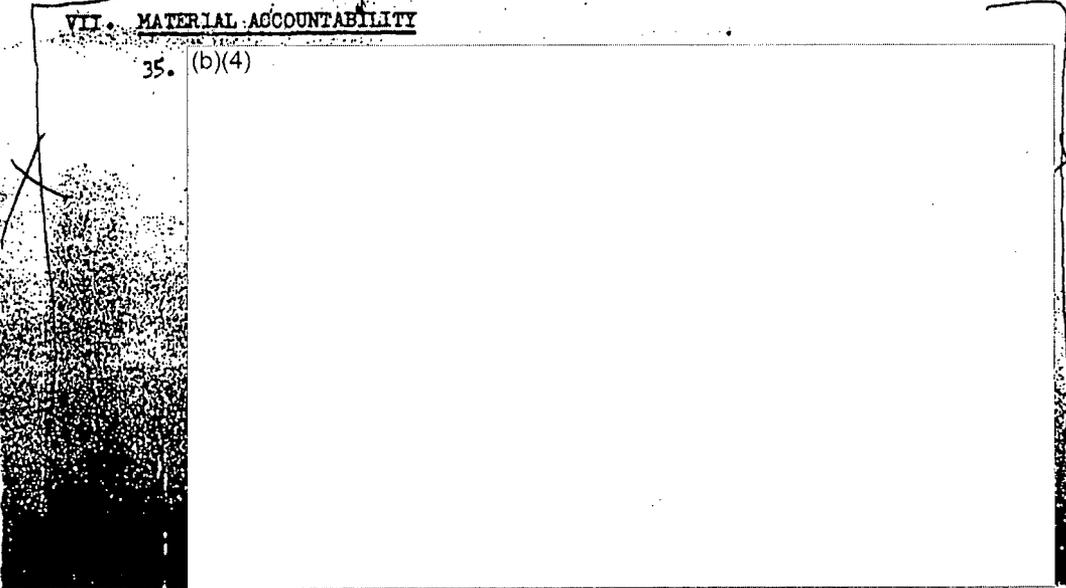
34. (b)(4)



EX-4

VII. MATERIAL ACCOUNTABILITY

35. (b)(4)



EX-4

1. Name of licensee
 Mallinckrodt, Inc.
 License No. SM-33
 License No. SM-33
 License No. SM-33

2. License number, date of issue, and expiration date
 License No. SM-33
 6-27-58 11-1-58
 (last renewal)

(b)(4)

(continued on reverse side)

6. Inspection findings (and items of noncompliance)

The licensee's activities that utilize source material obtained under this license are carried out in the same facilities that are used for a program involving special nuclear material obtained by Mallinckrodt under License No. SM-33. Both programs are confined to one plant located in Hematite, Missouri, which is devoted exclusively to commercial processing and production of uranium compounds and metals. No thorium has been procured under this license to date but may be obtained at some future date. The licensee's plant is staffed with qualified technical personnel, the majority of whom have had previous experience working with source grade material. A radiological safety program is in effect under the supervision of an experienced person who is both an Industrial Hygienist and a Health Physicist by training. Adequate radiation detection and monitoring devices are available and in operating condition. Personnel monitoring is conducted with the routine use of film badge and bio-assays services supplied by private commercial organizations. In addition, pre-employment and routine physical examinations are given all employees. Routine surveys are made to determine the levels of airborne radioactivity, surface contamination, levels of radiation in process areas and the concentrations of activity in plant effluents. A review of the survey records revealed no significant levels in excess of the permissible tolerances for controlled or uncontrolled areas. The records maintained did indicate that additional surveys and survey information would be desirable in order to give a more complete picture of the plant's radiological safety program. Licensee management stated that this will be done

(continued on reverse side)

7. Date of last previous inspection
 None

8. Is "Company Confidential" information contained in this report? Yes No
 (Specify page(s) and paragraph(s))
 Section VII of the Details and Exhibits A and B

DISTRIBUTION:

Division of Inspection
 Washington, D. C. (2)

Donald C. Hubbard
 Donald C. Hubbard
 (Inspector)

Copy to DER 12-12-58

Approved by: *Leo Dubinski*
 Leo Dubinski
 Oak Ridge Operations Office
 (Operations office)

See Paragraphs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

December 1, 1958

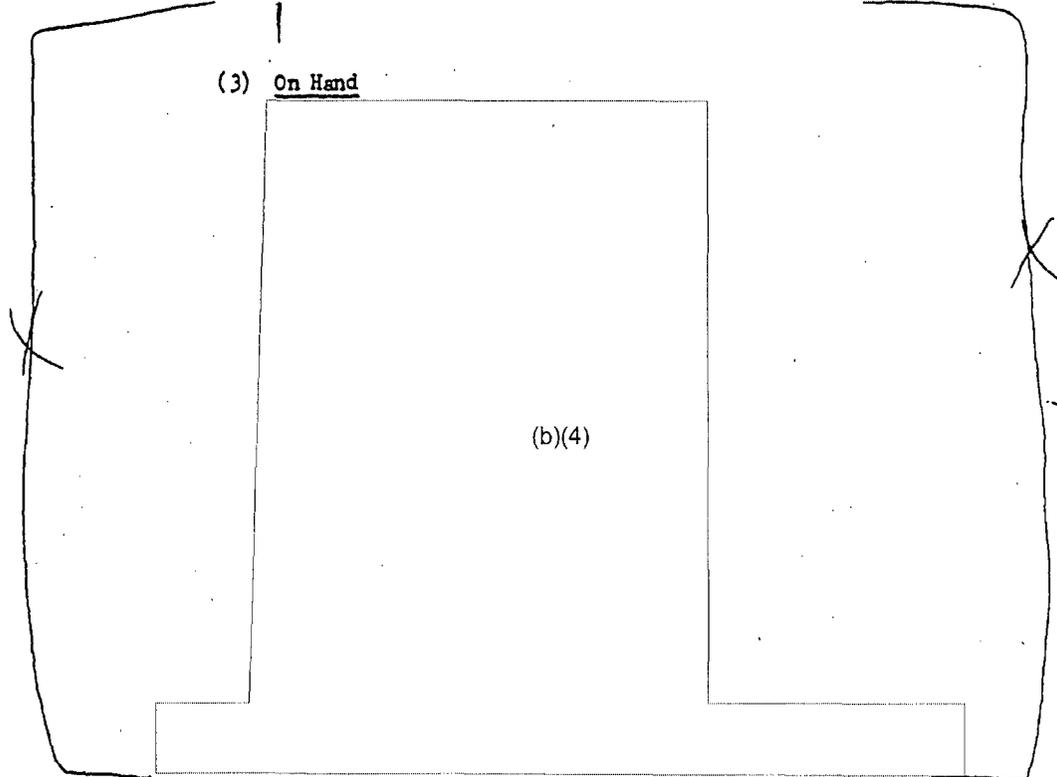
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RECOMMENDATIONS SHOULD BE SET FORTH IN SEPARATE LETTERS

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ex. 4



VIII. CRITICALITY CONTROL

37. The development of a new process prior to putting it into full scale production is carried out in the early stages by the Research and Development Group which devises the chemical flow sheet to be used. The chemical flow sheet is reviewed jointly by the Technical Director, the Production Group, and the Research and Development Group. Following this review the Technical Director, with consultation from Oak Ridge and Rocky Flats personnel, reviews the proposed process from a criticality viewpoint. After the criticality study has been completed, equipment is obtained or designed in accordance with the findings of the Technical Director. The process equipment is then fabricated in the form of a license application to the Division of Safety and Health. After approval has been obtained, the equipment is installed and several test runs are made using source grade material. During these tests the wrinkles are ironed out and an operator's process flow sheet is developed and written up.

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Exemptions 2010-0157
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the procedures and standards were undergoing review and would be revised to conform with experience gained during the past months.

38. Once a process is turned over to the Production Group, the foremen and process engineers assume primary responsibility to Dr. North for monitoring the process to ensure that the operations are carried out according to the developed procedures. These men are aware of the criticality limitations for each step of the process and for each piece of equipment and are responsible for seeing that the operators do not exceed them. The foremen and engineers are continuously circulating in the areas during the production and handling of source and enriched grades of uranium. Operator process flow sheets are reviewed at least once daily to ascertain that procedures are being followed. All operators are said to have been instructed to contact the foremen or engineers if they are uncertain about any phase of their work or if there appears to be an unusual situation arising.

39. (b)(4)

40.

EX. 4

(b)(4)

After the operations had been reviewed, a conference was held with Dr. North, Plant Manager; Dr. Leaders, Technical Director; and Mr. Miller, Industrial Hygiene Supervisor. The specific items noted above were discussed in some detail and the inspection representatives pointed out that by and large the operation is considered as being well designed and responsibly supervised. However, it was noted that, in the opinion of the Division of Inspection, reliance upon individuals at certain points in the process presents a potential hazard and that improvement in operational safety could possibly be realized by further development of procedure and procedural checks. The subject of divided responsibility in regard to research and development activities was mentioned, particularly since it had been observed as noted in section C above that certain questionable procedures were being followed by research personnel. It is the understanding of the Division of Inspection that Mallinckrodt management is taking steps to improve the situation.

IX. SUMMARY

41. (b)(4)

42. Plant supervision appears to be composed of experienced and qualified personnel who are interested in conducting safe nuclear and radiological programs in conjunction with the licensee's activities. The radiological safety program under Mr. Miller's direction is functioning effectively but additional survey and effluent monitoring information appears to be desirable. A more complete program covering these points is said to be planned for the future. The nuclear safety program under the direction of Dr. Leaders, while adequate from the equipment design point of view, does involve activities at several points in which there is reliance upon individuals to carry out procedures. Any reduction in the procedures which would limit reliance on individuals would further improve the over-all safety of the operation. Management intends to continuously review these matters and make improvements where reasonably possible.