BNL-66582
Informal Report

INSTALLATION OF A POST-ACCIDENT CONFINEMENT HIGH-LEVEL RADIATION MONITORING SYSTEM IN THE KOLA NUCLEAR POWER STATION (UNIT 2) IN RUSSIA

G.A. Greene and J.G. Guppy

September 1998

Department of Advanced Technology

Brookhaven National Laboratory
Upton, Long Island, New York 11973

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Under Contract No. DE-AC02-98CH10886

UNITED STATES DEPARTMENT OF ENERGY

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*This work was performed under the auspices of the U.S. Department of Energy

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Final Report
Post-Accident Confinement High-Level Radiation Monitoring System
WBS Number: 1.2.2.6
For the Kola Nuclear Power Plant, Polyarnie Zori, Russia

by

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This is the final report on the INSP project entitled, "Post-Accident Confinement High-Level Radiation Monitoring System" conducted by BNL under the authorization of Project Work Plan WBS 1.2.2.6 (Attachment 1). This project was initiated in February 1993 to assist the Russians in reducing risks associated with the continued operation of older Soviet-designed nuclear power plants, specifically the Kola VVER-440/230 Unit 2, through improved accident detection capability, specifically by the installation of a dual train high-level radiation detection system in the confinement of Unit 2 of the Kola NPP.

The major technical objective of this project was to provide, install and make operational the necessary hardware inside the confinement of the Kola NPP Unit 2 to provide early and reliable warning of the release of radionuclides from the reactor into the confinement air space as an indication of the occurrence of a severe accident at the plant. In addition, it was intended to provide hands-on experience and training to the Russian plant workers in the installation, operation, calibration and maintenance of the equipment in order that they may use the equipment without continued U. S. assistance as an effective measure to improve reactor safety at the plant.

This project was part of an overall approach to improve the level of nuclear safety at the

Kola NPP VVER-440/230's in Polyarnie Zori in the event of a serious accident, and to thereby assist plant and local officials in accident management and evacuation decisions if necessary. The U.S. provided all the hardware to be installed in Kola NPP Unit 2, which includes the four radiation detectors, power and instrument cables, connectors, the electronic monitoring modules for the control room as well as two radiation field calibrators. The U.S. provided for on-site training of Russian personnel in the installation, calibration, operation and maintenance of the radiation monitor system, and supplied several complete operations and service manuals from the vendor which had been translated into Russian. Under this project and with the help of field service engineers from the U. S., the Russian reactor engineers were able to install the four wall-mounted high-level radiation monitors, run the instrumentation and power cables, install the readouts in racks in the control room and deliver power to the entire system. During the last of three trips to the Kola NPP by representatives from Brookhaven National Laboratory and the equipment vendor, Victoreen Inc., the readouts were electronically calibrated to the equipment specifications and the detectors were calibrated with the field calibrators (radiation sources). All calibrations were successful and in conformance to the equipment specifications. All four radiation monitor channels were rendered operable and in-service on June 25, 1997.

A chronology of the tasks and sub-tasks accomplished as part of this activity are described below for historical perspective:

1. Project Planning: This task consisted of several sub-tasks:

   1a. Prepare Project/Task Information Sheet. The "Kola Post-Accident Confinement High-Level Radiation Monitoring System" Near Term Risk Reduction Project originated in February 1993 with the issuance of the Project/Task Information

Sheet and subsequent approval by the Expert Working Group on or about November 1993. This document is attached as part of Attachment 7.

1b. Final Project Definition and Preparation of the Project Work Plan. The original draft Project/Task Information Sheet document was revised in November 1993 (see Attachment 7). The original Project Work Plan was issued around the same time and has been updated as required throughout the period of performance of the project. The final Project Work Plan, WBS 1.2.2.6, is attached as Attachment 1. This document defines the tasks which would be performed in order to complete the installation of the radiation monitor system in the confinement of Kola NPP Unit 2.

1c. Specification for Radiation Monitor System. A detailed specification was developed for Brookhaven National Laboratory's RFP for the radiation monitor system by Ebasco Services Incorporated in April 1994. The specification is attached as Attachment 5; ancillary documentation associated with the specification is included in Attachment 7. This specification should serve as a model for future systems should the occasion arise for additional orders.

2. Negotiate and Award Contracts for Equipment, Installation and Training: This task consisted of several sub-tasks:

2a. Proposal from Victoreen, Inc. in Response to RFP. The specifications for the radiation monitor system were developed in April 1994. Upon completion, the specifications for the work were issued in a Request for Proposals and bids were received from several vendors. The proposal from Victoreen which was accepted is attached as Attachment 6.

2b. Contract With Victoreen for Radiation Monitor System for Kola NPP. After careful review, the contract for the work was issued to Victoreen, Inc. in February 1995. The contract with Victoreen is included in Attachment 7. This contract stipulated for the vendor to provide the radiation monitor hardware as specified in Attachment 5 as well as operations and maintenance manuals for the equipment in both English and Russian.

2c. Supplemental Contract With Victoreen, Inc. for Field Service Engineering Support. The support of the Victoreen, Inc. was required in Russia at the Kola NPP to insure the proper installation, setup and calibration of the radiation monitor system in Unit 2. This support was unanticipated and beyond the scope of the original contract as outlined in Attachment 7. The supplemental contract for field service engineering support in Russia is attached as Attachment 8.

3. Preparation of the INSP Project Work Plan, WBS 1.2.2.6: The Project Work Plan was prepared and submitted to the INSP office for review and approval in this time frame. It has been revised and updated as required through the progress of the project. It is attached as Attachment 1.

4. Delivery of Equipment to the Kola NPP in Russia, Installation and Calibration: This task consisted of several sub-tasks:

4a. Shipment of Equipment to Russia. The radiation monitor system was picked up by Matrix International from Victoreen and delivered to Russia without incident. It was discovered during the final visit to the Kola NPP (Attachment 4) that additional hardware would be needed by the Russians to properly install the in-

confinement power and signal cables to the detectors in order to meet the IEEE-383 specifications for Class 1E equipment and to ensure that the equipment would continue to operate during an accident. This equipment consisted primarily of flexible stainless steel hoses to complete the conduits and to isolate the cables from the confinement air space. Documentation of the purchase of the additional hardware and the shipment to the Kola NPP is included in Attachment 9. Two radiation sources called Field Calibrators were supplied to the Kola NPP for the radiation calibration of the detectors. Both contain a Cs^{137} source and required special arrangements for delivery. Once again, Matrix International was contracted to arrange the delivery to Russia. Documentation of the shipping request is included as Attachment 11.

4b. Reimbursement to Kola for Russian Labor Charges. The Kola NPP incurred a labor cost for installation of the radiation monitor system of $14,000.00. The request for reimbursement by DOE was approved by INSP and documentation of the payment is included as Attachment 10.

4c. Installation, Setup and Calibration of Equipment at Kola NPP. Three trips to the Kola NPP were made during the installation period to assist the Russians with setup and calibration of the radiation detectors. It was deemed to be essential to "see with our own eyes" in order to accurately understand the needs of the Russians and the problems that they were encountering during the installation, also to provide solutions for these problems and to train them in the operation and calibration of the radiation monitor system in order to guarantee that it would function properly and that they would be able to service it. The three Foreign Travel Trip Reports for G. A. Greene are attached as Attachments 2-4. Attachment 4 contains the detailed

records of the electronic calibrations for all four detectors (Victoreen form TP876A-1-108) which were performed in the control room of Kola Unit 2 on June 25, 1997. All the electronic units were set to the factory specifications as specified in the operations and calibration manual. This period was also used as a training session for the Kola engineers who were going to be responsible for operating and maintaining the system. After the electronic calibrations were completed, the radiation calibrations were performed with the field calibrators. The results of these calibrations are listed in Attachment 4, immediately following the electronic calibration records. The radiation calibrations verified that all four detectors were functioning properly and within preestablished factory tolerances. The installation was successful and all four detectors were operational and in service.

There are eleven attachments to this report. These attachments constitute the historical sequence of events of this project from the development of the specifications and the issuance of the RFP, through the award of the contract to Victoreen, Inc. based upon their proposal, to the shipment of the system to Russia, and finally the installation, setup and calibration in the Kola NPP Unit 2. In the event that it is decided to install a similar system in another Russian reactor confinement, this report would serve as a useful guide to the project managers. Documentation of the unanticipated difficulties which were experienced during this project and the lessons learned should be valuable in future hardware installation projects of this nature.

ATTACHMENTS

1. INSP Project Work Plan, WBS Number 1.2.2.6, "Kola Post Accident Radiation Monitors."

2. Foreign Travel Trip Report for G.A. Greene, May 24-30, 1996 (DOE Trip No. 9603507).

3. Foreign Travel Trip Report for G.A. Greene, October 11-19, 1996 (DOE Trip No. 9606937).

4. Foreign Travel Trip Report for G.A. Greene, June 22-29, 1997 (DOE Trip No. 9704154), including field calibration records for the radiation monitors.

5. "Specification for Post-Accident High-Range Confinement Radiation Monitoring System for Russian VVER-440/230 Nuclear Power Plant," Brookhaven National Laboratory (April 1994).

6. "Proposal for a Post-Accident High-Range Confinement Radiation Monitoring System for Russian VVER-440/230 Nuclear Power Plant for Brookhaven National Laboratory," Proposal Number 601860, RFQ Number 745221, Victoreen, Inc. (August 1994).

7. Administrative correspondences which resulted in the contract award to Victoreen, Inc. for post-accident confinement radiation monitors for the Kola Nuclear Power Plant (BNL Purchase Order 745221).

8. Purchase Order Contract (BNL Purchase Order 847905) with Victoreen, Inc. for Field Service Engineering at the Kola Nuclear Power Plant.

9. Documentation of shipment of additional hardware to the Kola Nuclear Power Plant, principally stainless steel hoses, to upgrade the installation of the in-confinement cables for the radiation monitors to U.S. standards (July 1997).

10. Documentation of reimbursement to Kola Nuclear Power Plant in the amount of $14,000 for additional installation costs incurred by Kola Nuclear Power Plant for post-accident radiation monitor system installation (March 1997).

11. Documentation of the delivery of two radioactive field calibrators to the Kola Nuclear Power Plant for calibration of the radiation detectors (October 1996).

ATTACHMENT 1

INSP Project Work Plan, WBS Number 1.2.2.6,
"Kola Post Accident Radiation Monitors"

Project Work Plan

Date: 10/8/97
Rev. No.:1

WBS Number: 1.2.2.6

1. Project Title: Kola Post Accident Radiation Monitors

2. Responsible Contractor: Brookhaven National Laboratory

3. Responsible Individual: James G. Guppy

4. Budget Target: $480K

5. Host Organization(s)/ Primary Contacts: Kola NPP

6. Technical Objective:

Provide a reliable indication that an accident has occurred and give indication of the seriousness of the accident by means of high-range monitoring the radiation level of the confinement atmosphere.

7. Scope

Two trains of safety grade (Class 1E) equipment conforming to requirements of US Regulatory Guide 1.97 will be provided for Kola Unit 2. Each train will have two high-range detector channels. The systems consist of:

- high-range detectors (2 per train)
- signal processing unit
- local display capability
- Control Room control board having: display, recorder and alarm annunciator
- interconnecting cabling

8. Description of Activities

a. Develop Requirements and Technical Specifications for Equipment (Completed)

An investigation was performed by Ebasco to address fast-track procurement of the equipment. The following was produced:

- Draft equipment specification

- Suggested bidders list
- Options list
- Vendor technical information

The draft specification was based, in part, on a visit to the Kola NPP.

b. Prepare Request for Proposals (RFP's) and Determine Potential Bidders (Completed)

Brookhaven performed additional research, finalized the technical specifications and prepared the RFP package.

c. Issue RFP's and Receive Bids (Completed)

The Post-Accident High-Range Confinement Radiation Monitoring System RFP was issued by BNL. Two bids were received.

d. Evaluate Bids and Award Contract for Equipment Supply (Completed)

Bids were evaluated and a recommendation for supply of the Radiation Monitoring System was formulated. Award of the contract was made by BNL to Victoreen.

e. Oversee Equipment Vendor Contract During Procurement (Completed)

Activities included: acquire vendor drawings, address issues, acquire any additional design information from the Kola NPP, forward equipment vendor information to the NPP.

f. Negotiate Contract for Installation (Completed)

Installation will be done by the vendor, Victoreen Inc. A contract for this work has been negotiated by BNL with the vendor.

g. Witness Equipment Testing (Completed)

Shop testing and calibration was performed by the equipment vendor. BNL personnel witnessed this testing. BNL accepted the equipment on the basis of this demonstration and authorized payment to Victoreen in the amount of the equipment and translation of the manuals. Payment to the vendor has been made.

h. Ship Equipment to Plant Site (Completed)

Victoreen and BNL will coordinate shipment of the equipment to Helsinki, Finland.

Once customs arrangements are completed, the equipment will be shipped from Helsinki to the Kola plant site in Russia. (equipment was dispatched to Helsinki in January 1996. Prediction of the time required to accomplish customs clearance to the plant is unreliable at this time).

i. Installation and Training Sessions at Kola NPP

Three trips to the Kola plant by a representative from the equipment vendor and by BNL will be organized. BNL will oversee that training (installation, startup, operation) and user documentation is provided to the Kola NPP personnel by Victoreen. These trips will take place (1) at the beginning of installation, (2) during installation for inspection, and (3) at the end of the installation for calibration and setup.

j. Engineering Support

BNL will estimate the materials and supplies needed to complete the installation, procure said materials, and ship to KOLA NPP.

k. Prepare Project Work Plan and Perform Project Reporting

The Project Work Plan will provide the following information:

- scope of the project
- responsibilities
- organizations involved
- description of major activities
- deliverables
- schedule milestones
- budget details
- host country contribution

Tracking and reporting on status of project activities, accomplishments, budget & schedule performance, and identification of problems will be done by BNL.

l. Prepare Project Close-Out Plan

This plan will document the approach and activities for project closure. The equipment installation at the Kola plant will be inspected and confirmed. The steps necessary for closure will be determined, and approval by the DOE will be included. The plan will develop a punch-list of remaining items that the project should address before closure. Experience and comments from the Kola plant staff will be acquired and included.

m. Prepare Final Report

This report will provide a discussion of the history of the project, lessons learned and recommendations for potential future involvement, if any. A qualitative benefit/cost

analysis will be generated. Based on Kola plant recommendations and evaluation of project benefits, DOE approval may be sought for supplying identical equipment to additional plant sites.

9. Deliverables:

1. RFP for Radiation Monitoring System
2. Contract for Equipment Supply
3. Contract for Installation (BNL & PNL)
4. Equipment Delivery to Kola, Installation and Training for NPP Workers
5. Project Work Plan
6. Project Close-out Plan
7. Final Report

10. Project Schedule Milestones:

1.	RFP for Radiation Monitoring System	08 JUL 94
2.	Contract for Equipment Supply	05 MAY 95
3.	Contract for Installation	30 OCT 95
4.	Equipment Delivery to Helsinki	01 APR 96
5.	Equipment Delivery to Kola	15 MAY 96
6.	Begin Installation & Training for NPP Workers	01 JUNE 96
7.	Inspection of Rad Monitors System	15 OCT 96
8.	Final Calibration and Setup at Kola	20 JUNE 97
9.	Procure and Ship Additional Engineering Material and Supplies for Installation	01 SEP 97
10.	Project Close-out Plan	31 OCT 97
11.	Final Report	31 DEC 97

See attached Gantt chart.

11. Period of Performance:

November 1, 1993 through December 31, 1997.

12. Time-phased Budget:

See attached spreadsheet.

13. Partner Country Contribution:

For this project, the partner country (Russia) contribution is in the form of:

1. Preparation for and participation in technical and planning meetings
2. Assessment of suggested equipment
3. Work for providing design information
4. Receipt of training
5. Evaluation of equipment supplied

The estimated value of the partner country contribution is:

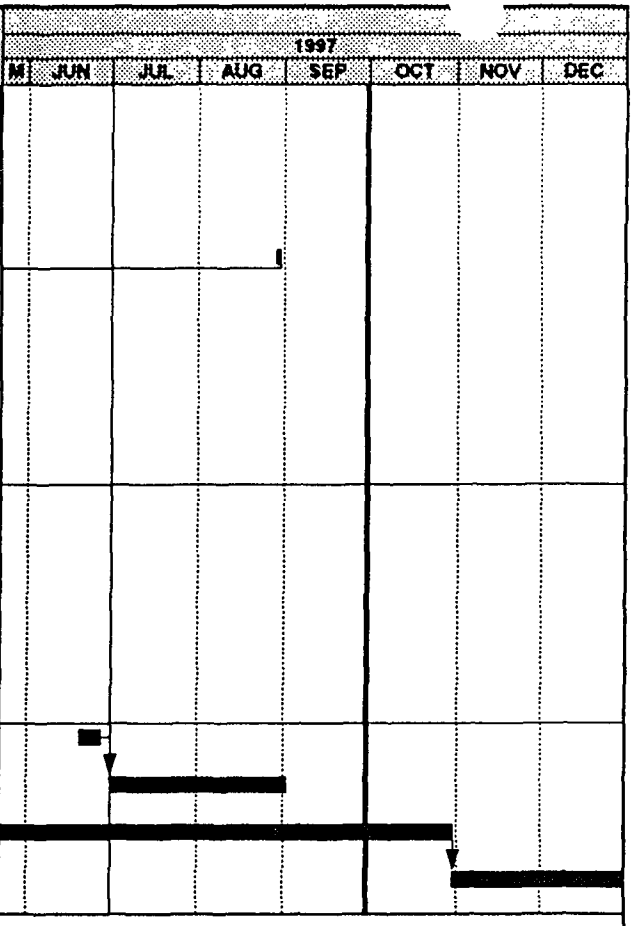
40 mandays of engineering effort valued at:

40 x 8 x $100/hr = $32,000.

14. Notes:

Initial project definition work for this project was done under WBS #3.3.5, Russian Safety Systems EWG Support (RBMK & VVER) (BNL #2.1.2.1).

WBS	ivity ID	Activity Description	Orig Dur	Comp	Early Start	Early Finish
1 Soviet Designed Reactor Safety Program						
.2 Engineering & Technology						
1.2.2 Confinement System Safety Upgrades						
1.2.2.06 Kola Post Accident Radiation Monitors						
1.2.2.06	OTA2300	Start NTRR FY92/93 Projects	1	0	29AUG97	29AUG97
1.2.2.06	OTA2330	Kola Rad Monitors-Prep RFP	1	100	01NOV93A	08JUL94A
1.2.2.06	OTA2335	Kola Rad Monitors-Prep Proj Work Plan	21	100	02MAR95A	02MAR95A
1.2.2.06	OTA2340	Kola Rad Monitors-Contract for Equip Supply	0	100		05MAY95A
1.2.2.06	OTA2345	Kola Rad Monitors-Contract for Installation	172	100	03MAR95A	30OCT95A
1.2.2.06	OTA2350	Kola Rad Monitors-Equip Delivery to Helsinki	275	100	02JAN95A	01APR96A
1.2.2.06	OTA2352	Kola Rad Monitors-Equip Delivery to Kola	35	100	01MAR96A	15MAY96A
1.2.2.06	OTA2355	Kola Rad Monitors-Trg for NPP Workers	31	100	04MAR96A	03JUN96A
1.2.2.06	OTA2360	Kola Rad Monitors-Installation	31	100	04MAR96A	03JUN96A
1.2.2.06	OTA2361	Inspection of Radiation Monitors	0	100		15OCT96A
1.2.2.06	OTA2362	Final Calibration and Setup at Kola	7	100	20JUN97A	27JUN97A
1.2.2.06	OTA2363	Proc. & ship Addit. Engin. Mtl & Suppl. for Inst	2	100	01JUL97A	01SEP97A
1.2.2.06	OTA2365	Kola Rad Monitors-Project Close-out Plan	45	0	16APR96A	30OCT97
1.2.2.06	OTA2370	Kola Rad Monitors-Final Report	44	0	31OCT97	31DEC97



ject Start 01JAN94
ject Finish 22AUG00
ta Date 30SEP97
n Date 08OCT97

Early Bar
Progress Bar
Critical Activity

INST

Sheet 1 of 1

BNL - Int. Nuclear Safety Program

WBS 1.2.2.6 Kola Radiation Monitors

Guppy

Date	Revision	Checked	Approved

›st Estimate Kola Radiation Monitors								
.'BS 1.2.2.6								
Period of Performance		November 1993 to December 1997						
	Staffmonths				Labor $			
Cost Element			FY98		FY96	FY98		Total
Labor								
Sub-total Labor			2.5			$34,495		$34,495
BNL Travel								
Destination	# of trips	# of Days	# People	Per Diem	Transp	Handling	G&A	Total
Sub-total Domestic	0	0	0	$0	$0	$0	$0	$0
Sub-total Foreign	0	0	0	$0	$0	$0	$0	$0
Sub-total Travel	0	0	0	$0	$0	$0	$0	$0
Contracts/Equipment					Contracts		BNL OH	Total
Victoreen Install/Calibrate					$11,700		$2,189.07	$13,889
Victoreen -Travel/Misc.					$5,304		$992.38	$6,296
‹are Parts					$2,647		$1,130.53	$3,778
ub-total Equipment					$19,651	$0	$4,312	$23,963
Actual Cost to Date thru 8/30/97								$420,731
MPO Processing								$1,210
Total Estimated Costs								$480,398

Cost Estimate Kola Radiation Monitors — **Time-Phased Estimate**

WBS 1.2.2.6

Period of Performance — **November 1993 to December 1997**

	Cum to date Aug-97	Sep-97	Oct-97	Nov-97	Dec-97	Total
Total Staffmonths		0.6	0.6	0.6	0.6	**2.5**
Total Labor $		$8,624	$8,624	$8,624	$8,624	**$34,495**
Travel						**$0**
Contracts/Equipment					$ 23,963	**$23,963**
Actual Cost to Date 8/97	$420,731					**$420,731**
						$0
MPO Processing		$303	$303	$303	$303	**$1,210**
Total Estimated Costs	**$420,731**	**$8,926**	**$8,926**	**$8,926**	**$32,889**	**$480,399**

ATTACHMENT 2

Foreign Travel Trip Report for G.A. Greene,
May 24-30, 1996 (DOE Trip No. 9603507)

DOE Trip No. 9603507

SUMMARY

FOREIGN TRAVEL TRIP REPORT

G. Alanson Greene, Mechanical Engineer
516-344-2296
Department of Advanced Technology
Building 820M
BROOKHAVEN NATIONAL LABORATORY

June 7, 1996

Dates of Trip: May 24-30, 1996

Destination: Kola Nuclear Power Plant, Polyarnie Zori, Russia

Statement of Purpose of Trip:

The purpose of the trip is to lend technical support and consulting to the staff at the Kola NPP in their integrated reactor safety program. During the trip, a walkdown of the Kola Unit 2 confinement will be conducted in order to visually examine the condition of the confinement boundary and sealant. The confinement pressurization and leaktightness testing will be witnessed. The status of the installation of the high-level confinement radiation monitors will be reviewed and all action items decided. Future activities will be discussed.

Abstract:

The walkdown of Unit 2 of the Kola NPP was conducted in concert with the under pressurization leak tightness tests of the confinement. Leakage points were identified and the defects were corrected by the application of sealant material where possible. The hutch locks, isolation valves, new gaskets, and the sealant have been installed during the current outage. The over pressurization test was observed following the under pressurization test. Discussions were held with the Kola management concerning their need for additional aid in the form of similar hardware for the upgrade of Unit 1, which goes into an outage on July 1, 1996. A review of the installation of the confinement radiation detectors was held and the project status was discussed. A conference call was scheduled for June 6, 1996 between Kola, BNL, and Victoreen to begin planning for a return visit to Kola for the final installation of the high level confinement radiation monitoring system.

Detailed Trip Report

George Greene (BNL) visited the Kola NPP (Unit 2) in Polyarnie Zori, Russia, from May 24-May 30, 1996, to review the current status of the installation of the high-level confinement radiation monitor system, and to witness and participate in the Unit 2 confinement leaktightness tests that were planned for May 28-30.

The four radiation monitors have been installed in the Kola Unit 2 confinement on the steam generator level in the vicinity of two steam generators and two primary coolant loops. The four sets of in-confinement power and signal cables have been pulled through steel conduits and have been passed through the confinement penetrations into the reactor building (ex-confinement). At the request of the Kola management, an additional 1000 feet of RG59 coaxial cable has been added to the shipment of the two field calibrators; this cable is needed to complete the wiring to the readout devices and the remote displays. Matrix International is making progress on shipping this material by air to Moscow and then by truck to Kola.

The confinement leaktightness testing began on May 26 and continued until May 28. The details of the test procedures are contained in a Kola test protocol document, a copy of which was supplied. The results of the testing were faxed to BNL in a summary report. Both documents are on file at BNL. A short summary of the tests follows. The first part of the leaktightness testing involved an under pressurization test in which a vacuum was pulled on the confinement of 226 mm H_2O by operation of the confinement ventilation fans, resulting in an in-flow of air through defects in the confinement boundary. During the under pressure test, personnel entered the confinement and examined the boundaries for leaks. These were marked and later repaired with sealant material, after the ventilation system had been sealed off to measure the time for the confinement to return to ambient pressure. Next, the overpressurization test was performed. A positive pressure was established in the confinement by operation of a compressor, and the resulting pressure in the confinement was measured. Leakage sites were again located and, at the end of the pressurization test, the leakage rate was determined (after the compressor had been shut down) by measuring the time for the confinement to bleed down to the ambient pressure (ie., $P_{gauge} = 0$).

The Kola summary report indicates that during the 1994 outage the Unit 2 confinement had been able to be pressurized to 70 mm H_2O and exhibited a leak rate of 4950 vol%/day. However, during the 1996 tests, the confinement was able to be pressurized to 275 mm H_2O and the leakage was reduced to 768 vol%/day. The sharp reduction in the measured leak rate can be attributed to the confinement leakage upgrades supplied through the INSP program: new isolation valves, replacement hutch locks, new gaskets, and application of sealant material to local defect sites. Several dozen leak sites remain which the plant intends to repair prior to startup on June 7, 1996. The reported leak rate was measured with these known defects yet unrepaired, hence the leakage at startup should be less than reported above. The Kola staff indicated that they were prepared to continue to upgrade the Unit 2 confinement to further reduce the leakage, and that they were interested in applying the same upgrades to Unit 1, another VVER 440-230 of similar age.

Appendix

Itinerary:

May 24, 1996	Depart New York JFK
May 25	Official Stop Over in St. Petersburg
May 26	Arrive Polyarnie Zori, Russia
May 26-28	Observe Leaktightness Tests and Discuss Status of Radiation Monitor Project
May 29	Depart Polyarnie Zori, Russia; Official Stop Over in Helsinki
May 30	Arrive New York JFK

People Contacted:

Gennady Paradnikov	Head of Adjustment and Startup Department
Sergey Gorelikhin	Deputy Head of Adjustment and Startup Department
Leonid Popruzhko	Engineer-in-Charge of Radiation Monitor Installation
Anatoly Tutunnik	Deputy Chief Engineer

Literature Acquired:

Procedural Guide for Conducting Leaktightness Testing of the Kola Confinement, on file in Russian.

Summary Report of 1996 Leaktightness Tests of Kola NPP Unit 2, translated to English and attached (9 pages).

ATTACHMENT 3

Foreign Travel Trip Report for G.A. Greene,
October 11-19, 1996 (DOE Trip No. 9606937)

DOE Trip No. 9606937

SUMMARY

FOREIGN TRAVEL TRIP REPORT

George Alanson Greene, Mechanical Engineer
516-344-2296
Department of Advanced Technology
Building 820M
BROOKHAVEN NATIONAL LABORATORY

October 24, 1996

Dates of Trip: October 11-19, 1996

Destination: Kola Nuclear Power Plant, Polyarnie Zori, Russia

Statement of Purpose of Trip:

The purpose of the trip is to complete the installation of the confinement high-level radiation monitoring system and to bring the system on line. In addition, the status of other INSP projects at the Kola NPP are to be reviewed, including the confinement leaktightness upgrades, the confinement isolation valves, and the emergency backup batteries. Other discussion points include the translation diskettes of the manual for the radiation monitoring system, the compilation of US standards for confinement radiation monitoring, and the contract with Kola for installation of the radiation monitoring system.

Abstract:

Two of the four radiation monitors were installed in the confinement and all electrical connections to the readout devices in the Unit 2 control room and to the remote indicators were completed. Only one detector system is operational; there is a short in the wiring for the second detector which we believe is a result of damage to the detector connector during hookup by the Kola staff. The other two detectors were not mounted in the confinement during our visit as a result of a misunderstanding. Kola staff will mount them and complete the wiring as we demonstrated for the other two detectors. A return visit will be required during the next outage to complete the installation of the radiation monitoring system. An update was given on the leaktightness work for Units 1 and 2. The status of the installation of the emergency backup batteries and the schedule for completion of the installation were discussed. A request for manual controls for two of the isolation valves was received for consideration. The translation diskettes of the manual for the radiation monitoring system were delivered, the US standards for confinement radiation monitoring were sent, and the $14,000.00 contract for installation of the cables for the radiation monitoring system was discussed.

Detailed Trip Report

Confinement Radiation Monitoring System for Kola Unit 2. BNL and Victoreen representatives visited the Kola NPP (October 11-19, 1996) to begin the final installation of the high-level confinement radiation monitoring system in Kola Unit 2. Non-standard connections were constructed at the confinement penetrations for the power and signal cables for each of the four detectors. The power and signal cables were terminated in a temporary rack in the reactor control room along with the wires from the four remote alarming-indicators. Only two of the four detectors were installed in the confinement, therefore we were only able to work on two detectors. One train of two detectors was wired to the readouts, a recorder, and two remote indicators; Kola staff will wire the second train themselves in exactly the same configuration as the first train. When the system was calibrated, all four readouts, two recorders, and four remote indicators worked properly. However, one cable was accidentally shorted out at the detector by the Kola staff during installation, so only one of the four detector channels was able to be made operational. This channel was tested with the radioactive field calibrator and it operated exactly as it had been calibrated at the Victoreen Company. It will be necessary to return to Kola during the next scheduled outage to correct the cabling deficiencies and to bring the entire system operational. It may be desirable to bring one Kola staff to Victoreen for in-depth training on the system before then.

Status of Confinement Leaktightness, Isolation Valves, and Emergency Backup Batteries at Kola NPP. The status of the INSP projects indicated above were determined through briefings by the cognizant Kola personnel during the visit to install the confinement high-level radiation monitoring system. Discussions were held with T. Petkevich (Chief of Localizing Systems Laboratory) concerning the leaktightness upgrades and the confinement isolation valves. At the time of my visit in May 1996, 21 leak sites were identified for correction prior to restart of Unit 2 in June 1996. Kola personnel were able to correct 15 of the 21 defects prior to restart (see Attachment 1). A total of fifteen additional defects have been identified for correction during the next scheduled outage. As for Unit 1 which is presently on an outage, 80% of the planned work on leaktightness has been completed. Kola has requested additional gasket material, sealant material, and valves in a memo from the plant chief engineer, which will be translated and forwarded for consideration (Attachment 2 in Russian). Prior to restart of Unit 1, leaktightness tests will be performed as was done for Unit 2 in May 1996. T. Petkevich requested that I look into her request for manual controls for two of the isolation valves which had been sent to Burns and Roe in May 1996. This request was communicated to R. Denning by telephone and is included in this report as Attachment 3. Discussions were held with A. Simeonov (Deputy Chief of the Electrical Department) concerning the status of the installation of the emergency backup batteries for Units 1 and 2. Two batteries and their switching panels were installed for Unit 2 in June 1996. The two batteries and switching panels for Unit 1 are currently being installed and are expected to be completed by the end of October 1996. The fifth battery and switching panel system which is common to both units is being installed and is expected to be completed before restart of Unit 1.

Appendix

Itinerary:

October 11, 1996	Depart New York JFK
October 12	Arrive Polyarnie Zori, Russia
October 13-17	Install Radiation Monitor System and Discuss Status of INSP Projects at Kola
October 18	Depart Polyarnie Zori, Russia; Official Stop Over in Oslo
October 19	Arrive New York JFK

People Contacted:

Gennady Paradnikov	Head of Setup, Testing, and Startup Department
Sergey Gorelikhin	Deputy Head of Adjustment and Startup Department
Leonid Popruzhko	Engineer-in-Charge of Radiation Monitor Installation
Tatiana Petkevich	Chief of Localizing Systems Laboratory
Alexander Simeonov	Deputy Chief of the Electrical Department
Marina Kasakova	Kola Interpreter

Literature Acquired:

1. Update to the "Summary Report of 1996 Leaktightness Tests of Kola NPP Unit 2," translated to English (9 pages).

2. Memo from Omelchuk to Greene, "Request For Additional Gasket Material, Sealant Material, and Valves," dated October 16, 1996, in Russian (2 pages).

3. Memo from Omelchuk to Chuebon (Burns and Roe), "Request For Manual Controls For Two Isolation Valves," dated May 11, 1996, in Russian (2 pages).

ATTACHMENT 4

Foreign Travel Trip Report for G.A. Greene,
June 22-29, 1997 (DOE Trip No. 9704154),
Including Field Calibration Records for the
Radiation Monitors

DOE Trip No. 9704154

SUMMARY

FOREIGN TRAVEL TRIP REPORT

George Alanson Greene, Mechanical Engineer
516-344-2296
Department of Advanced Technology
Building 820M
BROOKHAVEN NATIONAL LABORATORY
P. O. Box 5000
Upton, NY 11973-5000

July 1, 1997

Dates of Trip: June 22-29, 1997

Destination: Kola Nuclear Power Plant, Polyarnie Zori, Russia

Statement of Purpose of Trip:

The purpose of the trip is to complete the installation and calibration of the confinement high-level radiation monitoring system and to conduct training of Kola NPP staff in the use, maintenance, and calibration of the system.

Abstract:

All four radiation monitors were installed in the Kola NPP confinement and all electrical connections to the readout devices in the Unit 2 control room and to the remote indicators were completed. All four detector systems are operational and have been calibrated, both electronically and by response to an external radiation source. The $14000.00 payment to Kola NPP has been straightened out; the money was found in the Apatitty Bank in Murmansk, deposited in the wrong account. The status of the emergency backup batteries, the confinement isolation valves, and the leaktightness project were discussed. The installation of two manual isolation valves will complete that project. The emergency backup batteries are installed and that project is complete. The leaktightness activities are finished and that project is complete. Modifications to detector power and signal cables for the radiation monitors inside the Unit 2 confinement will be required prior to the end of the Unit 2 outage. Completion of these modifications will complete the Confinement High-Level Radiation Monitor System project.

Detailed Trip Report

BNL and Victoreen representatives visited the Kola NPP (June 22-29, 1997) to complete the final installation of the high-level confinement radiation monitoring system in Kola Unit 2. Upon arrival, a walkdown was conducted of the entire radiation monitor system, from the detectors in the confinement to the electronic modules which were mounted in the control room. The entire system consisting of four detectors (in confinement), four readouts and two strip chart recorders (in the main control room), four remote alarming-indicators (in the instrumentation control room), and power and signal cables from the detectors to the electronic readout modules to the remote alarming indicators were installed and operating. The Kola NPP engineers demonstrated that they were intimately familiar with the hardware and had studied the system manual thoroughly. Therefore, it was decided to conduct training of the Kola NPP engineers simultaneously with the calibration of the four detector channels in the control room.

The electronic channels for each of the four radiation detectors were painstakingly calibrated by the field service engineer from Victoreen with the electronic current generator that was supplied by Victoreen with the equipment. The test and calibration procedures that were followed were identical to those contained in Victoreen Test Procedure TP876A-1-108 Rev C, a copy of which may be found in the system manual which was supplied to Kola NPP along with the hardware. Kola supplied a frequency meter and a regulated power supply for the calibrations. The Kola engineers now have all the equipment required to perform these calibrations without any assistance. Each channel was completely recalibrated according to the factory procedures and each was verified to be operating within specifications. The two Kola engineers appeared to be familiar with each step in the procedure and participated hands-on. At the request of the Kola NPP supervisor, the alarm set points were set at 2 R/hr and 10 R/hr. Following the electronic calibrations, each detector was subjected to a source check with the field calibrator that was supplied with the hardware, which contains a 25 mCi source of ^{137}Cs. It was calculated that the source (field calibrator 133) had decayed from 7.7 R/hr to 7.4 R/hr since it had been factory calibrated at Victoreen 1.75 years earlier. The results of the source calibration are listed below:

Detector 877-1, S/N 487:	7.0 R/hr on Readout 876A-1-M4, S/N 101;	7.0 R/hr on recorder
Detector 877-1, S/N 483:	6.8 R/hr on Readout 876A-1-M4, S/N 102;	7.0 R/hr on recorder
Detector 877-1, S/N 490:	7.0 R/hr on Readout 876A-1-M4, S/N 104;	7.2 R/hr on recorder
Detector 877-1, S/N 485:	7.5 R/hr on Readout 876A-1-M4, S/N 103;	7.5 R/hr on recorder

When these four channels were bench calibrated at Victoreen on 9/13/95, they had read 7.5, 7.4, 7.5, and 7.5 R/hr, respectively, which is in excellent agreement with the current calibrations and within the specified accuracy of $\mp 10\%$. I am fully confident that the system is installed and functioning properly, and that the Kola NPP engineers are qualified to calibrate and service it.

The installation of the power and signal cables to the detectors in the confinement was found to be inadequate and it was decided to supply the Kola NPP with additional flexible hoses to improve this deficiency prior to the end of the current outage. Kola will construct four pull boxes which, when installed along with the stainless steel flexible hoses, will bring the wiring up to desired standards. The required hardware is being purchased and will be shipped soon. Kola will supply the labor at no expense to the US. Completion of these minor alterations in the wiring will result in a fully-installed and operational system and the project will be completed.

Appendix

Itinerary:

June 22, 1997	Depart New York JFK
June 23	Arrive Polyarnie Zori, Russia
June 24-27	Install and Calibrate the Radiation Monitor System and Conduct Training of Kola NPP Personnel
June 28	Depart Polyarnie Zori, Russia; Official Stop Over in Helsinki
June 29	Arrive New York JFK

People Contacted:

Sergey Gorelikhin	Deputy Head of Adjustment and Startup Department
Leonid Popruzhko	Engineer-in-Charge of Radiation Monitor Installation
Marina Kasakova	Kola NPP Interpreter
Victor Starosek	Kola NPP Engineer
Gennady Tshelkunov	Kola NPP Engineer

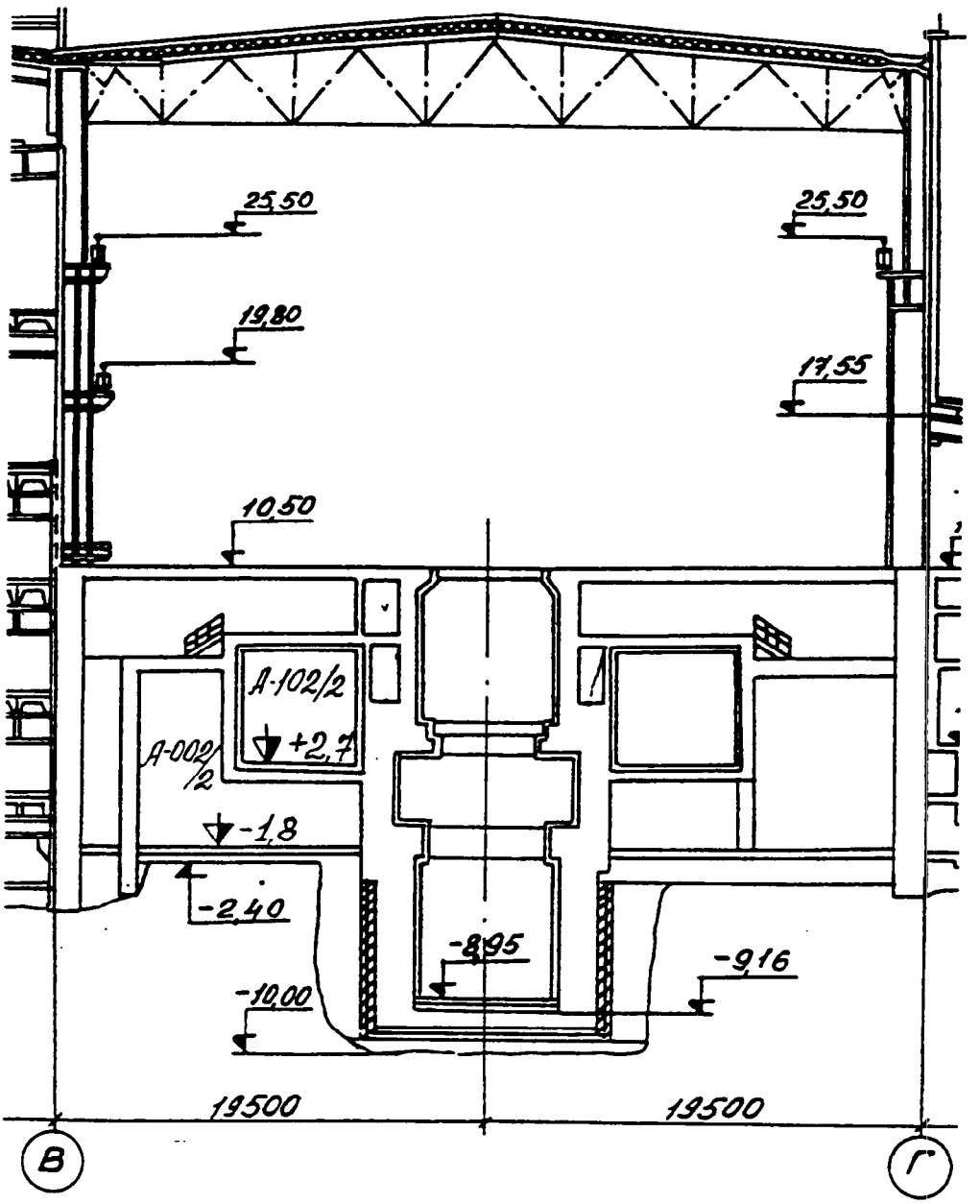
Literature Acquired:

1. Diagrams of the Kola NPP Unit 2 confinement floor plans indicating the locations of the four radiation detectors. (3 pages)

2. Copies of the Calibration Data Sheets for each of the four detectors. (32 pages)

3. Copy of the Radiation Calibration for each of the four detectors. (1page)

ATTACHMENT 1



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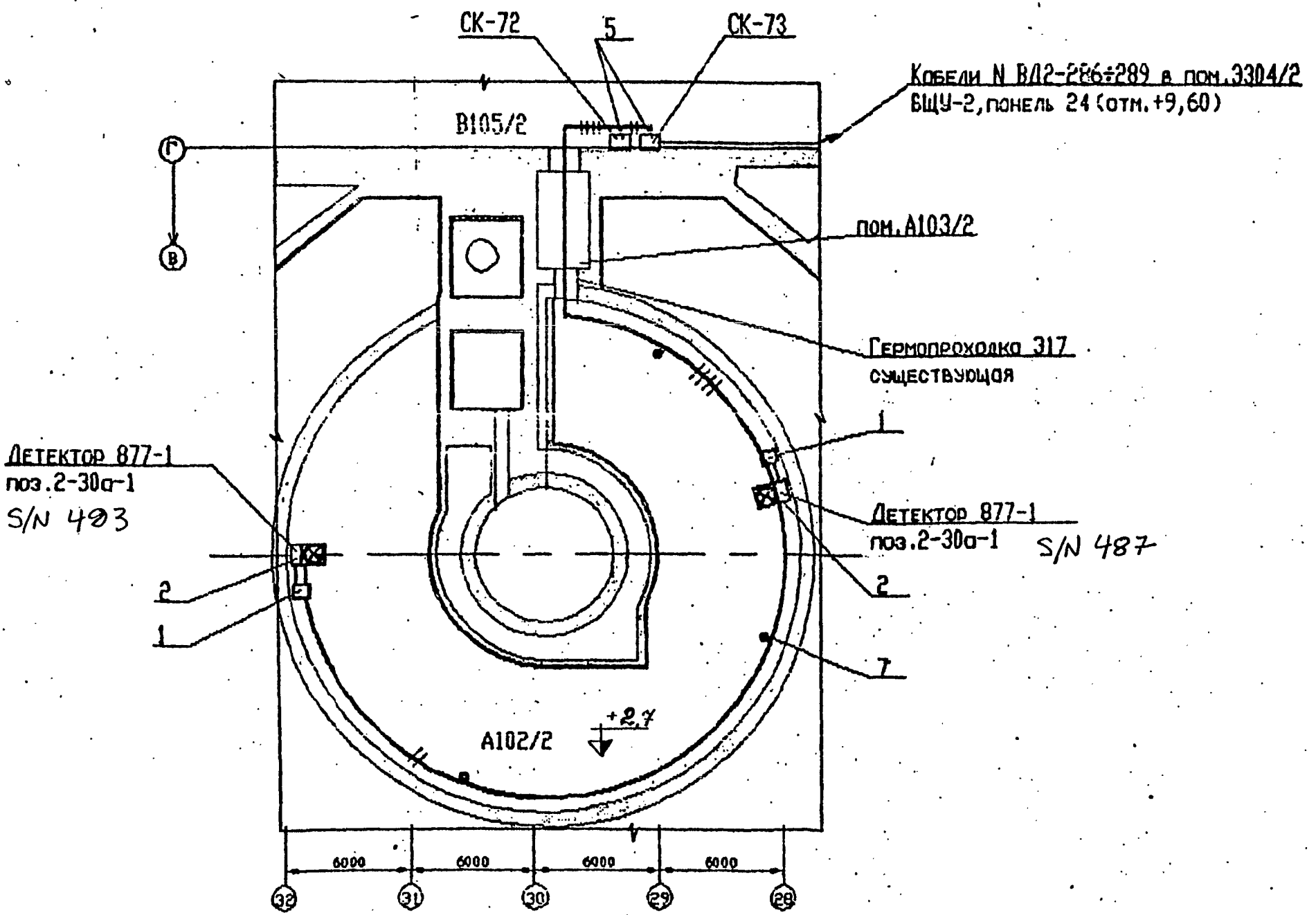

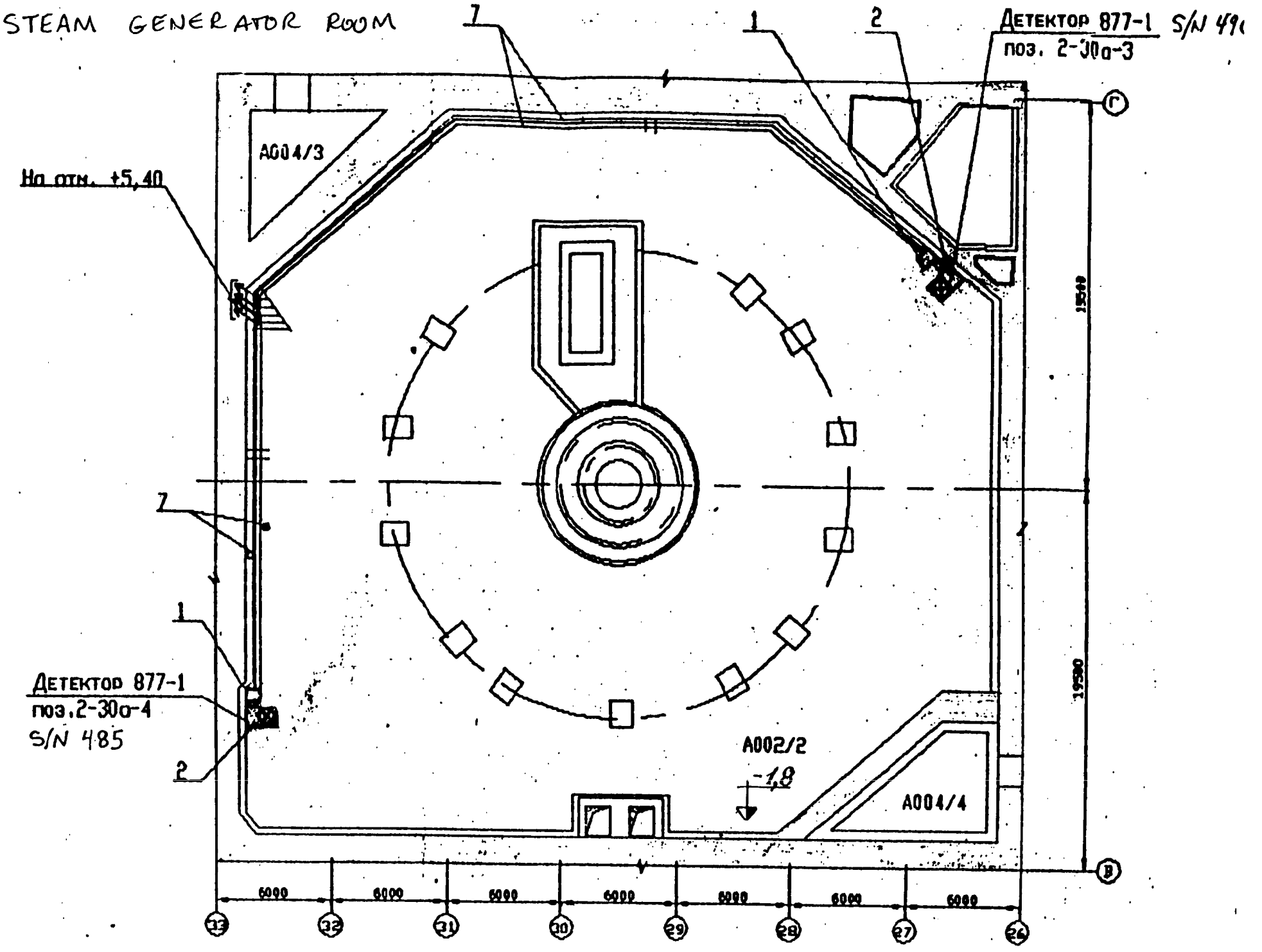
STEAM GENERATOR ROOM
Детектор 877-1 S/N 49(
поз. 2-30а-3
На отм. +5,40
А004/3
Детектор 877-1
поз.2-30а-4
S/N 485
А002/2
-1,8
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26

VICTOREEN, INC.
TITLE: TEST PROCEDURE FOR 876A-1-108 HIGH RANGE CONTAINMENT AREA MONITOR
CUSTOMER: N/A
DOCUMENT: TP876A-1-108 REV. C

Channel A

CALIBRATION DATA SHEET

MODEL 876A-1 HIGH RANGE CONTAINMENT MONITOR

5.1 PRELIMINARY INFORMATION

P.O. #_____ S.O. # _____

Customer_____

876A-1 Serial No. 101 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Digital Voltmeter Model 8060A S/N 427053

Calibration Due Date 10/24/97

Multi-function Counter Model ~~87~~ 43-63 S/N ~~N~~ N6C1352

Calibration Due Date 2/5/98

Precision Current Source Model 878-11 S/N 129

Calibration ~~Due~~ Date 6/20/95

5.2 METER MECHANICAL ZERO AND POWER SUPPLY ADJUSTMENT/TEST

5.2.1 Mechanical Zero at 1R/hr yes (yes)

5.2.2 One Hour Warm-up Completed yes (yes)

5.2.3 AC Supply Voltage 220.4 (120 ± 2.4 VAC)

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Step Number	Minimum Load Test Step 5.2.7 - 5.2.14	Full Load Test Step 5.2.16	Desired Voltage/Tolerance
5.2.7	23.08	22.31	+24 ± 3.0 volts
5.2.8	23.08	22.31	+24 ± 3.0 volts
5.2.9	-19.37	-19.00	-21 ± 2.0 volts
5.2.10	-10.00	-10.00	-10 ± 0.01 volts
5.2.11	15.02	15.02	+15 ± 0.2 volts
5.2.12	14.17	14.09	+14.3 ± 0.3 volts
5.2.13	6.200	6.200	+6.2 ± 0.001 volts
5.2.14	500.7	500.8	+506 ± 10 volts

5.2.15 Lamps illuminated yes (yes)

5.3 METER CIRCUIT CALIBRATION AND LINEARITY VERIFICATION

5.3.1 Adjustable Supply Voltage 5.0 (+5 ± 0.5 volts)
Short-Circuit Current N/A (13 ± 3.0 mA)

5.3.7 Scale Factor Value 2.571 (+2.571 ± 0.001 volts)

5.3.9

Range Switch Position	Actual Meter Response	Desired Meter Response/Tolerance
1-10E3 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10-10E4 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E2-10E5 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E3-10E6 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.3.10 Meter Down-scale on 10E4-10E7 Range? yes (yes)

5.3.11 Meter reading 1.0E3 R/hr on RED scale? yes (yes)

5.4 ALERT AND HIGH ALARM SETPOINT SPAN VERIFICATION

5.4.1 Alert Alarm can adjust to > 1.0E7 R/hr yes (yes)

Alert Alarm can adjust to minimum 1 R/hr yes (yes)

5.4.2 High Alarm can adjust to > 1.0E7 R/hr yes (yes)

High Alarm can adjust to minimum 1 R/hr. yes (yes)

5.5 PREAMPLIFIER ALIGNMENT AND CALIBRATION

5.5.7 Zero Adjustment/R304 0.000 v (0 ± 0.01 volts)

5.5.11 Current Source Output 1.00 uA (1 ± .01 uA)

5.5.12 Zero Adjustment/R306 0.000 v (0 ± 0.002 volts)

5.5.13 Current Source Output 1.00 nA (1 ± 0.01 nA)

5.5.14 Scale Factor Adj./R308 2.571 v (2.571 ± 0.003 volts)

5.5.15 Current Source Output 1.0 pA (1 ± 0.1 pA)

5.5.16 Offset Adjustment/R309 5.04 v (5.1 ± 0.1 volts)

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.6 ALERT AND HIGH ALARM TRIP ACCURACY, LATCH AND RESET

Step Number	Alert Alarm Steps 5.6.4 - 9	High Alarm Step 5.6.13	Response/Tolerance
5.6.4	Not Tripped	Not Tripped	"NOT TRIPPED" x10⁴
5.6.5	1.20 x10⁴ R/hr	1.20 x10⁴ R/hr	> 1.13/< 1.27 R/hr
5.6.6	Does not Reset	Does Not Reset	"DOES NOT RESET"
5.6.7	Does not Reset	Does Not Reset	"DOES NOT RESET"
5.6.8	Alarm Resets	Alarm Resets	"ALARM RESETS"
5.6.9	1.19x10⁴ R/hr	1.19x 10⁴ R/hr	> 1.09/< 1.27 R/hr x10⁴

5.7 DETECTOR EQUIVALENT CURRENT CALIBRATION

5.7.2 Data is : FOR 877-1 S/N 487 W/ ~~750.54~~ 750.54 nA (AVG. A/R/hr)

Determined on 25 / 8 / 95

or : NO DETECTOR SUPPLIED/700 nA AVE. USED

NOTE
N/A is entered in blanks if no detector is supplied.

5.7.3 R503 Adjustment 3.428 v (3.428 ± 0.001 volts)

5.8 ELECTRONIC CHECK SOURCE (ECS) BOARD CALIBRATION

5.8.3 Counter Period 1953 uS (1953 ± 2.0 uS)

5.8.8 Peak Ramp Voltage 2.57 v (2.57 ± 0.01 volts)

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.8.9 Panel Meter Indication 1×10^3 R/hr (1.0E3 R/hr)

5.8.11 ECS Cycle Interval 17mn 3sec minutes (> 15.4/< 18.8 min.)

5.8.12 Threshold Voltage 2.48 v (2.48 volts)

Panel Meter Indication 800 R/hr (800 R/hr)

5.8.14 "Safe/Fail" Lamp illuminated? yes (yes)

DVM Indication 2.48 v (2.48 volts)

5.8.15 DVM Indication 2.47 v (2.47 volts)

"Safe/Fail" Lamp extinguished yes (yes)

5.8.16 DVM Indication 2.48 v (2.48 volts)

"Safe/Fail" Lamp illuminated yes (yes)

5.8.17 DVM Indication 2.57 v (2.57 ± 0.01 volts)

Panel Meter Indication 1000 R/hr (1000 R/hr)

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.9 RECORDER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.144	
1.0E2 R/hr	1 - 10 E3 R/hr	0.284	
1.0E3 R/hr	10 - 10 E4 R/hr	0.427	
1.0E4 R/hr	10 E2-10 E5 R/hr	0.568	
1.0E5 R/hr	10 E3-10 E6 R/hr	0.713	
1.0E6 R/hr	10 E4-10 E7 R/hr	0.857	
1.0E7 R/hr	10 E4-10 E7 R/hr	1.001	

5.10 COMPUTER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.720	
1.0E2 R/hr	1 - 10 E3 R/hr	1.419	
1.0E3 R/hr	10 - 10 E4 R/hr	2.135	
1.0E4 R/hr	10 E2-10 E5 R/hr	2.842	
1.0E5 R/hr	10 E3-10 E6 R/hr	3.563	
1.0E6 R/hr	10 E4-10 E7 R/hr	4.282	
1.0E7 R/hr	10 E4-10 E7 R/hr	5.005	

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.10 RELAY CONTACT RESISTANCE AND LOGIC

5.11.3 Verify : P2-A TO P2-B RESISTANCE < 1 OHM _____ (yes)
: P2-E TO P2-F RESISTANCE < 1 OHM _____ (yes)
: P2-H TO P2-J RESISTANCE < 1 OHM N/A (yes)
: P2-K TO P2-L RESISTANCE < 1 OHM _____ (yes)
: P2-P TO P2-R RESISTANCE < 1 OHM _____ (yes)
: P2-T TO P2-U RESISTANCE < 1 OHM _____ (yes)

5.11.4 Verify : P2-B TO P2-C RESISTANCE > 20 MEG _____ (yes)
: P2-D TO P2-E RESISTANCE > 20 MEG _____ (yes)
: P2-G TO P2-H RESISTANCE > 20 MEG N/A (yes)
: P2-L TO P2-M RESISTANCE > 20 MEG _____ (yes)
: P2-N TO P2-P RESISTANCE > 20 MEG _____ (yes)
: P2-S TO P2-T RESISTANCE > 20 MEG _____ (yes)

5.11.7 Verify : P2-B TO P2-C RESISTANCE < 1 OHM _____ (yes)
: P2-D TO P2-E RESISTANCE < 1 OHM _____ (yes)
: P2-G TO P2-H RESISTANCE < 1 OHM N/A (yes)
: P2-L TO P2-M RESISTANCE < 1 OHM _____ (yes)
: P2-N TO P2-P RESISTANCE < 1 OHM _____ (yes)
: P2-S TO P2-T RESISTANCE < 1 OHM _____ (yes)

5.11.8 Verify : P2-A TO P2-B RESISTANCE > 20 MEG _____ (yes)
: P2-E TO P2-F RESISTANCE > 20 MEG N/A (yes)
: P2-H TO P2-J RESISTANCE > 20 MEG _____ (yes)
: P2-K TO P2-L RESISTANCE > 20 MEG _____ (yes)
: P2-P TO P2-R RESISTANCE > 20 MEG _____ (yes)
: P2-T TO P2-U RESISTANCE > 20 MEG _____ (yes)

P.O. #_____ 876A-1 Serial No. 101

S.O. # _____ 877-1 Serial No. 487

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.12 BACK-UP BATTERY CURRENT DRAIN

5.12.7 Maximum Current @ 24 ± 0.1 VDC N/A mA (550 ± 50 mA)

Performed by Richard Hartt Date 24/6/97

Q.A. Review by G A Fallone Date 24/6/97

VICTOREEN, INC.
TITLE: TEST PROCEDURE FOR 876A-1-108 HIGH RANGE CONTAINMENT AREA MONITOR
CUSTOMER: N/A
OCUMENT: TP876A-1-108 REV. C

Channel B

CALIBRATION DATA SHEET PAGE 1 OF 8

MODEL 876A-1 HIGH RANGE CONTAINMENT MONITOR

5.1 PRELIMINARY INFORMATION

P.O. #_____ S.O. # _____

Customer_____

876A-1 Serial No. 102 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Digital Voltmeter Model 8060A S/N 4270153

Calibration Due Date 10 / 24 / 97

Multi-function Counter Model 43-63 S/N N601352

Calibration Due Date 27 / 5 / 98

Precision Current Source Model 878-11 S/N 129

Calibration Due Date 6 / 20 / 95

5.2 METER MECHANICAL ZERO AND POWER SUPPLY ADJUSTMENT/TEST

5.2.1 Mechanical Zero at 1R/hr yes (yes)

5.2.2 One Hour Warm-up Completed yes (yes)

5.2.3 AC Supply Voltage 220 (120 ± 2.4 VAC)

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Step Number	Minimum Load Test Step 5.2.7 - 5.2.14	Full Load Test Step 5.2.16	Desired Voltage/Tolerance
5.2.7	23.10	22.59	+24 ± 3.0 volts
5.2.8	23.10	22.58	+24 ± 3.0 volts
5.2.9	-19.52	-19.00	-21 ± 2.0 volts
5.2.10	-10.00	-10.00	-10 ± 0.01 volts
5.2.11	15.01	15.02	+15 ± 0.2 volts
5.2.12	14.17	14.09	+14.3 ± 0.3 volts
5.2.13	6.200	6.200	+6.2 ± 0.001 volts
5.2.14	503.7	503.7	+506 ± 10 volts

5.2.15 Lamps illuminated YES (yes)

5.3 METER CIRCUIT CALIBRATION AND LINEARITY VERIFICATION

5.3.1 Adjustable Supply Voltage 5.00 (+5 ± 0.5 volts)
Short-Circuit Current N/A (13 ± 3.0 mA)

5.3.7 Scale Factor Value 2.572 (+2.571 ± 0.001 volts)

5.3.9

Range Switch Position	Actual Meter Response	Desired Meter Response/Tolerance
1-10E3 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10-10E4 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E2-10E5 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E3-10E6 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.3.10 Meter Down-scale on 10E4-10E7 Range? yes (yes)

5.3.11 Meter reading 1.0E3 R/hr on RED scale? yes (yes)

5.4 ALERT AND HIGH ALARM SETPOINT SPAN VERIFICATION

5.4.1 Alert Alarm can adjust to > 1.0E7 R/hr yes (yes)

Alert Alarm can adjust to minimum 1 R/hr yes (yes)

5.4.2 High Alarm can adjust to > 1.0E7 R/hr yes (yes)

High Alarm can adjust to minimum 1 R/hr. yes (yes)

5.5 PREAMPLIFIER ALIGNMENT AND CALIBRATION

5.5.7 Zero Adjustment/R304 0.000 v (0 ± 0.01 volts)

5.5.11 Current Source Output 1.00 uA (1 ± .01 uA)

5.5.12 Zero Adjustment/R306 0.000 v (0 ± 0.002 volts)

5.5.13 Current Source Output 1.00 nA (1 ± 0.01 nA)

5.5.14 Scale Factor Adj./R308 2.570 v (2.571 ± 0.003 volts)

5.5.15 Current Source Output 1.0 pA (1 ± 0.1 pA)

5.5.16 Offset Adjustment/R309 5.14 v (5.1 ± 0.1 volts)

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.6 ALERT AND HIGH ALARM TRIP ACCURACY, LATCH AND RESET

Step Number	Alert Alarm Steps 5.6.4 - 9	High Alarm Step 5.6.13	Response/Tolerance
5.6.4	Not Tripped	Not Tripped	"NOT TRIPPED" x10⁴
5.6.5	1.20x10⁴ R/hr	1.20x10⁴ R/hr	> 1.13/< 1.27 R/hr
5.6.6	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.7	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.8	Alarm Resets	Alarm Resets	"ALARM RESETS"
5.6.9	1.19x10⁴ R/hr	1.19x10⁴ R/hr	> 1.09/< 1.27 R/hr x10⁴

5.7 DETECTOR EQUIVALENT CURRENT CALIBRATION

5.7.2 Data is : FOR 877-1 S/N 483 W/ 754.78 nA (AVG. A/R/hr)

Determined on 28 / 8 / 95

or : NO DETECTOR SUPPLIED/700 nA AVE. USED

NOTE
N/A is entered in blanks if no detector is supplied.

5.7.3 R503 Adjustment 3.428 v (3.428 ± 0.001 volts)

5.8 ELECTRONIC CHECK SOURCE (ECS) BOARD CALIBRATION

5.8.3 Counter Period 1952 uS (1953 ± 2.0 uS)

5.8.8 Peak Ramp Voltage 2.57 v (2.57 ± 0.01 volts)

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.8.9 Panel Meter Indication 1×10^3 R/hr (1.0E3 R/hr)

5.8.11 ECS Cycle Interval 17min 3sec. minutes (> 15.4/< 18.8 min.)

5.8.12 Threshold Voltage 2.48 v (2.48 volts)

Panel Meter Indication 800 R/hr (800 R/hr)

5.8.14 "Safe/Fail" Lamp illuminated? yes (yes)

DVM Indication 2.48 v (2.48 volts)

5.8.15 DVM Indication 2.47 v (2.47 volts)

"Safe/Fail" Lamp extinguished yes (yes)

5.8.16 DVM Indication 2.48 v (2.48 volts)

"Safe/Fail" Lamp illuminated yes (yes)

5.8.17 DVM Indication 2.57 v (2.57 ± 0.01 volts)

Panel Meter Indication 1000 R/hr (1000 R/hr)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.9 RECORDER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.144	
1.0E2 R/hr	1 - 10 E3 R/hr	0.285	
1.0E3 R/hr	10 - 10 E4 R/hr	0.428	
1.0E4 R/hr	10 E2-10 E5 R/hr	0.570	
1.0E5 R/hr	10 E3-10 E6 R/hr	0.714	
1.0E6 R/hr	10 E4-10 E7 R/hr	0.858	
1.0E7 R/hr	10 E4-10 E7 R/hr	1.004	

5.10 COMPUTER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.728	
1.0E2 R/hr	1 - 10 E3 R/hr	1.428	
1.0E3 R/hr	10 - 10 E4 R/hr	2.142	
1.0E4 R/hr	10 E2-10 E5 R/hr	2.850	
1.0E5 R/hr	10 E3-10 E6 R/hr	3.571	
1.0E6 R/hr	10 E4-10 E7 R/hr	4.293	
1.0E7 R/hr	10 E4-10 E7 R/hr	5.020	

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.10 RELAY CONTACT RESISTANCE AND LOGIC

5.11.3 Verify : P2-A TO P2-B RESISTANCE < 1 OHM _____ (yes)
: P2-E TO P2-F RESISTANCE < 1 OHM _____ (yes)
: P2-H TO P2-J RESISTANCE < 1 OHM N (yes)
: P2-K TO P2-L RESISTANCE < 1 OHM _____ (yes)
: P2-P TO P2-R RESISTANCE < 1 OHM A (yes)
: P2-T TO P2-U RESISTANCE < 1 OHM _____ (yes)

5.11.4 Verify : P2-B TO P2-C RESISTANCE > 20 MEG _____ (yes)
: P2-D TO P2-E RESISTANCE > 20 MEG N (yes)
: P2-G TO P2-H RESISTANCE > 20 MEG _____ (yes)
: P2-L TO P2-M RESISTANCE > 20 MEG _____ (yes)
: P2-N TO P2-P RESISTANCE > 20 MEG A (yes)
: P2-S TO P2-T RESISTANCE > 20 MEG _____ (yes)

5.11.7 Verify : P2-B TO P2-C RESISTANCE < 1 OHM _____ (yes)
: P2-D TO P2-E RESISTANCE < 1 OHM _____ (yes)
: P2-G TO P2-H RESISTANCE < 1 OHM N (yes)
: P2-L TO P2-M RESISTANCE < 1 OHM _____ (yes)
: P2-N TO P2-P RESISTANCE < 1 OHM A (yes)
: P2-S TO P2-T RESISTANCE < 1 OHM _____ (yes)

5.11.8 Verify : P2-A TO P2-B RESISTANCE > 20 MEG _____ (yes)
: P2-E TO P2-F RESISTANCE > 20 MEG _____ (yes)
: P2-H TO P2-J RESISTANCE > 20 MEG N (yes)
: P2-K TO P2-L RESISTANCE > 20 MEG _____ (yes)
: P2-P TO P2-R RESISTANCE > 20 MEG A (yes)
: P2-T TO P2-U RESISTANCE > 20 MEG _____ (yes)

P.O. #_____ 876A-1 Serial No. 102

S.O. # _____ 877-1 Serial No. 483

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.12 BACK-UP BATTERY CURRENT DRAIN

5.12.7 Maximum Current @ 24 ± 0.1 VDC N/A mA (550 ± 50 mA)

Performed by Richard Howells Date 25/6/97

Q.A. Review by G C Greene Date 25/6/97

VICTOREEN, INC.
TITLE: TEST PROCEDURE FOR 876A-1-108 HIGH RANGE CONTAINMENT AREA MONITOR
CUSTOMER: N/A
DOCUMENT: TP876A-1-108 REV. C

Channel C

CALIBRATION DATA SHEET PAGE 1 OF 8

MODEL 876A-1 HIGH RANGE CONTAINMENT MONITOR

5.1 PRELIMINARY INFORMATION

P.O. #_____ S.O. # _____

Customer_____

876A-1 Serial No. 104 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Digital Voltmeter Model 8060A S/N 4270153

Calibration Due Date 10 / 14 / 97

Multi-function Counter Model 43-63 S/N N6013.52

Calibration Due Date 2 / 5 / 98

Precision Current Source Model 878-11 S/N 129

Calibration Due Date 6 / 20 / 95

5.2 METER MECHANICAL ZERO AND POWER SUPPLY ADJUSTMENT/TEST

5.2.1 Mechanical Zero at 1R/hr yes (yes)

5.2.2 One Hour Warm-up Completed yes (yes)

5.2.3 AC Supply Voltage 120 (120 ± 2.4 VAC)

P.O. #_____ 876A-1 Serial No. 124

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Step Number	Minimum Load Test Step 5.2.7 - 5.2.14	Full Load Test Step 5.2.16	Desired Voltage/Tolerance
5.2.7	23.14	22.18	+24 ± 3.0 volts
5.2.8	23.14	22.18	+24 ± 3.0 volts
5.2.9	-19.51	-19.00	-21 ± 2.0 volts
5.2.10	-10.00	-10.00	-10 ± 0.01 volts
5.2.11	15.06	15.06	+15 ± 0.2 volts
5.2.12	14.13	14.14	+14.3 ± 0.3 volts
5.2.13	6.200	6.200	+6.2 ± 0.001 volts
5.2.14	499.9	499.8	+506 ± 10 volts

5.2.15 Lamps illuminated yes (yes)

5.3 METER CIRCUIT CALIBRATION AND LINEARITY VERIFICATION

5.3.1 Adjustable Supply Voltage 5.00 (+5 ± 0.5 volts)
Short-Circuit Current N/A (13 ± 3.0 mA)

5.3.7 Scale Factor Value 2.570 (+2.571 ± 0.001 volts)

5.3.9

Range Switch Position	Actual Meter Response	Desired Meter Response/Tolerance
1-10E3 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10-10E4 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E2-10E5 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E3-10E6 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.3.10 Meter Down-scale on 10E4-10E7 Range? yes (yes)

5.3.11 Meter reading 1.0E3 R/hr on RED scale? yes (yes)

5.4 ALERT AND HIGH ALARM SETPOINT SPAN VERIFICATION

5.4.1 Alert Alarm can adjust to > 1.0E7 R/hr yes (yes)

Alert Alarm can adjust to minimum 1 R/hr yes (yes)

5.4.2 High Alarm can adjust to > 1.0E7 R/hr yes (yes)

High Alarm can adjust to minimum 1 R/hr. yes (yes)

5.5 PREAMPLIFIER ALIGNMENT AND CALIBRATION

5.5.7 Zero Adjustment/R304 0.000 v (0 ± 0.01 volts)

5.5.11 Current Source Output 1.00 uA (1 ± .01 uA)

5.5.12 Zero Adjustment/R306 0.000 v (0 ± 0.002 volts)

5.5.13 Current Source Output 1.00 nA (1 ± 0.01 nA)

5.5.14 Scale Factor Adj./R308 2.571 v (2.571 ± 0.003 volts)

5.5.15 Current Source Output 1.0 pA (1 ± 0.1 pA)

5.5.16 Offset Adjustment/R309 5.16 v (5.1 ± 0.1 volts)

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.6 ALERT AND HIGH ALARM TRIP ACCURACY, LATCH AND RESET

Step Number	Alert Alarm Steps 5.6.4 - 9	High Alarm Step 5.6.13	Response/Tolerance
5.6.4	Not Tripped	Not Tripped	"NOT TRIPPED" x10⁴
5.6.5	1.20 x10⁴ R/hr	1.20 x10⁴ R/hr	> 1.13/< 1.27 R/hr
5.6.6	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.7	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.8	Alarm Resets	Alarm Resets	"ALARM RESETS"
5.6.9	1.19x10⁴ R/hr	1.19x10⁴ R/hr	> 1.09/< 1.27 R/hr x10⁴

5.7 DETECTOR EQUIVALENT CURRENT CALIBRATION 752.05

5.7.2 Data is : FOR 877-1 S/N 490 W/ 752.05 nA (AVG. A/R/hr)

Determined on 28 / 8 / 95

or : NO DETECTOR SUPPLIED/700 nA AVE. USED

NOTE
N/A is entered in blanks if no detector is supplied.

5.7.3 R503 Adjustment 3.428 v (3.428 ± 0.001 volts)

5.8 ELECTRONIC CHECK SOURCE (ECS) BOARD CALIBRATION

5.8.3 Counter Period 1954 uS (1953 ± 2.0 uS)

5.8.8 Peak Ramp Voltage 2.57 v (2.57 ± 0.01 volts)

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.8.9 Panel Meter Indication 1000 R/hr (1.0E3 R/hr)

5.8.11 ECS Cycle Interval 17min 4 sec minutes (> 15.4/< 18.8 min.)

5.8.12 Threshold Voltage 2.48 v (2.48 volts)

Panel Meter Indication 800 R/hr (800 R/hr)

5.8.14 "Safe/Fail" Lamp illuminated? yes (yes)

DVM Indication 2.48 v (2.48 volts)

5.8.15 DVM Indication 2.47 v (2.47 volts)

"Safe/Fail" Lamp extinguished yes (yes)

5.8.16 DVM Indication 2.48 v (2.48 volts)

"Safe/Fail" Lamp illuminated yes (yes)

5.8.17 DVM Indication 2.57 v (2.57 ± 0.01 volts)

Panel Meter Indication 1000 R/hr (1000 R/hr)

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.9 RECORDER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.144	
1.0E2 R/hr	1 - 10 E3 R/hr	0.286	
1.0E3 R/hr	10 - 10 E4 R/hr	0.428	
1.0E4 R/hr	10 E2-10 E5 R/hr	0.570	
1.0E5 R/hr	10 E3-10 E6 R/hr	0.714	
1.0E6 R/hr	10 E4-10 E7 R/hr	0.859	
1.0E7 R/hr	10 E4-10 E7 R/hr	1.004	

5.10 COMPUTER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.720	
1.0E2 R/hr	1 - 10 E3 R/hr	1.427	
1.0E3 R/hr	10 - 10 E4 R/hr	2.142	
1.0E4 R/hr	10 E2-10 E5 R/hr	2.848	
1.0E5 R/hr	10 E3-10 E6 R/hr	3.570	
1.0E6 R/hr	10 E4-10 E7 R/hr	4.294	
1.0E7 R/hr	10 E4-10 E7 R/hr	5.024	

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.10 RELAY CONTACT RESISTANCE AND LOGIC

5.11.3 Verify : P2-A TO P2-B RESISTANCE < 1 OHM _____ (yes)
: P2-E TO P2-F RESISTANCE < 1 OHM _____ (yes)
: P2-H TO P2-J RESISTANCE < 1 OHM N/A (yes)
: P2-K TO P2-L RESISTANCE < 1 OHM _____ (yes)
: P2-P TO P2-R RESISTANCE < 1 OHM A (yes)
: P2-T TO P2-U RESISTANCE < 1 OHM _____ (yes)

5.11.4 Verify : P2-B TO P2-C RESISTANCE > 20 MEG _____ (yes)
: P2-D TO P2-E RESISTANCE > 20 MEG _____ (yes)
: P2-G TO P2-H RESISTANCE > 20 MEG N (yes)
: P2-L TO P2-M RESISTANCE > 20 MEG _____ (yes)
: P2-N TO P2-P RESISTANCE > 20 MEG A (yes)
: P2-S TO P2-T RESISTANCE > 20 MEG _____ (yes)

5.11.7 Verify : P2-B TO P2-C RESISTANCE < 1 OHM _____ (yes)
: P2-D TO P2-E RESISTANCE < 1 OHM _____ (yes)
: P2-G TO P2-H RESISTANCE < 1 OHM N (yes)
: P2-L TO P2-M RESISTANCE < 1 OHM _____ (yes)
: P2-N TO P2-P RESISTANCE < 1 OHM A (yes)
: P2-S TO P2-T RESISTANCE < 1 OHM _____ (yes)

5.11.8 Verify : P2-A TO P2-B RESISTANCE > 20 MEG _____ (yes)
: P2-E TO P2-F RESISTANCE > 20 MEG _____ (yes)
: P2-H TO P2-J RESISTANCE > 20 MEG N (yes)
: P2-K TO P2-L RESISTANCE > 20 MEG _____ (yes)
: P2-P TO P2-R RESISTANCE > 20 MEG A (yes)
: P2-T TO P2-U RESISTANCE > 20 MEG _____ (yes)

P.O. #_____ 876A-1 Serial No. 104

S.O. # _____ 877-1 Serial No. 490

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.12 BACK-UP BATTERY CURRENT DRAIN

5.12.7 Maximum Current @ 24 ± 0.1 VDC N/A mA (550 ± 50 mA)

Performed by _____ Date 2/5/97

Q.A. Review by _____ Date 2/6/97

VICTOREEN, INC.
TITLE: TEST PROCEDURE FOR 876A-1-108 HIGH RANGE CONTAINMENT AREA MONITOR
CUSTOMER: N/A
DOCUMENT: TP876A-1-108 REV. C

Channel D

CALIBRATION DATA SHEET

MODEL 876A-1 HIGH RANGE CONTAINMENT MONITOR

5.1 PRELIMINARY INFORMATION

P.O. #_____ S.O. # _____

Customer_____

876A-1 Serial No. 103 877-1 Serial No. 485

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Digital Voltmeter Model 8060A S/N 4270153

Calibration Due Date 10 / 24 / 97

Multi-function Counter Model 43-63 S/N N601352

Calibration Due Date 11 / 5 / 98

Precision Current Source Model 878-11 S/N 129

Calibration ~~Due~~ Date 6 / 20 / 95

5.2 METER MECHANICAL ZERO AND POWER SUPPLY ADJUSTMENT/TEST

5.2.1 Mechanical Zero at 1R/hr yes (yes)

5.2.2 One Hour Warm-up Completed yes (yes)

5.2.3 AC Supply Voltage 220 (120 ± 2.4 VAC)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

Step Number	Minimum Load Test Step 5.2.7 - 5.2.14	Full Load Test Step 5.2.16	Desired Voltage/Tolerance
5.2.7	22.96	22.21	+24 ± 3.0 volts
5.2.8	22.97	22.20	+24 ± 3.0 volts
5.2.9	-19.29	-18.50	-21 ± 2.0 volts
5.2.10	-10.00	-10.00	-10 ± 0.01 volts
5.2.11	15.07	15.07	+15 ± 0.2 volts
5.2.12	14.31	14.22	+14.3 ± 0.3 volts
5.2.13	6.201	6.201	+6.2 ± 0.001 volts
5.2.14	503.2	503.3	+506 ± 10 volts

5.2.15 Lamps illuminated yes (yes)

5.3 METER CIRCUIT CALIBRATION AND LINEARITY VERIFICATION

5.3.1 Adjustable Supply Voltage 5.00 (+5 ± 0.5 volts)
Short-Circuit Current N/A (13 ± 3.0 mA)

5.3.7 Scale Factor Value 2.572 (+2.571 ± 0.001 volts)

5.3.9

Range Switch Position	Actual Meter Response	Desired Meter Response/Tolerance
1-10E3 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10-10E4 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E2-10E5 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW
10E3-10E6 R/hr	1.00E3 0 NW	1.00E3 ± 1-1/2 NW

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.3.10 Meter Down-scale on 10E4-10E7 Range? yes (yes)

5.3.11 Meter reading 1.0E3 R/hr on RED scale? yes (yes)

5.4 ALERT AND HIGH ALARM SETPOINT SPAN VERIFICATION

5.4.1 Alert Alarm can adjust to > 1.0E7 R/hr yes (yes)

Alert Alarm can adjust to minimum 1 R/hr yes (yes)

5.4.2 High Alarm can adjust to > 1.0E7 R/hr yes (yes)

High Alarm can adjust to minimum 1 R/hr. yes (yes)

5.5 PREAMPLIFIER ALIGNMENT AND CALIBRATION

5.5.7 Zero Adjustment/R304 0.000 v (0 ± 0.01 volts)

5.5.11 Current Source Output 1.00 uA (1 ± .01 uA)

5.5.12 Zero Adjustment/R306 0.000 v (0 ± 0.002 volts)

5.5.13 Current Source Output 1.00 nA (1 ± 0.01 nA)

5.5.14 Scale Factor Adj./R308 2.570 v (2.571 ± 0.003 volts)

5.5.15 Current Source Output 1.0 pA (1 ± 0.1 pA)

5.5.16 Offset Adjustment/R309 5.08 v (5.1 ± 0.1 volts)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.6 ALERT AND HIGH ALARM TRIP ACCURACY, LATCH AND RESET

Step Number	Alert Alarm Steps 5.6.4 - 9	High Alarm Step 5.6.13	Response/Tolerance
5.6.4	Not Tripped	Not Tripped	"NOT TRIPPED" x10⁴
5.6.5	1.20 x10⁴ R/hr	1.20 x10⁴ R/hr	> 1.13/< 1.27 x10⁴ R/hr
5.6.6	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.7	Does Not Reset	Does Not Reset	"DOES NOT RESET"
5.6.8	Alarm Resets	Alarm Resets	"ALARM RESETS"
5.6.9	1.19 x10⁴ R/hr	1.19 x10⁴ R/hr	> 1.09/< 1.27 x10⁴ R/hr

5.7 DETECTOR EQUIVALENT CURRENT CALIBRATION

5.7.2 Data is : FOR 877-1 S/N 485 W/ 748.9 nA (AVG. A/R/hr)

Determined on 28 / 8 / 95

or : NO DETECTOR SUPPLIED/700 nA AVE. USED

NOTE
N/A is entered in blanks if no detector is supplied.

5.7.3 R503 Adjustment 3.428 v (3.428 ± 0.001 volts)

5.8 ELECTRONIC CHECK SOURCE (ECS) BOARD CALIBRATION

5.8.3 Counter Period 1954 uS (1953 ± 2.0 uS)

5.8.8 Peak Ramp Voltage 2.57 v (2.57 ± 0.01 volts)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.8.9 Panel Meter Indication 1000 R/hr (1.0E3 R/hr)

5.8.11 ECS Cycle Interval 17min. 4sec. minutes (> 15.4/< 18.8 min.)

5.8.12 Threshold Voltage 2.48 v (2.48 volts)

Panel Meter Indication 800 R/hr (800 R/hr)

5.8.14 "Safe/Fail" Lamp illuminated? yes (yes)

DVM Indication 2.48 v (2.48 volts)

5.8.15 DVM Indication 2.47 v (2.47 volts)

"Safe/Fail" Lamp extinguished yes (yes)

5.8.16 DVM Indication 2.48 v (2.48 volts)

"Safe/Fail" Lamp illuminated yes (yes)

5.8.17 DVM Indication 2.57 v (2.57 ± 0.01 volts)

Panel Meter Indication 1000 R/hr (1000 R/hr)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.9 RECORDER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.142	
1.0E2 R/hr	1 - 10 E3 R/hr	0.284	
1.0E3 R/hr	10 - 10 E4 R/hr	0.427	
1.0E4 R/hr	10 E2-10 E5 R/hr	0.569	
1.0E5 R/hr	10 E3-10 E6 R/hr	0.713	
1.0E6 R/hr	10 E4-10 E7 R/hr	0.857	
1.0E7 R/hr	10 E4-10 E7 R/hr	1.004	

5.10 COMPUTER OUTPUT LINEARITY

Meter Reading	Meter Range Sw. Position	Measured Output	Desired Voltage/Tolerance
10 R/hr	1 - 10 E3 R/hr	0.710	
1.0E2 R/hr	1 - 10 E3 R/hr	1.421	
1.0E3 R/hr	10 - 10 E4 R/hr	2.135	
1.0E4 R/hr	10 E2-10 E5 R/hr	2.842	
1.0E5 R/hr	10 E3-10 E6 R/hr	3.565	
1.0E6 R/hr	10 E4-10 E7 R/hr	4.285	
1.0E7 R/hr	10 E4-10 E7 R/hr	5.020	

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.10 RELAY CONTACT RESISTANCE AND LOGIC

5.11.3 Verify : P2-A TO P2-B RESISTANCE < 1 OHM _____ (yes)
: P2-E TO P2-F RESISTANCE < 1 OHM _____ (yes)
: P2-H TO P2-J RESISTANCE < 1 OHM N/A (yes)
: P2-K TO P2-L RESISTANCE < 1 OHM _____ (yes)
: P2-P TO P2-R RESISTANCE < 1 OHM _____ (yes)
: P2-T TO P2-U RESISTANCE < 1 OHM _____ (yes)

5.11.4 Verify : P2-B TO P2-C RESISTANCE > 20 MEG _____ (yes)
: P2-D TO P2-E RESISTANCE > 20 MEG _____ (yes)
: P2-G TO P2-H RESISTANCE > 20 MEG N/A (yes)
: P2-L TO P2-M RESISTANCE > 20 MEG _____ (yes)
: P2-N TO P2-P RESISTANCE > 20 MEG _____ (yes)
: P2-S TO P2-T RESISTANCE > 20 MEG _____ (yes)

5.11.7 Verify : P2-B TO P2-C RESISTANCE < 1 OHM _____ (yes)
: P2-D TO P2-E RESISTANCE < 1 OHM _____ (yes)
: P2-G TO P2-H RESISTANCE < 1 OHM N/A (yes)
: P2-L TO P2-M RESISTANCE < 1 OHM _____ (yes)
: P2-N TO P2-P RESISTANCE < 1 OHM _____ (yes)
: P2-S TO P2-T RESISTANCE < 1 OHM _____ (yes)

5.11.8 Verify : P2-A TO P2-B RESISTANCE > 20 MEG _____ (yes)
: P2-E TO P2-F RESISTANCE > 20 MEG _____ (yes)
: P2-H TO P2-J RESISTANCE > 20 MEG N/A (yes)
: P2-K TO P2-L RESISTANCE > 20 MEG _____ (yes)
: P2-P TO P2-R RESISTANCE > 20 MEG _____ (yes)
: P2-T TO P2-U RESISTANCE > 20 MEG _____ (yes)

P.O. #_____ 876A-1 Serial No._____

S.O. # _____ 877-1 Serial No. _____

Data is: "AS-FOUND" / "AS-LEFT" / "INITIAL" (circle one only)

5.12 BACK-UP BATTERY CURRENT DRAIN

5.12.7 Maximum Current @ 24 ± 0.1 VDC N/A mA (550 ± 50 mA)

Performed by _____ Date 25/6/97

Q.A. Review by _____ Date 25/6/97

ATTACHMENT 3

877-1
Detector S/N

876A-1-M4
Recorder S/N

Channel	Detector S/N	Recorder S/N	876	Recorder
A	487	101	7.0 ~~0~~	7.0 ~~0~~ Bias
B	483	102	6.8	7.0
C	490	104	7.0	7.2
D	485	103	7.5	7.5

Richard Horsts 27/6/97
Victoreen Inc.

ATTACHMENT 5

"Specification for Post-Accident High-Range Confinement
Radiation Monitoring System for Russian
VVER-440/230 Nuclear Power Plant,"
Brookhaven National Laboratory (April 1994)

Attachment B

SPECIFICATION FOR

POST-ACCIDENT HIGH-RANGE CONFINEMENT RADIATION MONITORING SYSTEM FOR RUSSIAN VVER 440 TYPE 230 NUCLEAR POWER PLANT

Brookhaven National Laboratory
Department of Advanced Technology
International Projects Division
Upton, NY 11973

April 1994

TABLE OF CONTENTS

POST-ACCIDENT HIGH-RANGE CONFINEMENT RADIATION MONITORING SYSTEM FOR RUSSIAN VVER 440 TYPE 230 NUCLEAR POWER PLANT

1.0 INTRODUCTION

This specification defines the technical requirements for a Post Accident High Range Confinement Radiation Monitoring System to be installed in a Russian VVER 440 Type 230 (PWR) Nuclear Power Plant (NPP). The Radiation Monitoring System must be considered Class 1E equipment, and must satisfy the requirements of the U.S. Nuclear Regulatory Commission Regulatory Guide 1.97.

A single Radiation Monitoring System consists of two redundant trains (Train A and Train B). Each train consists of (i) two radiation detectors to be positioned at two different locations within the plant Confinement Zone, (ii) signal processor(s) to be located in a room external to the Confinement Zone, and (iii) control and readout equipment to be positioned at two locations, one in the plant control room and a second local display external to the Confinement Zone, at a position near the signal processors. Additional ancillary equipment and services are defined in the specification.

2.0 SCOPE

This document covers the specifications for the design, testing, calibration and delivery of all material, equipment and spare parts for a High Range Confinement Radiation Monitoring System for one nuclear power plant unit. The Radiation Monitoring System for one nuclear plant unit consists of two independent Trains, designed as Class 1E equipment to satisfy the requirements for the Post Accident High Range Containment (Confinement for the VVER 440 NPP) Radiation Monitoring, as specified by U.S. Nuclear Regulatory Commission Regulatory Guide 1. 97. The Radiation Monitoring System will be installed in a Russian VVER 440, Type 230, Nuclear Power Plant.

The Seller is required to provide quotations for a single System. In addition the Seller is requested to provide quotations for four (4) such Systems which would be required for four (4) nuclear plant units, and for additional options. The remainder of this document describes the requirements for a single System.

It is not the intent of this document to specify all details of design and construction. It shall be the responsibility of the Seller to demonstrate as part of the Seller's quotation, that the equipment has been designed, fabricated, calibrated and tested in accordance with all applicable engineering codes, standards and U.S. government regulations, as applicable.

2.1 Equipment and Work to be Supplied by Seller

The Seller shall supply a redundant Post Accident High Range Containment Radiation Monitoring System consisting of two Trains of equipment, in accordance with this specification and including, but not limited, to the items delineated in Table 1.

Equipment, spare parts, tools and material furnished by the Seller shall be new and of highest quality. The Seller shall obtain the required export license and shall ship the equipment to the job site, in Russia. Before shipment, the radiation monitoring equipment shall be thoroughly shop tested under Seller's standard procedures, as approved by the Purchaser.

The specifications for the items delineated in Table 1 are presented in Section 4 below. All items must meet the codes and standards defined in Section 3.

2.2 Hardware and Services Excluded

The following hardware and services are excluded from this specification: (i) labor for unloading and storing equipment at job site, (ii) installation labor, (iii) electrical power sources (220 V 50Hz and 220 Vdc), (iv) all conduit required for the protection of the cables, (v) interconnecting cabling between equipment, when not specified herein, (vi) testing of the system at job site (to be offered as an option, see Section 9), and (vii) mounting supports for the equipment.

3.0 CODES AND STANDARDS

The Seller shall control the quality of items and services to meet the requirements of this specification, of all applicable U.S. codes and standards, and of other procurement documents. Seller's proposals shall clearly confirm that design offered complies with applicable and current U.S. requirements. Design, materials, manufacturing, examination, testing, inspection, stamping, certification, qualification and documentation shall conform to applicable portions of the latest issue (in force at the date of the purchase order) of the following standards and codes, including case rulings, interpretations, and addenda. The Seller shall ensure, in particular, that the items and services provided meet the codes and standards delineated in Table 2.

If conflict between statutes, codes, standards, and specification should exist, such conflicts shall be brought to the Purchaser's attention, in writing, for disposition. All exceptions to the applicable standards and codes shall be so stated in the Purchaser's Proposal section titled "Exceptions to the Specification".

4.0 DEFINITION OF SYSTEM HARDWARE COMPONENTS AND SERVICES TO BE SUPPLIED BY SELLER

The minimal hardware and service components of the System to be supplied by the Seller are defined in Table 1. Each Train consists of two high-range detectors, to be located within Confinement. One or more signal processors are provided for each Train to handle the processing and control functions of its two detector channels. The signal processors are located outside Confinement. Each Train contains a local readout for each detector, to be located outside confinement, at a position near the signal processor(s). In addition, each Train consists of a control room high-level radiation monitoring station, consisting of a control and display module for the two high-range detectors. One two-pen strip chart recorder is to be provided with each Train, one pen for each of the two radiation detector channels.

Figure 1 is a suggested conceptual schematic diagram of a single Train (or Channel), showing one high range detector channel associated with one signal processing unit. Alternatively, a single processor could serve two detectors. The detector is shown schematically as located in the Confinement Zone, the signal processing unit along with a local display is in an area outside confinement (to be determined at a later date), and the control board, including display and pen recorder, is located in the control room. The control board shall contain separately delineated, clearly distinguishable displays for the two detector Trains.

The Seller will provide the following additional hardware: all cables up to 500 feet in length per channel, to connect detectors, signal processors(s) and control and readout devices; all termination kits, connectors, racks, etc., required for interconnecting individual components;, output relays for remote alarms; all isolation devices, as required; special tools required to maintain or adjust individual components of the monitoring system; a calibration kit for each Train.

Seller shall provide all documentation as delineated in Section 9 below.

5.0 PERFORMANCE REQUIREMENTS

5.1 Design Life

Components located inside confinement shall be capable of withstanding photon exposures up to 10^8 R, referenced to the energy range between 0.6 and 1.3 MeV. Components which cannot meet this operational exposure time requirement shall be designed to permit their replacement during routine maintenance. The Seller shall also provide a suggested replacement schedule to ensure, except for the maintenance periods, the uninterrupted operability of the equipment.

5.2 Range

The range of the Post-Accident High-Range Confinement Radiation Monitors shall be 1 R/hr to 10^7 R/hr of gamma dose.

5.3 Required Accuracy

Overall system accuracy shall be within $\pm$ 40 percent at the 95 percent confidence level over the entire operating range, with precision within $\pm$ 15 percent for any single measurement level.

5.4 Required Response Characteristics

Time Response:

Overall electronic system response time (10 to 90 percent of the true reading) on the maximum range shall be $\leq$3 seconds. On all other ranges the system response time shall be no greater than 5 seconds.

Radiation Energy Response

The system shall be capable of measuring the gamma dose rate over a range of photon energies from 60 keV to 3 MeV, with linear energy response (±20 percent) over the range of 0.1 MeV to 3 MeV.

5.5 Local Environments in Which Equipment Must Operate

Table 1 defines the locations within the Nuclear Power Plant in which the various equipment items are located. The equipment must perform according to specifications during normal plant operation, and during postulated accident conditions. This section defines the assumptions regarding these conditions.

Table 3 delineates the assumed normal and accident conditions within the Confinement Zone, in which the high level radiation detectors would operate. Table 4 defines the environment conditions for the equipment located in the region outside confinement (signal processors and local monitors) and in the control room.

5.6 Equipment Power Supply Characteristics

The system shall be capable of operation on 220 volts, 50 Hz AC, and shall be unaffected by voltage or frequency changes of ±20 percent.

5.7 Additional Instrumentation Requirements

The following additional requirements apply to the monitoring system instrumentation. These requirements derive largely from ANSI Standard N320-1979, which is listed in Table 2 as one of the standards which this equipment must satisfy.

(1) The system shall have an internal electronic calibration check, which shall check operation of all circuitry other than the detector.

(2) The system shall be fail-safe; in the event of a malfunction or failure, an internal audit circuit shall be activated and transmit an appropriate signal to a central manned location.

(3) When responding to levels in excess of the maximum specified range, the instrument should not paralyze and the readout signal shall remain full upscale.

(4) Switches and other controls shall be protected to prevent inadvertent deactivation or operation of system.

(5) There shall be no deleterious effect to the system from radio frequency and microwave exposure to 10 mW/cm^2, photon exposure to 5×10^5 R, referenced to the energy range between 0.8 - 1.2 MeV, and from electrostatic charges with potentials to 10,000 volts.

(6) The operating temperature range of the system shall encompass the extremes anticipated. Where the instrumentation may be exposed directly to ambient outside temperatures, the 50 year extremes shall be applied.

(7) For the operating temperature range the temperature coefficient shall be < 0.5 percent per °C and it should be $\pm$ 15 percent over the entire range.

(8) The instrument system shall be unaffected by relative humidities from 5 percent to 95 percent over the designated temperature range.

(9) The system shall be able to withstand mechanical stress equivalent to a peak overpressure of 15 psi.

(10) Logarithmic or digital readout should be employed. If Multiple ranges are used, automatic range changing shall be provided. Manual adjustment of range shall be unnecessary.

(11) All units of similar function, including detectors, electronic modules, readout and display devices and power supplies, shall be wholly interchangeable within type.

(12) Electronic and other supporting components should reflect the latest technology.

(13) All modules shall be accessible for test without removal from the circuit. Plug-in type units should be considered.

(14) Each detector channel of the instrument system shall be equipped with an alarm capable of being externally set to alarm at any point over the stated range. The alarm should be both audible and visible, and should be capable of reset without removing the instrument from service.

(15) At a fixed design operating point, the drift shall not exceed $\pm$ 0.5 percent of linear full scale per day and $\pm$ 2 percent of linear full scale per 1000 hours.

(16) Detectors shall be provided with a sensing circuit with a live zero to prohibit spurious failure alarms when the detector is placed in a radiation environment less than 1.0 R/h.

(17) Detectors shall be provided with a check current (in lieu of isotopic source) for testing monitor electronics. Detectors shall be doped to provide a continuously biased output thus ensuring the detector is functional and continuity is maintained with associated electronics.

(18) Detector enclosure shall be grounded to protect maintenance personnel against high voltages. The ground shall remain effective if the detector is removed from the enclosure.

5.8 Materials

(1) The use of low melting point alloys such as lead or tin shall be restricted to detector shielding and electronic component soldering applications. Mercury shall not be used. Aluminum components shall not be permitted in the Confinement Zone.

(2) Materials shall be new and shall be selected by the Seller as the best commercially available to perform satisfactorily under the operational and environmental conditions imposed by the service and as set forth herein.

(3) All equipment supplied shall, unless otherwise approved, be constructed of fire retardant materials. Every effort shall be made to utilize inherently flame retardant, metallic components, consistent with practical and safe electrical considerations.

(4) All wire and cable shall be flame retardant type qualified to the requirements of IEEE 383.

(5) All exposed housing and rack interior and exterior paints shall be certified as fire retardant by the paint manufacturer, and shall be applied in accordance with his written procedures.

(6) All materials used for equipment installed in the Control Room shall be such that, when exposed to flame or excessive heat, they do not emit any noxious fumes or chemicals in quantities likely to endanger continuous habitability of the Control Room.

5.9 Electrical Wiring

Seller's Standards and NEC procedure shall be used for the equipment and rack internal wiring qualified to IEEE 383 flame test. Ten percent spare terminals minimum shall be provided in rack for Purchaser's disposition.

6.0 SHOP TEST

(1) The radiation monitoring equipment shall be thoroughly shop tested under Seller's standard procedures, as approved by the Purchaser.

(2) During these tests, the radiation monitoring equipment shall be demonstrated to meet all requirements stated herein, to the satisfaction of the Purchaser. The tests shall be conducted by the Seller and shall include provision for the Purchaser to take an active part, in order to become familiar with the practical operation of the devices, as well as to prove the accuracy of the system. The Seller shall notify Purchaser of the date of each test at least ten (10) days in advance. Final notification of a test shall be made at least seventy-two (72) hours prior to the test.

(3) The method of equipment operation shall be described in detail in a System's Manual, which shall be used in conjunction with the test.

(4) Shop tests shall verify the ability of all equipment supplied to perform their intended functions within the applicable tolerances and performance guarantees, such that when the equipment is shipped and correctly connected to the external devices, the complete system is operable as intended.

(5) A wiring insulation test of the Control Room Equipment Rack at 1500 volts 50Hz, to ground, shall be performed for one minute after all circuit grounds have been disconnected.

(6) The following shall be verified: (i) the proper grounding of equipment and shields, (ii) screw tightness of all terminals, and (iii) conformance with approved wiring diagrams.

(7) Primary calibration shall be performed in accordance with Seller's System Manual.

(8) In the event of failure of any equipment to meet the test requirements, the Seller shall obtain the Purchaser's permission before any repairs or modifications are carried out. If these repairs or modifications are, in the Purchaser's opinion, likely to affect the results of any test previously carried out, the appropriate retesting shall be performed.

(9) Nothing in the above requirements shall be interpreted as preventing the Seller from performing additional tests and inspections he may deem necessary or required by Codes and Standards.

7.0 CALIBRATION

(1) Before delivery, the monitor shall be calibrated and tested by the Seller to ensure that all components conform to this specification.

(2) Written test procedures shall be provided, which will describe a step-by-step method of verifying that all adjustments have been made, and that all functions operate properly.

(3) The Radiation Monitor shall be tested at three activity levels over the range 1 R/hr to 10^7 R/hr to demonstrate acceptable performance in accordance with the following:

a. Operate the monitor to reach thermal stability.
b. Record the background counting rate.
c. Introduce a source of activity into the monitor and record the time dependent counting rate above background. Sources shall be traceable to the National Institute for Standards and Technology (NIST).

(4) All calibration data specified in Section 9 shall be provided to the Purchaser.

8.0 AVAILABILITY TEST

Seller shall propose a System availability test procedure for approval by the Purchaser prior to shipment of the System. Maintenance and troubleshooting during the availability test will be performed by the Purchaser in accordance with written procedures supplied by the Seller and included with the documentation. Seller shall be available for telephone consultations during the System installation period, and during the availability test. Supervision and testing of the System at the jobsite, in Russia, shall be quoted as an option by the Seller.

9.0 SUBMISSION OF SELLER'S DOCUMENTATION AND RECORDS

(1) Seller shall submit with his quotation the name of at least one U.S. operating light-water reactor nuclear power plant in which the high-level monitoring equipment is currently installed and operational. Seller shall include the name, address and phone number of an individual in the utility who can be contacted to verify this information. Vendors who do not submit this information will be automatically disqualified from this procurement process.

(2) Seller shall submit with his quotation Seller's standard performance guarantees for all system components.

(3) Seller shall include with his quotation a section titled "Exceptions to the Specification," in which he shall enumerate all deviations of his equipment and services from the requirements of this specification document.

(4) Seller shall submit with his quotation, the environmental capabilities of each component of the equipment offered, including but not limited to the following:

a. temperature limits and test temperature profile
b. humidity limits
c. pressure limits
d. radiation lifetime
e. seismic qualification information/data, which can be an equipment-specific seismic qualification data, a generic seismic fragility test result performed on similar equipment, or an actual earthquake event experienced by similar equipment installed in conventional Power Plants and other industrial facilities (See Section 9.0 of IEEE 344-1987). In case no seismic qualification data is available, the Seller shall provide a generic equipment seismic qualification plan in his bid proposal and submit to Purchaser for review.

(5) The following documentation and records are considered as a minimum requirement to be submitted to the Purchaser for approval prior to start of fabrication, but the Purchaser has the right to be provided with other documentation as he deems necessary.

a. QA Manual
b. Cleaning and packaging procedures
c. Block diagram, connection diagram, outline drawings
d. Seismic and environmental qualification reports
e. Shop test procedures and shop test data

(6) Calibration test conditions and test procedures are to be supplied to the Purchaser prior to performance of the test. Seller shall provide the calibration test data to the Purchaser prior to delivery of the Radiation Monitoring System.

(7) The Seller shall include in his quotation a table of equipment specifications to include, at a minimum, the items delineated in Table 5 of this document.

A total of three copies of each of the above documents shall be provided for each Train.

Table 1 - Basic System Components and Location

HIGH-RANGE RADIATION MONITORING SYSTEM		
Location	**Train A**	**Train B**
In Confinement	Two (2) high-range detectors	Two (2) high-range detectors
Outside Confinement	Signal processor(s)	Signal processor(s)
	Local readout outside confinement for each detector.	Local readout outside confinement for each detector.
Control Room	One (1) control room monitoring station, including control and display for two (2) high-range detector channels	One (1) control room monitoring station, including control and display for two (2) high-range detector channels
	Strip chart recorder for each of the two detectors	Strip chart recorder for each of the two detectors
Ancillary Equipment	All cables up to 500 feet in length per channel to connect detectors, signal processor(s) and readouts	All cables up to 500 feet in length per channel to connect detectors, signal processor(s) and readouts
	Termination kits, connectors, racks, etc., for detectors, signal processors, readouts	Termination kits, connectors, racks, etc., for detectors, signal processors, readouts
	Output relays for remote alarms	Output relays for remote alarms
	Isolators, as required	Isolators, as required
	Special tools required to maintain or adjust monitoring equipment	Special tools required to maintain or adjust monitoring equipment
	3 Systems manuals	3 Systems manuals
	3 Sets of complete documentation, as per Section 9	3 Sets of complete documentation, as per Section 9

Table 2- Applicable Codes and Standards

U.S. ORGANIZATION	CODE/STANDARD	DESCRIPTION
USNRC	Regulatory Guide 1.97, Revision 3, May 1983	Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident
ANSI	Standard ANSI N320-1979 (Reaffirmed 1993)	Performance Specifications for Reactor Emergency Radiological Monitoring Instrumentation

Table 3 - Equipment Environment Conditions for Confinement Zone

ENVIRONMENT CONDITION	NORMAL	EMERGENCY
Temperature	20C to 80C	170C
Pressure	15-20 mm water below surrounding area	2 atm.
Radiation	Integrated exposure: 10^8 Rads	
Relative Humidity	5 percent - 95 percent	100 percent
Chemical Sprays	none	spray composition: 12 g boron/kg water KOH > 100g/kg water H_3BO_3 > 150g/kg water Hydrazine > 100g/kg water

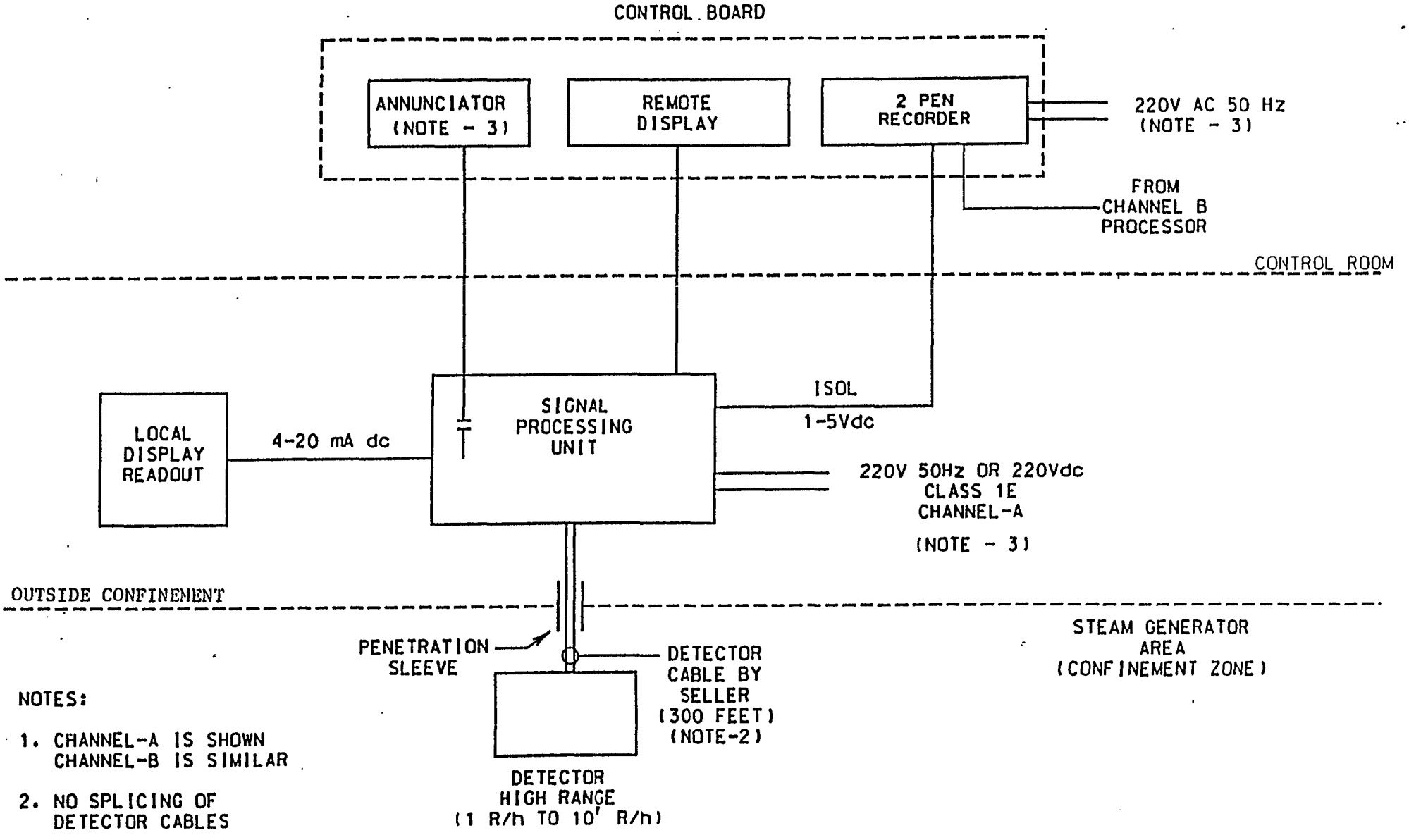
Table 4 - Equipment Environment Conditions for Outside Confinement and for Control Room

ENVIRONMENT CONDITION	NORMAL	EMERGENCY
Temperature	-40C to 40C	-40C to 40C
Pressure	1 atm.	1 atm.
Radiation	low	low
Relative Humidity	to 95 percent	to 95 percent
Chemical Sprays	low	low

Table 5 - Technical Data Sheets

EQUIPMENT ITEM	DATA ITEM	TECHNICAL DATA- Local	TECHNICAL DATA- Remote
Detector	Model No.		
	Range		
	Detector type		
	Detector voltage		
	Signal voltage		
	Connector type		
Detector cable (to processor)	Type		
	Size: OD		
	Length (max)		
Processor	Model No.		
	Processor type		
	Size and type of memories		
	Power supply required	220 volts ac, 50 Hz	220 volts ac, 50 Hz
Display	Model No.		
	Range (R/hr)		
Recorder	Model No.		
	No. Pens		
	Power Supply		220 volts ac, 50 Hz
Outputs	No. relay outputs DPDT		
	Relay contact rating at 220 volts ac, 50 Hz		
Indicator Lights	Alert alarm		

EQUIPMENT ITEM	DATA ITEM	TECHNICAL DATA-Local	TECHNICAL DATA-Remote
	High radiation alarm		
	Failure of background		
	Visual/audible		
	Others		
Communication	No. ports		
	Comm. cable type/size		
	Protocol		
Display on Selection	R/hr		
	Method of adjustment of alarm setpoint		
Control	Check source		
	Others		
Enclosure	NEMA (or IEC type)		
Accuracy	Detector		
	Processor		
	Readout		
	Combined		
	Drift		



NOTES:

1. CHANNEL-A IS SHOWN CHANNEL-B IS SIMILAR
2. NO SPLICING OF DETECTOR CABLES
3. BY OTHERS

Figure 1 - Functional Block Diagram of Post-Accident High-Range Containment Radiation Monitor

EBASCO SKETCH
6/30/93

ATTACHMENT 6

"Proposal for a Post-Accident High-Range Confinement
Radiation Monitoring System for Russian
VVER-440/230 Nuclear Power Plant for
Brookhaven National Laboratory,"
Proposal Number 601860,
RFQ Number 745221,
Victoreen, Inc. (August 1994)

Proposal
for a
Post-Accident High-Range
Confinement Radiation Monitoring System
for
Russian VVER 440 Type 230 Nuclear Power Plant
for
Brookhaven National Laboratory

Proposal Number 601860

RFQ Number 745221

Prepared by: S.T. Nawalaniec
(216)248-9300 x249

Submitted August 5, 1994

Victoreen, Inc.
6000 Cochran Rd.
Cleveland, OH 44139-3395

VICTOREEN

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VICTOREEN

Executive Summary

Proposal Description

The proposed radiation monitoring system is based on Victoreen's Model 875 High Range Containment Monitor, a specialized area monitor designed to provide indication of post-LOCA radiation levels within nuclear power plant containment structures. The 875 system includes a detector, ratemeter, cable, and mounting and installation configuration rigorously qualified to meet the requirements outlined by the United States Nuclear Regulatory Commission for post-LOCA (loss of coolant accident) conditions. Victoreen's system has been proven in dozens of installation around the world, accumulating hundreds of operating-years of consistent, reliable operation. This proposal for Brookhaven National Laboratory addresses the specified requirements in the most cost-effective manner possible; the proposed system is the lowest installed cost and life-cycle cost system available, maximizing the return on investment in advanced radiation monitoring without compromising the technical and operational specifications for this application in a Russian VVER 440 Type 230 confinement zone. The remainder of this proposal includes the pricing, commercial, and technical information requested as well as supporting documentation describing the Victoreen Model 875 System.

Victoreen Description

Victoreen is a world leader in the detection and characterization of ionizing radiation; the company was founded in 1929 as the first provider of accurate, reliable medical dose assessment instruments, and has since been recognized as a leader in diverse applications of radiation detection technology. Victoreen's current product line is represented by four major divisions identified as Components (supplies special high value resistors, corotrons, and spark gaps), Health Physics (supplies survey meters, probes, friskers, and related equipment), Medical Physics (supplies various dose calibration, quality assurance, and test instruments for X ray, radiation oncology, and nuclear medicine applications), and Systems (supplies engineered radiation monitoring systems for commercial nuclear power plants and the U.S. Department of Energy). One of Victoreen's strongest characteristics is that because no single division accounts for more than thirty percent of sales, the entire company is relatively immune from periodic fluctuations in a particular market. The Victoreen corporate structure includes the headquarters and primary manufacturing facility in Cleveland, a medical physics supplies distribution subsidiary (Nuclear Associates) on Long Island, a components manufacturing facility in Brownsville, Texas, and a European subsidiary (Victoreen GmbH) in Munich. The proposed system will be supplied by the Systems Division (located in Cleveland), which comprises nearly fifty people dedicated to the design, fabrication, testing, and support of process and area monitoring systems for nuclear power and research applications.

Supporting Documentation

Response to the Specification

(Specification for Post-Accident High-Range Confinement Radiation Monitoring System for Russian VVER 440 Type 230 Nuclear Power Plant)

1.0 Introduction

The proposed system meets the specified technical requirements for a Post-Accident High Range Confinement Radiation Monitoring System for a Russian VVER 440 Type 230 (PWR) Nuclear Power Plant (NPP). The proposed system is Class 1E equipment satisfying the requirements of U.S. Nuclear Regulatory Commission Regulatory Guide 1.97.

Each radiation monitoring system comprises two redundant trains (A and B) consisting primarily of (i) two radiation detectors positioned at different locations within the confinement zone, (ii) two signal processors/ratemeters in the plant control room, and (iii) two local displays mounted in a room external to the confinement zone. Additional ancillary equipment and services are defined in this proposal.

2.0 Scope

Acknowledged; supporting documentation attached to this proposal or referenced and available from Victoreen demonstrates that the Victoreen Model 875 System is designed, fabricated, calibrated, and tested in accordance with all applicable engineering codes, standards, and U.S. government regulations.

2.1 Equipment and Work to be Supplied by Seller

Acknowledged; the proposed system includes the items shown on the attached Equipment List.

2.2 Hardware and Services Excluded

Acknowledged; if desired, Victoreen can also supply the required conduit and pull boxes. It should be noted that the system qualification requires installation in accordance with Victoreen's specifications.

3.0 Codes and Standards

Acknowledged; supporting documentation confirming that the Victoreen Model 875 System meets all applicable U.S. requirements is either attached or referenced and available from Victoreen (some of the reports are quite lengthy).

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3.0 Codes and Standards

Acknowledged; supporting documentation confirming that the Victoreen Model 875 System meets all applicable U.S. requirements is either attached or referenced and available from Victoreen (some of the reports are quite lengthy).

no local ac power is required. Two two-pen, Class 1E strip chart recorders to be mounted on the control board are also included.

Two pieces of calibration equipment are included for each train - a radioactive calibrator and an electrical calibrator (the source and accompanying shielding necessary to calibrate the higher ranges of the system is not appropriate for portable, field use). The radioactive calibrator is a portable standard fixture that provides a nominal 10 R/h field for in-situ detector calibration. The electrical calibrator is a precision current generator and precision electrometer combined in one ruggedized package; the electrical calibrator and radioactive calibrator, when used together and in accordance with the procedures in Victoreen's manual, can provide a complete system calibration.

4.0 Definition of System Hardware Components and Services to be Supplied by Seller

The proposed system includes hardware and services as described herein. Each train includes two detectors mounted within confinement; a dedicated signal processor/ratemeter is provided in the control room for each channel - this dedicated architecture eliminates the possibility of a single point of failure inherent to a shared signal processor architecture. An additional local display to be mounted just outside confinement is included for each channel; panel-mounted two-pen strip chart recorders for mounting on the control board are also included (it is recommended that the recorders be split between trains - for example, channels A_1 and B_1 on one recorder, and A_2 and B_2 on the other).

The attached Figure 1 is a sketch of a typical channel; as mentioned above, dedicated ratemeters mounted in the control room provide signal processing, display, and control for each individual channel, thereby eliminating single points of failure.

The proposed system includes the additional equipment identified in the equipment list, namely:

a) cables - The 500' of cable per channel has been supplied in the form of two (one for the high voltage, the other for the signal) 250' in-confinement cables per channel, two 250' ex-confinement cables per channel, and a single 250' local display cable per channel, for a total of 2000' each of in- and ex-confinement cable and 1000' of local display cable. The add/delete prices on the quotation pricing sheet may be used to adjust the individual lengths as required.

b) terminations - The proposed price includes factory termination of the detector end of the in-confinement cable (the penetration connection is by others).

c) connectors - The proposed price includes connector kits for the ratemeter interface cables.

d) racks - Two two-bay rack chassis' are included for control room mounting of the ratemeters (the detectors and local displays are intended to be wall-mounted, the recorders are intended to be panel mounted).

e) output relays - Alarm output relays are integral to the ratemeters, as described on the attached data sheet (contact rating 5A @ 115 Vac/28 Vdc resistive).

f) isolation devices - none required

g) special tools - none required

h) calibration kit - A Model 878-10 High Range Field Calibrator and Model 878-11 Current Generator/Test Electrometer are included for each train; prior to shipment, transfer data will be taken for each calibrator.

All specified documentation is included.

5.0 Performance Requirements

5.1 Design Life

Comply; all components mounted inside containment can withstand photon exposure to 2 x 10^8 R, with a 10% safety margin. Victoreen's system manual includes a recommended maintenance schedule (required every five years) that ensures uninterrupted operability.

5.2 Range

Comply

5.3 Required Accuracy

Comply

5.4 Required Response Characteristics

Time Response:

Comply; the system response time is less than one second.

Radiation Energy Response:

Comply; the system response is ±8% from 0.1 to 3.0 MeV (refer also to the attached energy response curve).

5.5 Local Environments in Which Equipment Must Operate

Comply except as noted below; refer also to the attached LOCA test profile (950.301, Section IV, p. 34).

5.6 Equipment Power Supply Characteristics

The 875 system has been qualified for voltage variations of ±10% and frequency variations of ±3 Hz; if required, an uninterruptible power supply can be included. The 875 system is also capable of directly accepting 22 to 32 Vdc battery input power, to which it can switch automatically in the event of a loss of the 220 Vac power.

5.7 Additional Instrumentation Requirements

Comply, except as noted below.

(1) The 875 system includes an electronic check source (ECS) that automatically verifies system integrity every seventeen minutes; the ECS may also be initiated manually by the operator. The 875 system also includes an operator-initiated channel test function.

(2) Comply; a fail-safe output relay is provided.

(3) Comply

(4) Not included, but may be provided at additional cost. It is unlikely that incidental contact with any of the front panel controls would affect channel operation.

(5) Comply except as noted below; refer also to the attached EMI/RFI Test Report (950.349).

(6) Comply except as noted below.

(7) Comply; the temperature coefficient is ±0.4%/°C maximum, but less than ±8% full scale 0 to 70°C.

(8) Comply except as noted below; refer also to the attached detector test profile (950.301, Section IV, p. 34).

(9) Comply; refer also to the attached detector test profile profile (950.301, Section IV, p. 34 - the detector is qualified to 133 psig).

(10) Comply; a large logarithmic scale analog meter with a parallax mirror is provided on the control room ratemeter. While the unit can be left in a full-scale mode, switch-selectable three decade sub-ranges are available for better resolution. The analog meter allows at-a-glance reading of meter position for rapid scanning of the four instruments.

(11) Comply

(12) Comply; the 875 system is technically equal to or better than other qualified post-LOCA containment radiation monitors, with additional operational, installed cost, and life-cycle cost advantages over competing systems.

(13) Comply

(14) Comply; each channel includes two independently settable radiation alarms (note: no audible alarm is included - it has been assumed that the annunciator to be supplied by others provides an audible alarm triggered by a ratemeter contact closure).

(15) Comply

(16) Not required; Victoreen's more rigorous design does not require an artificial biasing source to provide psuedo-leakage current for proper operation; our superior design reads radiation below 1.0 R/h (preventing spurious alarms) but does not come on scale until that threshhold is reached. This provides several advantages over the "live zero" design, namely the elimination of isotopic sources (and corresponding source inventory paperwork), reduction in background, better ALARA considerations, and less complex, more reliable circuitry.

(17) Comply except as noted below; an electronic check source (ECS) is provided for automatic dynamic testing of the entire channel. Victoreen's modern design means that no detector doping is required for biasing, as described above.

(18) Victoreen's detector does not require a separate enclosure, making maintenance and installation easier and less cumbersome; the detector itself is fully grounded.

5.8 Materials

(1) Comply

(2) Comply

(3) Comply

(4) Comply

(5) Comply

(6) Comply

5.9 Electrical Wiring

Comply; the proposed system includes rack chassis' to be mounted in a control room rack supplied by others. All field connections to the ratemeter are through military-style backplane connectors (spare terminals are not applicable).

6.0 Shop Test

(1) Comply

(2) Comply as applicable (reports documenting previously conducted type tests and a Certificate of Conformance will be sufficient in many cases).

(3) Comply

(4) Comply, as applicable

(5) Comply

(6) Comply

(7) Comply

(8) Acknowledged

(9) Acknowledged

7.0 Calibration

(1) Comply, as applicable

(2) Comply

(3) Comply (a five activity level calibration is provided).

(4) Comply

8.0 Availability Test

Comply

9.0 Submission of Seller's Documentation and Records

(1) Refer to the attached Users List; a verification contact is:

Mr. Alex Taylor
Diablo Canyon Nuclear Power Plant
Pacific Gas & Electric Company
P.O. Box 56
Avila Beach, CA 93424

(805)545-4236

(2) Comply; Victoreen's standard performance guarantees are the specifications described in this proposal and on the attached documentation, particularly Section III of Qualification Report 950.301.

(3) Comply; see below

(4) Comply; refer to the attached supporting documentation (excerpts from Victoreen's 950.301 Qualification Type Test Data Report for Class 1E Victoreen High Range Containment Radiation Area Monitor System).

a. Report 950.301, Section IV, p. 10, p. 11, p. 32-34, p. 47
b. Report 950.301, Section IV, p. 10, p. 11, p. 47
c. Report 950.301, Section IV, p. 34
d. Report 950.301, Section IV, p. 10, p. 12, p. 47
e. Report 950.301, Section IV, pp. 25-31, pp. 53-58

(5) Acknowledged

(6) Comply

(7) Comply; refer to the attached Table 5.

Three copies of each will be supplied for each Train.

Exceptions to the Specification
(Specification for Post-Accident High-Range Confinement Radiation Monitoring System for Russian VVER 440 Type 230 Nuclear Power Plant)

The proposed system is in full compliance with the specification except as indicated below.

1.0 Introduction

(second paragraph)

Victoreen's standard design does not require a separate signal processor mounted outside confinement - the control room-mounted ratemeter is the signal processor; the proposed system configuration is outlined in Figure 1. This design eliminates single points of failure that can affect more than one channel, requires Class 1E ac power in only one location (the control room), provides easier access to the processor, reduces installation costs, and reduces life-cycle maintenance costs.

2.1 Equipment and Work to be Supplied by Seller

(second paragraph)

The proposed price includes shipment to Upton, NY in accordance with Note 1 on the Quotation Pricing Sheet (export documentation is included)..

4.0 Definition of System Hardware Components and Services to be Supplied by Seller

(first and second paragraphs)

Referring also to item 1.0 above, Victoreen's standard design incorporates the signal processor into the control room-mounted ratemeter - a separate signal processor is not required; the proposed system configuration is outlined in Figure 1.

5.5 Local Environments in Which Equipment Must Operate

The outside confinement and control room equipment is qualified for operation from 40° F to 120°F and 10% to 90% relative humidity (noncondensing).

5.6 Equipment Power Supply Characteristics

Victoreen's specifications for the 875 system allow voltage variations of ±10% and frequency variations of ±3 Hz. If required, an uninterruptible power supply can be included as an option; the 875 is also capable of accepting a direct 22 to 32 Vdc input

from a battery backup system, to which it is capable of automatically switching if the 220 Vac power is lost.

5.7 Additional Instrumentation Requirements

(1) Victoreen's 875 system includes an electronic check source that checks the operation of the entire channel, including the detector.

(4) The rotary switch and pushbuttons are not protected; if required, a removable protective cover can be provided at additional cost.

(5) The ratemeter has been qualified to a total integrated dose of 1×10^3 Rad @ Co^{60} integrated over a 40 year life.

(6) The outside confinement and control room equipment is qualified for operation from 40°F to 120°F and 10% to 90% relative humidity (noncondensing).

(8) The outside confinement and control room equipment is qualified for operation from 40°F to 120°F and 10% to 90% relative humidity (noncondensing).

(14) The proposed system does not include audible alarm annunciation, which is assumed to be included in the annunciator to be supplied by others as indicated in Figure 1 of the specification.

(16) The superior design of the Victoreen 875 system does not require a radiation source to generate a live zero to prohibit spurious failure alarms when exposed to fields less than 1.0 R/h; in a field less than 1.0 R/h, the system operates normally (analog outputs are clamped to prevent recorder pens from being jammed against the baseline). Victoreen's modern design has several advantages over competing "live zero" designs, including the elimination of isotopic sources (and corresponding source inventory paperwork), background reduction, ALARA considerations, and less complex, more reliable circuitry.

(17) Referring to item (16) above, Victoreen's pre-eminent design does not require detector doping; an automatic self test confirms proper function and continuity. Channel integrity is confirmed by an electronic check source initiated every 17 minutes or at operator request. The electronic check source feature is more fully described in the system description above.

5.9 Electrical Wiring

The proposed 875 system uses military-style backplane connectors; no terminal blocks are provided.

Equipment List

The following represents the equipment required for a single plant (two redundant trains):

Item	Quantity	Part Number	Description
1	2	13-75A	Strip Chart Recorder
2	2000'	50-103	Cable (outside confinement)
3	1000'	50-105	Remote Indicator Cable
4	4	844-18-M1	Remote Indicator
5	2	876-1-55	Rack Chassis
6	4	876A-1	Ratemeter
7	4	877-1	Detector
8	8	878-1-5	Cable Termination Assembly
9	2000'	878-1-9	Cable (in confinement)
10	2	878-10	High Range Field Calibrator
11	2	878-11	Current Generator/Test Electrometer

VICTOREEN

Recommended Spare Parts List

The following represents the equipment required for a single plant (two redundant trains):

Item	Quantity	Part Number	Description
1	1	876-1-104	Switch PC Board Assembly
2	1	876-1-110	Ribbon Cable
3	1	876-1-89	Power Supply PC Board Assembly
4	1	876A-1-41	Meter Assembly with Bezel
5	1	876A-1-75	Relay Driver PC Board Assembly
6	1	876A-1-86	Preamplifier PC Board Assembly
7	1	876A-1-92	Electronic Check Source PC Board Assembly
8	1	877-1	Detector
9	1	878-1-15	Cable Termination Kit
10	1	9-81	Knob
11	1	92-7005-10A	Bushing (P1)
12	1	92-7005-11A	Bushing (P2)
13	1	92-7005-12A	Bushing (P3)
14	1	92-7005-4A	Cable Connector (P1)
15	1	92-7005-5A	Cable Connector (P3)
16	1	92-7005-6A	Cable Connector (P2)
17	1	92-7005-7A	Cable Clamp (P1)
18	1	92-7005-8A	Cable Clamp (P2)
19	1	92-7005-9A	Cable Clamp (P3)
20	2	92-7035-A	BNC Coaxial Cable Connector (J1 & J2)
21	1	92-8002-1A	Red Lens Cap
22	1	92-8002-2A	Green Lens Cap
23	1	92-8002-3A	Amber Lens Cap
24	1	92-8003-A	Blue Lens Cap
25	5	92-9006-A	Lamp
26	5	92-9009-1A	Fuse
27	5	92-9009-2A	Fuse

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High Range Containment Monitor
Model 875 System
Users List (partial)

Arkansas Nuclear One 1 & 2
Asco 1 & 2 (Spain)
Beaver Valley 1
Big Rock Point
Browns Ferry 1, 2, & 3
Brunswick 1 & 2
Cooper
D. C. Cook 1 & 2
Diablo Canyon 1 & 2
Duane Arnold
Edwin I. Hatch 1 & 2
Fort Calhoun
Grand Gulf 1 & 2
Hanford Nuclear Reservation (Fast Flux Test Facility)
Indian Point 2
Joseph M. Farley 1 & 2
Kori 3 & 4 (Korea)
Midland 1 & 2
North Anna 1 & 2
Oconee 1, 2, & 3
Oyster Creek
Palisades
Robert E. Ginna
Robinson 2
Salem 1 & 2
Surry 1 & 2
Susquehanna 1 & 2
Three Mile Island 1
Tihange 1, 2, & 3 (Belgium)
Trino Vercellese (Italy)
Trojan
V. C. Summer
Vermont Yankee
WNP-2
Yankee Rowe
Yonggwang 1 & 2 (Korea)
Zimmer

Drawings

The following drawings are attached:

Figure 1	Typical Channel
GEL875-1	Interconnection Diagram
GEL876A-1	High Range Containment Area Monitor Readout Module Dimensional Outline
GEL877-1	High Range Containment Area Monitor Detector & Bracket Dimensional Outline
GEL876-1-55	Rack Chassis and Recommended Seismic Mounting
878-10-GEL	High Range Field Calibrator
878-11-5	Current Calibrator Assembly (sheet 2)
878-1-9-TAB	Detector Cable
50-103-TAB	Coaxial Cable
GEL844-18	Typical Remote Indicator

Energy Response Curve
Project Schedule

Data Sheets

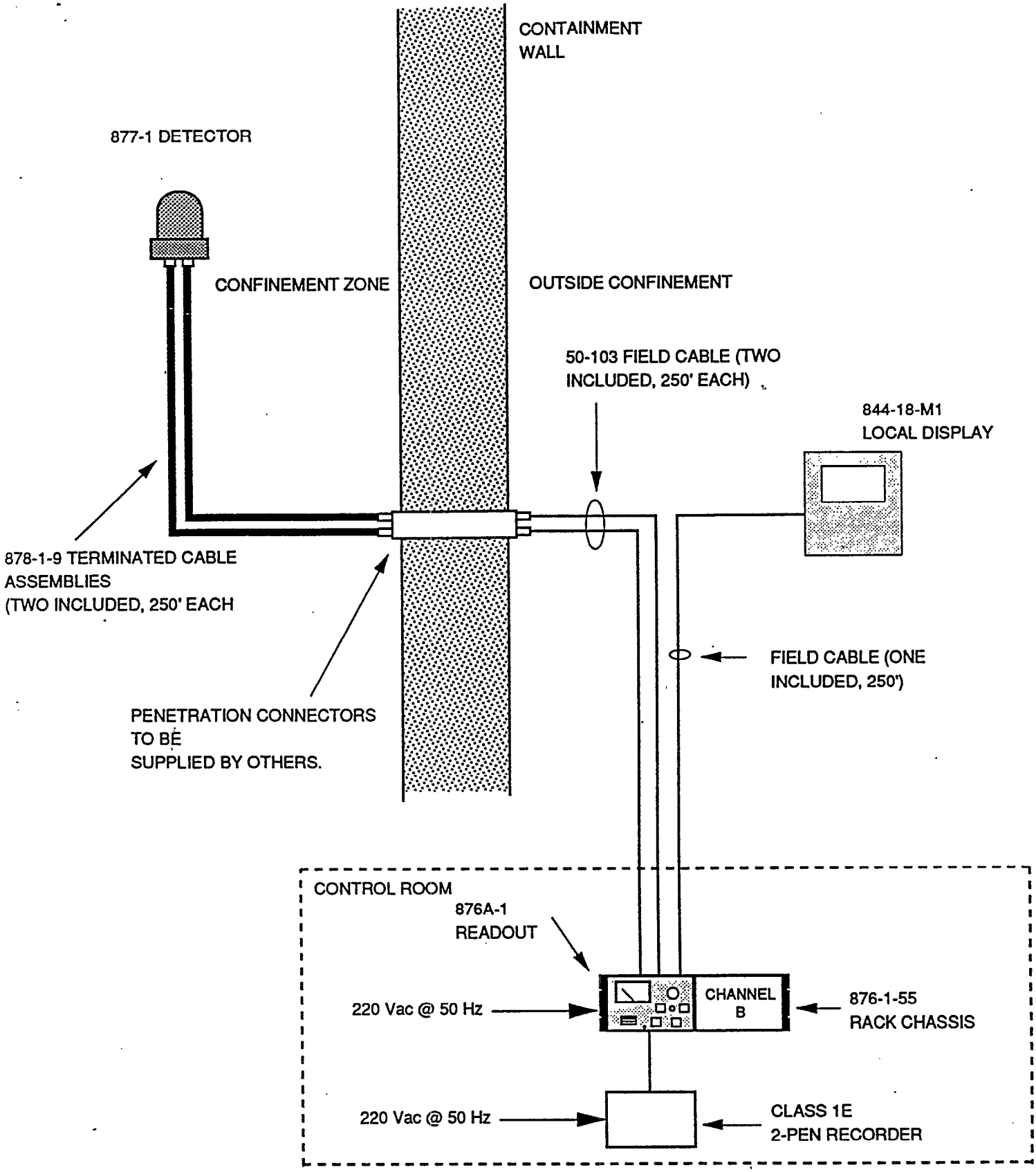
The following standard data sheets are attached:

High Range Containment Monitor - Model 875
High Range Field Calibrator - Model 878-10
Current Generator/Test Electrometer - Model 878-11
Table 5

Qualification Reports

The following Reports (or excerpts) are attached:

Report 950.301	Qualification Type Test Data Report for Class 1E Victoreen High Range Containment Radiation Area Monitor System [excerpts]
Report 950.349	EMI/RFI Test Report Model 875 High Range Containment Area Monitor



BROOKHAVEN NATIONAL LABORATORY
PROPOSAL NUMBER 601860

Figure 1
Typical Channel
Post-Accident High-Range Confinement Radiation Monitor

VICTOREEN

7/94

ATTACHMENT 7

Administrative Correspondences which
Resulted in the Contract Award to
Victoreen, Inc.
for Post-Accident Confinement Radiation Monitors
for the Kola Nuclear Power Plant
(BNL Purchase Order 745221)

Project/Task Information Sheet

Project/Task Number: V4.5.1

Project/Task Title: Post-accident Radiation Monitors

Safety Category: Confinement

Originator: B. W. Spencer **Origination Date:** 2/24/93

Revision No.: 2 **Revised by:** B. W. Spencer **Date:** 11/4/93

Purpose: Provide reliable indication that an accident has occurred in the confinement volume and give indication of the seriousness of the accident by means of monitoring the confinement atmosphere radiation level.

Relevance to Near Term Risk Reduction: Operator actions following an accident are guided by quantitative information about the seriousness of the accident, as provided by wide-range radiation level monitors.

References: Discussed by Mr. Koshmanov and Dr. Spencer at NTRR EWG follow-on meeting, Moscow, 2/18/93. Required at U.S. NPP's by Reg. Guide 1.97.

Summary Description: Two trains of safety grade equipment conforming to requirements of Reg. Guide 1.97 are being provided for Kola Unit #2. Each train will have two high-range detector channels. The systems consist of the high-range detectors (2 per train), signal processing unit to be located in an I&C room outside confinement, including local display, and control board to be located in Control Room including display, recorder, and alarm annunciator, plus interconnecting cabling. The NPP personnel will be responsible for installing and checking the equipment with assistance of U.S specialist(s).

Status: This is a fasttrack procurement currently underway at BNL.

Applicable Codes and Standards: Class 1E system; comply with requirements of Reg. Guide 1.97.

Schedule: Procure and ship equipment on schedule to install equipment at Kola Unit #2 during its 70-day outage presently scheduled from September 14, 1994 to November 24, 1994.

Cost Estimate and Basis:

U.S. cost of two trains of equipment	$180 K
U.S. cost to provide installation and checkout assistance	20
U.S. Cost for engineering assistance	25
Russian cost for engineering/installation	25
	$250 K

EBASCO

July 2, 1993
E/BNL-93-024
V.4.5.1

Dr. James Guppy
Brookhaven National Laboratory
International Projects Division
Building 475B
Upton, L.I., NY 11973

SUBJECT: LISBON NUCLEAR SAFETY INITIATIVE
NEAR TERM RISK REDUCTION
CONFINEMENT INSTRUMENTATION
V 4.5.1 POST ACCIDENT RADIATION MONITOR

Dear Mr. Guppy:

Enclosed for your review and use are:

- Ebasco Specification No. BNL-KOLA-IC-01 dated 7/2/93 "Post Accident High Range Containment Radiation Monitor"
- Suggested Bidders List
- Options List
- Vendor Technical Information

The specification has been prepared requiring compliance with all United States requirements including but not limited to Reg. Guide 1.97 and applicable 1E requirements. Equipment suppliers are required to provide a list of applicable standards guides and codes which govern the manufacturing and testing of their equipment. Prior to preparation of this specification radiation monitoring equipment suppliers were approached to identify any savings if required 1E Class documentation was omitted. Both suppliers declined to consider this approach as all their post accident high radiation monitors are manufactured in compliance with United States Regulatory requirements.

The specification identifies the requirements for one redundant radiation monitoring system for one unit. Options are identified to obtain prices for two (2) units (for Kola and/or Novovoronech) and for four (4) units (two at Kola and two at Novovoronesh. The specification assumes that only one monitor per channel will be required. However, a review of VVER 440/230 confinement arrangements indicated that more than one detector per channel may be needed. Therefore, options for two and three detectors per channel are requested.

July 2, 1993
Dr. James Guppy

In the absence of accident temperature and pressure profiles and also due to the lack of seismic data, bidders have been requested to furnish information with their proposals which can be reviewed by VVER engineering and design groups for acceptance.

Available technical information is attached for your use. The bidders list includes two suppliers that currently manufacture the subject monitor. Other US suppliers could not be identified. As both bidders have European or Russian offices each bidder should be requested to furnish details of their off-shore operations and capabilities.

Very truly yours,

Thomas J. Grant

Thomas J. Grant
Project Manager

cc: Dr. B.W. Spencer
Manager - LWR Programs and Advanced Projects
Reactor Analysis and Safety Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

ltr-024

OPTIONS LIST

The bidder shall provide separate quote for the following items per specification BNL-KOLA-IC-01

a. Two (2) Redundant systems for two units including all items specified in section 2.1

b. Four (4) redundant systems for four units including all items specified in section 2.1

c.1 Each redundant system including two (2) detectors per channel

c.2 Each redundant system including three (3) detectors per channel

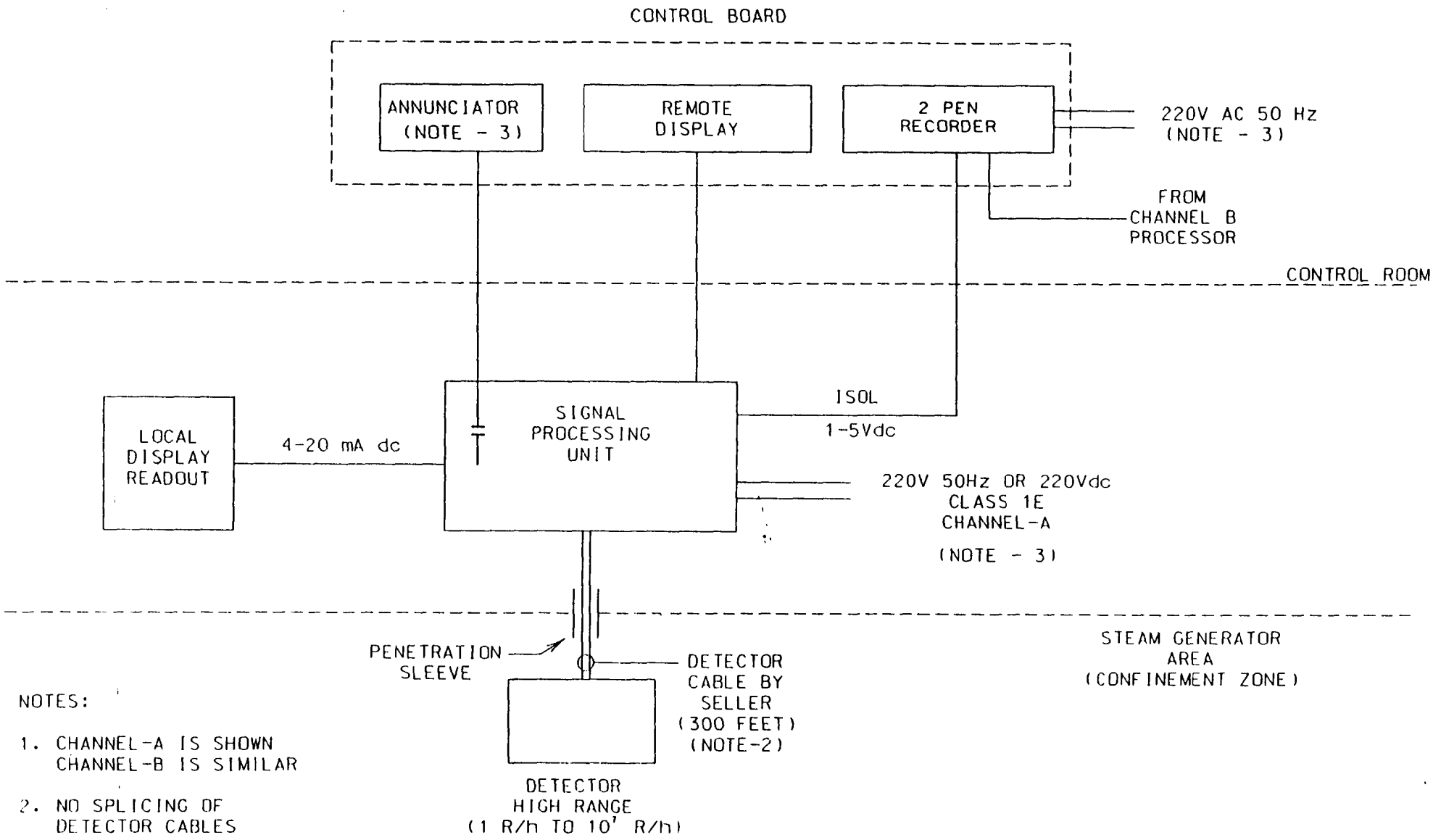
d. Special detector cable add/delete price per foot for adjustment to base length of 300 ft.

e. Supervision and Testing of the system at job site, in Russia (Refer to section 2.1.1.f)

f. Spare parts list (Refer to section 4.0 b)

EBASCO SPECIFICATION
POST ACCIDENT HIGH RANGE CONTAINMENT
RADIATION MONITOR

PROJECT IDENTIFICATION
BNL-KOLA-IC-01



NOTES:

1. CHANNEL-A IS SHOWN
   CHANNEL-B IS SIMILAR
2. NO SPLICING OF
   DETECTOR CABLES
3. BY OTHERS

FUNCTIONAL BLOCK DIAGRAM
PROCESSOR LOCATED OUTSIDE CONTROL ROOM

(SKETCH-A)
6/30/93

Brookhaven National Laboratory

To: *James Guppy, IPD*
From: *Tas Khan, RSD* TAK
Date: *August 24, 1994*
Subject: *Post-accident radiation monitoring system for Kola NPP*

With reference to the above, I have completed the review of the bids by NRC Industries and Victoreen Inc. I have also discussed with several nuclear power plants their experience with the post-accident monitoring systems supplied to them and with other systems provided by the two bidders. After careful consideration I have selected Victoreen Inc. as the supplier who will meet the needs of the Kola NPP. My reasons are summarized below:

1. Item 9.0 (1) of the Brookhaven requirements stated that "Seller shall submit with this quotation the name of at least one U.S. operating light water reactor nuclear power plant in which the high level monitoring equipment is currently installed and operational.....Vendors who do not submit this information will be automatically disqualified from this procurement process." The reason for this extremely important requirement was that the specification required a system that was well tried and tested; recognized to be robust and reliable and known to work in the very stringent operating conditions required of a post accident monitoring system. It was considered essential that this system be totally reliable. NRC have failed to provide a single U.S. plant where their post-accident monitors are in use. Victoreen have provided a list of 59 reactor units where their system is operating, including 48 nuclear power reactors in the U.S.

2. The Victoreen system is a fully operational, reliable and well tested system. The NRC system, it appears, will be designed from various components, some manufactured by NRC and others by other companies. Because of this Victoreen have provided test plans and test data on their system. NRC have not done so. The Victoreen terms of delivery are 21/2 months after order is placed. NRC's terms are 7 months after order has been placed.

3. I discussed the performance of the Victoreen system with several nuclear power plants and they gave it a reliable rating. I was unable to obtain such a rating for the NRC equipment from the persons listed in their bid. I have also discussed the matter with appropriate expert persons in BNL.

4. Victoreen specifically acknowledge compliance with all codes and standards in the BNL specification. NRC do not do so.

5. Victoreen specifically comply with all the materials requirements of the BNL specification of section 5.8. NRC do not. Victoreen also comply with the Shop test and Calibration requirements.

6. In their exceptions to the specifications, Victoreen show that in most cases their system is in compliance with the intent of the requirements but they do so in a different and often superior way.

7. Victoreen's quote includes a radiation source calibrator. NRC's does not.

I have found some technical superiorities in the Victoreen system above the NRC's proposed system but have not given Victoreen any credit for this because these superiorities are above and beyond the BNL specification. I have also examined the prices quoted by the two companies. It appears that there is a major difference for the costs of translating all the documents into Russian from English. Victoreen's price may be much higher because they have a lot more data and material requiring translation. I suggest that the translation to Russian be the responsibility of the Russians and be done in Russia where the services of a translator will be a lot cheaper. If the cost of the translation into Russian is removed then the total price of the Victoreen provided system for the four radiation

monitoring systems, the installation by the supplier and the spare parts and calibration equipment would be $564,000. The costs of similar equipment and services for the NRC system, excluding the radiation source calibrator, which they do not provide, is $490,931. The difference between the two prices is $73,069. I do not have the cost of the radiation source calibrator, but that cost would further reduce the difference in the quoted prices.

It is therefore my recommendation that, since NRC do not comply with the requirements of item 9.0 (1) of the BNL specification, and in view of the other points stated above, that the Victoreen Post-Accident Monitoring System be purchased for the Kola Nuclear Power Plant and, if appropriate, for the other Russian reactors.

Further, in item 2.2 of the Victoreen quotation, Victoreen state that, "....Victoreen can supply the required conduit and pull boxes. It should be noted that the system qualification requires installation in accordance with Victoreeen's specification." To ensure that the system complies with Victoreen's stated qualification requirements it is my further recommendation that appropriate conduits and pull boxes be purchased from Victoreen also.

cc: J. W. Baum, RSD
J. C. Small, Purchasing

BROOKHAVEN NATIONAL LABORATORY

M E M O R A N D U M

DATE: October 10, 1994
TO: Files
FROM: James G. Guppy, Phone 516 282 2698, Fax 516 341 1430
SUBJECT: Justification for Radiation Monitoring Equipment Project

This memo will serve to provide the justification for BNL/DAT/IPD to proceed with a Project to provide Radiation Monitoring equipment to a Russian Nuclear Power Plant (NPP) located at Kola. The subject Project will provide Kola NPP with state-of-the-art radiation monitoring equipment of US manufacture to assist the Russians in monitoring the level of radiation in confinement.

In line with the various Selection Criteria generally agreed to by the AUI Board on June 24, 1994, the subject Project is considered to be low risk because:

1. Completion of this Project will provide low risk technology aimed at improving the safety of radiation monitoring at a Russian NPP. All equipment is US standard for such applications. This equipment has a proven history of widespread application in US NPPs.

2. This Project does not involve any design related work on the part of BNL nor any US contractor, and the equipment to be utilized has been approved of by the Russians. Materials discussing various equipment types were submitted to the Russian side for their approval. The specific equipment to be delivered is that selected by the Russians as meeting their requirements, and are approved by their respective design and regulatory agencies.

3. This Project also provides advise and technical support to the Russian commercial nuclear power agencies to upgrade and further develop safety practices in the area of radiation monitoring. This goal of safety practice development is explicitly allowed by the Selection Criteria.

4. This Project also provides education, training and knowledge transfer to Russian NPP staff on technical methods, approaches, and techniques pertinent to radiation monitoring. This goal of education, training, and knowledge transfer is explicitly allowed by the Selection Criteria.

c:
L. Willis

JOHN S.

BROOKHAVEN NATIONAL LABORATORY

M E M O R A N D U M

DATE: October 11, 1994
TO: Fred Altrui/DCP
FROM: James G. Guppy, Phone 516 282 2698, Fax 516 341 1430
SUBJECT: Purchase of Radiation Monitors

I request that the equipment and other accessories indicated in the Purchase Request No. 745221 be procured. As we have indicated earlier, the low bidder (NRC) was deemed unacceptable and the reasons documented (Memo, T. Khan to J. Guppy, dated 8/24/94). The acceptable vendor is the next lowest bidder, Victoreen.

Please proceed with this procurement, with the following exception. Before giving Victoreen the option to translate the equipment documentation, I would like to get an indication of the amount of documentation involved (e.g., number of pages of text, number of figures, number of tables). The cost of $68,000 seems high, and we may be able to translate the materials by other means more cost effectively.

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

TO: John Small (DCP)
FROM: T. Ginsberg (DAT)
SUBJECT: Radiation Monitor RFQ 745221
DATE: October 26, 1994

I have reviewed the communication from Victoreen of October 25, 1994. The information presented in the fax demonstrates that the Victoreen and NRC price quotations for the radiation monitor systems are reasonably comparable. We believe that the Victoreen system is technically superior, as documented in the memo from T. Khan to J. Guppy of August 24, 1994, which is attached to this memorandum. Furthermore, NRC does not satisfy the very specific requirement defined in the BNL requirements document that the seller must identify at least one U.S. power plant in which their high-level monitoring equipment is currently installed and operational. On the basis of these argument, we request that DCP proceed with award of contract to Victoreen. Additional supporting information follows.

In order to compare the Victoreen and NRC proposals, we must establish a comparable set of equipment and services. The Victoreen system contains a Radiation Calibration Source, while the NRC system does not. The radiation source calibrator was not a requirement. So, we will exclude this cost from the costing basis. Both systems contain electronic calibrators, and we will include this in the costing basis. After due consideration, we believe it best to exclude translation services from the services to be provided. The Russians can supply the translation, probably much cheaper than we can in the U.S. On this basis the total price for Victoreen comes to approximately $520K. The total price for the NRC proposal comes to about $490K. We believe therefore, that the costs of the two systems are reasonably comparable.

On the basis of the above discussion, we request that DCP proceed with award of contract to Victoreen.

cc:

J. Guppy
T. Khan

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: November 8, 1994

TO: J. Small, DCP

FROM: T. Ginsberg, DAT

SUBJECT: Radiation Monitoring System

REFERENCE: Request for Quotation No. 745221
Proposal No. 601860
Fax Letter Victoreen to BNL, October 25, 1994
Fax Letter Victoreen to BNL, November 4, 1994

The clarifications transmitted to us by Victoreen on October 25, 1994 and November 4, 1994 now enable us to specify the equipment and services which are to be purchased from Victoreen.

Please place a Purchase Order for the following:

Item 1: One Radiation Monitoring System as described in Proposal No. 601860, Unit Price $134,000.

One Radiation Source Calibrator (Model 878-10), Unit Price $6,500.

One Electronic Calibrator (Model 878-11), Unit Price $4,600.

Item 2: Translation from English to Russian of Installation, Operation, and Maintenance Manual, Total Price $7,900.

The total cost of the purchase from Victoreen is $153,000.

TG/jmf94M52
Copies to:
J. Boccio
J. Guppy
W. T. Pratt

Brookhaven National Laboratory

To: *James Guppy, IPD*
From: *Tas Khan, RSD* TAK
Date: *March 21, 1995*
Subject: *Post-accident radiation monitoring system for Kola NPP*

This is in response to your request to amplify on my memo to you of August 24, 1994. I have the following comments:

Item 9.0 (1) of the Brookhaven requirements stated that the Seller shall submit with this quotation the name of at least one U.S. operating light water reactor nuclear power plant in which the high level post accident monitoring equipment is currently installed and operational.....Vendors who do not submit this information will be automatically disqualified from this procurement process." Victoreen is the only qualified vendor which has a qualified system available. Victoreen have provided a list of 59 nuclear power reactors, 48 of them in the U.S., where the post accident monitoring system is in use.

Victoreen has provided a list of minor exceptions where their system differs from the Brookhaven specifications. I shall discuss them one-by-one. The sections referred to in what follows are from the Brookhaven specifications and not from the Victoreen proposal.

1. In Victoreen's standard design, there are related exceptions to the second paragraph of section 1.0 and first and second paragraphs of section 4.0. The Brookhaven specifications states that "Figure 1 is a *suggested* conceptual schematic diagram of a single train (or Channel), showing one high range detector channel associated with one signal processing unit." The main point of the Brookhaven specification was to have a high range gamma monitor which can survive extreme post accident conditions inside the confinement. To have a local readout display outside confinement and to have a remote display and strip chart recorder in the control room. Victoreen accomplishes this in a manner superior to the *suggested* conceptual schematic. They integrate the signal processor with the control room-mounted rate meter. This design eliminates single points of failure that can affect more than one channel and requires Class 1E ac power in only the control room. It also provides easier access to the signal processor, thus reducing installation and maintenance costs.

2. There is an exception to second paragraph of section 2.1. The specification requires the Seller to ship the equipment to the job site. The proposal offers to ship it to Upton, NY. This is not a technical matter and so outside the scope of this memo.

3. There is an exception to section 5.5. The BNL specifications require the equipment *outside confinement* to be qualified to 95% relative humidity and temperatures between -40°C and 40°C. The proposal states that the equipment outside confinement is qualified to 90% relative humidity and 40°F to 120°F. The change in relative humidity limits from 95% to 90% is considered to have negligible effect. The essential point in such systems is that the equipment inside confinement should be able to survive the extreme post accident conditions. The main part of the rest of the equipment is located in the control room. Operators should be present in the control room to be able to utilize the post-accident monitoring system. The temperatures should be maintained in that area for them to function effectively. Therefore this is an acceptable exception to the specification, particularly in view of the slightly more advanced design where the critical parts of the system are either within confinement or inside the control room, as discussed in item 1 above. Moreover these monitors have functioned well in 48 U.S. plants.

4. Section 5.6 of the BNL specifications requires the system to be unaffected by voltage and frequency variations of +/- 20%. The proposal states that the Victoreen system allows variations of +/- 10% in

voltage and +/- 3 Hz in frequency. This variation to the specifications is acceptable, especially in view of the fact that they offer an uninterruptable power supply as an option, to which the system will switch if the 220 Vac power is corrupted. This feature is an added design advantage.

5. There are a number of exceptions to section 5.7 .

   (1) The BNL spec. requires check of all circuitry *other than* the detector. The proposed system *includes the detector* in the checking. This is obviously an advantage.

   (4) Their *rotary* switches are not protected in the proposed system, as specified in the spec. However, rotary switches are harder to use inadvertently. Moreover, a removable protective cover is offered.

   (5) The *rate meter in the proposal is qualified to 10^3 Rad. The spec. required the system* to be qualified to $5x10^5$ Rad. The point of this specification was to have a very reliable *system*. The rate meter is a small part of the system. It is located in the control room where radiation fields are likely to be low, even in post accident conditions. Routine maintenance will enable the rate meter to be easily changed if any malfunction appears.

   (6) and (8) Same comments apply as for item 3 above.

   (14) The BNL spec. specifies that an enunciator will be provided by an outside supplier. It is considered logical and acceptable that an audible alarm, of a type acceptable to the user, be provided by this supplier also.

   (16) The Victoreen design does not require a radiation source to generate a live zero to prohibit spurious false alarms. Victoreen's design is more advanced and has several advantages, including elimination of isotopic sources, background reduction, less complex and more reliable circuitry as well as ALARA considerations.

   (17) Victoreen's design does not require detector doping. An automatic test confirms proper function and continuity. Channel integrity is confirmed by an electronic check source. The check is initiated every 17 minutes or at operator request. All these points are superior to the requirements of the BNL specification.

6. Exception to section 5.9 is in the type of connectors used. The Victoreen proposal's connectors are at least as effective as required by the BNL specification.

I will be pleased to answer any questions.

cc: J. Baum
J. Small

BROOKHAVEN NATIONAL LABORATORY

M E M O R A N D U M

DATE: February 8, 1995, Revised March 28, 1995

TO: M. F. Healey

FROM: J. C. Small John C. Small

SUBJECT: BNL Purchase Order No. 745221- Victoreen

Attached for your approval is the subject firm fixed price Purchase Order in the amount $153,000 with payment terms Net 30 days F.O.B. Upton, NY to be awarded to Victoreen of Cleveland, Ohio.

Authorization to Proceed

AUI: AUI's Trustees have expressed concerns regarding liability related to the NIS Project Office. Therefore, the Brookhaven Technical Representative has included a statement in the supporting documentation that this procurement has been reviewed regarding risk and is authorized to be processed. Reference J. Guppy memo dated October 10, 1994.

DOE: Also due to the transition of the project responsibility from Brookhaven to Battelle PNL this procurement requires approval by the DOE International Safety Program. Attached is a copy of DOE approval for this procurement.

Commerce Business Daily (CBD)

Since the estimated value of this procurement exceeded $100,000 a notification was mailed for publication in the Commerce Business Daily. This notice was published on April 6, 1994 issue no. PSA-1069.

Request For Quotation

A request for quotation was mailed on July 8, 1994 to a total of sixteen (16) companies with a quotation due date of July 29, 1994.

Amendments No. 1 and 2

Two extensions to this solicitation were granted. Amendment No. 1 extended the due date until August 5, 1994 in response to a request for an extension. Secondly, a change to the technical specification was contemplated. Therefore, a final extension was granted and faxed to all companies extending the due date until August 10, 1994. After further consideration no changes were required.

Summary of Quotations

On August 11, 1994 quotations were opened and are summarized below. Brookhaven in its RFQ requested that all companies provide a price for both the base requirement, for quantity one (1) Radiation Monitoring System, and an option, to purchase three (3) additional systems plus installation, spares, and manuals. In the solicitation Brookhaven clearly indicated that the basis of award was the lowest total price for both the base requirement plus options. Furthermore, that Brookhaven intended to issue a purchase order for the base requirements and that options may be exercised depending upon need and available funding.

Only two quotations were received and are summarized below.

	NRC Industries	Victoreen
A. Base Requirement	$128,175.	$150,000.
B. Options	$371,006.	$474,000.
Total:	$499,181.	$624,000.

Quotations were forwarded to the requisitioner, J. Guppy for review and evaluation. On August 24, 1994 T. Khan informed J. Guppy in writing that award is recommended to Victoreen based upon the following. The apparent low bidder NRC Industries did not comply with paragraph 9.0 of Brookhaven's technical specification which required the seller to submit with its quotation the name of at least one U.S. operating nuclear power plant in which the radiation monitoring equipment proposed is currently installed and operational. Furthermore, that any seller that did not provide this information would not be eligible for an award. This requirement was included in the specification to ensure that the radiation monitoring system was a proven design not a prototype. NRC has submitted evidence that it has provided various components to U.S. and Foreign customers, however, it has never provided a complete radiation monitoring system to a U.S. operating nuclear power plant as required. Therefore, NRC could not comply with Par. 9.0. Lastly, NRC's proposal did not meet several other specifications including not providing a radiation source calibrator and its equipment does not meet the Equipment Environment Conditions listed in Table 4 of Brookhaven's specification. Victoreen on the other hand provided a list of 59 reactors where its monitoring equipment is installed. In addition, Victoreen specifically acknowledged compliance with all codes and standards in Brookhaven's specification, NRC did not.

Victoreen did detail in its technical proposal some exceptions and clarifications. These exceptions were reviewed by T. Khan. In most cases Victoreen's system is in compliance with the intent of the specification but they do so in different and often superior way.

In summary, both Victoreen and NRC took exceptions to Brookhaven's specifications. However, NRC's exception to paragraph 9.0 regarding having at least one operating radiation monitoring system in the U.S. is considered a major exception. Based upon this major exception NRC's proposal was eliminated and not given any further consideration.

Although Victoreen does not fully comply with all of Brookhaven's specifications the exceptions are minor and the system has been determined to be quite suitable and acceptable by Brookhaven engineers. For example, Victoreen's system allows a voltage variation of +/- 10%. Brookhaven's specification requires a voltage variation of +/- 20%. Under normal operating conditions line voltage does not vary more than +/- 10%. However, in the event it does Victoreen has an Uninterruptable Power Supply (UPS) to which the system will switch to if power is corrupted. Therefore, this exception to the specification is acceptable. A complete review of all Victoreen's exceptions is detailed in T. Khan memo dated March 3, 1995 and is included in this procurement file. Brookhaven has announced this procurement in the Commerce Business Daily, the solicitation was sent to sixteen (16) companies, but only two (2) companies responded. Therefore, even if a Request for Best and Final Offers was issued to all offerors with a revised specification the outcome and selection of Victoreen would not change due to the limited number of qualified manufacturers of Radiation Monitoring Equipment. Therefore, based upon the information provided above, it has been determined that Victoreen is the only qualified company that can provide the Radiation Monitoring System Brookhaven requires. Accordingly, it is in the best interest of the Government and Brookhaven to proceed with an award to Victoreen without further delay. The writer discussed the elimination of NRC and recommendation to award a contract to Victoreen with legal counsel, M. Goldman. Based upon the information provided M. Goldman agreed with the elimination of NRC and that award to Victoreen was justified on a Sole Source basis.

Since there was a significant difference in price (approx. $125,000) an examination of Victoreen's pricing and technical proposal was conducted. The following observations were made. Victoreen proposed a cost of $60,000 for the translation of manuals and documentation into Russian item 07 while NRC proposed $8,250 for item 07. In addition, it was indicated in Victoreen's technical and cost proposal that it had included in its base system two (2) Radiation Sources and Electronic Calibrators which were required by the technical specification, but were requested to be priced separately as options. This was done to ensure adequate funding was available to purchase the Radiation Monitor System.

Negotiations

Since NRC was eliminated for technical reasons and Victoreen was the only remaining company the writer contacted Victoreen to inquire why the cost for translation was so high and what was the cost for the radiation source and electronic calibrator. On October 25, 1994 Victoreen informed Brookhaven that the cost for the Radiation Monitoring System less the radiation and electronic calibrators was $134,000 a reduction of $16,000. The reduction of $16,000 is based on the following. Victoreen included two radiation sources and two electronic calibrators in its base proposal price $6,500 + $4,600 = $11,100 x 2 = $22,200 less system/qty discount = $16,000. Since Brookhaven is now only ordering one radiation source and one electronic calibrator the price is $11,100 and shown below. Also that the price for translation was a conservative number but was still $60,000. After review of this information with T. Ginsberg, Brookhaven, it was suggested that Victoreen obtain a quotation for translation from East West Interchange a company known by Brookhaven to provide quality work at a reasonable price. On November 4, 1994 Victoreen informed Brookhaven in writing that it could reduce its price for translation to $7,900 a reduction of $52,100. This was based upon a quotation Victoreen received from East West Interchange.

Based upon the above, T. Ginsberg, on November 8, 1994 requested in writing that DCP place a purchase order with Victoreen for a total of $153,000 as summarized below.

Item	Description	Total Price
01	Radiation Monitoring System	$134,000
	One Radiation Source and	
	Electronic Calibrator	$ 11,100
	SUB TOTAL	$145,100
02	Operation and Maintenance Manuals	
	translated into Russian	$ 7,900
	GRAND TOTAL	**$153,000**

Note: Victoreen confirmed via fax on 12/27/94 that all pricing is valid until 04/14/95.

Price Justification

Although the NRC system was disqualified for technical reasons it is a reasonable comparison for pricing purposes because the configurations are similar.

	NRC Industries	Victoreen (Revised Pricing)
A. Base Requirement	$128,175.	$134,000.
B. Options	$371,006.	$373,900.
Total:	$499,181.	$507,900.

Prices listed above do not include radiation and electronic calibrators which were separately priced options. NRC cannot provide the radiation monitor. The above prices reflect the same equipment configuration for comparison purposes.

Based upon the above, it is shown by analysis that Victoreen's price is fair and reasonable.

Other Considerations

The processing of this order was delayed for several reasons. Namely this project was at one point put on hold by AUI's Trustees and then a determination was made to proceed. Secondly, an extensive review and negotiations was required to determine if Victoreen's proposal was acceptable from a technical and price standpoint. All these factors contributed to the delay of this procurement.

However, it should be noted that Victoreen's original price for the base requirement plus operation and maintenance manuals translated into Russian was reduced greatly from an original price of $210,000 ($150,000 + $60,000) to $153,000 ($145,100 + $7,900) a savings of $57,000.

Recommendation For Award

Although this procurement was initially a competitive procurement, it has been shown after announcing this requirement in the Commerce Business Daily, soliciting sixteen (16) companies and evaluating the two quotations received, that Victoreen is the only qualified source for the Radiation Monitoring System.

Therefore, Award to Victoreen is recommended on a sole source basis based upon being the only company that can provide the Radiation Monitoring System Brookhaven requires at a fair and reasonable price.

This transaction meets the requirements of the Division of Contracts and Procurement Standard Operating Procedure SOP 25.2 and is recommended for approval.

APPROVED:

Mary Faith Healey

M. F. Healey, Manager
Div. of Contracts and Procurement

jr#4\745221M.MFH

ATTACHMENT 8

Purchase Order Contract
(BNL Purchase Order 847905)
with Victoreen, Inc. for
Field Service Engineering at the
Kola Nuclear Power Plant

Date of Contract	Date of Expiration	Buyer	Buyer	Amount	Contract Number
6/16/97	9/30/97	10	K. J. Fox	$26,700.00	847905

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, Inc.
P.O. Box 5000
UPTON, L.I., N.Y. 11973-5000

Victoreen Inc.
6000 Cochran Road
Solon, OH 44139
Attn: Jon A. Hale

CONTRACT

This is a Contract (the "Contract") made as of the date set forth above, between the party above named (the "Contractor"), and Associated Universities, Inc. ("Brookhaven"), the latter acting under Prime Contract No. DE-AC02-76CH00016 with the United States of America (the "Government") represented by the United States Department of Energy ("DOE"):

Hereto attached and hereby made a part hereof is Attachment A, which contains additional provisions of the Contract.

I. Scope of Work:

The Contractor shall provide the necessary personnel and facilities to perform installation and calibration of Radiation Detectors at the Kola Nuclear Power Plant and factory training. Specifically, the Contractor shall perform the following tasks:

1. Field Service Engineering

   A. Terminate wiring between detector and readout on two (2) channels

   B. Perform electrical alignment of two (2) readouts per procedure TP876A-1-108.

   C. Perform calibration of installed channels per procedure in section 7 of instrument instruction manual 877-1-1

This work is a continuation of the effort started on Contract 745221.

2. Factory Training

The scope for factory training will include the following:

Overview lecture describing operational/functional characteristics of equipment.

Demonstration of readout electrical alignment procedure by instructor.

Supervised performance of electrical alignment procedure by student.

Demonstration of NIST-traceable factory isotopic calibration using range source.

Demonstration of transfer calibration procedure by instructor.

Supervised performance of transfer calibration procedure by student.

Closeout lecture reviewing and summarizing training, Q & A.

Lunch for students

Factory training does not include travel and per diem expenses for students nor translation of training material.

1.A. Reports/Deliverables:

The Contractor shall submit a letter report summarizing the Field Engineering and Training.

2. Term:

This Contract shall be effective on the date it is executed by Brookhaven provided that the Contractor executes the Contract without exception or alteration. It shall remain in effect until September 30, 1997.

3. Estimated Cost, Compensation, Limitation of Costs and Payment:

A. Estimated Cost:
The estimated cost of this Contract is Twenty-Six Thousand Seven Hundred Dollars ($26,700.00). The Contractor shall not be reimbursed in excess of this amount without written authorization from Brookhaven's Division of Contracts and Procurement.

B. Compensation:

B.1 **Labor:** The Contractor shall be compensated at the fully burdened rate of $1,300.00 per day for Field Service Engineering and $2,400.00 per day for Factory Training. For the purposes of this Contract, "a day" shall be deemed to be eight hours worked in a calendar day. Field Service effort hereunder shall not exceed a total of 10 days and Factory Training effort shall not exceed 3 days.

B.2 **Travel Expenses:** The Contractor shall be reimbursed for travel and per diem including lodging, meals and incidental expenses authorized by Brookhaven's technical representative in accordance with Brookhaven's standard policy. Reimbursement rates under this policy include (a) airfare at actual expense for coach, (b) per diem in accordance with the Federal Travel Guidelines, which includes lodges, meals and incidental expenses, (c) subcompact rental vehicles at actual cost, and (d) use of private automobile at $.31 per mile plus tolls. These expenses shall be subject to a 10% G&A fee.

C.2 **Miscellaneous Expenses:** The Contractor shall be reimbursed for miscellaneous expenses including copying, faxing and telephone, etc. These expenses shall be subject to a 10% G&A fee.

C.3 **Limitation of Cost of Travel Expenses and Miscellaneous Expenses:** It is estimated that the total cost of the travel and miscellaneous expenses described in Paragraphs 3.B.2 and 3.B.3 above will not exceed $6,500.00. The Contractor agrees to use his best efforts to perform within this estimated cost.

If, at any time, the total miscellaneous costs approach 90% of this estimated total, and the Contractor has reason to believe that this total will be exceeded, he shall notify Brookhaven's Contracts and Procurement Division to that effect and provide a revised estimated total.

Brookhaven shall not be obligated to reimburse the Contractor for any travel expenses which exceed the total amount authorized in this Contract.

D. **Payment:** Brookhaven will pay the Contractor monthly upon receipt and approval of properly certified invoices which state the number of days expended during the previous month. If travel is authorized, the Contractor shall submit receipts for all travel expenses incurred. No payment will be made without these documents.

Invoices, in duplicate, shall be directed to Brookhaven's Accounts Payable Section, Contracts Division, Bldg. No. T-134B. In addition, the Contractor shall indicate the final invoice by clearly marking such invoice as "FINAL".

4. Brookhaven Representatives:

A. Technical: George Greene (516) 344-2696, is Brookhaven's technical representative, hereunder. He shall act as liaison between Brookhaven and the Contractor in technical matters only.

B. Contractual: K. J. Fox, Sr. Contracts Specialist, Telephone No. (516) 344-2766 is Brookhaven's contractual representative. Any change or modification in the terms and conditions of this Contract shall require the written approval of Brookhaven's Contracts and Procurement Manager, or her designee.

5. Additional Terms: Attachment A (General Provisions, Form No. BNL F2704) which are attached hereto and made a part hereof, contain additional provisions of this Contract.

This Contract does not bind nor purport to bind the Government of the United States.

ACCEPTED:

VICTOREEN INC.

By _____

Title _____

Date 6-19-97

ASSOCIATED UNIVERSITIES, INC.

By _____
K. J. Fox,

Title Sr. Contracts Specialist

Date June 16, 1997

Two copies of this Contract, executed by Brookhaven have been provided. Should you accept this Contract without exception or alteration, one copy of the Contract executed by both parties shall be returned to Brookhaven's Contractual Representative. Should you take any exceptions or attempt to alter the Contract in any manner, Brookhaven's execution thereof shall be null and void. Should you wish to take exceptions/alternations, you shall notify Brookhaven's Contractual Representative. Brookhaven will consider the requested exceptions/alterations and notify you accordingly. No Contract shall exist unless and until such differences are resolved.

The Contractor shall sign one (1) copy and return one copy of this contract to the attention of Mr. K. J. Fox, Sr. Contracts Specialist, Division of Contracts & Procurement, Contracts Section, Building No. 355. One copy of the fully executed Contract shall be retained by the Contractor.

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: June 11, 1997

TO: Bob Lake

FROM: George Greene

SUBJECT: Sole Source Purchase Order for Engineering Services from Victoreen, Inc.

Please expedite a sole source purchase order with the Victoreen, Inc. In the amount of $24000.00 to provide engineering services for two tasks as outlined in the attached Statement of Work. Both tasks are a continuation of work initially provided by Victoreen to BNL to build, install, and calibrate a dual-train high-level confinement radiation detector system for the Kola Nuclear Power Plant, Unit 2 in Polyarnie Zori, Russia. The initial work was provided under BNL PO# 745221 (4/24/95).

The two tasks which we require from Victoreen are as follows: 1) Travel to Polyarnie Zori, Russia to complete the installation, setup, calibration and on-site training in the use of the radiation monitor system which was begun under PO# 745221. This portion of the original work was not completed during the previous trip to the Kola NPP due to unexpected difficulties which were encountered by the Russians in their prep-work for the installation of the system which hindered our progress when we went to Russia in October 1996. The Russians did not notify BNL prior to our trip to the nuclear power plant that they were unable to complete the installation of the cabling and installation for two of the four detectors in the reactor confinement prior to restart of the reactor. Because the reactor was operating when we arrived in Russia, we were only able to complete our work on two of the four detectors; the remainder of the installation/operation/checkout/calibration needs to be finished. 2) Conduct in-depth training in the use and calibration of the equipment for selected Kola NPP personnel at the facilities of Victoreen in Cleveland, OH.

This request for engineering services is sole-source for the reasons that the equipment is one-of-a-kind eqwuipment which has been built by Victoreen and Victoreen has proprietary and patent rights to the equipment. Also, Victoreen is the only company experienced in the installation and calibration of the equipment, and the only company which can conduct training on its use and calibration.

BROOKHAVEN NATIONAL LABORATORY

PURCHASING REQUEST — WORK COPY*

ESTIMATED COST $26800

REQUIRED SECTIONS AND ITEMS ARE SHADED *SEE INSTRUCTIONS ON REVERSE SID

847905

GENERAL INFORMATION

NOTE: Enter Last Name First

Requested By G A Greene Life No 13714 Ext. 2296 Bldg. No. 820M Room No. 5 Date 6/10/97

Contact G A Greene Ext. 2296 Short Description Engineering Service

DELIVERY INFORMATION

NOTE: If Delivery Information Is The Same As Above, Enter "SAME" In The "DELIVER TO" Section

Deliver To: SAME Bldg. No. ____ Room No. ____ Ext. ____

LINE ITEM/JOB INFORMATION/ALLOCATION METHOD/QUALITY ASSURANCE

Number of Line Items Submitted (01-99) ____ Is This JCARS Related (Y/N) ____ Is this Available from Excess Sources (Y/N) N

Enter 1 for % of Split or 2 for $ Amount ____ Is QA Category other than A4? (Y/N) ____ Have Existing Equipment Lists been Reviewed (Y/N) Y

SPECIAL INFORMATION

(Place an "X" Where Applicable)

- ☐ "After the Fact" P.O.
- ☐ Controlled Inventory
- ☐ Emergency Order (less than 48 hours)
- ☐ Invoice Approval Required
- ☐ Job Shop
- ☐ Material Inspection Required
- ☐ Message to Buyer/ Other
- ☐ Price and Return
- ☐ Publication
- ☐ Repair or Service
- ☐ Required Design Specs to Follow
- ☐ Shipping Memo
- ☒ Sole Source Stateme
- ☐ Suggested Source(s)
- ☒ Urgent Order (critical delivery da

G.TO BUYER: ____

ner: ____

JGGESTED SOURCES

me ____ Phone No.: ( ) ____

dress (1): ____ Contact: ____

dress (2): ____ Foreign Country: ____

y: ____ State: ____ Zip Code: ____ Foreign Phone No. ____

NANCIAL AND DESCRIPTIVE INFORMATION: Is Data The Same For All Items? Financial Y/N ____; QA Y/N ____; Required Date Y/N ____

Account Number	O/C	FY	Project Code	C/C	ILR No.	Acct. Split %/$	Account Number	O/C	FY	Project Code	C/C	ILR No.	Acct. Split %/$
86145													

Quantity	Un. of Pur.	Part Number	Noun	Adjective	HMI	Unit Price	Required Date	Section/ Tracking No.
		FIELD SERVICE				18000	9/30/97	

Product Name:
Additional description

QA CATEGORY
BNL-QA-101 PARA'S APPLY

Account Number	O/C	FY	Project Code	C/C	ILR No.	Acct. Split %/$	Account Number	O/C	FY	Project Code	C/C	ILR No.	Acct. Split %/$
86143													

Quantity	Un. of Pur.	Part Number	Noun	Adjective	HMI	Unit Price	Required Date	Section/ Tracking No.
		TRAINING				8000		

Product Name:
Additional description

QA CATEGORY
BNL-QA-101 PARA'S APPLY

G A Greene 6/10/97 — Requisitioner-Date

PPROVALS

Level 1 Date

D Lomanno 6/16/97 — Level 2-Date

Level 3-Date

Special-Date

Other -Date

NL F 2420 E

FILE COPY

BROOKHAVEN NATIONAL LABORATORY
MEMORANDUM

DATE: June 16, 1997

TO: R. M. Lake

FROM: G. A. Greene G. A. Greene

SUBJECT: Level of Effort for Engineering Support from Victoreen, Inc.

Attached is a proposal from Victoreen, Inc. This effort is for the Kola Nuclear Power Plant in Polyarnie Zori, Russia to install high level post accident confinement radiation monitor system. This effort was originally started under PO 745221. This is a continuation of the installation and operator training which could not be completed due to preparation requirements from the Kola Nuclear Power. This effort will be against account number 86145 for the installation and account 86143 for the training.

I have reviewed the attached proposal from Victoreen, Inc. and find it fair and reasonable. The estimate for five days on site for installation and start-up is based upon my previous site visit on October 1996 is an adequate estimate to complete this work. Five days of travel time is necessary to go to and from Cleveland, Ohio to Polyarnie Zori, Russia. An additional three days of operator training are required, which will occur at Victoreen, Inc.

If you have any questions, please feel free to contact me at extension 2296 or Bob Lake at extension 2119.

R. Cole 3021
Need LOE memo
Need Modified Work Copy (more money)
K

VICTOREEN, INC.

6000 Cochran Rd.
Cleveland, OH 44139-3395

To: Kevin Fox
Brookhaven
Telefax: (516)344-5499
Telephone: (516)344-2766

From: Jon A. Hale
Product Manager
Telefax: (216)248-9301
Telephone: (216)248-9300 ext. 241
E-mail: systems@victoreen.com

Date: June 13, 1997

Subject: Installation of Model 875 Monitors
Victoreen Quote Q602410

Kevin:

In response to your message yesterday, we offer the following clarification to the quotation sent to George Greene for the remainder of the monitor installation at the Kola plant:

> According to our Field Service Engineer, the scope of the remaining installation tasks is approximately equal to the scope of the completed work. That scope includes the following:
>
> > Terminate wiring between detector and readout on two (2) channels
> >
> > Perform electrical alignment of two (2)readouts per procedure TP876A-1-108
> >
> > Perform calibration of installed channels per procedure in section 7 of instrument instruction manual 877-1-1

Based on the above list, we estimate that five (5) days on site for installation and start-up will be required. Also, based on experience gained from the previous site visit, we estimate that five (5) days roundtrip travel time will be required. Our international service rate is $1,300/day. Note: For clarity, as applied to service and travel time, a day is defined as 8 hours.

Note: The estimated duration of the service activities assumes that the detectors, readouts, and interconnecting cabling is installed before arrival of the field service technician. Delays caused by incomplete pre-visit preparation may result in the extension of the visit and an increase of the estimated costs.

Note: Original estimate for airfare was $2,500. This was a special rate based on sufficient advance notice. Due to the week delay of the activity and reschedule of the flight, the original rate was no longer available.

The scope for factory training will include the following:

Overview lecture describing operational/functional characteristics of equipment.

Demonstration of readout electrical alignment procedure by instructor.

Supervised performance of electrical alignment procedure by student.

Demonstration of NIST-traceable factory isotopic calibration using range source.

Demonstration of transfer calibration procedure by instructor.

Supervised performance of transfer calibration procedure by student.

Closeout lecture reviewing and summarizing training, Q & A.

The following items are not included within the scope of training:

Student travel and local lodging expenses

Student breakfast and supper expenses (daily lunches will be provided)

Translation expenses -Note: All printed training materials will be in the English language.

Based on the above list, we estimate that three (3) days of factory training will be required. Our standard factory training rate is $2,400/day. Note: For clarity, as applied to training time, a day is defined as 8 hours.

To summarize the information presented above, we offer the following estimate:

Field Service	
5 days travel @ $1,300/day	$6,500
5 days installation @ $1,300/day	6,500
Airfare (coach class)	4,500
Lodging	750
Meals	750
Miscellaneous	500

Note: Original estimate for airfare was $2,500. This was a special rate based on sufficient advance notice. Due to the week delay of the activity and reschedule of the flight, the original rate was no longer available.

Training	
3 days @ $2,400/day	$7,200
Budgetary Estimate Total	$26,700

Note: Listed daily rates for service, travel, and training are fixed and firm. All other listed expenses are estimated and will be billed at actual cost plus 10% handling. If required, receipts for expenses will be provided

Please review this information and let me know if you require anything else.

Regards,

Jon A. Hale

Jon A. Hale
Product Manager

BROOKHAVEN NATIONAL LABORATORY
MEMORANDUM

DATE: July 17, 1997

TO: R. M. Lake

FROM: G. A. Greene

SUBJECT: Amendment for Contract No. 847905, Victoreen, Inc.

Please add $2,627.00 on the attached letter from Victoreen, Inc. for parts needed to complete the installation of radiation dectectors at the Kola Nuclear Power Plant in Russia. The account to be used is 13145.

If you have any questions, please feel free to contact me at extension 2296.

Executor: Kola "MU" "AOOT" "GEM"
Address: 184141, City: Poliarnii Zori
Murmansk Oblast

Customer: Kola NPP
Address: 184151, City: Poliarnii Zori
Murmansk Oblast.

Currency bill:
Beneficiary ZAO "GEM"
Bank of Beneficiary:
MERITA BANK LTD
KANSALLIS-OSAKE-PANKKI
HELSINKI FINLAND
USD ACCOUNT N.20006008004353
MURMANSK SAVING BANK APATTTY (?), ACCOUNT NO. 410702041/001

Payor: Battelle Institute
Pacific Northwest National Laboratory USA
(For the Kola NPP)
By subcontract 190085-A-RA
Task Order No.7 from Sept. 18, 1996

Subject of the bill	Amount (%)	Sum ($)
Payment within the framework of subcontract 190085-A-R4. Task Order No.7 for work completed in the installation of post-accident radiation monitoring system for Two Units of the Kola NPP, to subcontractor at the Kola NPP in agreement with contract 62/93		14000
Total:		14000

Director KMU GEM — Igdal, B.L.

I confirm

Director Kola NPP — Kolomsev U.B.

РОССИЯ
Кольское монтажное управление

Акционерное общество
открытого типа
«ГИДРОЭЛЕКТРОМОНТАЖ»

184151, г. Полярные Зори Мурманской обл.
Р/счет 467734 АПК ПСБ г. Полярные Зори
МФО 221191 РКЦ г. Мурманск 221005
корсчет 700161600
Телетайп 126709 «ядро», тел. 6-46-55

от _____ № _____

на № _____ № _____

Исполнитель: Кольское МУ АООТ ГЭМ
Адрес: 184151 г.Полярные Зори
Мурманской обл.

Заказчик: Кольская АЭС
Адрес: 184151 г.Полярные Зори
Мурманской обл.

Валютный счет:
Бенифициар ZAO "GEM"
Банк бенифициара:
MERITA BANK LTD
KANSALLIS-OSAKE-PANKKI
HELSINKI FINLAND
USD ACCOUNT N 200060080043S3
MURMANSK SAVING BANK APATITY, СЧЕТ N 410702041/001

Плательщик: Институт "БАТТЕЛЛЕ"
Северозападная-Тихоокеанская
национальная Лаборатория США
(для Кольской АЭС)
По Субконтракту 190085-A-R4
Заказ-задание N 7 от 18.09.96г.

Предмет счета	Количество (Х)	Сумма ($)
Оплата в рамках субконтракта 190085-A-R4 Заказ-задание N 7 за выполненные работы по установке системы послеаварийного радиационного контроля для II блока Кольской АЭС, субподрядчику на Кольской АЭС срогласно контракта 61/93	-	1400
Итого:		1400

Директор КМУ АООТ ГЭМ **Игдал Б.Л.**

Подтверждаю
Директор Кольской АЭС **Коломцев Е.В.**

Зак. 1094

ATTACHMENT 9

Documentation of Shipment of Additional Hardware
to the Kola Nuclear Power Plant,
Principally Stainless Steel Hoses,
to Upgrade the Installation of the
In-Confinement Cables
for the Radiation Monitors to U.S. Standards
(July 1997)

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Advanced Technology
Building 820M
Brookhaven National Laboratory
Upton, New York 11973-5000

FAX: 516-344-3526
Phone: 516-344-2296
E-mail: GREENE1@BNL.GOV

DATE: July 31, 1997

TO: Jeff Deal, PNNL
FAX: 509-372-4411
VER: 509-372-6204

MESSAGE

****

Mr. Deal:

I have received word from Jim Guppy (BNL) that Rich Reister (DOE) has discussed the shipment to Russia of the extra hardware for the completion of the installation of the high-level confinement radiation monitor system in Kola NPP Unit 2 with Doug Timmons (PNNL). Mr. Reister has verbally approved the shipment to proceed through the US Embassy route, as I understand you discussed with Rich Denning and Jim Guppy yesterday.

I have attached several documents to this fax which you requested in order to authorize the shipment. The first document is an inventory of the contents of each of the three boxes and the total weight of the shipment (105.5 pounds). The total value of the three boxes is $7300.00, as indicated on the BNL shipping memo to Matrix which is attached. The BNL purchase orders for the hardware are also attached. The boxes have been prepared for shipment to Matrix and will be sent to their Virginia address upon receipt of approval for shipment from your office. You may indicate such approval to ship to me by phone, fax, or email as indicated above. Please give a copy of this fax to Mr. Timmons for his information.

Sincerely,

George Greene

****

Total Pages Including Cover Page

BOX #1 LABELED 1/3

1. 2 ea., 18.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-S12
2. 6 ea., 48.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-L12
3. 12 ea., Connector, BNC, Amphenol, part# 4868-UG-914/U
4. 12 ea., Connector, BNC, Amphenol, part# 1-221265-0
5. 16ea., Stainless steel screws, #6-32X .5 inch (no value)
6. 16 ea., Stainless steel washers, #6 (no value)
7. 16 ea., Stainless steel lock washers, #6 (no value)

Box dimensions: 59.5in X 9in X 5inchs
Box wt. 37lb

BOX #2 LABELED 2/3

1. 2 ea.,18.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-S12
2. 4 ea., 48.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-L12
3. 10 ea. shrink tubing 1 inch x 6 inch in one ZIP-LOCK bag (no value)

Box dimensions: 59.5in X 9in X 5inchs
Box wt. 35.5lb

BOX #3 LABELED 3/3

1. 2 ea., 18.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-S12
2. 4 ea., 48.5 inch flexible hose, stainless steel, Swagelok part# SS-12HO-6-L12
3. 20 ea., Front ferrule, stainless steel, Swagelok part# SS-1213-1
4. 20 ea., Back ferrule, stainless steel, Swagelok part# SS-1214-1
5. 1 Catalog, Victoreen, Medical, Health physics (no value)
6. 1 Catalog, Victoreen, Systems selection guide (no value)
7. 1 envelope containing 6 photographs (no value)

Box dimensions: 59.5in X 9in X 5inchs
Box wt. 33lb

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Advanced Technology
Building 820M
Brookhaven National Laboratory
Upton, New York 11973-5000

FAX: 516-344-3526
Phone: 516-344-2296
Email: GREENE1@BNL.GOV

DATE: August 4, 1997

TO Jeff Cohen
Matrix International
FAX: 703-461-3679
VER: 703-461-8700 x250

MESSAGE

****

Attached is the cost information (TOTAL = $7300.00):

BOX 1: item 1: 2 ea x $226 = $452
item 2: 6 ea X $400 = $2400
item 3: 12 ea x $4 = $48
item 4: 12 ea x $13.50 = $162
Total: $3062.00

BOX 2: item 1: 2 ea x $226 = $452
item 2: 4 ea X $400 = $1600
TOTAL: $2052.00

BOX 3: item 1: 2 ea x $226 = $452
item 2: 4 ea x $400 = $1600
item 3: 20 ea x $3.70 = $74
item 4: 20 ea x $3 = $60
TOTAL: $2186.00

The contact person at the Kola Nuclear Power Plant in Russia is Mr. Leonid Popruzhko, phone from US is 7-81532-68567, fax is 47-789-14168, email is askro@kolnpp.elektra.ru.

Sincerely,

George Greene

****

Total Pages Including Cover Page

Matrix International Logistics, Inc.
205 South Whiting Street
Alexandria, VA 22304
Phone: (703) 461-8700
Fax: (703) 461-3679
Ext. 237
email: tmarda@matrix-intl.com

FACSIMILE TRANSMITTAL

To:	George Greene	**Fax:**	516 344 3526
Company:	Brookhaven National Lab	**Date:**	11-Aug-97
From:	Tim Mardaleyshvili		
Subject:	Shipment to KOLA NP		
cc:	Jeffrey Cohen		

Number of pages, including cover: 2

Dear Mr. Greene,

lease see attached an updated transportation plan for your cargo. Please be advised that dates on the transportation plan are only estimates and can be adjusted depending on career's availability and other factors.

Your cargo was cleared in Moscow customs and delivered to our warehouse on August 11. Matrix/Moscow is making flight arrangements out of Moscow.

Sincerely,

MATRIX

Client Transportation Plan

8/11/97

Client **Brookhaven National Lab** ***OBL/AWB Number*** 00657685655 ***Scope*** dd ***Complete***

Origin Alexandria, VA USA ***Booking Number*** ***Mode*** Air ○

Destination Polyarnyye Zori, Russia ***Reference Number*** 761344087 ***Shipment Status*** Booked

Leg	Mode	Carrier	Vessel	Load	Unload	ETD	ETA	ATD	ATA	Leg Status
1	truck	Accurate Express		Alexandria	IAD	08-06	08-06	08-06	08-06	Complete
2	truck	Delta Airlines		IAD	JFK	08-06	08-07	08-06	08-07	Complete
3	air	Delta Airlines		JFK	SVO	08-07	08-08	08-07	08-07	Complete
4	Truck	Matrix		SVO	Moscow	08-11	08-11	08-11	08-11	Complete
5	air	Matrix		Moscow	Murmansk	08-15	08-15			Planned
6	truck	Matrix		Murmansk	Polyarnue Zori	08-15	08-15			Planned

Notes:

Consignee American Embassy - Moscow
19/23 Novinskiy Blvd,
Moscow, 121099
RUSSIA

Pieces:

Box (non standard)	147 lbs.	61 in.	30 in.	11 in.	12 cft

Containers:

Matrix International Logistics, Inc.
205 South Whiting Street
Alexandria, VA 22304
Phone: (703) 461-8700
Fax: (703) 461-3679
Ext. 237
email: tmarda@matrix-intl.com

FACSIMILE TRANSMITTAL

To:	George Greene	**Fax:**	516 344 3526
Company:	Brookhaven National Lab	**Date:**	18-Aug-97
From:	Tim Mardaleyshvili		
Subject:	#761244087		
cc:	Jeffrey Cohen		

Number of pages, including cover: 3

Good morning,

Please see attached final transportation plan and signed receipt for your cargo delivered to Kola NPP on August 15th.

Regards and have a great day,

Tim

MATRIX

Client Tra portation Plan

8/18/97

Client **Brookhaven National Lab** *OBL/AWB Number* 00657685655 *Scope* dd *Complete*

Origin Alexandria, VA USA *Booking Number* *Mode* Air ○

Destination Polyarnyye Zori, Russia *Reference Number* 761344087 *Shipment Status* Linehaul to Destinati

Leg	Mode	Carrier	Vessel	Load	Unload	ETD	ETA	ATD	ATA	Leg Status
1	truck	Accurate Express		Alexandria	IAD	08-06	08-06	08-06	08-06	Complete
2	truck	Delta Airlines		IAD	JFK	08-06	08-07	08-06	08-07	Complete
3	air	Delta Airlines		JFK	SVO	08-07	08-08	08-07	08-07	Complete
4	Truck	Matrix		SVO	Moscow	08-11	08-11	08-11	08-11	Complete
5	air	Matrix		Moscow	Murmansk	08-15	08-15	08-14	08-14	Complete
6	truck	Matrix		Murmansk	Polyarnue Zori	08-15	08-15	08-15	08-15	Complete

Notes:

8/7/97 1 piece, 147 lbs Paperwork started with DOE at US Embassy on August 7th

8/8/97 Picked up documents from US Embassy

8/11/97 Cargo cleared customs and delivered to the Matrix Moscow warehouse

8/13/97 Matrix Moscow secured reseravations to Murmansk for August 14th

8/14/97 Matrix Moscow confirms that cargo will depart to Murmansk on the 14th. ETA Kola NPP - August 15

Consignee American Embassy - Moscow
19/23 Novinskiy Blvd,
Moscow, 121099
RUSSIA

Pieces:

Box (non standard)	147 lbs.	61 in.	30 in.	11 in.	12 cft

Containers:

ATTACHMENT 10

Documentation of Reimbursement to
Kola Nuclear Power Plant
in the Amount of $14,000 for
Additional Installation Costs
Incurred by Kola Nuclear Power Plant
for Post-Accident Radiation Monitor System Installation
(March 1997)

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.

P.O. Box 5000
Upton, New York 11973-5000
TEL (516) 344- 2296
FAX (516) 344- 3526
E-MAIL

Department of Advanced Technology
Building 820

March 11, 1997

Dr. Richard S. Denning
Battelle
505 King Avenue
Columbus, OH 43201

Dear Dr. Denning:

Enclosed please find a copy of the following documents, one each in English and Russian, to enable reimbursement to the Kola NPP by PNNL for tasks related to the installation of the High-Level Confinement Radiation Monitor System (WBS 2.2.6). The documents include (a) fax message from V.V. Omel'chuk (Kola NPP) to G.A. Greene (BNL), (b) signed Statement of Work, (c) Task Order for the work requested, and (d) invoice for $14,000 from Kola NPP. Please forward these documents to the appropriate office at PNNL for payment to Kola NPP for tasks related to the installation of the High-Level Confinement Radiation Monitor System.

Sincerely,

for

G.A. Greene

GAG/lh
Enclosures

cc: J. Ace, PNNL
J. Guppy, BNL
W. Horak, BNL
A. Reisman, BNL

C:\WPWIN60\WPDOCS\GREENE\DENNING.LTR

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Advanced Technology
Building 820M
Brookhaven National Laboratory
Upton, New York 11973
USA

FAX: 516-344-3526
Phone: 516-344-2296
E-mail: GREENE1@BNL.GOV

DATE: December 9, 1996

TO: Gennady Paradnikov
Kola Nuclear Power Plant
FAX: 9-011-47-789-10766
VER: same as above

MESSAGE

****

Dear Mr. Paradnikov and Mr. Popruzhko:

The request below was sent in October and has not been answered: (1)Please send to me the signed contract and invoice for $14,000 as soon as possible by fax. (2)Please send the dosimetry reports for Rich Horvath and myself by fax after they have been translated. (3)Please inform me when you receive the binder with the US standards that was sent to you through Mr. Tysgankov (Kurchatov) to Mr. Shutov (Kola). (4)I would like to be kept informed about the progress in wiring the rest of the electronics for the radiation monitors that we were not able to complete during our visit. Mr. Horvath and I will return during the next outage to complete the calibration, probably in June 1997.

In addition to the requests above, please send me monthly updates on the following tasks so I can keep the US DOE informed on progress: Unit 1 and 2 leaktightness improvements, installation of emergency backup batteries, wiring and installation of the confinement radiation monitors. I have to submit a written report to US DOE each month with this information. Please send me a short report on the status of these tasks as soon as possible.

Sincerely,

George Greene

****

Total Pages Including Cover Page

TO:	George A. Greene		FROM:	Omelchuk, V.V.
COMPANY	Brookhaven National Laboratory, USA		TELE.	47-789-14168
TELE.	1-516-344-2296		FAX	47-789-14168
FAX	1-516-344-3526		DATE	Dec. 17, 1996
			ISSUING NO.	11/30-520
			NOS. OF PAGES, INC. COVER PAGE	11(?)

Dear Mr. Greene!

I am directing to your attention:

- A signed Task Order - No.7 to subcontractor 190085-A-R4 in both Russian and English;
- An invoice for payment of work completed.
- Information regarding accumulated dose amounts.

Concurrently I am informing you of the following:

- For the given moment there are two instrument channels. The connection of the secondchannel was possible after the elimination of the short circuit in the cable passage at the point of junction of cables 50-103 and 878-1-9;
- We are ready to send a Russian and English version of documentation to Victoreen. Please, indicate the address we should send to.

All of this information was directed via fax on Nov. 13, 1996 to Mr. R. Braemen.

In addition I would like to inform you:

- We received standards, which you sent to us through the Kurchatov Institute. Thank You Very Much.
- Two measurement channels, the sensors for which are located in a compartment/box of the steam generator, will be turned on during the next outage of Unit 2.

With Respect,

V.V. Omel'chuk

КОЛАЭТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

КОМУ:	George A. Greene		ОТ КОГО:	Omelchuk V.V.
ФИРМА:	Brookhaven National Laboratory, USA		Телефон	47-789-14168
Телефон	1-516-344-2296		Факс	47-789-14168
Факс	1-516-344-3526		Дата	17.12.96 г.
			Исходящий №	11/30 - 520
			Число страниц, включая титульную	11

Уважаемый господин Грин !

Направляю Вам:

- подписанное Заказ - задание №7 к субконтракту 190085-A-R4 на русском и английском языке;
- инвойс на оплату выполненных работ;
- справки о дозовых нагрузках.

Одновременно сообщаю следующее:

- на данный момент в работе находятся два измерительных канала. Подключение второго канала стало возможным после устранения короткого замыкания в кабельном разъеме в месте соединения кабелей 50-103 и 878-1-9;
- мы готовы выслать русский и английский экземпляры документации VICTOREEN. Укажите, пожалуйста, в чей адрес.

Вся эта информация была направлена факсом 13.11.96г. господину Р. Бренемену.

Дополнительно сообщаю:

- мы получили стандарты, которые Вы переслали через Курчатовский институт. Большое спасибо;
- два измерительных канала, датчики которых расположены в боксе парогенераторов, будут включены при первой остановке блока 2.

С уважением, В. В. Омельчук

Попружко, 68-2567
f141296.doc

BOA 190085-A-R4
Task Order No. 7
September 18, 1996

STATEMENT OF WORK

Additional Installation Costs for Post Accident Radiation Monitoring System Kola Unit 2

Background

One of the confinement system upgrades that has been provided to the Kola NPP is a post-accident radiation monitoring system that would alert the plant of a release of radioactive material to the confinement and would initiate confinement isolation. This system was provided by the Victoreen Company through a contract with Brookhaven National Laboratory. At the ourset of the program, it was agreed that the U.S. would provide the equipment to the plant but that the plant would provide the manpower associated with installation. However, when the equipment was delivered to the plant, the installation instructions indicated the need for substantially higher costs for materials and installation than had been anticipated. Kola NPP has subsequently requested through Rosenergoatom that the U.S. pay for these additional installation expenses.

Statement of Work

The costs of the following materials and activities shall be included in this activity:

- Assembly materials, in particular the cost of stainless steel tubing to be used in the routing of detector cables within the confinement structure
- Engineering design costs associated with the layout of the installed system
- Storage costs for the storage and protection of equiment prior to installation.

Costs associated with the actual installation of equipment are not included in this task.

Deliverable

Provide Richard Demming, PNNL, a copy of the statement from the plant that the detectors have been installed according to instructions provided by Victoreen.

Базовый Договор по Заказу 19065-А-Ка

Заказ-Задание №7

12 сентября 1996 года

ОПИСАНИЕ РАБОТ

Стоимость Дополнительных Затрат на Установку Системы Послеаварийного Радиационного Контроля для 2 Блока КАЭС

Предпосылки

Данная система Послеаварийного Радиационного Контроля, предоставленная Кольской АЭС, является одной из систем по усовершенствованию гермообъема, которая призвана предупредить станцию об опасности выбросов радиоактивных материалов внутри гермообъема, что, в свою очередь, должно инициировать отсечение гермообъема. Данная система была предоставлена Компанией Виктории по контракту с Брукхейвенской Национальной Лабораторией. На начальных этапах контракта было согласовано, что США предоставляет станции оборудование, но станция обеспечивает этап установки оборудования соответствующими специалистами. Однако, когда оборудование было доставлено на станцию, на основании инструкции по установке оборудования, обнаружилась необходимость более высоких затрат на материалы и установку, чем это предполагалось. В связи с этим КАЭС запросила через Росэнергоатом о том, чтобы США оплатили дополнительные расходы по установке.

Описание Работ :

Стоимость инженерных работ и материалов составляют сущность задания:

- Материалы для сборки, в частности, стоимость трубок из нержавеющей стали, которые необходимо использовать для прокладки кабелей детекторов внутри гермообъема;
- Стоимость инженерных разработок, связанных с компоновкой устанавливаемой системы;
- Стоимость хранения и охраны оборудования до его установки.

Стоимость реальной установки оборудования не включаются в Задание.

Передача (условия оплаты работ)

Предоставить Ричарду Деннингу, PNNL, копию Акта установки детекторов на станции в соответствии с инструкциями фирмы Виктории.

BATTELLE MEMORIAL INSTITUTE
PACIFIC NORTHWEST NATIONAL LABORATORY

Task Order No. 7

To: Kola NPP

Pursuant to Basic Ordering Agreement No. 190085-A-R4, the Contractor shall perform the following services:

1. Description of Services and Location:

See the attached Statement of Work dated September 18, 1996.

2. Period of Performance:

Work covered by this Task Order shall be completed by December 31, 1996.

3. Firm Fixed Price:

The firm fixed price for this Task Order is $14,000 U.S.

4. Payment:

The following payment schedule based on deliverables shall be made:

a. Assembly Materials	$ 8,500
b. Storage Expenditure	$ 500
c. Engineering Support	$ 5,000
Total	$14,000

4. Technical Administrator:

All technical questions should be directed to the Technical Administrator, Rich Deming at 614-424-7412.

5. Terms and Conditions:

The terms and conditions of BOA No. 190085-A-R4 and all terms and conditions set forth above are applicable to this Task Order.

6. Integration: This Task Order contains the entire understanding between the parties, and there are no understandings or representations not set forth or incorporated by reference herein. No subsequent modifications to this Task Order shall be of any force or effect unless in writing signed by the party claimed to be bound thereby. No communication, written or oral, by other than a Battelle Contract Representative shall be effective to modify or otherwise affect the provisions of the Task.

BATTELLE MEMORIAL INSTITUTE
PACIFIC NORTHWEST DIVISION

By: _____
Robert D. Breneman
Contracts Specialist

Date: September 16, 1996

KOLA NUCLEAR POWER PLANT

By: _____

Title: _____

Date: 04 ноября 96г.

ИНСТИТУТ БАТТЕЛЛЕ

СЕВЕРО - ЗАПАДНАЯ ТИХООКЕАНСКАЯ НАЦИОНАЛЬНАЯ ЛАБОРАТОРИЯ

Заказ - задание № 7

Кому: Кольская АЭС.

Относится к Базовому Заказу - Заданию № 190085-A-R4. По контракту должны быть выполнены следующие услуги:

1. Описание услуг и их размещение:

Смотрите приложенное описание работ, датированное 18 сентября 1996 года.

2. Срок выполнения:

Работы, описанные в данном Заказе - Задании, должны быть выполнены к 31 декабря 1996 года.

3. Твердая цена Фирмы:

Фирма определила стоимость работ в размере 14.000 US $.

4. Оплата:

Оплата будет произведена по ниже приведенному графику:

a.	Материалы для сборки	$ 8, 500
b.	Затраты на хранение	$ 500
c.	Инженерная поддержка	$ 5, 000
	Всего:	$ 14, 000

4. Техническое администрирование:

Все вопросы технического характера должны направляться Техническому Администратору Ричарду Деннингу по телефону 614 - 424 - 7412.

5. Сроки и условия:

Сроки и условия Базового Заказа-Задания № 190085-A-R4 и все условия и сроки, обозначенные выше, применимы к данному Заказу-Заданию.

6. Интеграция

Данный Заказ - Задание содержит полное взаимопонимание между сторонами и в нем не содержится никакого недопонимания или неурегулированных заранее вопросов, или вопросов, включенных в него позже. Не может быть произведено никаких изменений Заказа-Задания ни при каких условиях и ни под чьим давлением, кроме тех, которые могут быть внесены сторонами по обоюдному согласию и только в письменной форме при подписании их обеими сторонами. Никакой устный или письменный контакт с кем-либо, кроме Представителя Баттелле по Контрактам, не может повлечь за собой изменения или какое-либо другое воздействие на условия данного Задания.

ИНСТИТУТ БАТТЕЛЛЕ
СЕВЕРО - ЗАПАДНОЕ
ТИХООКЕАНСКОЕ ОТДЕЛЕНИЕ

Роберт Д. Бреннеман
Специалист по Контрактам

Дата: Ноябрь 20, 1996

КОЛЬСКАЯ АТОМНАЯ
ЭЛЕКТРОСТАНЦИЯ

Коломцев Ю.В.
Директор

Дата: 01.11.96

Executor: Kola "MU" "AOOT" "GEM"
Address: 184141, City: Poliarnii Zori
Murmansk Oblast

Customer: Kola NPP
Address: 184151, City: Poliarnii Zori
Murmansk Oblast.

Currency bill:
Beneficiary ZAO "GEM"
Bank of Beneficiary:
MERITA BANK LTD
KANSALLIS-OSAKE-PANKKI
HELSINKI FINLAND
USD ACCOUNT N.20006008004353
MURMANSK SAVING BANK APATTTY (?), ACCOUNT NO. 410702041/001

Payor: Battelle Institute
Pacific Northwest National Laboratory USA
(For the Kola NPP)
By subcontract 190085-A-RA
Task Order No.7 from Sept. 18, 1996

Subject of the bill	Amount (%)	Sum ($)
Payment within the framework of subcontract 190085-A-R4. Task Order No.7 for work completed in the installation of post-accident radiation monitoring system for Two Units of the Kola NPP, to subcontractor at the Kola NPP in agreement with contract 62/93		14000
Total:		14000

Director KMU GEM — Igdal, B.L.

I confirm

Director Kola NPP — Kolomsev U.B.

РОССИЯ
Кольское монтажное управление

Акционерное общество открытого типа «ГИДРОЭЛЕКТРОМОНТАЖ»

184151, г. Полярные Зори Мурманской обл.
Р/счет 467734 АПК ПСБ г. Полярные Зори
МФО 221191 РКЦ г. Мурманск 221005
корсчет 700161600
Телетайп 126709 «ядро», тел. 6-46-55

от _____ №_____

на №_____ №_____

Исполнитель: Кольское МУ АООТ ГЭМ
Адрес: 184151 г.Полярные Зори
Мурманской обл.

Заказчик: Кольская АЭС
Адрес: 184151 г.Полярные Зори
Мурманской обл.

Валютный счет:
Бенифициар ZAO "GEM"
Банк бенифициара:
MERITA BANK LTD
KANSALLIS-OSAKE-PANKKI
HELSINKI FINLAND
USD ACCOUNT N 200060080043S3
MURMANSK SAVING BANK APATITY,СЧЕТ N 410702041/001

Плательщик:Институт "БАТТЕЛЛЕ"
Северозападная-Тихоокеанская
национальная Лаборатория США
(для Кольской АЭС)
По Субконтракту 190085-A-R4
Заказ-задание N 7 от 18.09.95г.

Предмет счета	Количество (%)	Сумма ($)
Оплата в рамках субконтракта 190085-A-R4 Заказ-задание N 7 за выполненные работы по установке системы послеаварийного радиационного контроля для II блока Кольской АЭС, субподрядчику на Кольской АЭС срогласно контракта 61/93	-	1400(
Итого:		1400(

Директор КМУ **Игдал Б.Л.**

Подтверждаю
Директор Кольской АЭС **Коломцев Е.В.**

Зак. 1094

ATTACHMENT 11

Documentation of the Delivery of Two Radioactive Field Calibrators to the Kola Nuclear Power Plant for Calibration of the Radiation Detectors (October 1996)

MATRIX

Matrix International Logistics, Inc.
205 South Whiting Street
Alexandria, VA 22304
Phone: (703) 461-8700
Fax: (703) 461-3679
Ext. 250
email: jcohen@matrix-intl.com

FACSIMILE TRANSMITTAL

To:	George Greene	**Fax:**	
Company:	Brookhaven National Lab	**Date:**	25-Oct-96
From:	Jeffrey Cohen		
Subject:	Delivery receipt for Kola radioactive shipment		

Number of pages, including cover: 2

George,

Here is the delivery reciept that you requested for the radiation field calibrators that were delivered to the Kola NPP on July 26,1996. If you have any additional questions concerning this shipment, please contact me. Thank you.

Regards,

Jeffrey Cohen
Matrix International

467

MATRIX

РАСПИСКА ПОЛУЧАТЕЛЯ
PICKUP/DELIVERY RECEIPT

Название организации / Organization: Кольская АЭС

Адрес получателя / Consignee address: Полярные Зори, Кольская АЭС
Посадников Леонид Алексеевич.
тел. 81532-068-564
68-345

Накладная / AWB #: 555-8080902 REF #: 40927046

Груз / Cargo 3 мест / pieces 60 кг / kg получен / received

Дата получения груза / Date of cargo delivery: 26.07. 1996

Фамилия Имя Отчество получившего / Surname Name Sec Name of receiver: Образцов Н.В.

Должность получившего / Position of consignee:

Печать / Stamp

Подпись / Signature

Замечания / Excepcions:

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Nuclear Energy
Building 820M
Brookhaven National Laboratory
Upton, New York 11973

FAX: 516-344-3526
Phone: 516-344-2296
Email: GREENE1@BNL.GOV

DATE: May 24, 1996

TO Jeff Cohen
Matrix International
FAX: 703-461-3679
VER: 703-461-8700 x250

MESSAGE

****

The request from Kola for the 1000 ft spool of RG59.

Sincerely,

George Greene

****

Total Pages Including Cover Page

КОЛАТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

КОМУ:-	George A. Greene	ОТ КОГО:	Omelchuk V.V.
ФИРМА:	Brookhaven National Laboratory, USA	Телефон	0047-78914168
Телефон	516 344 2296	Факс	0047-78914168
Факс	516 344 3526	Дата	24.05.96 г.
		Исходящий №	11- 232
		Число страниц, включая титульную	1

Уважаемый господин Грин !

Прошу поставить в наш адрес 1000 футов кабеля RG59.

Дополнительное количество кабеля необходимо в связи с большим расстоянием от щита управления до проходок гермооболочки.

С уважением, В. В. Омельчук

Попружко, 68-2567
f240596.doc

КОЛАТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

КОМУ:	George A. Greene
ФИРМА:	Brookhaven National Laboratory
Телефон	516 344 2296
Факс	516 344 3526

ОТ КОГО:	Y. Kolomtsev
Телефон	47-78914168
Факс	47-78914168
Дата:	26.04.96г.
Исходящий №	11- 182
Число страниц, включая титульную	2

Dear Mr A. Greene,

Kola NPP received equipment and cables for post-accident radiation monitoring system. The equipment was transported by "MATRIX" company (see attached acceptance report).

The equipment received according to attached documents. Damage of equipment was not discovered, the equipment condition is good.

We plan to implement the equipment on second unit of Kola NPP till 25.05.96.

I ask you to inform us your about proposals for sensors placements inside of containment (including a distances to the reactor and other primary circuit equipment, height of placement under the floor of steam generation compartment, free space round the sensors for increasing of viewing space angle of steam generation compartment). If it is possible, send us the placement drawing of the same sensors for typical US NPP.

Please, inform us also about the US norms, standards and requirements for post-accident radiation monitoring system inside the containment.

Sincerely yours

Y. Kolomtsev

Plant Manager

Приложение №1

MATRIX
Matrix-Moscow 11,Ordzonikidze str., Moscow 117908, Russia, Phones 7-095-9582150,
Fax 7-095-9582151

ПРИЕМНО-СДАТОЧНЫЙ АКТ
ACCEPTANCE REPORT (REF.# 567110026)

Kola NPP
Кола АЭС

«14» Апреля 1996

Настоящий акт составлен между грузополучателем: Кола АЭС и экспедитором "МАТРИКС-Москва". "МАТРИКС-Москва" сдал груз CMR № 065000015251: 2 места, 825 фунтов, содержимое: записывающее и регулирующее оборудование.
Груз доставлен получателю за исправными пломбами. Вышеуказанный груз принят Кола АЭС согласно графика поставки без замечаний.

This report is completed by the consignee - Kola NPP and the forwarder "MATRIX-Moscow". "MATRIX-Moscow" has delivered cargo CMR № 065000015251: 2 pieces, 825 LBS, Radiation Monitoring Equipment.
The shipment is delivered with unbroken seals. Kola NPP has accepted the above mentioned cargo in accordance with the schedule of delivery without exceptions.

Груз сдал
Cargo handed by

Груз принял
Cargo accepted by

Matrix International Logistics Inc., 205 South Whiting Street, Alexandria, VA 22304
Phone:(703)461-8700 Fax (703)461-3679 Telex 3723891 MATRIX SW

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Nuclear Energy
Building 820M
Brookhaven National Laboratory
Upton, New York 11973

FAX: 516-344-3526
Phone: 516-344-2296
Email: GREENE1@BNL.GOV

DATE: May 20, 1996

TO Jeff Cohen
Matrix International
FAX: 703-461-3679
VER: 703-461-8700 x250

MESSAGE

****

The request from Kola for the radiation calibrators.

Sincerely,

George Greene

****

Total Pages Including Cover Page

КОЛАТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

КОМУ:	George A. Greene		ОТ КОГО:	Omelchuk V.V.
ФИРМА:	Brookhaven National Laboratory, USA		Телефон	0047-78914168
Телефон	516 344 2296		Факс	0047-78914168
Факс	516 344 3526		Дата	20.05.96г.
			Исходящий №	11
КОПИЯ			Число страниц, включая титульную	6
КОМУ:	Наумовой Е.В.			
ФИРМА:	MATRIX, Ст-Петербург			
Телефон	812-312 74 78			
Факс	812-315 59 77			

Уважаемые господа !

Кольская АЭС подтверждает готовность принять калибраторы 878-10 и просит организовать их доставку.

Направляю Вам копию санитарного паспорта Кольской АЭС. В пункте 6.2.12. дано разрешение на работу с закрытыми источниками Cs-137 указанной активности с целью проверки работоспособности, градуировки и поверки дозиметрической аппаратуры.

С уважением, В. В. Омельчук

Попружко, 68-2567
t200596.doc

ГОРОДСКОЙ ЦЕНР САНИТАРНО-ЭПИДЕМИОЛОГИЧЕСКОГО НАДЗОРА МСЧ-118

ФЕДЕРАЛЬНОЕ УПРАВЛЕНИЕ МЕДИКО-БИОЛОГИЧЕСКИХ И ЭКСТРЕМАЛЬНЫХ ПРОБЛЕМ ПРИ МИНИСТЕРСТВЕ ЗДРАВООХРАНЕНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

184151,г.Полярные Зори Мурманской области
тел. 6-41-78 Экз.N

САНИТАРНЫЙ ПАСПОРТ №

на право работы с источниками ионизирующего излучения (ИИИ)

1. Учреждение:

КОЛЬСКАЯ АТОМНАЯ ЭЛЕКТРОСТАНЦИЯ (КАЭС)
184151, г.Полярные Зори Мурманской области
тел. 68-359

2. Министрерство,ведомство:

Министерство Российской Федерации по атомной энергии (МАЭ РФ)
103074, г.Москва, Китайский проезд, 7

3. Вышестоящая (непосредственно над учреждением) организация:

КОНЦЕРН "РОСЭНЕРГОАТОМ" (РЭА)
103070, г.Москва, Китайский проезд, 7
тел. 220-63-16

4. Подразделение учреждения (объект), получающее паспорт:

КОЛЬСКАЯ АЭС в составе энергоблоков N 1,2,3,4
184151, г.Полярные Зори Мурманской области
тел. 68-359

5.Должностное лицо, ответственное за радиационную безопасность на объекте:

Директор КОЛОМИЕВ ЮРИЙ ВАСИЛЬЕВИЧ
тел. 68-359

6 Разрешаются работы с ИИИ

РАБОТА С ОТКРЫТЫМИ ИИИ

№	Вид и характеристика ИИИ	Вид и характер работ	Место проведения работ	Ограничительные условия
6.1.1.	Тип источников - ОРР Изотоп - стронций-90+ итрий-90 А < 1*10Е3 Бк	Калибровка и проведение радио- химических анализов	ООТиТБ (ЛООС)	Максимальная активость на рабочем месте : 3,7*10Е7 Бк
6.1.2.	Тип источника-СОРТВ Изотоп- тритий А < 2*10Е5 Бк	Калибровка и про ведение радиохимических анализов	ООТиТБ (ЛООС)	Максимальная активность на рабочем месте : 3,7*10Е7 Бк

6.1.3. При выполнении радиационно-опасных ремонтных и других работ присутствует загрязнение различных поверхностей РВ в открытом виде. Количественные методики оценки РВ на "загрязненном" оборудовании и поверхностях рабочих помещений на КАЭС отсутствуют.

РАБОТА С ЗАКРЫТЫМИ ИИИ

№	Вид и характеристика ИИИ	Вид и характер работ	Место проведения работ	Ограничительные условия
6.2.1.	Тип источника ИБН-22,25,26 Изотоп - плутоний - берилий А < 3*10Е11 Бк	Проверка блоков детектирования системы АКНП, "Иней","Суган", "ДСКЗ "Алтай", СКП бл.1,2,3,4.	Помещение А101/1,2, центральный зал блоков 1 и 2 очереди,хранилище.	Хранение ИБН вне станционного хранилища разрешается в пом. А-156/1-бл.3 (работы ведутся по дознарядам)

№	Вид и характеристика ИИИ	Вид и характер работ	Место проведения работ	Ограничивающие условия
6.2.10.	Тип источника- 1-КО Изотоп - кобальт -60 A < 1*10E5 Бк	Поверка, градуировка, проверка работоспособности радиометрической и дозиметрической аппаратуры	ОЯБиН,ООТ, ЛМ,ХЦ, хранилище	Обращать особое внимание на целостность активного слоя источников.
6.2.11.	Изотоп- кобальт -60 A < 6*10E11 Бк	Градуировка и поверка дозиметрической аппаратуры.	ЛМ	Не превышение основного дозового предела (контрольного уровня) Для персонала категории "А"-30 мЗв
6.2.12.	Изотоп - цезий-137 A < 1*10E9 Бк	Проверка, работоспособности дозиметрической аппаратуры, градуировка и поверка.	ЛМ,ООТ,ОЯБиН	Не превышение основного дозового предела (контрольного уровня) Для персонала категории "А"-30 мЗв
6.2.13.	Тип источника- ОМАСН Изотоп - цезий -137 A < 4*10E5 Бк америций-241 A < 1*10E5 Бк европий -152 A < 5*10E5 Бк	Калибровка спектрометрической аппаратуры.	ОЯБиН,ООТ, хранилище	Не превышение основного дозового предела(контрольного уровня) Для персонала категории "А"-30 мЗв

ДРУГИЕ РАБОТЫ С ИИИ

№	Вид характеристики ИИИ	Вид деятельности (ИИИ)	Место проведения работ	Ограничительные условия
6.4.1.	Ядерный реактор, оборудование и технологические среды систем: центрального зала, основного циркуляционного контура, СУЗ, СГО, СВО, ГЦН, ГЦК, САОЗ, БП,БВ, ТО,ХЖО и т.д. спецвентиляция,спецкорпуса 1 и 2 очереди, баковое хозяйство, КИП (ЯР,ВКУ, ОЯТ, трубопроводы и оборудование 1 контура, трубопроводы и оборудование спецканализации и спецводоочистки, воздуховоды и оборудование вентиляции и СГО)	Все виды работ (стационарные, нестационарные исследовательские и т.д.)	Все помещения ЗСР 1 и 2 очереди, промплощадка	Непревышение основного дозового предела "А"-30мЗв "Б"- 3 мЗв и соответствующих ему допустимых уровней согласно разд.3 и табл. 8.1-8.5, 8.14, 8.15 НРБ-76/87
	Вещества, находящиеся в твердом, жидком и газообразном состояниях ; продукты деления, активации, коррозии. Радионуклидный состав: U-235,U-239, Kr-83m, Kr-85m, Kr-85,Kr-87, Kr-88, Kr-89, Xe-131m, Xe-133, Xe-135m, Xe-135, Xe-137,Xe-138,Ar-41, Sr-90, I-131, I-132-135, I-137, Cr-134, Cs-137, Mo-99, Zr-95, Zr-97, Nb-95, Na-24,Cu-64,Cr-51, Fe-59, Co-58,Co-60,Mn-54,Mn-56 и все прочие продукты распада U-235 и активации примесей. Максимальная одноразовая активность на рабочем месте и годовое потребление не нормируется.			

№	Вид и характеристика СНиП	Вид и участок работ	Место проведения работ	Ограничительные условия
6.4.2.	Радиоактивные отходы (РАО),находящиеся в твердом, жидком и газообразном состояниях и загрязненные выше указанными радионуклидами.	Сбор, переработка и захоронение РАО	Места образования РАО, сбора и транспортировки,.места захоронения: МЦЗ-1, МЦЗ-2, ХСО-1, ХСО-2 , ХССО	1)Непревышение основного дозового предела "А"-30мЗв, "Б" -3мЗв и соответствующих ему допустимых уровней согласно разд.3 и табл. 8.1-8.5, 8.14,8.15 НРБ-76/87 2)При перевозке РАО спользовать спецавтомашины ОТ-20 N 13-09 МУО, N 16-64 МУМ для перевозки РВ в транспортных контейперах 1 кат. УАЗ 3741-01 N10-73 МУН.

7. Санитарный паспорт выдан на основании актов приемки энергоблоков в эксплуатацию.

8. Санитарный паспорт действителен до 31 декабря 1997г.

Главный государственный санитарный врач МСЧ-118 В.В.Королев

Дата выдачи санитарного паспорта - декабря 1994г.

Рассылка:

№	Учреждение	Дата	Отметка о получении
1	Кольская АЭС		
2	Кольская АЭС		
3	П.Зоринский ГОВД		
4	ГЦГСЭН МСЧ-118	29.12.94	
5	ГЦГСЭН МСЧ-118	29.12.94	

Исполнитель: Русских С.И.
тел. 6-40-99

FACSIMILE TRANSMISSION

from

GEORGE ALANSON GREENE
Experimental Heat Transfer and Fluid Dynamics Group
Department of Nuclear Energy
Building 820M
Brookhaven National Laboratory
Upton, New York 11973

FAX: 516-344-3526
Phone: 516-344-2296
Email: GREENE1@BNL.GOV

DATE: May 15, 1996

TO Jeff Cohen
Matrix International
FAX: 703-461-3679
VER: 703-461-8700 x250

MESSAGE

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For your information, the request from Kola for the radiation calibrators. For your convenience, I list a translation below:

"Respected Mr. Greene!

We have received the hardware for the radiation monitoring/radiation control system of the containment/confinement. We plan to install the hardware in May of 1996. In accordance with our agreements of 5/8/96, in order to calibrate the measuring channels, I ask that you send to our address the necessary radiation field calibrators.

With respect. V. V. Omelchuk"

Sincerely,

George Greene

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Total Pages Including Cover Page

КОЛАТОМ Кольская Атомная Электростанция

ТЕЛЕФАКС

КОМУ:	James G. Guppy	ОТ КОГО:	Омельчука В. В.
ФИРМА:	Brookhaven National Laboratory		
Телефон	516 282 2698	Телефон	0047-78914168
Факс	516 282 5344	Факс	0047-78914168
		Дата	12.05.96г.
		Исходящий №	11-201
		Число страниц, включая титульную	1

Уважаемый господин Гаппи !

Оборудование системы радиационного контроля гермооболочки получили.

Планируем смонтироавать оборудование в мае 96г.

В соответствии с договоренностью в телефонном разговоре 08.05.96г. для проведения калибровки измерительных каналов прошу поставить в наш адрес необходимые полевые радиационные калибраторы.

С уважением, В. В. Омельчук

Please send us the calibrators

Попружко, 68-2567
f120596.doc

From: dd_greer@ccmail.pnl.gov
Date: Tue, 30 Jul 1996 08:51 -0700 (PDT)
Subject: Delivery of RADIOACTIVE shipment to Kola NPP
To: greene1@bnl.gov, jr_honekamp@ccmail.pnl.gov, jm_deal@ccmail.pnl.gov, jk_ace@ccmail.pnl.gov
Cc: jcohen@matrix-intl.com, dd_greer@ccmail.pnl.gov

Date: Tue, 30 Jul 1996 04:30 -0700 (PDT)
From: jcohen@matrix-intl.com
Subject: Delivery of RADIOACTIVE shipment to Kola NPP
To: dd_greer@ccmail.pnl.gov, greene1@bnl.gov
Cc: lf_james@ccmail.pnl.gov
MIME-version: 1.0
MIME-version: 1.0

Congratulations to all on the successful delivery of the below described cargo. If any shipment had to potential for "snafu" this was it. Good job and thanks!
Denver

_____ Forward Header _____

Subject: Delivery of RADIOACTIVE shipment to Kola NPP
Author: jcohen@matrix-intl.com at -SMTPlink
Date: 07/30/96 04:30 AM

The radiation field calibrators were delivered to the Kola NPP on July 26,1996 as scheduled. I am expecting a delivery receipt from Matrix Moscow as soon as the specialized carrier's truck returns to Moscow. Please contact me if you have additional questions concerning this shipment or future shipments to the CIS. Thank you.

Regards,
Jeffrey Cohen
Matrix International