TRIP REPORT

18 April 1980

TO: Nuclear Regulatory Commission

TOPIC: Inspection of Dike #4 and Cell #2 Liner Placement
Energy Fuels Nuclear (EFN), Blanding, Utah

REMARKS: On 15 April 80, an inspection of Dike #3 (safety dike) and the placement of a PVC liner in Cell #2 was performed. Specific comments are as follows:

Dike #3

The inspection of the safety dike was performed with an estimated 10+% of dike construction completed. Presently, EFN is placing approximately 12,000 cubic yards of material per day, working men and equipment twenty hours per day (two 10 hour shifts). The material is placed in 3-4 inch lifts with a scraper and then compacted. The clay material utilized for embankment fill is being excavated from what will eventually be Cell #3 and a dry material stockpiled during the fall of 1979. Due to the wet winter, the water content (w.c.) of the material from Cell #3 is approximately 11-13% with the optimum w.c. being 9.5%. To insure that the minimum density requirements are achieved along the embankment, the dryer material is being layered between the moist layers of the embankment. The area in Cell #3 from which material is being extracted is being scarified and sidecast to escalate the drying process.

Examination of the consulting engineer's records revealed that density tests (nuclear gage) are being taken after placement of every 1,000 cubic yards of material. Also, it was noted that minimum densities were not achieved on two occasions. However, Mr. Richard Greenwood, P.D., consulting engineer (D'Appolonia, Inc.) noted in the records that whenever a

failure was encountered, the entire layer of material was scarified, the material was sidecast several times with a grader and the entire layer of material was recompacted. In each instance, the recompacted layer met or exceeded the 90% density standard. Thus far, all failures have been corrected and recorded.

It is estimated that the embankment will be completed on or about 28-30 April 80, barring adverse weather or excessive equipment breakdowns.

Liner Placement

A PVC liner, 30 mil thick (B. F. Goodrich Company product), was being placed in Cell #2. At the time of this inspection, approximately 1.1 million square feet of 2.8 million square feet had been placed. The general procedure implemented for liner installation was noted as follows:

a) The cell floor had been stripped to bed rock, ripped with a D-9 dozer and the larger rock fragments were hauled away. Smaller fragments were pulverized through continuous rolling with a smooth surface roller.

b) The surface was graded level and rolled smooth prior to liner placement.

c) The liner was laid out insuring a minimum of one foot overlap on all adjacent liner edges.

d) Edges were then swept clean, treated with solvent, and glued along the liner edge. Glue was applied in a minimum width of approximately six inches.

e) After glueing, the edges were sealed. A small hand roller was used to compress the seam.

f) Seams (both factory and field fabricated) were walked and checked by the seaming crew. Upon completion of the seaming crew, an independent inspector (EFN) walked and checked all field and factory seams. All flaws, tears and other ruptures were flagged and repaired by a patching crew.

g) The factory representative then spot-checked patching workmanship.

h) The leading edge of the liner was then buried with fill material. The material was placed with a dump and spread with a dozer. The material was placed at a minimum thickness of 12" on the cell bottom and 18" along the embankments. Then all the areas behind the leading edge were covered with fill.

i) Each piece of equipment worked from atop the previously placed material, thereby not directly contacting the liner. One guide (EFN) was assigned to each piece of equipment directing movement and to spot and repair tears or ruptures.

The entire project was supervised by Mr. Fred Long, Technical Advisor, B. F. Goodrich Company, and Mr. Harold Roberts, P.E., Senior Design Engineer, EFN. Also, spot checks of procedure, materials and workmanship were being made by Mr. Richard Greenwood, D'Appolonia Inc.

Several seams were checked and hand tested by this inspector. Also, the entire cell, lined and unlined, was walked and observed. The liner placement was seemingly well organized and supervised. The cell floor was well prepared.

The downstream embankment was inspected to include observation of the drain tile along the toe of the embankment. It was noted that approximately one foot of sand had been placed over the entire embankment and

rolled smooth. More sand had to be placed over the drain, but was being corrected before placement of the liner.

The placement procedure was not rushed and seams were checked at least three times before soil was placed atop the liner. Several observations of the clay material indicated a very small sand or gravel content.

Recommendations:

1) EFN has thus far complied with the license specifications applicable to the embankment construction and the liner placement. Therefore, it is recommended that work up to this inspection be approved for continuation.
2) It is recommended that the consulting engineer (P.E.) remain on-site to observe, check and document all activities related to the preparation, placement and inspection of the PVC liner. Thus far, the consulting engineer has not been specifically tasked with liner inspection, although the site engineer has performed and recorded his inspection findings. The request for an independent engineer's inspection was verbally expressed to Mr. Richard Greenwood, D'Appolonia Inc., and Mr. Howard Baker, EFN.
3) Enclosed is a copy of the B. F. Goodrich certified laboratory test data performed on the PVC lining material provided to EFN.

Individuals in attendance during this inspection:

Steven R. Abt	Colorado State University, U.S.N.R.C.
Ed Baker	EFN
Harold Robbins	EFN
Lynn Laws	EFN
Don Sparling	EFN
Richard Greenwood	D'Appolonia Inc.
Fred Long	B. F. Goodrich Company

Respectfully submitted,

Steven R. Abt
COLORADO STATE UNIVERSITY

SRA/rv
Encl:
cc: Mr. Glen Brown
Mr. Dan Gillian
Dr. J. D. Nelson
Mr. William Staub

General Products Division

The B.F.Goodrich Company
General Products Division
500 South Main Street
Akron, Ohio 44318

Address reply to Dept 0414
Bldg WHB-3

March 6, 1980

Mr. Harold Roberts
Energy Fuels Nuclear, Inc.
3 Park Central Suite #900
Denver, CO 80202

Dear Mr. Roberts:

Enclosed are the certified laboratory test data on the PVC lining material to be supplied for the above stated project.

If you have any questions, don't hesitate to call.

Sincerely,

Ken Gray

K. J. Gray
Product Manager
Environmental Products

kh
Enclosure
cc: R. D. Cunningham
C. Marcott
R. Ward

The BF Goodrich Company
Engineered Products Group
Oak Grove
P.O. Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

Product Number: 64-03-3730-92-3 (30 Mil PVC Sheet)
Customer : Energy Fuels Nuclear
Roll Number : 271181 Representing 271169-271200
Blanket Number: 005

Physical Property		Requirement	Test Results	Test Method
Thickness, Inches		.030 $\pm$.003	.030-.031	Cauge
Specific Gravity		-	1.26	
Tensile Strength, psi	L	2300 Min.	2615	ASTM D882
	T	2300 Min.	3545	
100% Modulus, psi	L	1350 Average	1332	ASTM D882
	T	1350 Average	1215	
Ultimate Elongation, %	L	300 Min.	480	ASTM D882
	T	300 Min.	530	
Elmendorf Tear, gm/mil	L	175 Min.	210+	ASTM D882
	T	175 Min.	210+	
Graves Tear, #/Inch	L	300 Min.	431	ASTM D1004
	T	300 Min.	394	
Water Extraction, %		.30 Max.	+0.14	ASTM D1239 (24 Hrs. at 23°C)
Volatility %		.70 Max.	0.67	ASTM D1203
Impact Cold Crack, -20°F		5 Failures/10 Max.	2 Failures	ASTM D1790
Hardness, Shore A		94 Average	92	ASTM D2240
Dimensional Stability, %	L	-	-2.8	ASTM D1204
	T	-	+1.3	(212°F/1 Hr.)

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 19th day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth
My Comm. Expires Nov. 21, 1982

The BF Goodrich Company
Engineered Products Group
Oak Grove
P. O. Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

Product Number: 64-03-3730-92-3 (30 Mil PVC Sheet)
Customer : Energy Fuels Nuclear
Roll Number : 271265 Representing 271243-271284
Blanket Number: 010

Physical Property		Requirement	Test Results	Test Method
Thickness, Inches		.030 ± .003	.0296-.0302	Gauge
Specific Gravity		-	1.27	
Tensile Strength, psi	L	2300 Min.	2715	ASTM D882
	T	2300 Min.	2635	
100% Modulus, psi	L	1350 Average	1330	ASTM D882
	T	1350 Average	1240	
Ultimate Elongation, %	L	300 Min.	525	ASTM D882
	T	300 Min.	560	
Elmendorf Tear, gm/mil	L	175 Min.	210+	ASTM D689
	T	175 Min.	210+	
Graves Tear, #/Inch	L	300 Min.	418	ASTM D1004
	T	300 Min.	428	
Water Extraction, %		.30 Max.	+0.09	ASTM D1239 (24 Hrs. at 23°C)
Volatility, %		.70 Max.	0.62	ASTM D1203
Impact Cold Crack, -20 °F		5 Failures/10 Max.	3 Failures	ASTM D1790
Hardness, Shore A		94 Average	93	ASTM D2240
Dimensional Stability, %	L	-	-2.4	ASTM D1204
	T	-	+1.1	(212°F/1 Hr.)

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 19th day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth
My Comm. Expires Aug. 31, 1982

The BF Goodrich Company
Engineered Products Group
Oak Grove
P. O Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

Product Number: 64-03-3730-92-3 (30 Mil PVC Sheet)
Customer : Energy Fuels Nuclear
Roll Number : 271223 Representing 271201-271242
Blanket Number: 027

Physical Property		Requirement	Test Results	Test Method
Thickness, Inches		.030 ±.003	.0307-.0312	Gauge
Specific Gravity		-	1.25	
Tensile Strength, psi	L	2300 Min.	2595	ASTM D882
	T	2300 Min.	2490	
100% Modulus, psi	L	1350 Average	1285	ASTM D882
	T	1350 Average	1210	
Ultimate Elongation, %	L	300 Min.	505	ASTM D882
	T	300 Min.	550	
Elmendorf Tear, gm/mil	L	175 Min.	210+	ASTM D689
	T	175 Min.	210+	
Graves Tear, #/Inch	L	300 Min.	413	ASTM D1004
	T	300 Min.	421	
Water Extraction, %		.30 Max.	+0.08	ASTM D1239 (24 Hrs. at 23°C)
Volatility, %		.70 Max.	0.58	ASTM D1203
Impact Cold Crack, -20°F		5 Failures/10 Max.	2 Failures	ASTM D1790
Hardness, Shore A		94 Average	92	ASTM D2240
Dimensional Stability, %	L	-	-2.2	ASTM D1204
	T	-	+1.0	(212°F/1 Hr.)

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 19th day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth

The BF Goodrich Company
Engineered Products Group

Oak Grove
P O Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

Product Number:	64-03-3730-92-3 (30 Mil PVC Sheet)	
Customer :	Energy Fuels Nuclear	
Roll Number :	271307 Representing 271285-271326	
Blanket Number:	047	

Physical Property		Requirement	Test Results	Test Method
Thickness, Inches		.030 $\pm$.003	.0309-.0313	Gauge
Specific Gravity		-	1.26	
Tensile Strength, psi	L	2300 Min.	2915	ASTM D882
	T	2300 Min.	2830	
100% Modulus, psi	L	1350 Average	1415	ASTM D882
	T	1350 Average	1340	
Ultimate Elongation, %	L	300 Min.	550	ASTM D882
	T	300 Min.	585	
Elmendorf Tear, gm/mil	L	175 Min.	210+	ASTM D689
	T	175 Min.	210+	
Graves Tear, #/Inch	L	300 Min.	411	ASTM D1004
	T	300 Min.	429	
Water Extraction, %		.30 Max.	+0.09	ASTM D1239 (24 Hrs. at 23°C)
Volatility, %		.70 Max.	0.66	ASTM D1203
Impact Cold Crack, -20°F		5 Failures/10 Max.	5 Failures	ASTM D1790
Hardness, Shore A		94 Average	93	ASTM D2240
Dimensional Stability, %	L	-	-2.0	ASTM D1204
	T	-	+1.0	(212°F/1 Hr.)

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 19th day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth

The BFGoodrich Company
Engineered Products Group

Oak Grove
P O Box 657
Marietta, Ohio 45750
373-6611

February 22, 1980

LABORATORY TEST REPORT

Product Number: 64-03-3730-92-3 (30 Mil PVC Sheet)
Customer : Energy Fuels Nuclear
Roll Number : 271349 Representing 271327-271368
Blanket Number: 065

Physical Property		Requirement	Test Results	Test Method
Thickness, Inches		.030 +.003 -.003	.0296-.0304	Gauge
Specific Gravity		-	1.27	
Tensile Strength, psi	L	2300 Min.	2785	ASTM D882
	T	2300 Min.	2785	
100% Modulus, psi	L	1350 Average	1445	ASTM D882
	T	1350 Average	1345	
Ultimate Elongation, %	L	300 Min.	475	ASTM D882
	T	300 Min.	565	
Elmendorf Tear, gm/mil	L	175 Min.	210+	ASTM D689
	T	175 Min.	210+	
Graves Tear, #/Inch	L	300 Min.	425	ASTM D1004
	T	300 Min.	375	
Water Extraction, %		.30 Max.	+0.10	ASTM D1239 (24 Hrs. at 23°C)
Volatility, %		.70 Max.	0.69	ASTM D1203
Impact Cold Crack, -20°F		5 Failures/10 Max.	4 Failures	ASTM D1790
Hardness, Shore A		94 Average	93	ASTM D2240
Dimensional Stability, %	L	-	-2.4	ASTM D1204
	T	-	+1.0	(212°F/1 Hr.)

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 22nd day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth

The BF Goodrich Company
Engineered Products Group

Oak Grove
P. O. Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

FACTORY SEAM STRENGTH

Product Number: 64-50-3730-92-9
Description : 30 Mil PVC Fabricated Blankets (135' X 150')
Customer : Energy Fuels Nuclear

Blanket Number	Material Strength[1]	Seam Strength[1]	Percentage
001-012	96.5	77.0	
	96.0	73.0	
	87.0	76.5	
	92.5	75.5	
	95.0	77.0	
Average	93.4	75.8	81.2
013-024	94.5	77.0	
	89.5	77.0	
	91.0	78.5	
	87.5	78.0	
	87.5	77.5	
Average	90.0	77.6	86.2
025-036	94.5	76.0	
	94.0	76.5	
	95.0	76.5	
	89.0	78.0	
	90.5	76.0	
Average	92.6	76.6	82.7
037-048	88.0	70.0	
	87.0	73.0	
	89.5	72.5	
	89.0	74.0	
	90.5	73.0	
Average	88.8	72.5	81.6

[1] Testing in accordance with ASTM D882

(continued)

The BFGoodrich Company
Engineered Products Group
Oak Grove
P.O. Box 657
Marietta, Ohio 45750
373-6611

February 19, 1980

LABORATORY TEST REPORT

FACTORY SEAM STRENGTH

Product Number: 64-50-3730-92-9
Description : 30 Mil PVC Fabricated Blankets (135' X 150')
Customer : Energy Fuels Nuclear

Blanket Number	Material Strength[1]	Seam Strength[1]	Percentage
049-060	84.4	76.2	
	93.0	78.0	
	90.5	78.0	
	90.0	71.8	
	89.0	78.4	
Average	85.6	76.5	85.6

[1] Testing in accordance with ASTM D882

BFGoodrich Company
Fabricated Polymer Products

Thomas Richard Ward

TRW:mbf

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 19th day of February 1980.

Notary Public in and for said County

Mary M. Farnsworth
My Comm. Expires August 31, 1982