UNITED STATES

#### NUCLEAR REGULATORY COMMISSION

REGIONI

478 ALLENDALE ROAD

KING OF PRUSSIA, PENNSYLVANIA 19408

JAN 1 1 1990

Docket No. 50-423 File No. RI-89-A-0052



This letter is in response to the following issues that you discussed with us on April 22 and May 11, 1989:

-- Concrete used to pour the fuel building exter in walls was substandard because of a failed slump test.

-- Concrete for the fuel building was poured with forms missing causing a bulge in an exterior wall.

-- Geologic faults exist under the containment structure.

-- Contamination by radon gas should have been reported by the licensee.

During the construction of Millstone Unit 3, numerous concrete pourings were witnessed by NRC inspectors with no inadequacies identified. A copy of an NRC inspection regarding concrete pouring for the containment structure is included as Attachment 1 for your review. Your specific concern over the acceptability of concrete which failed a slump test was reviewed and determined not significant since a failed slump test does not necessarily infer a reduced concrete structural strength. Final concrete breaking strength is determined through dynamic and static load breaking tests which are independent of the slump test.

Although the pouring of concrete with forms missing is not a good industry practice, the bulge you referred to in the fuel building wall would not reduce the strength of the rebar/concrete. Therefore, this issue is not safety significant and no further action is planned on this item.

The location of geologic faults at the Millstone site have been identified through extensive site drilling and excavation. These faults were documented in the Millstone Unit 3 Final Safety Analysis Report (FSAR) which was reviewed by the NRC. None of the faults were identified as a safety concern due to their age and inactivity. A copy of the chapter in the FSAR that identifies the location of the faults is enclosed for your review as Attachment 2.

Radon gas emissions from granite bedrock that collect in enclosed areas in nuclear power plants, as well as private homes, have long been a source of nuisance radiation alarms at operating nuclear plants. The gas is electrostatically charged and naturally clings to materials of opposite charge, such as polyester clothing. Radon gas from bedrock materials is short lived and decays rapidly, therefore no significant radiation exposure is received by an individual over an eight hour day/forty hour work week. The NRC does not require a licensee to report the contamination of individuals by these naturally occurring radioactive substances.

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The NRC appreciates you informing us of your concerns, and we feel that our actions have been responsive to them. If you have any further questions regarding these matters, you may call me collect at (215) 337-5120.

Sincerely,

Donald R. Haverkamp, Objet Reactor Projects Section 4A Division of Reactor Projects

Attachments: Attachment 1, Inspection Report 81-09 Attachment 2, Millstone Unit 3 FSAR Chapter 2 ATTACHMENT 1

Inspection Report No. 50-423/81-09

# U.S. NUCLEAR REGULATORY COMMISSION OFFICE OF INSPECTION AND ENFORCEMENT

#### Region I

Report No.	50-423/81-09	
Docket No.	50-423	
License No.	CPPR-113 Priority Category A	
Licensee:	Northeast Nuclear Energy Company	
	P. O. Box 270	
	Hartford, Connecticut	
Facility Nam	e: Millstone, Unit 3	
Inspection a	t: Waterford, Connecticut	
Inspection c	onducted: July 27-31, 1981	
Inspectors:	onducted: July 27-31, 1981  L. E. July  Reactor Inspector	9/9/8/ date signed
Approved by:	8. 6. Jugo	9/9/81
	2. E. Tripd, Chief, Materials and Process Section, Engineering Inspection Branch	date signed

Inspection Summary:
Inspection on July 27-31, 1981 (Report No. 50-42),81-09)
Areas Inspected: An unannounced inspection by a regional based inspector of the areas of concrete placement, Batch Plant, and design change control of concrete specifications. The inspection involved 37 inspector-hours onsite by one regional based inspector.
Results: No items of noncompliance were identified in two areas. One item of noncompliance was identified in the area of design control - failure to follow procedures.

Region I Form 12 (Rev. April 77)

IMP

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#### DETAILS

## Persons Contacted

#### NUSCO

\* R. E. Busch, Project Manager

\* K. W. Gray, Supervisor - Construction QA \* R. A. Hastings, Tech A - Construction QA

\* D. O. Nordquist, Supervisor - Design and Operations \* S. Orefice. Superintendent - New Site Construction

\* T. F. Sullivan, Resident Electrical Engineer

#### Stone and Webster Engineering Corporation

\* J. S. Carty, Head SEO

\* P. A. Gagel, Program Administrator - QA

5. Golob, Field Engineer

J. A. Jenson, SEO Lead Power Engineer J. Kappas, Superintendent - Construction

S. Misenti, FOC Inspector W. D. Miller, Field QC

S. D. Morris, Senior Engineer, FQC

\* A. M. Prusi, Resident Engineer

M. Sinha, Structural Engineer - SEO \* G. G. Turner, Superintendent, FQC

J. Apostilitisa. OFC Batch Plant Inspector W. Thompson, FOC Inspector

\* F. K. Sullivan, Sr. Resident Engineer

# U. S. Nuclear Regulatory Commission

\* J. C. Mattia, Sr. Resident Inspector

\* denotes persons attending exit interview.

# Plant Tour

The inspector performed a walk-through tour of the plant site to assess general conformance to work procedures and good construction practices in the area of concrete placement, curing, and structural steel erection. The inspector also observed work in progress and preparations for concrete placement of the dome section of the containment exterior wall. Also, the inspector interviewed craft, engineering, and quality control personnel available in the work area. Where more detailed inspection of an area was conducted, the inspection scope and findings are described in other paragraphs of this report.

No items of noncompliance were identified.

#### Changes to Concrete Specifications

The inspector reviewed specifications, procedures and Engineering Design and Coordination Reports (E&DCR) applicable to those concrete specifications. and held discussions with cognizant licensee and AE/Constructor personnel. The review of documentation and discussions were to determine the adequacy of the technical requirements specified and control exercised over the changes made in the requirements. The following documents were reviewed:

S&W Specification #C-261, May 2, 1973, "Mixing and Delivery of Concrete"

- Addenda: 1. November 30, 1973
  - 2. April 19, 1974
  - 3. July 8, 1974
  - 4. December 31, 1974
- S&W Specification #C-282, April 17, 1974, "Concrete Testing Services"

- Addenda: 1. July 10, 1974
  - 2. October 16, 1974
  - 3. December 6, 1974
  - 4. August 19, 1975
  - 5. May 17, 1977
- S&W Specification #C-999, Revision 2, January 16, 1981, "Placing Concrete and Reinforcing Steel"
- S&W Engineering Assurance Procedure, EAP 6.3, Revision 3, "Preparation, Review, Approval and Control of E&DCRs"
- S&W Engineering Assurance Procedure, EAP 6.5, Revision 0, "Preparation, Review, Approval and Control of Engineering and Design Coordination Reports (E&DCRs) - Computerized Logging and Tracking System"
- Millstone Nuclear Power Station, Unit 3, PSAR, Chapter 17, Sections 17.1.1.3, 17.1.2.5 and 17.1.2.5
- S&W "E&DCR and N&D Specification Change Record" for Specifications 2199-142-999

#### E&DCRs:

F-S-3257	F-S-2002	P=S=3452
F-S-3059	F=S=193	P-S-2136
F-S-3010	F+S-176	P-S-1932
F-S-2959	F-5-97	P-S-2286
F-S-2216	F-S-91	
F-S-2123	F-S-74	

F-5-4F29	F+S+4022	P-S-3307
F-S-4551	F=S=3668	P-S-3302
F=S=4416	F-S-3468	P-S-3278
F-S-4373	P-S-3427	PS-S-1136
F-S-4152	P-S-3385	PS-S-1074
F-S-4081	P-S-3380	PS-S-1004
F-S-4027	P-S-3310	F=S=2683

S&W Computer Log: "Unincorporated E&DCR/VIR Document Changes", July 16, 1981

Based on the review of above records and discussions with cognizant personne), the inspector determined that the changes to the concrete specifications were controlled by the E&DCR system. However, the inspector also observed that E&DCRs, in many cases, had been issued to change and/or impose further requirements contained in other E&DCRs by reference only. As an example, E&DCR #F-S-2683 was issued for providing concrete repair procedures not contained in Specification C-999. This E&DCR was not required to be incorporated in the specification, and was designated to be "for information only". However, the repair procedure was generic. and was used extensively onsite for concrete repairs. The Specification C-999 was revised in January, 1981, but the requirements of E&DCR F-S-2683 were not incorporated in the specification because the E&DCR was "for information only". On February 24, 1981, another E&DCR PS-S-1004 was initiated to revive the old E&DCR F-S-2683 by reference, because F-S-2683 had become obsolete due to the specification revision. S&W EAP 6.3, Revision 3, and EAP 6.5, Revision O, which established and controlled the design change system did not provide for such use of E&DCRs. Procedure EAP 6.3, Revision 3, which was applicable at the time of the issuance of E&DCR PS-S-1004 did not provide for such use as incorporating an "information only" E&DCR into the specification by reference. Section 5.0 of EAP 6.3 which described the special uses of E&DCRs provided only for revision and/or cancellation of E&DCRs. It did not provide for reviving an obsolete document by a new E&DCR by reference only.

Furthermore, the same procedure (EAP 6.3, Revision 3, Section 3.0), also requires that changes to specification requirements would be entered in the "E&DCR and N&D Specification Change Record" against the specification. However, the inspector observed that as of July 30, 1981 the "E&DCR and N&D Specification Change Record" for Specification C-999 did not accurately reflect the status of E&DCRs against above specification. Specifically, E&DCRs F-S-2640 and F-S-3374 had been incorporated in the Revision #2 of the Specification C-999 issued in January, 1981; however, the "E&DCR and N&D Specification Change Record" for the above specification listed these two E&DCRs as "open" and still to be incorporated.

The above are examples of violation of 10 CFR 50, Appendix B, Criterion V. (81-09-01)

## 4. Safety Related Concrete Placement

The inspector witnessed the placement of concrete in the exterior wall of containment (Placement #C-3762. Containment Dome, Elev. 116'8" South half) for an independent evaluation of work performance, and to ascertain if the placement activities were being accomplished in accordance with project procedures and applicable codes. In addition to the personal observation of the placement, the following documents were reviewed:

- -- S&W Specification C-999, Revision 2, "Placing Concrete and Reinforcing Steel".
- -- S&W Specification C-281, May 2, 1973, "Mixing and Delivery of Concrete" with Addenda 1, 2, 3, 4, and 5.
- -- Concrete Batch Delivery Tickets for the concrete delivered to the placement.

By review of documentation and personal observation, the inspector determined as follows:

- a. Forms were properly secured and clean.
- b. Rebars and other embedments were properly secured, free of excessive rust and concrete, and proper clearance was maintained.
- c. Preplacement inspection was completed before the release of placement.
- d. Proper concrete mix was specified on the "pour card" and was delivered at the placement.
- e. Duration of concrete mixing/agitation in transport trucks, placing equipment, and required testing of concrete were adequately controlled and met the project procedures.
- f. Adequate crew and procedures were used to place and consolidate the concrete in forms. Chutes were utilized to prevent excessive free fall.
- g. The inspection at the point of placement was adequate.

Based on the above observations, the inspector determined that the placement of concrete was carried out as required by project procedures and applicable codes. However, the inspector noticed that during the placement of first and second lifts, the lateral movement of concrete due to vibration appeared excessive. The inspector pointed out this problem to the placement QC inspector, and this apparent problem was brought under control.

No items of noncompliance were identified.

## 5. Concrete Batch Plant Operation

The inspector observed the onsite batch plant operation during production of concrete. By this personal observation, the inspector determined that the concrete aggregates were being drawn from proper aggregate piles, the cement was free flowing and did not have excessive storage time in bins, water, ice, admixtures were properly stored and were dispensed by properly calibrated equipment. There was a S&W batch plant inspector available in the batch plant to observe and verify the plant operation. The inspector also witnessed an air-content test run by batch plant personnel. The test was for information only for the benefit of the batch plant operator.

The inspector also verified that the batch plant scales were calibrated and sealed by the State of Connecticut. This calibration is done on an annual frequency.

No items of noncompliance were identified.

## 6. Status of Previously Identified Items

(Closed) Unresolved Item 423/81-06-02: Pertaining to the bundling of rebars in containment structure. The inspector reviewed the licensees rationale for this design and considered it acceptable. The bundled rebars are hoop reinforcement, and are cadweld spliced as a complete hoop. In hoop reinforcements, bond stresses are not critical, therefore, the item is resolved to the inspector's satisfaction.

# 7. Exit Interview

The inspector met with licensee representatives (denoted \* in paragraph 1) at the conclusion of the inspection on July 31, 1981. The inspector summarized the purpose and scope of this inspection, and discussed the inspection findings.

ATTACHMENT 2
Millstone Unit 3 FSAR Chapter 2

directly overlying the fault was examined and found to be not disturbed. The largest fault uncovered in this portion of the discharge tunnel consists of three related faults, numbers 2817, 2818, and 2819. Offset of pegmatite veins up to 1.8 feet were observed across 2817 and 2818, whereas no continuity could be determined across 2819 in the width of the excavation. Fault gouge material from 2819 produced a K/Ar age date of 142 million to million years. The zone was filled with undisturbed drusy quartz and also showed no disruption of overlying stratified and unstratified glacial deposits. Faults 2894 and 2899 (NNECo. 1982) show 4-inch and 0.5-inch displacements, respectively, on very narrow fault zones. Displacements on both faults were observed to end within the excavation.

2.5.3.2.1 Petrographic Analysis

Six samples were taken from the T-2 and T-3 fault zones at final excavation grade to determine the geologic history of the faulting. Figures 2.5.3-1 through 2.5.3-3 show the location of these samples. Table 2.5.3-2 lists the jamples and gives a general description of each.

Appendix 2.5B includes a report on the petrographic analyses performed by Dr. Reinhard A. Wobus of Williams College, Williamstown, Massachusetts. The work described herein supplements previous studies performed on these faults (NNECo. 1975) from samples taken at the bedrock surface.

Petrographic analyses of the samples indicate that the fault zones have undergone at least one period of deformation, and possibly more. The cataclasite samples (2F, 5F, 6F, 9F, and 11F) consist mainly of a very fine-grained matrix of subhedral quartz prisms. For the most part, these prisms exhibit no preferred orientation. Chlorite is also common in the matrix, along with some plumose muscovite. The remainder of the cataclasite is made up of quartz, plaquoclase, and mica fragments. The fragments indicate that large pieces have undergone some deformation. The quartz crystals are highly strained and the plaquoclase twin lamellae have been deformed. All of the larger fragments have been altered and chlorite is present between many of the crystals. Chlorite has replaced the plaquoclase in many places, and, where it has not been replaced, the plaquoclase has been altered to a highly-birefringent clay (Appendix 2.5B).

Sample 12F is a sample of the Monson Gneiss taken adjacent to the T-3 fault zone. Hand specimens of the gneiss appear to be sheared. The analysis indicates that quartz present in the thin section is very highly strained and that the plagiculase has been altered to highly birefringent clay. Wobus (Appendix 2.5B) classifies this as an altered biotite-quartz-andesine gneiss.

The petrographic analysis by Wobus (Appendix 2.5B) indicates that the material from the two different fault zones, T-2 and T-3, is similar: He has classified the material in the zones as hydrothermally altered

exception of iF. Table 2.5.3-3 lists the dates of samples previously tested at Millstone. These samples had a range of ages between 168 to 198 m.y.a. Excluding the date from Sample IF, the average age of finiting from all tests performed on the clay gouge from the Millstone site is 176 m.y.a.

The date on Sample IF is considerably lower than the other dates. Compared to the other samples taken at final grade, this sample had considerably smaller amounts of the illite fraction (Appendix 2.5C), and a higher ratio of smectite to illite. The smectite may have formed after the gouge material, due to weathering, hydration of the illite, or by hydrothermal alteration. The younger date may reflect the interference of the smectite portion of the sample. As mentioned in Section 2.5.3.2.1, hydrothermal alteration is quite prominent, and the fault zone has been influenced by weathering.

Five samples of gouge were taken from fault 1940 in the engineered safety features building and faults 2282 and 2339 in the Millstone 3 pumphouse. Dr. R. C. Reynolds of Dartmouth College analyzed the clay mineralogy of these samples. His reports are included as Appendix 2.5E.

Large amounts of smectite and little illite were present in the samples (B, C, and D) from fault 1940 which precluded K/Ar dating of the material. Samples P-1 and P-2, taken from faults 2282 and 2339, respectively, were composed mostly of kaolinite with a small percentage of montmorillinite (Appendix 2.5E). A trace of illite was noticed in sample F-2 bur neither sample could be dated.

231.3

The form and quantity of the smectite present in the samples from fault 1760 does, however, indicate a probable hydrothermal origin for the material. The kaolinite from the faults in the pumphouse (P-1 and P-2) was found to have a crystalline structure, also indicative of a hydrothermal origin. The date of the last hydrothermal event, as indicated by the studies of faults, T-2 and T-3, is between 168 and 198 m.y.a.

Clay gouge samples from faults 2781 and 2819 (NNECo. 1982) in the discharge tunnel were also analyzed by Dr. R.C. Reynolds. His study indicated the material from fault 2781 was not suitable for age dating, as it comprised mostly original micas from the parent rock. The material from 2819 was found to contain sufficient authigenic illite and was suitable for age dating. It produced a K/Ar age date of 142 million 16 million years.

231.3

#### 2.5.3.2.3 Conclusions

The K/Ar age dating, petrographic analysis, x-ray diffraction studies, soils mapping, and the detailed mapping of the fault zones indicate that the faults at the Millstone site are incapable features. The petrographic analysis shows that the cataclasite has been silicified and hydrothermally altered, and that the fractures and cracks have been filled with chlorite. Prismatic quartz crystals, drusy quartz, and the silicified cataclasite found in the

#### MNPS+3 FSAR

Skehan, J. W. 19('. The Green Mountain Anticlinorium in the Vicinity of Wilmington and Woodford, Vermont, Vermont Development Department, Bull. No. 17, Montpelier, Vt.

Suter: R.: deLaguna, W.: and Perlmutter. N. M. 1949. Mapping of Geologic Formations and Aquifers of Long Island. New York. New York Dept. of Conservation. Water Power and Control. Conn. Bull. GW-18. p 212. Albany. NY.

Sutter, J.F. 1971. K-Ar Relationships in Mylonite Rocks (Abs). A.G.U. Trans., Vol. 52, p. 367-368.

Velde, B. 1965. Experimental Determination of Muscovite Polymorph Stabilities, Amer. Mineral., Vol. 50, p. 436-449.

Yoder, H.S. and Eugster, H.P. 1955. Synthetic and Natural Muscovites. Geochim et Cosmochim Acta, Vol. 8, p. 225+280.

#### TABLE 2.5.3-1 [Cont]

	Attitude trike Dip	Sense of Brisplanement in the Borizontal Plane	Amount of Calculated Displacement Displacement (ft) [ft]	tocation	Memorales.
83 N	25W 7HE			forbine bailding, discharge tunnel area	Stightly simons, tight with very fine grained quart. [mytonite] displaces (mail) granitic dime
900 N1	12E 84W	Left interal	0.7 to 0.2	Containment Structure	timear, long, chloritied siliceous filling, smooth slightly weathered surfaces with slickensides, S-24.
	1314 - GA1- 13E - 74E	teft lateral	4.5	Containment structure	Related to joint Phil found in the auxiliary building. Extensive shear Zone with very closely spaced joint planes. Fracture surfaces are smooth with some slickensides, 5-13. Crystalline quartz also evident within the fault.
518 No	IIE SIW	Right fateral	0.2 to 0.3	Containment Structure	f tensive, linear, smooth, chloritic clay coating with slickensides, 5-37 and 5-38.
633 N3	4w 23E		0.1 to 0.2	Containment structure	Simous, open with clay filling, smooth surfaces with chlorite coating and slicken- sides, S-55.
887 N3	1E 50E	Right lateral	0.3	Containment structure	Simons, tight, broken in places, slithensides, S-77,
1688 NO	9E 59W	(eff lateral	0.5	Discharge tonnel	timear, tight, scouth surfaces with chibritic coating and slickensides, 5-80.
1182 N12	2W 90	Left lateral	0.3-0.6	Discharge tussel	Small fault mear 1-3, iron maide stained surfaces with some clay filling.
1219 NOS	94 671	Eighi laterat	6.2	Discharge tunnel	Very Simmons, splays off of 1-3 smooth, surfaces with 0.1-inch chieratic clay filling.

MNPS-3 FSAR

#### TABLE 2.5.3-1 (Cont)

fault	Attitu Strike	de Dip	Sense of Displacement in the Horizontal Plane	Amount of Apparent Displacement (ft)	Catculated Displacement [7t]	Location	Remarks
2286		85W	Right lateral	0.1 to 0.2		Pumphonse	Simons very closely spaced fractures zone is 1.5 feet wide. rough surface with crystalline quart/ coating, occasional chlorice coating, some clay filling.
2295	N26E	99	Right fateral	0-0-5		Pumphouse	Splays from joint 2282 and rejoins within timit of excavation. Similar filling as joint 2282.
2349	24.3.7 E	83W	left (atera)	0.8 to 1.0		Primphonise	timear, very closely solved fractures, tight to lightly open, partially rehalfed with siliceous filling that contains granite and gueiss flagments and some drusy quarts.
2434	NIOE	851	Right lateral	0.5 to 1.0		Pumphouse	light fault filled with broken and weathered rock and small amounts of clay. Displacement appears to die out at the southern estent.
2426	820£	7114	teft lateral	0.2 to 0.3		Pumphouse	Linear, tight fami: with silicified treceis zone varying from 0.25 to 1.0 inch.
2427	N30£	65W	Right lateral	8.25 to 0.4		Pumphouse	Sinmons tight fault splaying off of fau.; 3-2424 with a 1 inch wide silicified zone, displacement dies out to the south.
2441	NOTE	96	Right lateral	0 to v.2		Pumphouse	Splays off of fault J-2339, linear, open with drusy quarts filling, rough surfaces.

TABLE 2.5.3-3

### LIST OF K/AR AGE DETERMINATIONS OF FAULT GOUGE

# From Final Excavation Grade Mapping

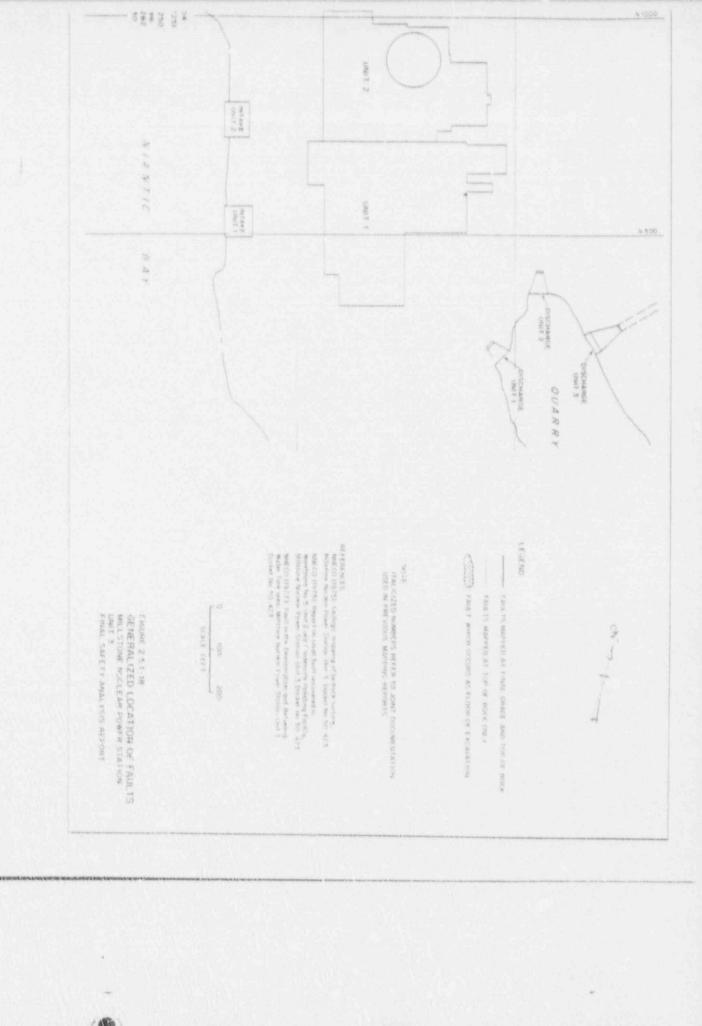
Szimple Number	Fault	Age (m.y.a.)	
1F	1541	109±5	
7 F	1-2	200±7	
10F	1+3	18217	
13F	7-3	155±6	
14F	T+2	165±6	
157	7-3	178±7	
A	2819	142±6	

#### From Previous Reports

-	T-2	175±7*
8	T-3	17426*
C-1	18	168±9**
6+8	18	192±9**
C-3	18	198±9**
C-4	18	181±10**

Sources

\*MNECO. (1975) \*\*MNECO. (1976)



# ALLEGATION RECEIPT REPORT

Date/Time Received: Mar2,891 151	5 mar 1526 Allegation No. $RZ - 89 - A - \infty 65$ (leave blank)
Name: Anonymous	Address:
Phone:	City/State/Zip:
Confidentiality Requested: Ye	s No X Implied Granted
Alleger's Employer: UNKNOWN	Per Panel Miles or should be "No" for Confident is (of Request.  Position/Title: Un Known Market of Regular).
Facility: Hannam Neur	Penn Docket No.: 50:213
PATIENT WAS EMPLOYED	1 PAT THE WADDEN NELL PRAT.
Number of Concerns: CNE	
imployee Receiving Allegation:	first two initials and last name)
Type of Regulated Activity: (a (b)	) Reactor
Materials License No. (if applic	cable):
Functional Area(s):(a) Ope (b) Cor (c) Saf (d) Tra	erations(e) Emergency Preparedness nstruction(f) Onsite Health and Safety feguards(g) Offsite Health and Safety ansportation(h) Other:

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NRC Region 1 Form 207
(Revised June 1984)

Allegation Receiption
Allegation Nacespace,  Allegation No. X = 19+ A + 0.765
Detailed Description of Allegation: France on 1924 4 7
PERIENTS COMPUTED REGIONS OF VITAL . PROTECTED
RAFIR RUTHORITATIONS. I DIP NOT STIND
THE PENSUN NAMED BY THE PRONYMOUS CALLER.
From 1989. I will CHECK MUNTARY
AUTHORIZATIONS IN THE FUTURE.
THE PROSEN NOMED MAY HAVE BEEN INTERVIEWED
For Emporment on may HINE STANTED WITH
THE SECURITY INVESTIGATION PROCESS ).