APPENDIX 4

FIELD OPERATIONS PROCEDURES

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U.S. Army I.O.C.
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HSP-001	_____	Date:_____
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HSP-009	_____	Date:_____
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HP-IP-002	_____	Date:_____
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HP-IP-006	_____	Date:_____
HP-IP-007	_____	Date:_____
HP-IP-008	_____	Date:_____
HP-IP-011	_____	Date:_____
HP-OP-001	_____	Date:_____
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HP-OP-005	_____	Date:_____
HP-OP-006	_____	Date:_____
HP-OP-009	_____	Date:_____
HP-OP-010	_____	Date:_____
HP-OP-011	_____	Date:_____
HP-OP-012	_____	Date:_____
RP-OP-002	_____	Date:_____

Reviewed by:_____
ATG Project Manager Date

ALLIED TECHNOLOGY GROUP, INC.

REQUISITION AND RECRUITMENT

PROJECT CONTROL AND REPORTING PROCEDURE

Allied Technology Group, Inc.
47375 Fremont Blvd.
Fremont, California 94538

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: AD-003, Requisition and Recruitment - Project Control and Reporting Procedure, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/13/95

Thomas J. O'Dou, CHP
Project Radiation Safety Officer, HP Technical Support — Date: 4/13/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Procedure Number: AD-003

Title: REQUISITION AND RECRUITMENT - PROJECT CONTROL AND REPORTING

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Rev. No.	0
Date	2/22/95
Approval	2/22/95

REQUISITION AND RECRUITMENT
PROJECT CONTROL AND REPORTING

1.0 SCOPE

1.1 Purpose

This document is designed to ensure compliance with Occupational Safety and Health Administration and Nuclear Regulatory Commission, Environmental Protection Agency and Company requirements associated with Decontamination and Decommissioning (D&D) type field projects.

1.2 Applicability

This procedure applies to all personnel at Allied Technology Group, Inc. temporary field project job sites. Requirements of this procedure apply before, during and after the on-site project activities.

2.0 REFERENCES

2.1 United States Code of Federal Regulations, Title 10, "Energy"

2.2 United States Code of Federal Regulations, Title 29, "Labor"

2.3 United States Code of Federal Regulations, Title 40, "Protection of Environment"

3.0 DETAILED PROCEDURE

3.1 Project Organization and Administration

3.1.1 The Director, Decontamination & Decommissioning (Director, D&D) will assign and individual to be the Project Manager for each Field Project.

3.1.2 Together, the Director, D&D and the assigned Project Manager will designate a Project Supervisor who will supervise work-related staff and activities. Also, the Project Manager, together with the Corporate Radiation Safety Officer (CRSO) will assign a qualified individual to be the Radiological Control Supervisor (RCS) for the Project.

3.1.3 The Project Manager is responsible for completing Form ATGF-051, "Project Scope and Organization Outline Form". The following Topics should be discussed and approved by the appropriate personnel when completing the form:

3.1.3.1 Scope of Work for the Project,

3.1.3.2 Operational techniques to be employed,

3.1.3.3 Estimated Project schedule(s),

3.1.3.4 Project manning requirements and organization,

3.1.3.5 Operational equipment and supply needs,

3.1.3.6 Availability and sources for required equipment/supplies, and

3.1.3.7 Handling/packaging/shipping of Radioactive Materials, shipping broker requirements.

3.1.4 The assigned Project Manager is responsible for the development of the necessary operational procedures for the project and obtaining appropriate approvals for such procedures. The Project Supervisor is responsible for implementation of all ATG Policies & Procedures and/or other instructions applicable to the project with the exception of those responsibilities assigned to the RCS in Section 3.2.

3.1.5 The Project Manager, together with the Controller, must initiate a Control Number and Work Authorizing Document. The assigned Project Manager is responsible for obtaining the Control Number and Work Authorizing Document and the distribution of the Work Authorizing Document.

3.2 ALARA Requirements

3.2.1 "ALARA Requirements" are those requirements necessary to minimize personnel exposure to radiation and/or radioactive materials. These include the technical information, training, supporting equipment, and personnel needed to achieve this goal.

3.2.2 Field project operations and all Work Instructions, Temporary Procedures, and/or Procedures written for such operations, shall be in accordance with the applicable requirements set forth by law, Corporate policy and/or contract. Adherence to these controls will aid in limiting exposure(s) to a level that is "As Low As Reasonably Achievable" (ALARA).

3.2.3 The RCS and Project Manager/Supervisor shall review and decide upon the necessary measures to satisfy the ALARA requirements for the project in concurrence with the CRSO.

3.2.4 The designated RCS is responsible for the maintenance of Radiological Controls specified by the regulations and license under which the project is being conducted.

3.2.5 The proposed Radiological Controls Program for the Project shall be coordinated with the customer in order to include specific requirements necessary for approval.

3.2.6 The Project Manager/Supervisor and RCS shall decide upon and select the necessary Radiological staff to accommodate the proposed Radiological Controls Program.

3.2.7 The RCS and Project Manager/Supervisor shall determine training requirements for Project personnel (General Employee Training, Radiation Worker Training, OSHA, etc.) with the approval of the CRSO.

3.2.8 The RCS will be responsible for selecting and acquiring the appropriate Radiological Controls equipment with concurrence of the CRSO.

3.2.9 Form ATGF-052 "Regulatory Requirements Data Form for Field Projects" of this procedure has been designed to assist the RCS and the CRSO in developing the Project Radiological Control Program.

3.2.10 The RCS and Project Supervisor shall hold an ALARA briefing with the project crew upon project mobilization. The Project Supervisor shall document this briefing on ATGF-024, "ALARA Considerations Form" and the original briefing document shall be maintained on-site by the RCS.

3.2.11 The RCS is responsible to develop or obtain, if existing, the necessary procedures, to implement the Radiological Controls Program for the Project, and obtain appropriate approval for such procedures.

3.3 Regulatory Requirements

3.3.1 The designated Project Manager/Supervisor is responsible to ensure that the conditions specified in the governing Regulations and License(s) are followed throughout the Project.

3.3.2 The Project Manager and Supervisor shall together review the Regulatory requirements for the Project, conduct a Regulatory briefing with the project crew and complete Form ATGF-052, "Regulatory Requirements Data Form."

3.4 Industrial Safety

The Project Supervisor and RCS shall conduct an Industrial Safety Briefing with the project crew. Form ATGF-025, "Pre-Job Briefing Checklist (IH/Safety)" shall be used as an agenda and to document this briefing. The RCS is responsible for the Health and Safety aspects of the project. The completed ATGF-025 will be forwarded to the CRSO for review.

4.0 PROJECT ACCOUNTING

ATG Finance Department maintains the overall responsibility for accounting practices within the Company however it is field activities which expend resources in executing the contract. Therefore, it is the prime responsibility of the Project Manager, within the guidelines established by the Director, Decontamination and Decommissioning, to properly account for the project expenditures and activities under his control. This includes making timely project financial reports to the finance department or management as directed. The Project Manager shall adhere to the ATG administration Policy and Procedure in the generation, control, distribution and record maintenance for all field

activities within his jurisdiction. In the absence of a Contract Coordinator or Cost Tracking Specialist assigned to the project, it shall be the duty of the assigned Project Manager to maintain a cost tracking system suitable to meet the needs of the Company and the Government for the reporting of all project costs to-date.

5.0 RECORDS

5.1 All of the necessary records, documents, procedures, etc., applicable to the project shall be available at the project site for use/reference.

5.2 Forms ATGF-051 and ATGF-052 originals shall be stored in a project file and maintained by the Project Manager, Supervisor or RCS.

5.3 The Project Manager and Supervisor are responsible to maintain daily Operational Logs. These Logs shall be filed in the Project File at the completion of the project.

5.4 The RCS is responsible to maintain the daily Radiological Controls Log, and Health & Safety Log, including associated Survey and Instrument Records. These documents shall be filed in the Project file at the completion of the project.

5.5 Upon completion of the project, the original copies of the project file shall be transmitted to ATG Field Project Office in Genoa, Ohio by the assigned Project Manager.

6.0 FORMS

6.1	ATGF-024	ALARA Considerations Form
6.2	ATGF-025	Pre-Job Briefing Checklist
6.3	ATGF-051	Project Scope and Organization Outline Form for Field Projects
6.4	ATGF-052	Regulatory Requirements Data Form for Field Projects

ALARA CONSIDERATIONS

SECTION I: GENERAL INFORMATION	
PROJECT:	RWP #:
JOB LOCATION:	START DATE:
PROJECT MANAGER:	END DATE:
JOB DESCRIPTION:	

SECTION II: PERSON-REM ESTIMATE (Total)			
TASK No. & TITLE	ESTIMATE PERSON-HOURS	EFF. DOSE EQUIVALENT RATE (rem/hr)	ESTIMATE PERSON-REM

SECTION II - B: POST AND PRE-JOB DOSE ESTIMATES		
Total Estimate (Pre-Job) Person-Rem:	Entered By:	Date:
Total Estimate (Post-Job) Person-Rem:	Entered By:	Date:

SECTION III: EXTERNAL RADIOLOGICAL CONTROLS				
ALARA RECOMMENDATIONS	YES	NO	N/A	REMARKS
Decontamination				
Flushing/Filling				
Temporary Shielding				
Pre-Job Meeting				
Special Training (Mock-Up)				
Stay Time				
Post Low Dose Areas				
Other (Specify)				
CONTROLS IN LIEU of RESPIRATORS				
Respiratory Protective Devices				
Full Face Particulate				
Supplied Air				
Self Contained Breathing Apparatus				
Other (Specify)				

ALARA CONSIDERATIONS - (continued)

SECTION IV: INTERNAL RADIOLOGICAL CONTROLS				
CONTROLS IN LIEU of RESPIRATORS	YES	NO	N/A	REMARKS
Ventilation				
Decontamination				
Containments				
Relocation of Work				
Stay Time (DAC-Hours)				
Total Estimate (Pre-Job) Person-Rem:	Entered By:			Date:
Total Estimate (Post-Job) Person-Rem:	Entered By:			Date:

Prepared By: _____ Date: _____

Approved By: _____ Date: _____

Additional Approvals Required: [ ] YES [ ] NO (If YES, See below)

REQUIRED APPROVALS			
RWP#:	Total Person-Rem Estimates		
Job Description:	Individual: mrem		
	Collective: mrem		
> 500 mRem INDIVIDUAL or > 5,000 mRem COLLECTIVE			
	NAME	SIGNATURE	DATE
Health Physics Supervisor			
RFO/Project Manager			
> 1,000 mRem INDIVIDUAL or > 10,000 mRem COLLECTIVE			
Health Physics Supervisor			
RFO/Project Manager			
ATG Corp. Health Physicist			

PRE-JOB BRIEFING CHECKLIST
(Industrial Hygiene/Safety)

briefing is required for every job. Each of the following topics must be included in the briefing.

1. SAFETY REQUIREMENTS
All Industrial Safety Hazards discussed, such as:

	Yes	No	N/A
Confined Spaces			
Adequate Lighting			
Toxic or Explosive Gases			
IDLH			
Excessive Heat			
Housekeeping			
Hearing Protection:			
Hardhats:			
O_2 Analyzer:			
Safety Glasses:			
Gloves: Type:			
Fire Protection			
Organic Vapor Monitor:			
Foot Protection			
Explosive/Combustible Gas Monitor:			

2. WORK AREA HAZARDS:

A.
B.
C.
D.
E.
F.

3. OTHER SAFETY REQUIREMENTS and/or SAFETY EQUIPMENT:

A.
B.
C.
D.
E.
F.

4. JOB SPECIFIC DISCUSSION:

A.
B.
C.
D.
E.
F.

Briefing Conducted By (Print / Sign)	Date / Time

PROJECT SCOPE AND ORGANIZATION OUTLINE FORM FOR FIELD PROJECTS

ɔject Name _____ Location _____

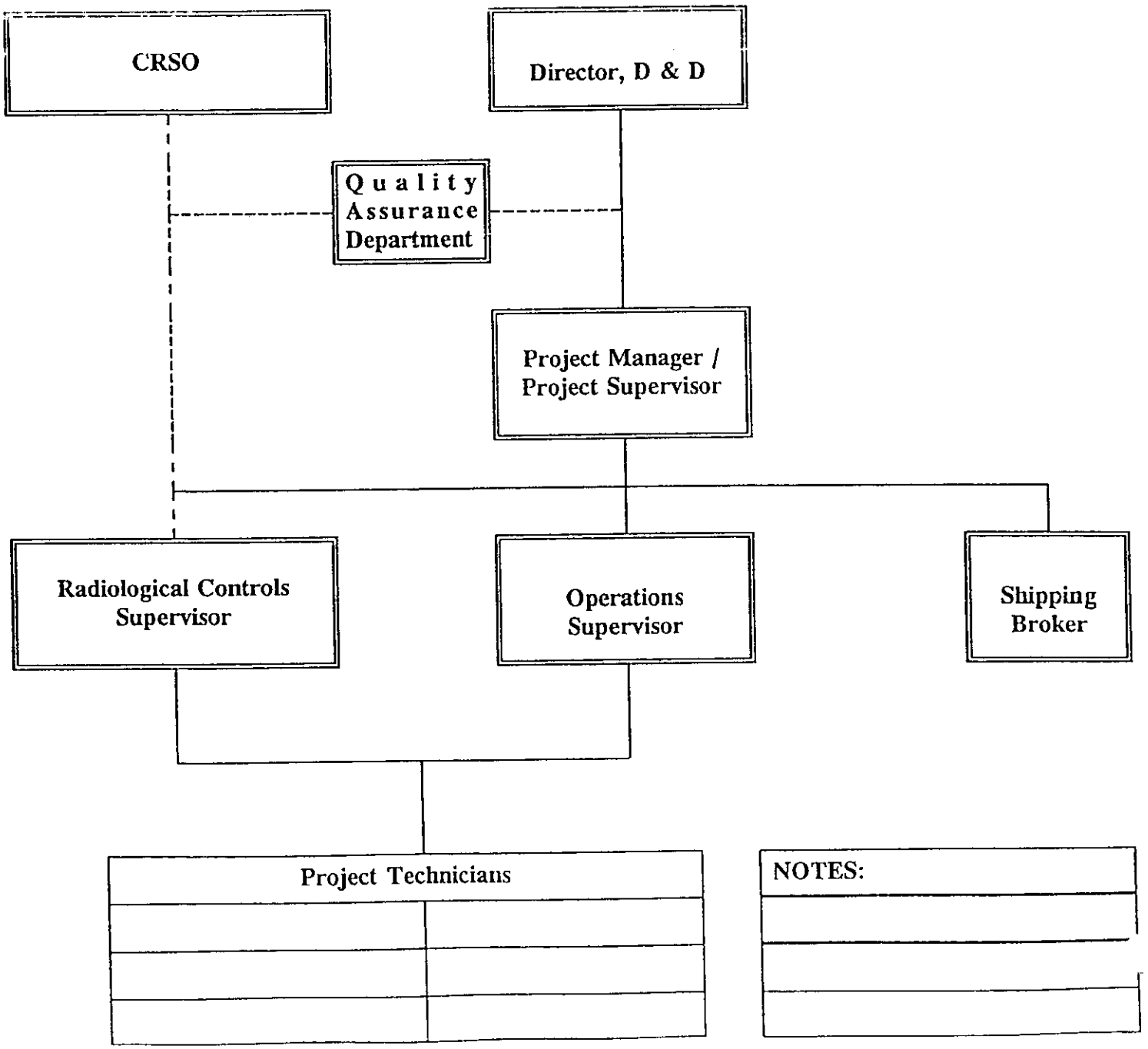
roject Number _____ Date(s) From _____ To _____

1. Project Scope _____

_____

_____

2. Organization and Corporate Support Structure



3. Major Operational Equipment and Supplies

Approval _____ Date _____

REGULATORY REQUIREMENTS DATA FORM FOR FIELD PROJECTS

Project Name/# _____ Date(s) From _____ To _____

Location _____ Designated RCS _____

Project Scope _____

_____

_____

1. Authorizing Radioactive Material License _____

   Expiration Date _____ Last Amendment Number _____

   Issuing Authority _____ Issued to: (Name/Address) _____

   Authorized user for project materials: _____

   _____

   _____

2. Documents referenced in license (type and date) _____

   _____

   _____

   Waste Permit (transport/user) _____

   Expiration Date _____ Issued to: (Name/Address) _____

   Issuing Authority _____

4. Other permits/licenses _____

   _____

5. Operating Procedures (number, title, revision level)

   _____

   _____

   _____

   _____

6. Applicable Regulations (Title, Revision/Date)

   _____

   _____

   _____

7 Notice to Employees (Federal/State)

   Approval _____ Date _____

ATG, INC.

AD-004
Revision 0

ALLIED TECHNOLOGY GROUP, INC.

ADMINISTRATIVE/REGULATORY/ALARA COMPLIANCE

POLICY & PROCEDURE

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: AD-004, ADMINISTRATIVE/REGULATORY/ALARA COMPLIANCE, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/13/95

Thomas J. O'Dou, CHP
Project Radiation Safety Officer, HP Technical Support — Date: 4/13/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Procedure Number: AD-004

Title: ADMINISTRATIVE/REGULATORY/ALARA COMPLIANCE

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0	2/22/95

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Rev. No.	Date

CURRENT REVISION	
Rev. No.	0
Date	2/22/95
Approval	2/22/95

ADMINISTRATIVE/REGULATORY/ALARA COMPLIANCE

1.0 SCOPE

1.1 Purpose

This document is designed to ensure compliance with Occupational Safety and Health Administration and Nuclear Regulatory Commission, Environmental Protection Agency and company requirements associated with Decontamination and Decommissioning (D&D) type field projects.

1.2 Applicability

This procedure applies to all personnel at Allied Technology Group, Inc. temporary field project job sites. Requirements of this procedures apply before, during and after the on-site project activities.

2.0 REFERENCES

2.1 United States Code of Federal Regulations, Title 10, "Energy"

2.2 United States Code of Federal Regulations, Title 29, "Labor"

2.3 United States Code of Federal Regulations, Title 40, "Protection of Environment"

3.0 DETAILED PROCEDURE

3.1 Project Organization and Administration

3.1.1 The Director, Decontamination & Decommissioning (Director, D&D) will assign an individual to be the Project Manager for each Field Project.

3.1.2 Together, the Director, D&D and the assigned Project manager will designate a Project Supervisor who will supervise work-related staff and activities. Also, the Project Manager, together with the Corporate Radiation Safety Officer (CRSO), will assign a qualified individual to be the Radiological Control Supervisor (RCS) for the Project.

3.1.3 The Project Manager is responsible for completing Form 051, "Project Scope and Organization Outline Form". The following Topics should be discussed and approved by the appropriate personnel when completing the form:

3.1.3.1 Scope of Work for the Project,

3.1.3.2 Operational techniques to be employed,

3.1.3.3 Estimated Project schedule(s),

3.1.3.4 Project manning requirements and organization,

3.1.3.5 Operational equipment and supply needs,

3.1.3.6 Availability and sources for required equipment/supplies,

3.1.3.7 Handling/Packaging/Shipping of Radioactive Materials, shipping broker requirements.

3.1.4 The assigned Project Manager is responsible for the development of any additional necessary operational procedures for the project and obtaining appropriate approvals for such procedures. The Project Supervisor is responsible for implementation of all ATG Policies & Procedures and/or other instructions applicable to the Project with the exception of those responsibilities assigned to the RCS in Section 3.2.

3.1.5 The Project Manager, together with the Controller, must initiate a Control Number and Work Authorizing Document and the distribution of the Work Authorizing Document.

3.2 ALARA Requirements

3.2.1 "ALARA Requirements" are those requirements necessary to minimize personnel exposure to radiation and/or radioactive materials. These include the technical information, training, supporting equipment, and personnel needed to achieve this goal.

3.2.2 Field project operations and all Work Instructions, Temporary Procedures, and/or Procedures written for such operations, shall be in accordance with the applicable requirements set forth by law, Corporate policy and/or contract. Adherence to these controls will aid in limiting exposure(s) to a level that is "As Low As Reasonably Achievable" (ALARA).

3.2.3 The RCS and Project Manager/Supervisor shall review and decide upon the necessary measures to satisfy the ALARA requirements for the project in concurrence with the CRSO.

3.2.4 The designated RCS is responsible for the maintenance of Radiological Controls specified by the regulations and license under which the project is being conducted.

3.2.5 The proposed Radiological Controls Program for the Project shall be coordinated with the customer in order to include specific requirements necessary for approval.

3.2.6 The Project Manager/Supervisor and RCS shall decide upon and select the necessary Radiological staff to accommodate the proposed Radiological Controls Program.

3.2.7 The RCS and Project Manager/Supervisor shall determine training requirements for Project personnel (General Employee Training, Radiation Worker Training, OSHA, etc.) with the approval of the CRSO.

3.2.8 The RCS will be responsible for selecting and acquiring the appropriate Radiological Controls equipment with concurrence of the CRSO.

3.2.9 Form ATGF-052 "Regulatory Requirements Data Form for Field Projects" of this procedure has been designed to assist the RCS and the CRSO in developing the Project Radiological Control Program.

3.2.10 The RCS and Project Supervisor shall hold an ALARA briefing with the crew upon project mobilization. The Project Supervisor shall document this briefing on ATGF-024, "ALARA Considerations Form" and the original briefing document shall be maintained on-site by the RCS.

3.2.11 The RCS is responsible to develop or obtain, if existing, the necessary procedures, to implement the Radiological Controls Program for the project, and obtain appropriate approval for such procedures.

3.3 Regulatory Requirements

3.3.1 The designated Project Manager/Supervisor is responsible to ensure that the conditions specified in the governing Regulations and License(s) are followed throughout the Project.

3.3.2 The Project Manger and Supervisor shall together review the Regulatory requirements for the Project, conduct a Regulatory briefing with the work crew and complete Form ATGF-052.

3.4 Industrial Safety

The Project Supervisor and RCS shall conduct an Industrial Safety Briefing with the crew. Form ATGF-025 "Pre-Job Briefing Checklist" shall be used as an agenda and to document this briefing. The RCS is responsible for the Health & Safety aspects of the project. The completed Form ATGF-025 will be forwarded to the CRSO for review.

4.0 PROJECT ACCOUNTING

ATG Finance Department maintains the overall responsibility for accounting practices within the Company; however, it is field activities which expend resources in executing the contract. Therefore, it is the prime responsibility of the Project Manager, within the guidelines established by the Director, Decontamination and Decommissioning, to properly account for the project expenditures and activities under his control. This includes making timely project financial reports to the finance department or management as directed.

The Project Manager shall adhere to the ATG Administration Policy & Procedure in the generation, control, distribution and record maintenance for all field activities within his jurisdiction. In the absence of a Contract Coordinator or Cost Tracking Specialist assigned to the project, it shall be the

duty of the assigned Project Manager to maintain a cost tracking system suitable to meet the needs of the Company and the Government for the reporting of all project costs to-date.

5.0 RECORDS

5.1 All of the necessary records, documents, procedures, etc., applicable to the project shall be available at the project site for use/reference.

5.2 Forms ATGF-051 and ATGF-052 originals shall be stored in a project file and maintained by the Project Manager, Supervisor or RCS.

5.3 The Project Manager and Supervisor are responsible to maintain daily Operational Logs. These Logs shall be filed in the Project File at the completion of the Project.

5.4 Upon completion of the Project, the original copies of the Project File shall be transmitted to ATG Field Project Office in Genoa, Ohio by the assigned Project Manager.

6.0 FORMS

6.1	ATGF-024	ALARA Considerations Form
6.2	ATGF-025	Regulatory Requirements Data Form for Field Projects
6.3	ATGF-051	Project Scope and Organization Outline Form for Field Projects
6.4	ATGF-052	Regulatory Requirements Data Form for Field Projects

ALARA CONSIDERATIONS

SECTION I: GENERAL INFORMATION	
PROJECT:	RWP #:
JOB LOCATION:	START DATE:
PROJECT MANAGER:	END DATE:
JOB DESCRIPTION:	

SECTION II: PERSON-REM ESTIMATE (Total)			
TASK No. & TITLE	ESTIMATE PERSON-HOURS	EFF. DOSE EQUIVALENT RATE (rem/hr)	ESTIMATE PERSON-REM

SECTION II - B: POST AND PRE-JOB DOSE ESTIMATES		
Total Estimate (Pre-Job) Person-Rem:	Entered By:	Date:
Total Estimate (Post-Job) Person-Rem:	Entered By:	Date:

SECTION III: EXTERNAL RADIOLOGICAL CONTROLS				
ALARA RECOMMENDATIONS	YES	NO	N/A	REMARKS
Decontamination				
Flushing/Filling				
Temporary Shielding				
Pre-Job Meeting				
Special Training (Mock-Up)				
Stay Time				
Post Low Dose Areas				
Other (Specify)				
CONTROLS IN LIEU of RESPIRATORS				
Respiratory Protective Devices				
Full Face Particulate				
Supplied Air				
Self Contained Breathing Apparatus				
Other (Specify)				

ALARA CONSIDERATIONS - (continued)

SECTION IV: INTERNAL RADIOLOGICAL CONTROLS				
CONTROLS IN LIEU of RESPIRATORS	YES	NO	N/A	REMARKS
Ventilation				
Decontamination				
Containments				
Relocation of Work				
Stay Time (DAC-Hours)				
Total Estimate (Pre-Job) Person-Rem:	Entered By:			Date:
Total Estimate (Post-Job) Person-Rem:	Entered By:			Date:

Prepared By: _____ Date: _____

Approved By: _____ Date: _____

Additional Approvals Required: [ ] YES [ ] NO (If YES, See below)

REQUIRED APPROVALS			
RWP#:	Total Person-Rem Estimates		
Job Description:	Individual: mrem		
	Collective: mrem		
> 500 mRem INDIVIDUAL or > 5,000 mRem COLLECTIVE			
	NAME	SIGNATURE	DATE
Health Physics Supervisor			
RFO/Project Manager			
> 1,000 mRem INDIVIDUAL or > 10,000 mRem COLLECTIVE			
Health Physics Supervisor			
RFO/Project Manager			
ATG Corp. Health Physicist			

PRE-JOB BRIEFING CHECKLIST
(Industrial Hygiene/Safety)

briefing is required for every job. Each of the following topics must be included in the briefing.

1. **SAFETY REQUIREMENTS**
All Industrial Safety Hazards discussed, such as:

	Yes	No	N/A
Confined Spaces			
Adequate Lighting			
Toxic or Explosive Gases			
IDLH			
Excessive Heat			
Housekeeping			
Hearing Protection:			
Hardhats:			
O_2 Analyzer:			
Safety Glasses:			
Gloves: Type:			
Fire Protection			
Organic Vapor Monitor:			
Foot Protection			
Explosive/Combustible Gas Monitor:			

2. **WORK AREA HAZARDS:**

A.
B.
C.
D.
E.
F.

3. **OTHER SAFETY REQUIREMENTS and/or SAFETY EQUIPMENT:**

A.
B.
C.
D.
E.
F.

4. **JOB SPECIFIC DISCUSSION:**

A.
B.
C.
D.
E.
F.

Briefing Conducted By (Print / Sign)	Date / Time

PROJECT SCOPE AND ORGANIZATION OUTLINE FORM FOR FIELD PROJECTS

ct Name _____ Location _____

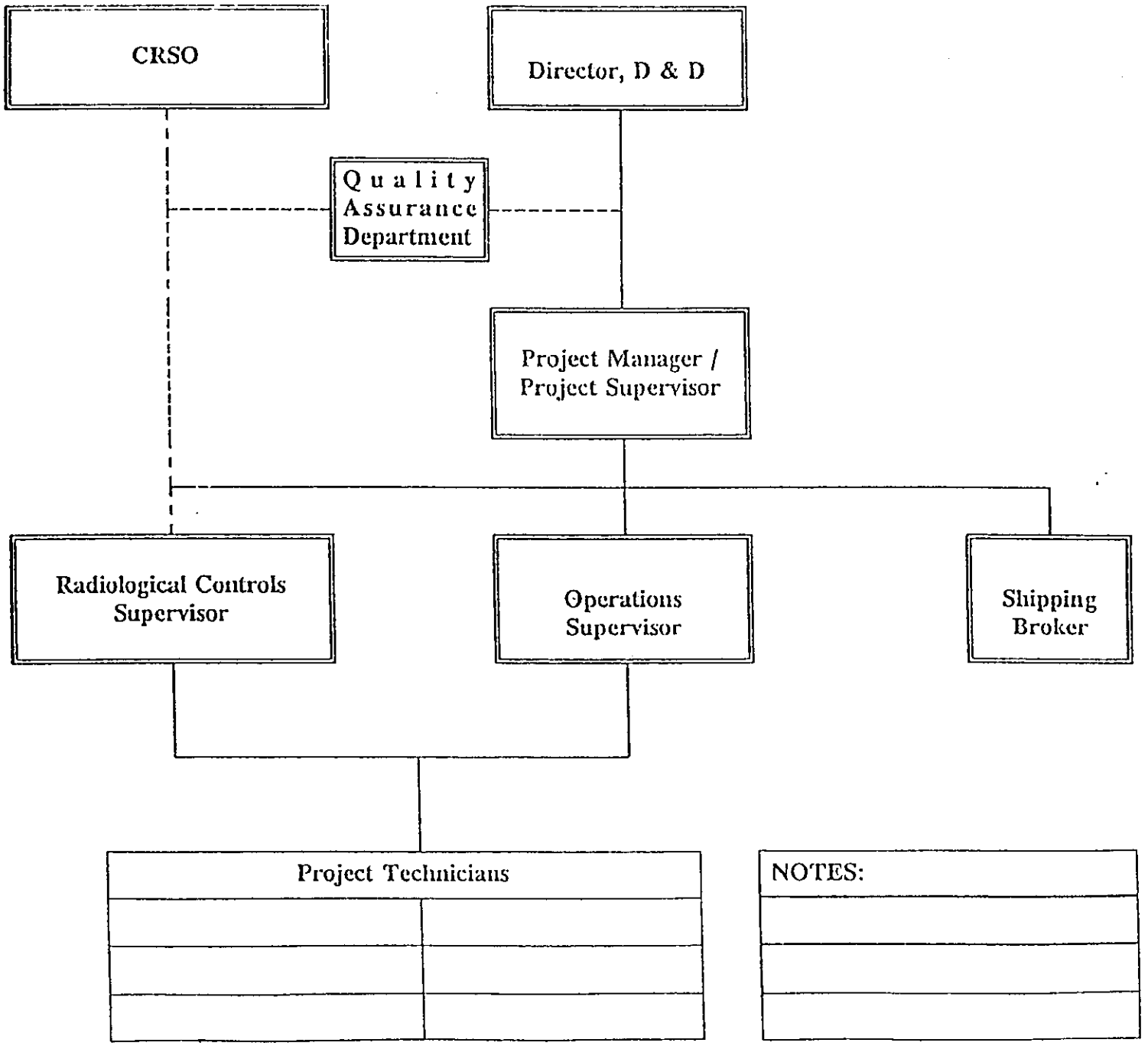
ject Number _____ Date(s) From _____ To _____

1. Project Scope _____

_____

_____

2. Organization and Corporate Support Structure



3. Major Operational Equipment and Supplies

)val _____ Date _____

REGULATORY REQUIREMENTS DATA FORM FOR FIELD PROJECTS

ject Name/# _____ Date(s) From _____ To _____

Location _____ Designated RCS _____

Project Scope _____

_____

_____

1. Authorizing Radioactive Material License _____

   Expiration Date _____ Last Amendment Number _____

   Issuing Authority _____ Issued to: (Name/Address) _____

   Authorized user for project materials: _____

   _____

   _____

2. Documents referenced in license (type and date) _____

   _____

   _____

   Waste Permit (transport/user) _____

   Expiration Date _____ Issued to: (Name/Address) _____

   Issuing Authority _____

4. Other permits/licenses _____

   _____

5. Operating Procedures (number, title, revision level)

   _____

   _____

   _____

   _____

6. Applicable Regulations (Title, Revision/Date)

   _____

   _____

   _____

7. Notice to Employees (Federal/State)

   Approval _____ Date _____

ATG, INC.

HSP-001
Revision 0

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

SAMPLE CHAIN OF CUSTODY

Allied Technology Group, Inc.
47375 Fremont Blvd.
Fremont, California 94538

Prepared by
D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: HSP-001, Sample Chain of Custody, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 2/23/95

Thomas J. O'Dou, CHP, Project Radiation Safety Officer, HP Technical Support — Date: 2/10/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Procedure Number: HSP-001

Title: Sample Chain of Custody

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SAMPLE CHAIN OF CUSTODY

1.0 Scope

This procedure is to establish administrative controls for transfer of samples collected at ATG field projects to the subcontractor laboratory for analysis.

2.0 Purpose

The purpose of this procedure is to provide guidlines for administrative controls of samples collected and transferred to the subcontractor laboratory for analysis.

3.0 References

3.1 Project/Site Health and Safety Plan

3.2 Project/Site Detailed Work Procedure

3.3 NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination

4.0 Responsibilities

4.1 ATG Radiological Field Operations Manager(Project Manager)

4.1.1 Implementation of this procedure.

4.1.2 Periodic reviews of adherence to the requirements of this procedure.

4.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

4.2 Health Physics Supervisors

4.2.1 Assignment of Health Physics Technicians performing this procedure.

4.2.2 Reviewing and approving documentation generated by the use of this procedure.

4.3 Health Physics Technicians

4.3.1 Performance of the requirements of this procedure.

4.3.2 Adherence to other procedures referenced.

4.3.3 Documentation of all work performed under this procedure.

5.0 Procedure

5.1 The sample collector must initiate a chain of custody form by filling in the requested information. Identifying data for the sample must also be entered into the sample log in accordance with References 3.1 and 3.2.

5.2 Proper chain of custody is maintained when the sample is maintained under the direct surveillance of an individual, in a controlled access facility, or the sample is in a tamper-proof container.

5.3 If the sample is to be transported by any means other than hand delivery by the custodial individual, security seals must be used. Log the seal number in the sample log and include a copy of the chain of custody form with the sample container.

5.4 Upon transfer of the samples to another individual, that individual shall sign as receipient. A copy of the chain of custody form will be maintained for record keeping purposes while the original will remain with the sample.

5.5 Upon arrival of the sample at the laboratory, the laboratory recipient shall inspect the sample for signs of tampering. If indication of tampering is noted, the laboratory shall notify site personnel who will collect another sample.

5.6 Once the sample is in the custody of the laboratory, it shall be maintained in accordance with the laboratory's chain of custody and quality assurance procedures.

5.7 Samples sent to an off site laboratory for analysis shall be returned to the site after processing for disposal if this is the condition of the laboratory contract. There may be occassions where the laboratory will hold and/or dispose of the samples.

6.0 General Information

6.1 The chain of Custody/Analysis Record form must be completed in its entirety as follows:

Project Number - A unique number which associates the project to specific records of analysis. This is as assigned by the Project Manager.

Project Name - Name of the facility and the type of project. For example: "Lake City AAP Characterization".

Required Report Date - The date which you expect to get sample results by. Be realistic, ASAP is not appropriate here.

Lab Contact and Lab Phone - The number you called and the person at the laboratory you spoke with.

Sample ID # - The unique number recorded in the sample log book, on the sample and on the chain of custody form for a sample.

Sample Type - Air, Water, Soil, Oil, etc. as appropriate. Basically this answers the question, what is it a sample of?

Container - Describe the sample container such as; glass jar, Marinelli Beaker, Petri Dish, plastic bag, etc.

Volume - Record the volume and units of the volume such as; 1000 ml, 2l, 5E6 cc, 1 gal., etc.

Preservative - Indicate the chemical name or brand name of preservative used in the sample.

Analysis Req'd - Indicate the desired type of analysis for the laboratory to conduct.

Date - The date the sample was taken.

Notes - Any other information for the laboratory. If there is need for a verbose note, place a circled number in this box and attach an addendum with the note written in detail prefaced with the circled number.

Lab ID# - A number assigned by the laboratory.

Sample TAT Req'd - The needed turnaround time for sample analysis. Be realistic, ASAP is not appropriate and short times may lead to increased (unnecessary) costs.

Check **all** sample characteristics that apply to this sample. For example; a sample may be Flammable, Hazardous, Liquid, and Radioactive.

6.2 Custody of samples must be maintained at all times to ensure appropriate assignment of the result to a sample. In custody tracking, the [1) Relinquished by is the person who took the sample or someone who was there when it was taken.] The date and time and the signature of the person who took the sample is recorded. The [1) Received by is the person who took custody.] The signature and date and time of the person who took custody is recorded. These dates and times must match. Unless the sample(s) are transported by means other than hand delivery.

In the instance of transport of the samples by means other than hand delivery the [1) Received by is the person at the laboratory who received the sample(s) and took custody.] The date and time and signature of the person at the laboratory receiving the sample(s) is recorded.

ATG II
Allied Technology Group

Chain of Custod nalysis Record

Doc (
Page ___ of ___

Project Number _____
Project Name _____
Project Manager _____
Project Phone _____

Project Fax _____
Req'd Report Date _____
Lab Contact _____
Lab Phone _____

SEND REPORT TO:

	Sample ID#	TYPE	CONTAINER	VOLUME	PRESERVATIVE	ANALYSIS REQ'D	DATE	NOTES	[LAB ID#]
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Sample TAT Req'd: _____ Notes: _____

SAMPLE CHARACTERISTICS

Flammable ☐ Hazardous ☐ Gas ☐ Liquid ☐ BiPhase ☐ Sp. Grav. _____ Color _____

Corrosive ☐ Radioactive ☐ Solid ☐ Sludge ☐ TriPhase ☐ Flash Pt. _____ Odor _____

CUSTODY TRACKING

1) Relinquished By:_____ Date: _____ Time: _____ Received By: _____ Date: _____ Time: _____

2) Relinquished By:_____ Date: _____ Time: _____ Received By: _____ Date: _____ Time: _____

3) Relinquished By: Date: Time: Received By: _____ Date: _____ Time: _____

ATG, INC.

HSP-002
Revision 0

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

SURFACE SOIL SAMPLING

Allied Technology Group, Inc.
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Prepared by
D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: HSP-002, SURFACE SOIL SAMPLING, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Handy, Project Director — Date: 2/24/95

Thomas J. O'Dou, CHP, Project Radiation Safety Officer, HP Technical Support — Date: 2/24/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

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Title: SURFACE SOIL SAMPLING

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SURFACE SOIL SAMPLING

1.0 SCOPE

This procedure describes the appropriate methods for collecting samples of surface soil on ATG field projects.

2.0 PURPOSE

The purpose of this procedure is to provide guidelines for collecting surface soil samples.

3.0 REFERENCES

3.1 Project/Site Health and Safety Plan

3.2 Project/Site Detailed Work Procedure

3.3 NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination

3.4 NUREG/CR-5512, Residual Radioactive Contamination From Decommissioning

3.5 HSP-001, Sample Chain of Custody

3.6 HSP-003, Sediment Sampling

3.7 HSP-004, Water Sampling

3.8 HSP-005, Miscellaneous Sampling

4.0 EQUIPMENT

4.1 Digging implement: garden trowel, shovel, spoons, post-hole digger, etc.

4.2 Special sampling apparatus (cup cutter, shelby tube, etc.) as required.

4.3 Plastic bags, approximately 10 cm diameter x 30 cm long.

4.4 Cardboard "ice cream" containers (1 quart size) or geology sample bags.

4.5 Twist-ties.

4.6 Masking or duct tape.

4.7 Record forms.

4.8 Labels and security seals.

4.9 Indelible pen.

4.10 Equipment cleaning supplies, as appropriate.

5.0 RESPONSIBILITIES

5.1 ATG Radiological Field Operations Manager(Project Manager)

5.1.1 Implementation of this procedure.

5.1.2 Periodic reviews of adherence to the requirements of this procedure.

5.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.2 Health Physics Supervisors

5.3.1 Assignment of Health Physics Technicians performing this procedure.

5.3.2 Reviewing and approving documentation generated by the use of this procedure.

5..3 Health Physics Technicians

5.3.1 Performance of the requirements of this procedure.

5.3.2 Adherence to other procedures referenced.

5.3.3 Documentation of all work performed under this procedure.

6.0 PROCEDURE

NOTE: Because standard surface soil contamination criteria for radionuclides are applicable to the average concentration in the upper 15 cm of soil, the usual sampling protocol described here is based on obtaining a sample of this upper 15 cm. Special situations, such as evaluating trends or airborne deposition, determining near surface contamination profiles, and measuring non-radiological

contaminants, necessitate special sampling procedures. These special situations are evaluated and incorporated into site specific survey plans as the need arises.

Direct surface radiation measurements are to be performed at each location before initiating sampling. This will identify the presence of gross contamination, which will require that samples and equipment be treated as radioactive and handled in accordance with appropriate procedures.

6.1 Loosen the soil at the selected sampling location to a depth of approximately 15 cm, using a trowel or other digging implement.

6.2 Remove large rocks, vegetation, and foreign objects (these items may also be collected as separate samples, if directed.)

6.3 Place approximately 2 kg (or an amount in accordance with References 3.1 and 3.2) of this soil into a plastic bag-lined cardboard container or geology sample bag.

6.4 Seal the bag using a twist-tie, cap, and tape the cap in place (or tie the sample bag strings.)

6.5 Label and secure the sample container in accordance with References 3.1 and 3.2.

NOTE: A box shall be lined with plastic and approved absorbent material prior to placing samples inside the box if the samples are to be shipped for analysis.

NOTE: A load rating stamped on the bottom of the box shall be noted. This rating shall not be exceeded to prevent degradation of the box during shipping.

6.6 The container should be placed in a cardboard box (also properly labeled) for storage or shipping.

CAUTION
Samples must be contained within an outer protective cover to prevent (minimize) cross contamination of samples from one site to another.

6.7 Document all samples obtained on Form ATGF-049, Sample Status Log and in the sample log book if applicable.

6.8 Sample Chain of Custody records shall be documented in accordance with Reference 3.5.

> CAUTION
>
> DO NOT procede to the next sample site or leave the area with any equipment until you have completed Steps 6.9 AND 6.10.

6.9 Clean sampling tools before proceeding to the next sampling location.

6.10 Survey sampling equipment to ensure no removable contamination exists which could result in cross contamination of samples.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form ATGF-049, Sample Status Log

8.0 FORMS

8.1 Form ATGF-049, Sample Status Log

ALLIED TECHNOLOGY GROUP
SAMPLE STATUS LOG

Project/Location: _____

SAMPLE ID	LOCATION	DATE/TIME SAMPLE OBTAINED	ANALYSIS	STATUS

ALLIED TECHNOLOGY GROUP, INC.

FIELD OPERATIONS

CONFINED SPACE ENTRY

Allied Technology Group, Inc.
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Prepared By:

D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/7/95

Thomas J. O'Doy, CHP — Date: 4/5/95
Project Radiation Safety Officer
HP Technical Support

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

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Title: CONFINED SPACE ENTRY

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CONFINED SPACE ENTRY

1.0 SCOPE

1.1 This procedure applies to all areas posted as a confined space, any other space meeting the definition of a permit-required confined space, or any space in which confined space hazards are present.

1.2 This procedure does not attempt to outline the specific entry procedures and requirements for the different types of confined spaces. Specific procedures for certain confined spaces may be required; for example, radiological requirements for entry into a underground tank. The Confined Space Entry Permit and any attached procedures (i.e., RWP) serve to specify conditions and requirements for entry.

1.3 This procedure applies to all ATG and subcontractor personnel who are required to enter confined spaces on ATG field projects.

DANGER

This procedure requires actions to ensure a confined space is habitable with provided protection. Deviation from guidelines of this procedure may be harmful or deadly.

2.0 PURPOSE

This procedure defines the minimum requirements and procedures to protect the health and safety of workers entering a confined space on ATG field projects. This procedure also provides the methodology to meet the requirements of 29 CFR 1910.146, Permit-Required Confined Spaces.

3.0 REFERENCES AND DEFINITIONS

3.1 References

3.1.1 29 CFR 1910.146, Permit-Required Confined Spaces

3.1.2 29 CFR 1926.650, 651 and 651, Excavations

3.1.3 ANSI Z117.1-1989, Safety Requirements For Confined Spaces

3.1.4 Respiratory Protection Program for A.T.G.

3.2 Definitions

3.2.1 Acceptable Entry Conditions: The conditions that must exist in a permit space to allow entry and to ensure that workers involved with a permit-required confined space entry can safely enter into and work within the space.

3.2.2 Attendant: A worker who is stationed outside a permit-required confined space and is authorized by ATG and trained to monitor Authorized Entrants inside a confined space the entire time the space is occupied.

3.2.3 Authorized Entrant: A worker who is authorized by ATG and trained to enter non-permit and permit-required confined spaces.

3.2.4 Confined Space: A space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, underground vaults, and pits are spaces that may have limited means of entry.); and
- Is not designed for continuous employee occupancy.

3.2.5 Confined Space Entry Permit: The Confined Space Entry Permit (CSEP) is the instrument by which ATG authorizes entry into permit-required confined spaces. The CSEP will identify the permit space, define the conditions under which the confined space may be entered, state the reasons for entering the space, list the anticipated hazards of the entry, document monitoring for known and suspected hazards, list eligible Attendants, Authorized Entrants and individual(s) who will be in charge of the entry, and establish the length of time for which the permit remains valid. The Confined Space Safety Checklist (CSSC)is part of the CSEP and must accompany the CSEP for it to be valid.

3.2.6 Confined Space Safety Checklist: The Confined Space Safety Checklist (CSSC) is the checklist portion of the entry permit which addresses the following:

- The hazards of the permit space;
- The measures for isolation of the permit space;
- The measures used to remove or control potential hazards, such as lockout/tagout, equipment and procedures for purging, inerting, ventilating and flushing hazards;
- Acceptable environmental conditions, quantified with regard to the hazards identified in the permit space;
- Testing and monitoring equipment and procedures by which the employer shall verify that acceptable environmental conditions are being maintained during entry;

- The rescue and other services which would be summoned in case of emergency and the means of communication with those services;

- The communication procedures and equipment used by authorized entrants and attendants to maintain contact;

- The personal protective equipment such as respirators, clothing, and retrieval lines, provided in order to ensure employee safety; and

- Any other information whose inclusion is necessary, given the circumstances of the particular permit space in order to ensure employee safety.

3.2.7 Double Block and Bleed: The closure of a line, duct or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

3.2.8 Emergency: Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

3.2.9 Engulfment: The surrounding and effective capture of a worker by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing.

3.2.10 Entry: The action by which an Authorized Entrant passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening in the space.

3.2.11 Entry Supervisor/Qualified Person: A person who by reason of training, education, and experience is knowledgeable in the operation to be performed, is competent to judge the hazards involved, is able to determine if acceptable entry conditions are present and is able to determine when entry should be terminated. The entry Supervisor authorizing or in charge of entry into permit spaces will be designated by ATG management.

3.2.12 Hazardous Atmosphere: An atmosphere which exposes workers to risk of death, incapacitation, impairment of ability to self-rescue, injury or acute illness from one or more of the following causes:

- A flammable gas, vapor or mist in excess of 10 percent of its Lower Flammable Limit (LFL);

- An airborne combustible dust at a concentration that obscures vision at distances of 5 feet or less;

- An atmospheric oxygen concentration below 19.5 (oxygen deficient) or above 23.5 percent (oxygen enriched);

- An atmospheric concentration of any substance for which a Permissible Exposure Limit (PEL) is published in Subpart Z of 29 CFR 1910 or for which a Threshold Limit Value (TLV) is published in the latest issue of the American Conference of Governmental Industrial Hygienist (ACGIH) Manual for "Threshold Limit Values and Biological Exposure Indices," and could result in employee exposure in excess of either the PEL or TLV; or

- Any atmospheric condition recognized as Immediately dangerous to Life or Health (IDLH).

3.2.13 Hot Work: Operations which could provide a source of ignition such as riveting, welding, cutting, burning, or heating.

3.2.14 Hot Work Permit: Written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

3.2.15 Immediately Dangerous to Life or Health (IDLH): Any condition which poses an immediate threat of loss of life; may result in irreversible or immediate/severe health effects; may result in eye damage; irritation or other conditions which could impair unaided escape from confined spaces.

3.2.16 Inerting: The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. A properly inerted atmosphere will not support flame, fire, combustion, or life. Inerted atmospheres are IDLH atmospheres and may cause death upon exposure.

3.2.17 Isolation: Separation of a confined space from unwanted forms of energy which could be a serious hazard to confined space entrants. Isolation is usually accomplished by blanking or blinding; removal or misalignment of pipe sections or spool pieces; double block and bleed; lockout/tagout of all energy sources, etc.

3.2.18 Line Breaking: The intentional opening of a pipe, line or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

3.2.19 Lockout/Tagout: The placement of a lock and tag on the energy isolating device, indicating that the energy isolating device shall not be operated until removal of the lock and tag in accordance with the established procedure.

3.2.20 Lower Flammable Limit (LFL): The minimum concentration of a combustible gas in the air that will ignite and burn. Ten percent (10%) of the LFL in a confined space is the established action level for worker protection. This protection factor, 10 percent of the LFL, is only for flame/fire and ignition/explosion protection. Ten percent of the LFL ca be extremely hazardous from a toxicological perspective depending on the substance in question.

3.2.21 Non-Permit Confined Space: A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

3.2.22 Oxygen Deficient Atmosphere: An atmosphere containing less than 19.5 percent oxygen by volume.

3.2.23 Oxygen Enriched Atmosphere: An atmosphere containing more than 23.5 percent oxygen by volume.

3.2.24 Permit-Required Confined Space (Permit Space): A space which has limited or restricted means of entry or exit; is large enough and so configured that an employee can bodily enter and perform assigned work; and is not designed for continuous employee occupancy. A permit space has one or more of the following characteristics:

- Contains or has a known potential to contain a hazardous atmosphere;
- Contains a material with the potential to engulf an entrant;
- Has an internal configuration such than an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which sloped downward and tapers to a smaller cross-section; or,
- Contains any other recognized serious safety or health hazard (not to be limited to atmospheric hazards, but also including mechanical, electrical, radiological, and other hazards).

3.2.25 Permit-Required Confined Space Program (Permit Space Program): Is ATG's overall program for controlling and, where appropriate, for protecting workers from permit space hazards for regulating workers entry into permit spaces.

3.2.26 Permit System: Use of this procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

3.2.27 Prohibited Condition: Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

3.2.28 Rescue Service: The personnel designated to rescue entrants from permit spaces.

3.2.29 Retrieval System: The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) to be used for non-entry rescue of entrants from permit spaces.

3.2.30 Testing: The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit spaces.

4.0 PRECAUTIONS

An entry program has been established to control entry into all identified confined spaces at ATG field project sites.

> **CAUTION**
>
> The absence of confined space records does not indicate the absence of a confined space hazard. If you are concerned about a space, ask your supervisor or the project manager.

4.1 Hazard Identification:

A pre-job survey of the ATG field project sites to identify permit-required and non-permit required confined spaces. This survey shall be completed by a person knowledgeable in the operations that shall be performed and is competent to judge the hazards involved (a Qualified Person).

4.2 Based upon the presence or absence of each of the potential hazards listed below, a confined space shall be designated as either a permit or non-permit space. Each space shall be posted with an appropriate sign.

- The past and current uses of the confined space which may adversely affect the atmosphere of the permit space;
- The physical characteristics, configuration and location of the permit space;
- The potential for a hazardous atmosphere as defined in Section 3.2.12;
- The mechanical, electrical, biological and radiological hazards;
- The potential for changing conditions in the permit space; or
- The work activities anticipated which would require entry into the permit space.

4.3 Permit Entry System

A Confined Space Entry Permit (CSEP, Form ATGF-045) and the Confined Space Safety Checklist (CSSC, Form ATGF-044) must be completed by the Entry Supervisor/Qualified Person prior to entry into a permit-required confined space.

4.3.1 The identity of the permit space, the purpose of the entry, the date of entry, and the authorized duration the CSEP is valid, shall be documented on the CSEP.

4.3.2 The names of the Attendants and Authorized Entrants shall be documented on the CSEP.

4.3.3 The name of the individual in charge of entry (entry supervisor) shall be documented on the CSEP.

4.3.4 The CSEP shall not be signed authorizing entry until all actions and conditions necessary for safe entry have been identified and are verified to be in place.

4.3.5 A hot work permit shall be issued in conjunction with the CSEP if hot work is required in the permit space.

4.3.6 A lockout/tagout clearance shall be issued in conjunction with the work on any CSEP if work on energy sources is required in the permit space.

4.3.7 A Radiological Work Permit (RWP) Form ATGF-002 shall be issued in conjunction with the CSEP if a radiological hazard is present.

4.3.8 The CSEP shall be canceled by the individual authorizing entry after completion of entry and once all entrants have exited.

4.3.9 The CSEP shall be in effect for one shift only. If the space is vacated for any reason during the day, but work in the space is not completed, CSSC and CSEP shall be reviewed prior to re-entry on that day. The requirements of the CSEP shall be completed prior to re-entry into a permit required confined space if the space has been completely vacated for any reason. Where the work in the space is required for more than one day, the authorizing persons (entry supervisors) must add the new date of entry to the CSEP and initial and date the signature block. The CSSC shall also be reviewed and modified, if required, and initialed each day by the Attendants, Authorized Entrants and the Entry Supervisor/Qualified Person.

NOTE: Entry to a non-permit confined space may be authorized for a period up to one year as specified on the CSEP.

4.4 Hazard Control

The appropriate equipment and/or procedures for hazard control/reduction shall be maintained and available for permit space entry. The type of equipment and procedures needed shall be determined from the initial hazard identification and characterization of permit-required confined spaces, and the hazard evaluation conducted when the CSEP and CSSC are completed. The need for the following equipment and/or procedures shall be evaluated and indicated on the CSEP.

4.4.1 Atmospheric Monitoring: Atmospheric monitoring shall be conducted prior to entry or re-entry into any permit-required confined space. Monitoring shall be conducted for oxygen deficiency and combustible gases/vapors as a minimum. The need for monitoring for toxic gases shall be determined by the Entry Supervisor/Qualified Person based on the characteristics of the permit space and work activities to be conducted. The appropriate intervals to monitor or the need for continuous monitoring shall be determined by the Entry Supervisor/Qualified Person prior to entry into the permit space.

NOTE: If a confined space is designated as a non-permit space, atmospheric monitoring may not be required. The CSEP shall indicate whether atmospheric monitoring is required.

4.4.2 Ventilation: The need for mechanical ventilation shall be determined when the CSEP and CSSC are completed for a permit space. The permit space shall be purged with fresh air prior to entry except where ventilating is not consistent with the potential hazards of the space; i.e., there is a potential for airborne radiological hazards, or when determined not to be necessary by the Entry Supervisor/Qualified Person. Continuous ventilation may be specified on the CSEP and CSSC based upon hazard evaluation. Atmospheric monitoring shall be conducted prior to ventilation and after ventilation was begun for a predetermined time to verify that the ventilation system is not introducing any air contaminants (carbon monoxide, for example) into the permit space atmosphere and that the ventilation is effective in establishing an acceptable environmental condition before entry is allowed.

4.4.3 Personal Protective Equipment (PPE): The type of PPE required for entry into a confined space shall be determined by the Entry Supervisor/Qualified Person when the CSEP and the CSSC are completed for a permit space.

- Head protection shall be required when there is a potential for falling objects, both from within the confined space and also through the entryway, and when there are structures and equipment that present hazards to the head.

- Eye and face protection shall be required when there is a potential for irritant dusts, vapors, mists, abrasive particles, chemical splashes, flying objects, or impacts. Safety glasses, impact goggles, chemical goggles, or face shields appropriate for the conditions in the confined space and the work to be performed shall be required as specified in the CSEP and CSSC.

- Hand protection shall be required for mechanical protection (sharp edged, abrasions, punctures), chemical protection, (acids, solvents) physical protection (heat, cold), electrical protection, radiological protection, and when handling slippery tools and materials based on hazards of the permit space.

- Foot protection shall be required when physical hazards (falling objects, rolling equipment), chemical hazards (acids, solvents), slip resistance, electrical conductivity, and the generation of sparks are potential hazards in the permit space.

- Protective clothing shall be required based upon the potential for radiological contamination, chemical contamination, or the physical conditions of the permit space.

- Hearing protection shall be required when there is potential of excessive noise exposure in the confined space. Alternative communication shall need to be developed if the ambient noise levels interfere with verbal communication.

- Respiratory protection shall be required when there is a potential for a hazardous atmosphere as defined in Section 3.2.12 or there is a potential for airborne radioactive material (Authorized Entrants required to wear respirators must meet the requirements of Reference 3.1.4.)

4.4.4 Isolation and Lockout/Tagout: All energy sources which are potentially hazardous to Authorized Entrants shall be secured, relieved, disconnected, locked out/tagged out and/or restrained before entry into the permit space. The type of energy sources and method of controlling energy sources shall be specified on the CSEP.

- Hazardous materials, high pressure, high temperature or other piping which could introduce hazards into the permit space shall be isolated through blanking and binding, removal or misalignment of pipe sections, double block and bleed, or other isolation methods.

- Equipment or processes which can introduce hazards in the permit spaces shall be locked and tagged out.

4.4.5 External Hazards: The CSEP shall specify the type of barricades and/or warning system which shall be used around the entrance to prevent persons or objects from falling into the permit space. The protection provided shall not interfere with the required ventilation of the permit space or the egress from the permit space.

4.4.6 Non-Permit Spaces: The CSEP shall indicate whether the confined space is a non-permit space. Entry into a non-permit space may be authorized for a period up to one year without providing an Attendant provided that:

- Appropriate entry practices and procedures have been determined and are followed.

- If a potential for atmospheric hazards exist, the atmosphere is tested prior to entry, and as entry proceeds using a direct reading meter and a remote sensing probe.

- Permit space hazards (defined in Section 3.2.24) are not present immediately before entry.

- The CSEP must be revoked when the direct reading instrument or some other circumstances indicated conditions are no longer acceptable for entry. The space shall not be considered a non-permit space until conditions are restored.

4.5 Special Hazards:

There are certain conditions and operations which take place in permit spaces which need special procedures and precautions prior to entry. These conditions/operations may require additional permits and written procedures prior to authorizing entry.

4.5.1 Hot Work: The CSEP shall note whether hot work is to be performed in the permit space. The CSEP shall indicate how the hot work shall impact the atmosphere.

- Additional monitoring and PPE requirements shall be determined by the Entry Supervisor/Qualified Person.
- Hot work shall not be done if flammable dusts or vapors (at any measurable concentration) are present in the permit space or in the air around the permit space.
- Cylinders of compressed gases used for welding/cutting shall never be taken into a permit space, and shall be turned off at the cylinder when not in use.
- All hot work equipment shall be removed from the permit space when the space is vacated for any reason. Gas hoses shall be immediately removed from the permit space when disconnected from welding/cutting torches or other gas consuming devices.

4.5.2 Radiological Work: When radiological hazards are evaluated and found to represent a significant potential hazard, a radiological work permit (RWP) ATGF-002 must be issued and so noted on the CSEP.

4.5.3 Wet Location: Electrical equipment used in permit spaces which have residual water, or wet surfaces because of condensation. shall be used with a ground fault interrupter (GFI).

4.5.4 Excavations: Permit-required confined space entry procedures may be required for entry into certain excavations and trenches. Each situation must be evaluated separately to determine whether the anticipated work will include work in a confined space. Generally, excavations greater than four feet in depth would be considered a confined space.

- Excavations and trenching shall be completed in accordance with 29 CFR 1926 Subpart P- Excavations.
- The potential for a hazardous atmosphere shall be determined by the Entry Supervisor/Qualified Person.
- Rescue methods must consider the potential for hazardous atmospheres and the potential for a cave-in. (Rescue from a hazardous atmosphere requires removing the victim from the hazardous atmosphere as quickly as possible and could entail using hoisting devices. Serious injury could result if these devices were used to attempt to rescue a victim trapped by a cave-in.)

4.5.5 Tanks and Vessels: Specific procedures would need to be developed based upon the characteristics of the tank or vessel.

4.6 Rescue:

Emergency rescue from confined spaces shall be accomplished by one of three mechanisms. (a) by the attendant using rescue equipment provided from outside the space without the attendant or others entering the space, (b) by ATG rescue team, and (c) by the outside rescue team. It is mandatory that the rescue plan and procedure establish whether the ATG or the outside rescue team will be summoned to perform the rescue. Even if rescue capability from outside the space is provided to the attendant, the rescue plan and procedure must also include either the ATG or outside rescue team response.

4.6.1 Rescue Plan and Procedure: Rescue plans and procedures shall be determined prior to authorizing entry into a permit space. The plan shall include the methods of rescue which is to be implemented based upon the characteristics of the space. The CSEP shall designate how rescue shall be accomplished and the type of rescue equipment that shall be used. It shall include rescue procedures for the attendant from outside of the space as well as rescue procedures by either ATG or outside rescue team. The means to summon the rescue team(s) must be included in the rescue plan.

4.6.2 Rescue by the Attendant: Unless authorized by the Entry Supervisor/Qualified Person and the CSEP, the attendant must perform rescue only by using the equipment provided from outside the space without entering the space. Such equipment may include hoists which are attached to the lifelines and safety harnesses worn by the authorized entrants. The attendant must also summon, rescue and direct other emergency services as soon as the attendant determines that the authorized entrants need to escape from the permit space.

4.6.3 Rescue by the ATG Rescue Team: ATG may choose to establish an in-house rescue team. Once established, all authorized entrants, attendants, and qualified persons must be officially informed of the ATG Rescue Team capability by the Project Manager. Until such official notification is provided, reliance must be placed on the outside rescue team. The means to summon the rescue team must be established. When the Entry Supervisor/Qualified Person determines that an entry presents a significant potential hazard, the Entry Supervisor/Qualified Person can specify in the CSEP and rescue plan that the rescue team must be notified in advance when entry into the space is under way.

4.6.4 Training of ATG Rescue Personnel: ATG rescue personnel shall be trained in the following areas:

- Proper use of PPE, including respiratory protective equipment.
- Practice in making permit space rescues at least annually, or more frequently as needed.
- Training in basic first-aid and cardiopulmonary resuscitation (CPR) skills. (At least one member of each rescue team shall maintain current certification in first-aid and CPR.)
- Training required for Authorized Entrants as outlined in Section 4.7.1.

4.6.4.1 All training shall be documented on Form-027, Training Record.

4.6.5 Rescue by the Outside rescue Team: The outside rescue team must be summoned until notification is made by the Project Manager that the ATG Rescue Team has been established and is operational. The Project Manager must arrange with local rescue services such as fire departments or other rescue squads to provide rescue for confined space entries. Arrangements must be made with the outside rescue team representatives to visit the ATG project sites and view representative confined spaces and their associated hazards to be aware of the conditions which they would confront during the rescue. The outside rescue teams will be allowed the opportunity to practice rescues at the ATG project sites in representative confined spaces, so long as such exercises do not place the rescue team at undue risk from site hazards.

4.7 Employee Information and Training

Permit-Required and Non-Permit Confined Spaces on ATG field projects shall be identified and posted with signs. Authorized Entrants, Attendants and Entry Supervisors in charge of confined space entry shall receive training as specified in this section in order to perform their duties with regard to entering into permit-required and non-permit confined spaces.

4.7.1 The training required and duties of the Authorized Entrants are as follows:

- The hazard which may be faced during entry: signs and symptoms of exposure to the hazards and consequences of the exposure;
- The method (i.e., headphones, hand signals) to be used to maintain communication with the Attendant and notification of Attendant when they self-initiate evacuation of the space;
- The equipment required to enter the permit space, and how to use it properly, including external barriers needed to protect against external hazards, and
- When to exit from the confined space (when ordered by the attendant, when an automatic alarm sounds or when the entrants perceive danger).

4.7.2 The training required and duties of the Attendant are as follows:

- Maintain an accurate count of the number of entrants in a permit space;
- Recognize permit space hazards and monitor activities inside and outside the permit space to determine if it is safe for entrants to remain in the space;
- Maintain effective and continuous communication with entrants;
- Order evacuation when: unauthorized activity is taking place, behavioral effects from hazardous exposures are observed, unacceptable activity outside the permit space occurs, there is an uncontrolled hazard in the space, or the attendant must focus on rescue in another permit space or leave the work station for any other reason;

- Warn unauthorized persons away from the space and warn against entering the permit space, order them to exit if they have entered the permit space, inform the Entry Supervisor/Qualified Person if unauthorized persons have entered the permit space; and;

- Summon rescue and other emergency services when determined that the authorized entrants need to escape from permit space hazards, properly use any rescue equipment without entering the permit space.

- Have training required under Section 4.7.1, "Authorized Entrant".

4.7.3 The training required and duties of the Entry Supervisor/Qualified Person authorizing and supervising entry are as follows:

- Determine whether the entry permit (CSEP) contains the requisite information, the necessary procedures and equipment are in place, whether acceptable entry conditions are present and terminate entry if necessary, and conclude entry operations when completed;

- Take appropriate measures to remove unauthorized personnel who are in or near permit spaces; and

- Serve as Authorized Entrants and/or Attendants since they are required to have the training outlined in Sections 4.7.1 and 4.7.2.

4.8 Documentation

ATG field projects shall maintain a current list of workers who have received proper training to become Attendants, Authorized Entrants, rescue personnel, and Entry Supervisor Qualified Persons designated to authorize and be in charge of entry into permit spaces. All training completed shall be documented on Form 027, Training Record.

5.0 RESPONSIBILITIES FOR PERMIT-REQUIRED CONFINED SPACE PROGRAM

5.1 Responsibilities of ATG Project Manager or his/her Designee.

5.1.1 Ensure permit-required and non-permit confined space areas have been identified and posted at ATG field project locations.

5.1.2 Ensure that the Confined Space Entry Program and Procedures are properly implemented and effective by performing periodic reviews of CSEP's and by conducting on site inspections.

5.1.3 Ensure that Entry Supervisors/Qualified Persons, Attendants, and Authorized Entrants have received proper training in confined space entry.

5.2 Responsibilities of the Entry Supervisor/Qualified Person (individual authorizing and in charge of entry into a Permit Area).

5.2.1 Complete a Confined Space Entry Permit (CSEP) and a Confined Space Safety Checklist (CSSC) in accordance with the requirements of the Entry permit system as defined in section 4.3. Sign the CSEP in conjunction with the Project Manager or his/her designee.

5.2.2 Ensure that necessary procedures, practices, and equipment for safe entry and emergency rescue are in place before allowing entry.

5.2.3 Ensure the CSEP contains the requisite information before authorizing and allowing entry.

5.2.4 Determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are present.

5.2.5 Cancel the entry authorization and terminate entry whenever acceptable entry conditions are not present.

5.2.6 When entry procedures are complete, take necessary steps to close off the space and cancel the entry permit.

5.2.7 Take appropriate measures to remove unauthorized personnel who are in or near entry permit spaces.

5.2.8 Be able to perform the duties as outlined in Sections 5.3 and 5.4.

5.3 Responsibilities of Authorized Entrants.

5.3.1 Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure.

5.3.2 Properly use PPE as defined by Section 4.4.3.

5.3.3 Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

5.3.4 Alert the attendant whenever:

- Any entrant recognizes any warning sign or symptom of exposure to a dangerous situation; or
- Any entrant detects a prohibited or unusual condition.

5.3.5 Exit from the permit space as quickly as possible whenever:

- An order to evacuate is given by the attendant or the entry supervisor;
- The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
- The entrant detects a prohibited condition; or
- An evacuation alarm is activated.

5.4 Responsibilities of Attendants

5.4.1 Know the hazards that may be faced during entry, including information on the mode (e.g., inhalation, absorption, etc.), signs or symptoms, and consequences of exposure.

5.4.2 Shall be aware of possible behavioral effects of hazard exposure.

5.4.3 Continuously maintain an accurate count of authorized entrants in the permit space.

5.4.4 Remain immediately outside the permit space during entry operations until relieved by another attendant.

5.4.5 Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

5.4.6 Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

- When the attendant detects a prohibited condition;
- When the attendant detects behavioral effects of hazard exposure in an authorized entrant;
- When the attendant detects a situation outside the space that could endanger the authorized entrants; or
- When the attendant cannot effectively and safely perform all his or her duties.

5.4.7 Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards. Establishes these lines of communication from entry point prior to entry.

5.4.8 Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:

- Warn the unauthorized persons that they must and shall stay away from the permit space;

- Advise the unauthorized persons that they must and shall exit immediately if they have entered the permit space; and

- Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

5.4.9 Perform non-entry rescues as specified by Section 4.6 of this procedure.

5.4.10 Perform no duties that might interfere with his/her primary duty to monitor and protect the authorized entrants.

5.4.11 Be able to perform the duties outlined in Section 5.3.

5.5 Responsibilities of all ATG or ATG Contractor Employees at ATG field project sites

5.5.1 Observe and obey signs posted near permit-required confined spaces.

5.5.2 Participate in required training for Attendants and Authorized entrants before performing the duties of an Attendant or an Authorized Entrant.

5.5.3 Do not enter any permit-required confined space without reviewing and understanding the completed CSEP and CSSC. Each Attendant and Authorized Entrant shall initial the CSSC indicating they understand the hazards and controls prior to entry.

5.5.4 Bring any unsafe condition to the immediate attention of the ATG supervisor. The supervisor shall document and resolve any unsafe condition reported.

6.0 CONFINED SPACE ENTRY PROCEDURE

6.1 The following procedures shall be followed for permit-required confined space entry at ATG field project sites.

6.1.1 The ATG Project Manager or his/her designee and/or a Subcontractor shall inform the site's designated Safety representative of the need for entry into a permit-required confined space.

6.1.2 An Entry Supervisor/Qualified Person, along with the Project Manager or his/her designee and/or Subcontractor shall complete the CSEP and CSSC. The Entry Supervisor/Qualified Person shall sign the CSEP.

6.1.3 The hazard identification and characterization previously completed (Section 4.1) on the permit space shall be reviewed. It shall be determined whether conditions have changed since the characterization.

6.1.4 The actual work that will be completed in the permit space must be evaluated to determine the impact on the hazard evaluation of the permit space. Control of hazards associated with both work activities and the space itself must be considered.

6.1.5 The atmospheric monitoring requirements, ventilation requirement, personal protective equipment requirements, isolation requirements, lockout/tagout requirements, rescue procedures and other hazard control procedures needed, shall be determined and documented on the CSEP.

6.1.6 Entry into the permit space shall be authorized by the Entry Supervisor/Qualified Person after all actions and conditions necessary for safe entry have been met, including verifying that Attendant(s) and Authorized Entrant(s) listed on the CSEP have received proper training. The CSEP must be signed by the ATG Entry Supervisor/Qualified Person.

NOTE

If the confined space is determined to be a non-permit space that does not require an Attendant, there will be no Attendant listed on the CSEP.

6.1.7 A safety meeting shall be conducted by the Entry Supervisor/Qualified Person prior to entry for the Attendants and Authorized Entrants. The meeting shall consist of a review of the CSEP and CSSC, and include the potential hazards in the permit space, safe work practices, and emergency procedures. This meeting shall be documented. (Any changes in hazardous conditions or additional people involved shall require an additional safety meeting with all or additional participants, addressing the changes in conditions).

6.1.8 The CSEP shall be posted in a conspicuous location adjacent to the permit space access opening.

6.1.9 The Entry Supervisor/Qualified Person shall ensure that:

6.1.9.1 The proper equipment is available prior to entry into the permit space.

6.1.9.2 The Authorized Entrants are provided with and use the PPE specified on the CSEP.

6.1.9.3 Safety and rescue equipment is available and ready for use as required by the CSEP.

6.1.9.4 Signs are posted and barriers are erected as required by the CSEP.

6.1.9.5 The necessary hazard controls are in place prior to entry, such as cleaning/purging, isolation, lockout/tagout, etc.

6.1.10 Initial atmospheric monitoring shall be conducted prior to entry or re-entry into a permit space by the Entry Supervisor/Qualified Person or an attendant trained in the use of the equipment.

6.1.10.1 When monitoring indicates the atmosphere is hazardous as defined in Section 3.2.12 entry shall be prohibited until appropriate controls are implemented.

6.1.10.2 Monitoring shall be conducted before mechanical ventilation has been provided and during ventilation to ensure the ventilation system itself is not causing a hazardous condition by bringing outside contaminants into, or disturbing contaminants in the space.

6.1.10.3 Monitoring shall be conducted prior to entry using remote sampling probes to check all areas of the permit space at various levels (ie. high and low, in corners, etc.). The monitoring sequence should be for oxygen concentration, flammable gas or vapor concentrations, potential toxic contaminants, and radiological contaminants.

6.1.11 Immediately before entry, the Entry Supervisor/Qualified Person shall revise the CSEP and the CSSC with the Attendant(s) and Authorized Entrant(s) to ensure they understand the hazards and the controls that are in place. The CSSC shall be initialed by all.

6.1.12 The Authorized Entrant(s) shall sign in on the Confined Space Sign In/Out Log prior to entry into the permit space (ATGF-046). This log shall be maintained by the Attendant at all times.

6.1.13 Communication between the Attendant and Authorized Entrant(s) shall be maintained at all times.

6.1.13.1 The Attendant shall order the Authorized Entrant(s) to evacuate immediately when:

- Conditions are observed which are not allowed on the CSEP;
- Behavioral effects from hazardous exposure are observed;
- Conditions outside the permit space are observed which could endanger the Authorized Entrant(s);
- An uncontrolled or previously unidentified hazard is observed within the permit space;
- The Attendant is monitoring entry in more than one permit space and must focus attention on one of the spaces (Authorized Entrants of the other spaces must and shall exit in this circumstance); and
- The Attendant must leave the station.

6.1.13.2 Under no circumstances shall the Attendant enter the permit space unless another person qualified as an Attendant is present.

6.1.14 Upon exit from the permit space the Authorized Entrant(s) shall sign out on the Confined Space Sign In/Out Log ATGF-046.

6.1.15 The Entry Supervisor/Qualified Person shall cancel the CSEP when work in the permit space is complete, or has been terminated.

6.2 **The following precautions shall be implemented for authorizing entry into all posted non-permit confined spaces at ATG field project locations.**

6.2.1 An Entry Supervisor/Qualified Person shall complete and sign a CSEP.

6.2.2 Prior to each entry the Authorized Entrant shall review and initial the CSSC.

6.2.3 Entry into a non-permit space may be authorized for a period of up to one year without the presence of an Attendant provided that the following conditions are met:

- The atmosphere is tested prior to each entry to document that atmospheric hazards (Section 3.2.24) are not present.
- Atmospheric testing shall be performed using a direct reading meter equipped with a remote sensing probe.
- Entry shall be suspended immediately when the direct reading instrument or some other circumstance indicates that conditions are no longer acceptable for entry. The area of entry shall cease to be considered a non-permit space until conditions are fully restored.
- All sampling data shall be recorded on the CSEP.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form 027 - Training Record

7.2 Form ATGF-044 - Confined Space Safety Checklist

7.3 Form ATGF-045 - Confined Space Entry Permit

7.4 Form ATGF-046 - Confined Space Sign In/Out Log

8.0 FORMS

8.1 Form 027 - Training Record

8.2 Form ATGF-044 - Confined Space Safety Checklist

8.3 Form ATGF-045 - Confined Space Entry Permit

8.4 Form ATGF-046 - Confined Space Sign In/Out Log

TRAINING RECORD

TRAINING DATE:	INSTRUCTOR:
LOCATION:	TOTAL CLASS HOURS:
TRAINING COURSE TITLE:	
SCOPE OF TRAINING:	

NAME OF STUDENT	SOCIAL SECURITY NO.	SIGNATURE

TRAINING APPROVED BY (Project Director):

CONFINED SPACE SAFETY CHECKLIST

DESCRIPTION	INITIALS	
	Pre-Entry Planning	Immediately Before Entry
1. Describe permit space to be entered:		
2. Indicate purpose of entry and nature of work:		
3. Describe actions and procedures necessary to prepare permit space for entry (cleaning, flushing, purging, etc.)		
4. Describe mechanical, electrical equipment, piping in the space, how it will be impacted by work in space and how it will be controlled (lock out / tag out isolation)		
5. Indicate the required personal protective equipment (other than respiratory, rescue equipment)		
6. Indicate the type of respiratory protection that will be required:		
7. Describe walking/working surfaces, lighting requirements, entry opening protection:		
8. Describe additional hazards in space because of work to be performed (hot work, cleaning, etc.):		
9. Describe expected atmospheric conditions in space and indicate monitoring and ventilation requirements:		
10. Describe type of rescue equipment including communication that will be available and/or used for entry		

CONFINED SPACE ENTRY PERMIT

PROJECT / LOCATION:		
RWP #	TIME:	DATE ENTRY AUTHORIZED:
NATURE OF WORK		
ENTRY SUPERVISOR:		

ATTENDANT(S):		AUTHORIZED ENTRANT(S):	

Y = YES IS REQUIRED NR = NOT REQUIRED

Y	NR	SPECIAL REQUIREMENTS	Y	NR	PPE REQUIREMENTS	Y	NR	RESCUE REQUIREMENTS
		Lockout/Tagout			Hard Hat			Safety Belt
		Hot Work Permit			Eye/Face Protection			Safety Harness
		Ventilation Equipment			Hand Protection			Life Line
		Isolation of Lines			Foot Protection			Hoisting Device
		Barriers to Protect Opening			Protective Clothing			SCBA
		Other:			Respiratory Protection			Communication
					Hearing Protection			Other:
					Other:			

Y	NR	Atmospheric Monitoring Requirements	Initial	Subsequent Readings: Time Taken			
		% Oxygen - Maintain Between 19.5% and 23.5%					
		% of LFL-Maintain Less than 10%					
		Other Contaminants-TLV (List)					

Equipment Used:				
Calibration Date(s):				
Is this confined space a non-permit space (Check One)? ☐ Yes ☐ No				
If yes, indicate effective dates for entry:				
Entry Supervisor:	Date:	Time:		
Project Manager/Supervisor:	Date:	Time:		

NOTE: Any person entering an IDLH atmosphere must notify the project manager and the rescue team upon entry and upon exit.

CONFINED SPACE SIGN IN/OUT LOG

ject/Location:_____ Date:_____

ntry Supervisor:_____ RWP#:_____

Name	Time In	Time Out	Name	Time In	Time Out

ATG, INC.

HSP-009
Revision 0

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

INTRUSIVE SOIL SAMPLING

Allied Technology Group, Inc.
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Fremont, California 94538

Prepared by
D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: HSP-009, INTRUSIVE SOIL SAMPLING, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/10/95

Thomas J. O'Dou, CHP
Project Radiation Safety Officer
HP Technical Support — Date: 4/10/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Procedure Number: HSP-009

Title: INTRUSIVE SOIL SAMPLING

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REVISION RECORD	
Rev. No.	Date

CURRENT REVISION	
Rev. No.	0
Date	04/10/95
Approval	

INTRUSIVE SOIL SAMPLING

1.0 SCOPE

This procedure describes the appropriate methods for collecting intrusive samples of soil on ATG field projects.

2.0 PURPOSE

The purpose of this procedure is to provide guidelines for collecting intrusive soil samples.

3.0 REFERENCES

3.1 Project/Site Health and Safety Plan

3.2 Project/Site Detailed Work Procedure

3.3 NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination

3.4 NUREG/CR-5512, Residual Radioactive Contamination From Decommissioning

3.5 HSP-001, Sample Chain of Custody

3.6 HSP-003, Sediment Sampling

3.7 HSP-004, Water Sampling

3.8 HSP-005, Miscellaneous Sampling

4.0 EQUIPMENT

4.1 Digging implement: hollow point auger, split spoons, post-hole digger, etc.

4.2 Special sampling apparatus (cup cutter, shelby tube, etc.) as required.

4.3 Plastic bags, approximately 10" x 11".

4.4 500ml marinelli containers, 500ml wide mouth plastic bottles..

4.5 Twist-ties.

4.6 Masking or duct tape.

4.7 Record forms.

4.8 Labels and security seals.

4.9 Indelible pen.

4.10 Equipment cleaning supplies, as appropriate.

5.0 RESPONSIBILITIES

5.1 ATG Radiological Field Operations Manager(Project Manager)

5.1.1 Implementation of this procedure.

5.1.2 Periodic reviews of adherence to the requirements of this procedure.

5.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.2 Health Physics Supervisors

5.3.1 Assignment of Health Physics Technicians performing this procedure.

5.3.2 Reviewing and approving documentation generated by the use of this procedure.

5..3 Health Physics Technicians

5.3.1 Performance of the requirements of this procedure.

5.3.2 Adherence to other procedures referenced.

5.3.3 Documentation of all work performed under this procedure.

6.0 PROCEDURE

NOTE

Direct surface radiation measurements are to be performed at each location before initiating sampling. This will identify the presence of gross contamination which will require that samples and equipment be treated as radioactive and handled in accordance with appropriate procedures.

6.1 Intrusive samples will be collected with a hollow point auger, split spoon etc. Each soil sample is a core evaluation. These samples must not be composited. The soil removed for sampling must be sufficient to yield a sample of approximately 500ml in volume.

6.2 Remove large rocks, vegetation, and foreign objects (these items may also be collected as separate samples, if directed.)

6.3 Place approximately 2 kg (or an amount in accordance with References 3.1 and 3.2) of soil into a plastic 500ml marinelli container/500ml wide mouth plastic bottle or plastic bag..

6.4 Seal the bag using a twist-tie, cap, and tape the cap in place (or tie the sample bag strings.)

6.5 Label and secure the sample container in accordance with References 3.1 and 3.2.

NOTE

A box shall be lined with plastic and approved absorbent material prior to placing samples inside the box if the samples are to be shipped for analysis.

NOTE

A load rating stamped on the bottom of the box shall be noted. This rating shall not be exceeded to prevent degradation of the box during shipping.

6.6 The container should be placed in a cardboard box (also properly labeled) for storage or shipping.

CAUTION

Samples must be contained within an outer protective cover to prevent (minimize) cross contamination of samples from one site to another. Double bagging the sample will meet this specification.

6.7 The soil samples collected will be monitored by wiping the external surface of the containers with cloth or paper wipes. The wiped will be analyzed using field survey instruments to determine the presence of external contamination. Any soil samples found to have external contamination must be wiped clean and resurveyed prior to analysis..

6.8 The soil samples collected will be surveyed for radiation levels using a Model 19 micro R meter or equivalent on the external surfaces of the sample container. The samples must be shielded if radiation levels exceed .5 mr/hr (500 μR/hr) on the external surface of the container.

6.9 Document all samples obtained on Form ATGF-049, Sample Status Log and in the sample log book if applicable.

6.10 Sample Chain of Custody records shall be documented in accordance with Reference 3.5.

CAUTION
DO NOT proceed to the next sample site or leave the area with any equipment until you have completed Steps 6.11 AND 6.12.

6.11 Clean sampling tools before proceeding to the next sampling location.

6.12 Survey sampling equipment to ensure no removable contamination exists which could result in cross contamination of samples.

6.13 The layout of the initial sample survey grid and the points from which samples were removed will be retained as a part of the survey report. The types of instrumentation and measurement geometry descriptions will be retained. The information regarding the estimates of the total activity and the resolution of the materials recovered will be retained with the results of the sampling program developed to characterize the residual activity of the affected area.

6.14 Each sampling point will be identified with a marker (ex. marking flag) and given a unique identifying number in accordance with References 3.1 and 3.2.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form ATGF-049, Sample Status Log

8.0 FORMS

8.1 Form ATGF-049, Sample Status Log

ALLIED TECHNOLOGY GROUP
SAMPLE STATUS LOG

Project/Location: _____

SAMPLE ID	LOCATION	DATE/TIME SAMPLE OBTAINED	ANALYSIS	STATUS

ATG Inc.

HP-IP-001
Revision 1

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

HEALTH PHYSICS OPERATING PROCEDURE

OPERATION AND CALIBRATION OF THE LUDLUM MODEL 3 SURVEY METER

Allied Technology Group, Inc.
47375 Fremont Blvd.
Fremont, California 94538

Prepared by

D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: HP-IP-001, Operation and Calibration of the Ludlum Model 3 Survey Meter has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/12/95

Thomas J. O'Dou, CHP, Project Radiation Safety Officer, HP Technical Support — Date: 4/12/95

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

PROCEDURE NUMBER: HP-IP-001

TITLE: Operation and Calibration of the Ludlum Model 3 Survey Meter

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OPERATION AND CALIBRATION OF THE LUDLUM MODEL 3 SURVEY METER

1.0 SCOPE

This procedure sets forth the specific requirements to be used for the operation and calibration of the Ludlum Model 3 Survey Meter for use on Allied Technology Group, Inc. field projects.

2.0 Purpose

The purpose of this procedure is to provide instructions for the operation and calibration of the Ludlum Model 3 Survey Meter in accordance with the requirements specified in Reference 3.1.1.

3.0 REFERENCES

3.1 References

3.1.1 Regulatory Guide 10.8, Rev.2-1987, Guide for the Preparations of Applications for Medical Use Programs

3.1.2 ANSI N3.1-1987, Selection, Qualification and Training of Personnel For Nuclear Power Plants

3.1.3 Manufacturer's instruction manual for the Ludlum Model 3 Survey Meter

3.1.4 ANSI N323-1978, Instrument Test and Calibration

4.0 PRECAUTIONS, LIMITATIONS

4.1 Precautions

4.1.1 Take care not to puncture the thin mica window of the "pancake" G-M detector, or the thin mylar window of the ZnS (Ag) scintillation detector.

4.1.2 To prevent contamination of the probe, avoid contact with the person(s) or object(s) being surveyed.

4.1.3 When using this instrument case in a known, or suspected contaminated area, seal the instrument in a protective media (i.e., plastic, poly) to prevent contamination of the instrument.

4.2 Limitations

4.2.1 The operation of the Model 3 depends on the condition of the battery. Therefore, the battery check should be performed before operation and periodically during use to ensure proper operation.

4.2.2 Calibration shall be performed semi-annually, after maintenance is performed, if the instrument fails the performance test or if its proper operation is in question.

4.2.3 A daily performance test is required when the instrument is in use.

4.2.4 "Pancake" GM detectors and ZnS (Ag) scintillation detectors shall be considered 10% efficient unless otherwise noted for a specific situation.

5.0 RESPONSIBILITIES AND QUALIFICATIONS

5.1 Responsibilities

5.1.1 ATG Radiological Field Operations Manager

5.1.1.1 Implementation of this procedure.

5.1.1.2 Periodic reviews of the adherence of personnel to the requirements of this procedure.

5.1.1.3 Ensures by training and experience Health Physics Technicians are qualified to perform the requirements of this procedure.

5.1.2 Health Physics Supervisors

5.1.2.1 Performs periodic surveillance of the use and maintenance of the instrument.

5.1.2.2 Ensures the instrument is calibrated at specified intervals.

5.1.2.3 Ensures that records pertaining to the instrument are maintained on file throughout the duration of the project and copies retained in the permanent project file.

5.1.3 Health Physics Technicians

5.1.3.1 Performance of the requirements in Section 6.1, and 6.3 of this procedure.

5.1.3.2 Documentation of all records in this procedure.

5.1.3.3 Notification to Health Physics Supervision of any unsafe or unusual conditions observed during operation of the instrument.

5.1.4 Health Physics Instrument Personnel

5.1.4.1 Perform the requirements of Sections 6.2, 6.3, and 6.4 of this procedure.

5.2 Qualification

5.2.1 Health Physics technicians shall be qualified in accordance with the requirements of ANSI 3.1 - 1987 to operate this instrument for any of the following: Surveys, radiation work permits and job coverage.

5.2.2 Junior Health Physics and Decontamination Technicians may operate this instrument under supervision of a Health Physics Technician meeting the requirements of section 5.2.1.

6.0 PROCEDURE

6.1 Operation

6.1.1 Verify that the instrument has a valid Calibration Data Sticker Label # ATGL-DCK and is not out of calibration, and the daily performance test has been completed and initialled on the Performance Test Daily Check Sticker. If the performance test has not been completed, have a Health Physics Technician perform the test (Section 6.3).

6.1.2 Inspect the instrument for any obvious physical damage which could interfere with its proper operation. It should include inspecting for loose, damaged knobs, buttons, broken or damaged meter movements/displays, dented or corroded instrument cases, punctured/deformed probe/probe window(s). Particular attention should be given to cables and connectors, since these components frequently become damaged or worn. Any instrument or detector having a questionable physical condition shall not be used until properly corrected.

6.1.3 Perform a battery check on the instrument by moving the switch to the "BAT" position. Observe the meter indication for the current battery condition.

6.1.4 If unsatisfactory results are obtained, refer to Reference 3.1.3 for the replacement of the batteries and repeat the check. The instrument shall display a satisfactory battery check prior to each use.

6.1.5 Set the audio switch to the "on" position. Set the response switch to the slow "s" position, and range selector to the lowest setting.

6.1.6 In a low background area perform a background check on the instrument. If the instrument is equipped with a ZnS (Ag) scintillation detector hold the detector probe up to, and facing a light source. Observe the instruments reading. Reading should be between 0 and 5 cpm. If a greater reading is noted, the detectors mylar window may be damaged, the instrument should be Health Physics Supervision notified immediately.

6.1.7 If the instrument is equipped with a "pancake" GM detector observe the instruments reading. If the reading is ≥ 300 cpm the instrument must be moved to a lower background area for air sample filter, smear filter, and masslin counting purposes. The lowest possible background area should be used for counting purposes.

NOTE: When using a ZnS (Ag) alpha probe or GM pancake probe, to do an evaluation of a surface which may contain natural radioactivity (such as concrete or plaster), determine background near contact with a non-contaminated section of the material. This will ensure that activity determination accounts for the presence of low level natural radioactivity in the material.

6.1.8 If a low background rate cannot be achieved check the instrument probe face for contamination. Decontaminate if necessary, taking care not to damage the probe face.

6.1.9 Proceed with operation in accordance with the desired use.

6.1.10 If performing a direct probe survey with a "pancake" GM detector, the detector face should be within 1/2" of the surface being surveyed. The movement rate of the detector probe should be one probe width per second or slower.

6.1.11 If performing a direct probe survey with a ZnS (Ag) scintillation detector, the detector face should be within 1/4" of the surface being surveyed. The movemen rate of the detector probe should be one probe width per second or slower.

6.1.12 If counting air sample filters the counting time should be of a minimum of 1 minute, or when meter deflection stabilizes.

6.1.13 If counting smears, masslinn etc. the counting time should be a minimum of 30 seconds, or when meter deflection stabilizes.

6.1.14 When performing direct scan surveys of objects, surface areas etc., static readings should be performed frequently to insure the detection of residual activity.

6.1.15 If the Model 3 is calibrated with the Ludlum Model 44-6 Probe or equivalent as a dose rate meter, ensure probe is parallel to the source/surface being surveyed.

6.1.16 High energy betas may be seen if the Model 44-6 probe shield is rotated sideways exposing the GM tube.

NOTE: This probe only indicates the presence of beta and is not a quantitative measurement. Measurement of photon dose rates are strongly energy dependent and calibration must ensure determination of meter response for a specific energy range.

6.2 Calibration

6.2.1 Equipment needed:

6.2.1.1 Calibrated Electrostatic Voltmeter or equivalent traceable to N.I.S.T.

6.2.1.2 Calibrated MP-2 or equivalent traceable to N.I.S.T.

6.2.1.3 Tc99 Reference Source traceable to N.I.S.T.

6.2.2 Initiate the Instrument Service Record- Ludlum Model 3 form ATGF-007 by completing section 1. Attach the old Calibration Data Sticker to the new form ATGF-007.

6.2.3 Check the physical condition of the instrument for defects that could affect instrument operation. If necessary complete the "AS FOUND" data and arrange for repair before proceeding. Record your findings on Form ATGF-007.

6.2.4 Check and adjust the mechanical zero on the meter face as necessary.

6.2.5 Perform a battery test. Replace as necessary. Record on form ATGF-007.

6.2.6 Connect an Eberline MP-2 or equivalent to the Model 3 probe connector. Set the pulser amplitude to approximately 80 millivolts. Set the Model 3 selector switch to the X10 position.

6.2.7 Set the pulser to provide a pulse rate of 40,000 cpm. Record the resulting meter reading on the Model 3 in the appropriate space under Instrument Reproducability on the Calibration and Data sheet. Remove the pulser signal.

6.2.8 Repeat the last step to collect three successive values and record on the Calibration and Data sheet. All values should exhibit less than 10% deviation from the average. Complete the calculation on form ATGF-007.

6.2.9 "AS FOUND" data collection:

6.2.9.1 Note any completed repairs that may influence the "AS FOUND" values in the remarks section of form ATGF-007.

6.2.9.2 Using an electrostatic voltmeter or equivalent, check the High Voltage of the Model 3 and record in the "AS FOUND" space on form ATGF-007.

6.2.9.3 Connect an Eberline Minipulser or equivalent to the Model 3 probe connector. Set the pulser to approximately 80 millivolts.

6.2.9.4 For the following pulse rates and appropriate scale, record the indicated value on the Model 3 in the "AS FOUND" values on form ATGF-007.

X.1 scale	X1 scale	X10 scale	X100 scale
100 cpm	1,000 cpm	10,000 cpm	100,000 cpm
400 cpm	4,000 cpm	40,000 cpm	400,000 cpm

6.2.10 Review the "AS FOUND" data to ensure the values are within the acceptance range on form ATGF-007. If they are, proceed to step 6.2.13. Step 6.2.12 may be performed for better accuracy, if desired. If the "AS FOUND" values are 20% or more out of tolerance, notify Health Physics Supervision for evaluation.

6.2.11 High Voltage Adjustment: Using an electrostatic voltmeter or equivalent, adjust the high voltage to 900 volts using the HV Adjust potentiometer and record this value as the high voltage "AS LEFT" on form ATGF-007. If this cannot be achieved, terminate this calibration and arrange for repair of the instrument.

6.2.12 Calibration potentiometer adjustments:

6.2.12.1 Adjust the X.1, X1, X10, and X100 potentiometers as necessary to bring the readings as close as possible to the following pulse rates:

X.1 scale	X1 scale	X10 scale	X100 scale
100 cpm	1,000 cpm	10,000 cpm	100,000 cpm
400 cpm	4,000 cpm	40,000 cpm	400,000 cpm

6.2.12.2 After each scale has been adjusted as necessary, record the final readings as the "AS LEFT" values on form ATGF-007. If the acceptance range cannot be met, terminate this calibration and arrange for the repair of the meter.

6.2.13 Efficiency determination

6.2.13.1 Connect Ludlum Model 44-9 probe or equivalent to the instrument.

6.2.13.2 Determine and record on form ATGF-007 the background count.

6.2.13.3 Verify the current DPM of the reference source or decay correct the reference sources using the following formula:

$$A = A_0 e^{-.693 (t)/t_{1/2}}$$

Where: A = corrected source activity
A_0 = original activity
e = 2.71828
$t_{1/2}$ = radionuclide half-life
t - elapsed time

6.2.13.4 Place the probe 1/2" above the Tc-99 source and record the resulting count rate on form ATGF-007.

6.2.13.5 Subtract the background CPM from the source CPM to obtain the net counts per minute.

6.2.13.6 Determine the efficiency using the following formula:

$$\%EFF = \frac{\text{Net Counts Per Minute (cpm) x 100\%}}{\text{Source Activity (DPM)}}$$

Record the results on form ATGF-007.

6.2.13.7 The efficiency must be greater than 10%. If not, terminate this procedure and arrange for repair of the meter.

6.2.14 Determine Performance Test Reference Data

6.2.14.1 Record the Tc-99 source serial number on form ATGF-007.

6.2.14.2 Perform a one minute background count and record on form ATGF-007.

6.2.14.3 Perform a one minute source count and record results on form ATGF-007.

6.2.14.4 Determine the reference value by subtracting the background count from the source count.

6.2.14.5 Calculate the reference range, ± 10% of the reference value, and record on form ATGF-007.

NOTE: Step 6.2.15 need only be performed if the Model 3 is calibrated to the Ludlum Model 44-6 Probe or equivalent as a dose rate meter.

6.2.15 Model 3 Dose Rate Calibration

6.2.15.1 Dose rate calibrations of the Model 3 shall be performed by the manufacturer or qualified vendor.

6.2.15.2 Upon receipt from the manufacturer or qualified vendor, initiate the Instrument Service Record - Ludlum Model 3 (Dose Rate) form ATGF-007-1 by completing Section 1.

6.2.15.3 Perform a physical condition inspection of the instrument for transient damage. Record on form ATGF-007-1 as satisfactory or unsatisfactory. Unsatisfactory conditions shall require a description of the defect in Section 3 of form ATGF-007-1.

6.2.15.4 Perform a battery test. Replace the batteries if necessary. Document on form ATGF-007-1 as satisfactory or unsatisfactory.

6.2.15.5 Determine Performance Test Data

(a) Obtain a 5μCi Cs-137 Button Source and record the serial number on form ATGF-007-1.

(b) Place the source in contact with the side of the Model 44-6 probe, switch the instrument to the appropriate range to obtain an on-scale reading. Record the reading on form ATGF-007-1.

(c) Calculate the reference value range ± 10% of the source reading, and record on form ATGF-007-1.

6.2.15.6 Attach a copy of the manufacturer or qualified vendor's Calibration Data Sheet to form ATGF-007-1

6.2.16 If the above calibration steps are completed satisfactorily, attach a completed Calibration Data Sticker, and Performance Test Daily Check Sticker to the instrument and complete Section 3 of form ATGF-007. The old Calibration Data Sticker shall be attached to the new form ATGF-007.

6.3 Performance Test

6.3.1 Conduct a performance test daily check on the instrument and record all data on form ATGF-003, Performance Test Log Sheet.

6.3.2 Obtain the Performance Test source designated by the Performance Test Daily Check Sticker on the instrument.

6.3.3 Record the information for each section of form ATGF-003.

6.3.4 Examine the instrument for any obvious physical damage which could interfere with its proper operation.

6.3.5 Verify that the instrument has a current Calibration Data Sticker and Performance Test Daily Check Sticker.

6.3.6 Perform a Battery Check to ensure that the battery is within the Batt OK range on the meter.

6.3.7 Expose the detector to the performance test source. If the response is within the designated range for the source, proceed to step 6.3.9. If the instrument fails, record "F" for fail on form ATGF-003 and remove the instrument from service for repair or calibration.

6.3.8 If the instrument fails any portion of the performance test, log the instrument as failing on the Performance Test Log Sheet, remove from service. and notify Health Physics Supervision.

6.3.9 If the instrument passes the performance test, record "P" for pass on form ATGF-003, then initial the Performance Test Daily Check Sticker on the instrument and initial the Performance Test Log Sheet.

6.4 Maintenance

6.4.1 Instruments shall be stored in areas which prevent damage by movement, accumulation of moisture or dust. Detector covers shall be used for storage when practical.

6.4.2 Electronic maintenance (except probe and cable replacements) shall be performed by an Health Physics Instrumentation Technician or by the manufacturer or a approved vendor.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form ATGF-007 Instrument Service Record- Ludlum Model 3

7.2 Form ATGF-007-1 Instrument Service Record- Ludlum Model 3 (Dose Rate)

7.3 Form ATGF-003 Daily Instrument Performance Test Log Sheet

7.4 Calibration Data Sticker

7.5 Performance Test Daily Check Sticker

8.0 FORMS AND EXHIBITS

8.1 Forms

8.1.1 ATGF-007, Instrument Service Record- Ludlum Model 3

8.1.2 ATGF-007-1, Instrument Service Record- Ludlum Model 3 (Dose Rate)

8.1.3 ATGF-003, Daily Instrument Performance Test Log Sheet

8.2 Exhibits

8.2.1 Performance Test Daily Check Sticker

8.2.2 Calibration Data Sticker

EXHIBIT 8.2.1

ATG, Inc.

DAILY INSTRUMENT CHECK

INSTRUMENT	SERIAL NUMBER

CHECK MONTH

J	F	M	A	M	J	J	A	S	O	N	D

DAY	INITIALS	DAY	INITIALS	DAY	INITIALS
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	
				31	

TECHNICIAN INITIALS INDICATE BATTERY & SOURCE CHECKS OK

EXHIBIT 8.2.2

ATG Inc. Form ATGF-OOD
Survey Meter Calibration

Model _____ Serial No._____

Range +/- 10% CF within +/- 20%

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

Dedicated Check Source S/N _____

Activity ____ Date ____ Reading _____

Calibration Date _____

Next Calibration Due _____

Calibrated by _____

DAILY INSTRUMENT PERFORMANCE TEST LOG SHEET

PROJECT:

DATE	MODEL/TYPE	S/N	PHYSICAL DAMAGE Y/N	CAL DUE DATE	SOURCE I.D.	ACTIVITY	BKRD	READING	EFF.	PASS/ FAIL P/F	TECH INIT

INSTRUMENT SERVICE RECORD - LUDLUM MODEL 3

SECTION 1 - INSTRUMENT DATA:			
del 3 Serial No:		Calibration Due Date:	
Voltmeter M&TE No:		Date:	
Mini Pulser M&TE No:		Calibration Due Date:	
TC-99 I.D. No.		Activity:	Assay Date:
SECTION 2 - CALIBRATION DATA:			
Physical Condition:	☐ Satisfactory	☐ Unsatisfactory	
Battery Test	☐ Satisfactory	☐ Unsatisfactory	
Reproducability - Meter Reading:			
1.	2.	3.	Avg.
Are readings within ±			High
As Found:		As Left:	

ACCEPTANCE RANGE: 850 - 950 Volts

Scale	Pulse Rate (CPM)	As Found Values (CPM)	As Left Values (CPM)	Acceptance Range (CPM)
X0.1	100			90 - 110
X0.1	400			360 - 440
X1	1,000			900 - 1,100
X1	4,000			3,600 - 4,400
X10	10,000			9,000 - 11,000
X10	40,000			36,000 - 44,000
X100	100,000			90,000 - 110,000
X100	400,000			360,000 - 440,000

EFFICIENCY DETERMINATION:

Background	Meter Reading with Source	Activity	Efficiency = Net CPM x 100

IS EFFICIENCY GREATER THAN 10% ☐ YES ☐ NO

PERFORMANCE TEST DATA:

TC-99 Serial #	Background	Master Reading	Reference Value Meter	Range ± 10% of Reference

SECTION 3 - REMARKS:

Calibrated by:_____ Date:_____ Calibration Due Date:_____

Reviewed by:_____ Date:_____

INSTRUMENT SERVICE RECORD- LUDLUM MODEL 3

SECTION I: INSTRUMENT DATA

MODEL 3 SERIAL NUMBER:	CALIBRATION DATE:

SECTION 2: CALIBRATION DATA:

NOTE: Please see attached copy of the manufacturer's (or qualified vendor's) Calibration Data Sheet for Dose Rate Data.

PHYSICAL CONDITION:	☐ SATISFACTORY	☐ UNSATISFACTORY
BATTERY TEST	☐ SATISFACTORY	☐ UNSATISFACTORY

PERFORMANCE TEST DATA:

Cs 137 SERIAL NUMBER	METER READING WITH SOURCE	RANGE ± 10% OF METER READING

SECTION 3: REMARKS

CALIBRATED BY:	DATE:
CALIBRATION DUE DATE:	DATE:
REVIEWED BY:	DATE:

ATG Inc.

HP-IP-002
Revision 1

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

HEALTH PHYSICS OPERATING PROCEDURE

OPERATION AND CALIBRATION OF THE LUDLUM MODEL 19 MICRO-R METER

Allied Technology Group, Inc.
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Prepared by

D. Spicuzza

Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: HP-IP-002, Operation and Calibration of the Ludlum Model 19 Micro-R Meter has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 4/12/95

Thomas J. O'Dou, CHP, Project Radiation Safety Officer, HP Technical Support — Date: 4/12/95

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Procedure Number: HP-IP-002

Title: Operation and Calibration of the Ludlum Model 19 Micro-R Meter

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OPERATION AND CALIBRATION OF THE LUDLUM MODEL 19 MICRO-R METER

1.0 SCOPE

This procedure sets forth the specific requirements to be used for the operation and calibration of the Ludlum Model 19 Micro-R Meter for use on ATG, Inc. field projects.

2.0 PURPOSE

The purpose of this procedure is to provide instructions for the operation and calibration of the Ludlum Model 19 Micro-R Meter in accordance with the requirements specified in Reference 3.1.1.

3.0 REFERENCES

3.1 References

3.1.1 Regulatory Guide 10.8, Rev.2-1987, Guide for the Preparations of Applications for Medical Use Programs

3.1.2 ANSI N3.1-1987, Selection, Qualifications and Training of Personnel For Nuclear Power Plants

3.1.3 Manufacturer's instruction manual for the Ludlum Model 19 Micro-R Meter

3.1.4 ANSI N323-1978, Instrument Test and Calibration

4.0 PRECAUTIONS, LIMITATIONS

4.1 Precautions

4.1.1 Due to the very low response ranges on the Model 19 only the 5,000 μR scale can be calibrated to an actual source reading. All other scales will be calibrated to a pulse generator.

4.1.2 These detectors are not guaranteed light tight when outside of their instrument cases.

4.1.3 Due to the very low response ranges this instrument should not be used in areas where elevated (> 5 mrem/hr) radiation fields are anticipated.

4.4.4 When using this instrument in a known, or suspected contaminated area, seal the instrument in a protective media (i.e., plastic, poly) to prevent contamination of the instrument.

4.2 Limitations

4.2.1 The operation of the Model 19 depends on the condition of the battery. Therefore, the battery check should be performed before each use and periodically during use to ensure proper operation.

4.2.2. Calibration shall be performed semi-annually, after maintenance is performed, if the instrument fails the performance test or if proper operation is in question.

4.2.3 A daily performance test is required when this instrument is in use.

4.2.4 This is a gamma ray/photon exposure rate survey instrument only. Due to the non-linear detection efficiency of the sodium iodide detector, the term exposure rate is used loosely in this sentence.

RESPONSIBILITIES AND QUALIFICATIONS

5.1 Responsibilities

5.1.1 ATG Radiological Field Operations Manager

5.1.1.1 Implementation of this procedure.

5.1.1.2 Periodic reviews of adherence to the requirements of this procedure.

5.1.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.1.2 Health Physics Supervisors

5.1.2.1 Perform periodic surveillance of the use and maintenance of the instrument.

5.1.2.2 Ensures the instrument is calibrated at specified intervals.

5.1.2.3 Ensures that records pertaining to the instrument are maintained on file throughout the duration of the project and copies retained in the permanent project file.

5.1.3 Health Physics Technicians

5.1.3.1 Performance of the requirements in Section 6.1, and 6.3 of this procedure.

5.1.3.2 Documentation of all records in this procedure.

5.1.3.3 Notification to Health Physics Supervision of any unsafe or unusual conditions observed during operation of the instrument.

5.1.4 Health Physics Instrument Personnel

5.1.4.1 Perform the requirements of Sections 6.2, 6.3, and 6.4 of this procedure.

5.2 Qualifications

5.2.1 Health Physics technicians shall be qualified in accordance with the requirements of ANSI 3.1 - 1987 to operate this instrument for any of the following: Surveys, radiation work permits and job coverage.

5.2.2 Junior Health Physics and Decontamination Technicians may operate this instrument under supervision of a Health Physics Technician meeting the requirements of section 5.2.1.

6.0 PROCEDURE

6.1 Operation

6.1.1 Verify that the instrument has a valid Calibration Data Sticker,is not out of calibration, and the daily performance test has been completed and initialled on the Performance Test Daily Check Sticker. If the performance test has not been completed, have a Health Physics Technician perform the test (Section 6.3).

6.1.2 Inspect the instrument for any obvious physical damage which could interfere with its proper operation. It should include inspecting for loose, damaged knobs, buttons, broken or damaged meter movements/displays, dented or corroded instrument cases, punctured/deformed probe/probe window(s). Particular attention should be given to cables and connectors, since these components frequently become damaged or worn. Any instrument or detector having a questionable physical condition shall not be used until properly corrected.

NOTE: The Model 19 detector is a scintillation solid attached to a fragile glass photomultiplier tube with a glass wall. The thickness of this

wall is similar to that of a light bulb. If the detector is subjected to shock the tube will break and disable the detector.

6.1.3 Perform a battery check by pressing the "BAT" button on the meter with the instrument selector switch turned to an "on" scale position. Ensure that the meter needle is within the "BATTERY" area on the meter face.

6.1.4 If unsatisfactory results are obtained, refer to Reference 3.1.3 for replacement of the batteries and repeat the check. The instrument shall display a satisfactory battery check prior to each use.

NOTE: If entering a limited visibility area to perform a survey check the meter face light by depressing the "L" button.

6.1.5 If the instrument fails any of the above checks, remove it from service, notify Health Physics Supervision, and arrange for repair of the meter.

6.1.6 Set the audio response switch to the "on" position.

6.1.7 Set the F/S selector switch to the appropriate setting. (F:Fast, 4 sec response time, erratic needle deflection S:Slow, 22 sec response time, stable needle deflection).

6.1.8 Set the range selector switch to an appropriate range for the activity being investigated. When entering an area of unknown radiation levels always enter the area on the highest scale (5,000 μR/hr) and scale down until an upward meter deflection is observed.

NOTE: 1 μR/hr = .001 mrem/hr.

6.1.9 The instrument's case is constructed with three dimples on the bottom front end of the case. These dimples represent the detector crystal centerline. This area of the instrument should be held closest to the source of activity when performing surveys.

6.1.10 Read the meter after sufficient response time (i.e., the meter needle is relatively stable) changing ranges as necessary for the activity encountered. If the meter is used for an extended period of time, check the battery condition periodically to ensure proper operation.

6.1.11 Upon completion of instrument use, Sections 6.1.2 and 6.1.3 should be performed to ensure the instrument is still functioning properly. If the instrument fails either portion, notify Health Physics Supervision and arrange for instrument repair.

6.2 Calibration

6.2.1 Equipment needed:

6.2.1.1 Calibrated Eberline MP-2 or equivalent traceable to N.I.S.T.

6.2.1.2 Calibrated Shepherd Model 28-B Calibrator or equivalent traceable to N.I.S.T.

6.2.2 Initiate the Instrument Service Record- Ludlum Model 19 Form ATGF-008 by completing Section 1. Attach the old Calibration Data Sticker to the new ATGF-008 form.

6.2.3 Perform the following checks. If necessary, complete the "As Found Data" and arrange for repair before proceeding. Record your findings in the remarks section of form ATGF-008.

6.2.3.1 Check the physical condition of the instrument for defects that could affect instrumentation operation and record the results on ATGF-008.

6.2.3.2 Perform a battery check, replace if necessary in accordance with reference 3.1.3. Record results on ATGF-008.

6.2.3.3 Depress the reset switch to see that the meter returns to zero from any deflection. Record as "SAT" or "UNSAT" in Section 2 on ATGF-008.

6.2.3.4 Change F/S switch (FAST/SLOW) between positions and verify the instrument's meter responds accordingly. Record as "SAT or "UNSAT" on ATGF-008.

6.2.3.5 Switch the audio "ON" and verify that the speaker works. Record as "SAT or "UNSAT" on ATGF-008.

6.2.4 Determine the exposure rates to be used as follows:

6.2.4.1 Select from the calibration curve of the Model 28-5A source (or equivalent) two exposure rate values for the high scale. These values should be approximately 20% and 80% of full scale value.

6.2.4.2 Determine the required values for the four lower scales, which will be pulse calibrated by reducing the exposure rates selected on high scale by the appropriate factors (i.e. reduce by a factor of 10 when going from 5000 to the 500 scale.

6.2.5 Determine the "AS FOUND" reading for the high scale as follows:

6.2.5.1 Ensure that the selector switch is at the desired scale position.

6.2.5.2 Expose the properly centered detector to each selected exposure rate.

6.2.5.3 Record the reading in the "AS FOUND" column on ATGF-008.

6.2.6 Determine the "AS FOUND" reading for the lower scales, which are calibrated by pulse generator, as follows:

6.2.6.1 Disconnect the detector jacks from the circuit board.

6.2.6.2 Connect thepulse generator to the detector jacks on the circuit board.

6.2.6.3 Set the pulse height to between 60 and 100 milli-volts negative.

6.2.6.4 Set the selector switch to the high scale.

6.2.6.5 Adjust the pulse rate until the required value for 20% of the high scale is indicated.

6.2.6.6 For each lower scale, reduce the pulse rate by the appropriate factor (i.e. reduce by a factor of 10 when going from 5000 scale to the 500 scale).

NOTE: On the Model 19 when switching from the 500 scale to the 250 scale or the 50 scale to the 25 scale, decreasing the pulse rate by 50% is accomplished by decreasing the mini-pulser base switch setting by 50%.

6.2.6.7 Record the readings in the "AS FOUND" column on ATGF-008.

6.2.6.8 Repeat steps 6.2.6.4 through 6.2.6.7 for approximately 80% of the scale.

6.2.6.9 Remove the pulse generator and connect the detector to the circuit board.

6.2.7 Place the selector switch to the high scale.

6.2.7.1 Connect an electrostatic voltmeter or equivalent to the connections on the circuit board.

6.2.7.2 Measure the high voltage at the detector connection and record the high voltage in the "AS FOUND" column on ATGF-008.

6.2.8 With the selector switch in the "OFF" position, determine if the meter movement is on zero (0).

6.2.8.1 If the meter movement reads zero proceed to Section 6.2.9.

6.2.8.2 If the meter movement is not on zero, turn the mechanical zero screw on the meter face until the meter movement reaches zero.

6.2.9 If the "AS FOUND" readings observed in Section 6.2.6 fall within the ± 10% tolerance limit and the mechanical zero was not adjusted, record the readings in the "AS LEFT" column on ATGF-008. If better accuracy is desired, Steps 6.2.11, 6.2.12, and 6.2.13 may be performed.

6.2.10 If any of the "AS FOUND" readings observed in Sections 6.2.5 and 6.2.6 do <u>not</u> fall within the ± 10% tolerance limit or if the mechanical zero was adjusted, proceed to Step 6.2.11.

6.2.11 Determine the detector operating voltage as follows:

6.2.11.1 Expose the instrument to an approximately 1 mr/hr field.

6.2.11.2 Decrease the high voltage until there is a marked decrease in the exposure rate indicated on the meter.

6.2.11.3 Increase high voltage in approximately 50 volt increments and plot a voltage vs. indicated exposure rate plateau until there is a significant increase in exposure rate as indicated on the meter. Do not increase the voltage more than 1200 volts.

6.2.11.4 Set the voltage in the middle of the plateau.

6.2.11.5 Measure the high voltage and record as the "AS LEFT" voltage on ATGF-008.

6.2.12 Calibrate the high scale to the required value as follows:

6.2.12.1 Position the instrument so that the effective center of the detector will be in the source beam when the source is exposed.

6.2.12.2 Expose the detector to the selected exposure rate to give 80% of full scale response, (4000 μR/hr).

6.2.12.3 Adjust calibration control until the reading is within ± 10% of the required value.

6.2.12.4 Expose the detector to the selected exposure rate to give 20% of full scale response, (1000 μR/hr).

6.2.12.5 Adjust the calibration control, if necessary to obtain the reading to within ± 10% of the required value.

6.2.12.6 Record the observed value for each selected position in the "AS LEFT" column on ATGF-008.

6.2.12.7 If the instrument cannot be adjusted to ± 10% of the required value, remove the instrument from service, notify Health Physics Supervision, and arrange for repair of the instrument.

6.2.13 Adjust each scale that is to be calibrated to the pulse generator as follows:

6.2.13.1 Set the selector switch to the high scale.

6.2.13.2 Adjust the pulse generator until the required value selected for approximately 80% of full scale.

6.2.13.3 Set the selector switch to the next range to be checked and reduce the pulse rate by the appropriate factor.

6.2.13.4 Adjust the calibration control until the reading is within ± 10% of the tolerance limit.

6.2.13.5 Repeat Steps 6.2.13.3 and 6.2.13.4 for each lower scale.

6.2.13.6 Repeat Steps 6.2.13.1 through 6.2.13.3 for approximately 20% of the full scale.

6.2.13.7 Record the final observed value for each selected position in the "AS LEFT" position on ATGF-008.

6.2.13.8 If the instrument cannot be adjusted to read within ± 10% of the required value, then remove the instrument from service,

notify Health Physics Supervision and arrange for instrument repair.

6.2.13.9 Disconnect the pulse generator and reconnect the detector.

6.2.13.10 Reassemble the unit.

6.2.14 Determine Performance Test Data

6.2.14.1 Obtain a 5 μCi Cs-137 button source and record the serial number on ATGF-008.

6.2.14.2 Switch the instrument to the appropriate range and obtain a source reading on contact. Record the observed reading on ATGF-008.

6.2.14.3 Calculate the performance test range, ± 10% of the source reading, and record the results on ATGF-008.

6.2.15 If the above calibration steps are completed satisfactory, attached a completed Calibration Data Sticker and Performance Test Daily Check Sticker to the instrument. Complete form ATGF-008 as appropriate.

6.3 Performance Test

6.3.1 Perform a performance test on the instrument and record all data form ATGF-003, Performance Test Log Sheet.

6.3.2 Obtain the performance test source designated by the Performance Test source designated by the Performance Test Daily Check Sticker on the instrument.

6.3.3 Record the information for each section of form ATGF-003.

6.3.4 Examine the instrument for any obvious physical damage which could interfere with its proper operation.

6.3.5 Verify that the instrument has a current Calibration Data Sticker and Performance Test Daily Check Sticker.

6.3.6 Perform a battery check by turning the selector switch to the 5000 μR/hr scale and depressing the "BATT" button, if the unit does not read in the "BATTERY" area, replace the batteries.

6.3.7 Expose the center of the detector to the designated source. If the reading is within the designated range for the source, proceed to Step 6.3.9. If the instrument fails record "F" for "FAIL" on ATGF-003 and remove the instrument from service for repair or calibration.

6.3.8 If the instrument fails any portion of the performance test, log the instrument as failing on the Performance Test Log Sheet, remove from service, and notify Health Physics Supervision.

6.3.9 If the instrument passes the performance test, record "P" for "PASS" on form ATGF-003, then initial the Performance Test Daily Check Sticker on the instrument and initial Performance Test Log Sheet.

NOTE: Due to the extremely low ranges incorporated in the instrument, only the high scales may be performance tested to an actual source reading.

6.4 Maintenance

6.4.1 No special storage requirements.

6.4.2 Electronic maintenance shall be performed by an Health Physics Instrumentation Technician or by the manufacturer or a approved vendor.

6.4.3 All maintenance shall be performed in accordance with the manufacturers' specifications.

6.4.4 If recalibration is not required, performance test the instrument as per Step 6.3 prior to returning the instrument to service.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form ATGF-008 Instrument Service Record- Ludlum Model 19

7.2 Form ATGF-003 Daily Instrument Performance Test Log Sheet

7.3 Calibration Data Sticker

7.4 Performance Test Daily Check Sticker

8.0 FORMS AND EXHIBITS

8.1 Forms

8.1.1 ATGF-008, Instrument Service Record- Ludlum Model 19

8.1.2 ATGF-003, Daily Instrument Performance Test Log Sheet

8.2 Exhibits

8.2.1 Performance Test Daily Check Sticker

8.2.2 Calibration Data Sticker

EXHIBIT 8.2.1 Performance Test Daily Check Sticker

ATG, Inc.

DAILY INSTRUMENT CHECK

INSTRUMENT	SERIAL NUMBER

CHECK MONTH

J	F	M	A	M	J	J	A	S	O	N	D

DAY	INITIALS	DAY	INITIALS	DAY	INITIALS
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	
				31	

TECHNICIAN INITIALS INDICATE BATTERY & SOURCE CHECKS OK

EXHIBIT 8.2.2 Calibration Data Sticker

ATG Inc. Form ATGF-OOD
Survey Meter Calibration

Model _____ Serial No._____

Range +/- 10% CF within +/- 20%

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

Dedicated Check Source S/N _____

Activity____ Date _____ Reading_____

Calibration Date _____

Next Calibration Due _____

Calibrated by _____

DAILY INSTRUMENT PERFORMANCE TEST LOG SHEET

PROJECT:

DATE	MODEL/TYPE	S/N	PHYSICAL DAMAGE Y/N	CAL DUE DATE	SOURCE I.D.	ACTIVITY	BKRD	READING	EFF	PASS/ FAIL P/F	TECH INIT

INSTRUMENT SERVICE RECORD - LUDLUM MODEL 19

SECTION 1: INSTRUMENT DATA

Description	Serial No.	Calibration Date
Model 19		
Voltmeter		
Mini Pulser		
Shepherd 28-S or Equivalent		

SECTION 2: CALIBRATION DATA

Physical Condition	SAT	UNSAT
Battery Test		
Audio Check		
Reset Switch		
F/S Response		

HIGH VOLTAGE

☐ As Found	☐ As Left

RADIATION SOURCE CALIBRATION

SCALE	ACTUAL	AS FOUND	AS LEFT	ACCEPTANCE CRITERIA
5000	4000 µR/hr			3600 - 4000
5000	1000 µR/hr			900 - 1100

PULSE CALIBRATION

SCALE	ACTUAL	AS FOUND	AS LEFT	ACCEPTANCE CRITERIA
500	400			360 - 440
500	100			90 - 110
250	200			180 - 220
250	50			45 - 55
50	40			36 - 44
50	10			9 - 11
25	20			18 - 22
25	5			4.5 - 5.5

PERFORMANCE TEST DATA

5 µCi Cs^{137} Button Source Serial #	Meter Reading with Source	Performance Test Range ± 10% of Meter Reading

SECTION 3

REMARKS:

Calibrated by:	Calibration Due Date:
Reviewed by:	Date:

ATG, Inc.

HP-IP-003
Revision 3

ALLIED TECHNOLOGY GROUP FIELD OPERATIONS

HEALTH PHYSICS OPERATING PROCEDURE

OPERATION AND CALIBRATIONS OF THE LUDLUM MODEL 2929 DUAL CHANNEL SCALER

Allied Technology Group, Inc.
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Allied Technology Group, Inc.

PROCEDURE/PLAN APPROVAL PAGE

This procedure: OPERATION AND CALIBRATIONS OF THE LUDLUM MODEL 2929 DUAL CHANNEL SCALER, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

William G. Haney, Project Director — Date: 9/4/96

Health Physics Manager/Technical Support — Date: 9/9/96

REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Procedure Number: HP-IP-003

Title: Operation and Calibration of the Ludlum Model 2929 Dual Channel Scaler

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Rev. No.	3
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OPERATION AND CALIBRATIONS OF THE LUDLUM MODEL 2929 DUAL CHANNEL SCALER

1.0 SCOPE

This procedure sets forth the specific requirements to be used for the operation and calibration of the Ludlum Model 2929 Dual Channel Scaler and the Ludlum Model 43-10-1 Alpha-Beta-Gamma Detector for use on ATG, Inc. field projects.

2.0 PURPOSE

The purpose of this procedure is to provide instructions for the operation and calibration of the Ludlum Model 299 Dual Channel Scaler and the Ludlum Model 43-10-1 Alpha-Beta-Gamma Detector in accordance with the requirements specified in Reference 3.1.1.

3.0 REFERENCES

3.1 References

3.1.1 Regulatory Guide 10.8, Rev.2-1987, Guide for the Preparation of Applications for Medical Use Programs

3.1.2 ANSI N3.1-1987, Selection, Qualifications and Training of Personnel For Nuclear Power Plants

3.1.3 Manufacturer's instruction manual(s) for the Ludlum Model 2929 Dual Channel Scaler and Ludlum Model 43-10-1 Alpha-Beta-Gamma Sample Probe

3.1.4 ANSI N323-1978, Instrument Test and Calibration

3.1.5 HP-OP-001, Radiation and Contamination Surveys

3.1.6 HP-OP-005, Control of Radioactive Material

4.0 PRECAUTIONS, LIMITATIONS

4.1 Precautions

4.1.1 In the event of loss of power to the instrument, the Ludlum Model 2929 shall require a performance test.

4.1.2 The user should verify that the sample activity does not cause a count rate in excess of 1,000 cpm with a pancake probe GM detector prior to inserting the sample into the counter to prevent contaminating the probe surface area.

4.1.3 Unless the sample tray drawer is locked closed, the probe will receive no high voltage and the instrument will register no counts. The scaler will cycle through the counting process regardless of the sample tray drawer position.

4.1.4 All sources and samples shall be controlled in accordance with Reference 3.1.6.

4.2 Limitations

4.2.1 The Ludlum Model 2929 is semi-portable and requires 110 volt line current to operate.

4.2.2 Only thin samples of diameter no larger than 2" (5cm) may be counted on the instrument.

4.2.3 Calibration shall be performed semi-annually, after maintenance is performed, if the instrument fails the performance test or if its proper operation is in question.

4.2.4 The instrument shall be performance tested daily when in use per Section 6.4.

5.0 RESPONSIBILITIES AND QUALIFICATIONS

5.1 Responsibilities

5.1.1 ATG Radiological Field Operations Manager

5.1.1.1 Implementation of this procedure.

5.1.1.2 Periodic reviews of the adherence of personnel to the requirements of this procedure.

5.1.1.3 Ensures by training and experience Health Physics Technicians are qualified to perform the requirements of this procedure.

5.1.2 Health Physics Supervisors

5.1.2.1 Performs periodic surveillance of the use and maintenance of the instrument.

5.1.2.2 Ensures the instrument is calibrated at specified intervals.

5.1.2.3 Ensures that records pertaining to the instrument are maintained on file throughout the duration of the project and copies retained in the permanent project file.

5.1.3 Health Physics Technicians

5.1.3.1 Performance of the requirements in Section 6.1, and 6.4 of this procedure.

5.1.3.2 Documentation of all records in this procedure.

5.1.3.3 Notification to Health Physics Supervision of any unsafe or unusual conditions observed during operation of the instrument.

5.1.4 Health Physics Instrument Personnel

5.1.4.1 Perform the requirements of Sections 6.2, 6.3, and 6.4 of this procedure.

5.2 Qualifications

5.2.1 Health Physics technicians shall be qualified in accordance with the requirement of ANSI 3.1 - 1987 to operate this instrument for any of the following: Surveys, radiation work permits and job coverage.

5.2.2 Junior Health Physics and Decontamination Technicians may operate this instrument under supervision of a Health Physics Technician meeting the requirements of section 5.2.1.

6.0 PROCEDURE

6.1 Operation

6.1.1 Verify that the instrument has a valid Calibration Data Sticker Label ATGL-DCK and is not out of calibration, and the performance test has been completed and initialed on the Performance Test Daily Check Sticker. If the performance test has not been completed, have a Health Physics Technician perform the test (Section 6.4).

6.1.2 Inspect the instrument for any obvious physical damage which could interfere with its proper operation. It should include inspecting for loose, damaged knobs, buttons, broken or damaged meter movements/displays, dented or corroded instrument cases, punctured/deformed probe/probe window(s). Particular attention should be given to cables and connectors, since these components frequently become damaged or worn. Any instrument or detector having a questionable physical condition shall not be used until properly corrected.

6.1.3 Perform counting of smears and air samples by:

6.1.3.1 Place the sample in a clean planchet with the suspected radioactive material up.

6.1.3.2 Place the planchet in the sample drawer and push the drawer fully into the detector unit.

6.1.3.3 Lock the drawer in place by using the lever on the side of the detector housing.

6.1.3.4 Activate the count for the preselected period by pressing the "count" button.

6.1.3.5 Air samples should be counted for a minimum of 5 minutes.

6.1.3.6 Smears should be counted for a minimum of 1 minute, depending on the desired sensitivity for the count.

6.1.3.7 Upon completion of the count period, obtain the total counts in the alpha and beta-gamma channel displays and record this data on the ATGF-006 form.

6.1.3.8 Remove the sample from the detector unit by unlocking and pulling out the drawer.

6.1.3.9 Repeat Steps 6.1.3.1 through 6.1.3.8 for the remaining samples to be counted.

6.1.3.10 MDA shall be calculated and recorded in accordance with Section 6.4.4.

6.2 Calibration

6.2.1 Equipment needed:

6.2.1.1 Calibrated electrostatic voltmeter or equivalent traceable to N.I.S.T.

6.2.1.2 Calibrated Eberline minipulser or equivalent traceable to N.I.S.T.

6.2.1.3 Th-230 reference source greater than 10,000 dpm traceable to N.I.S.T.

6.2.1.4 Tc-99 reference source greater than 10,000 dpm traceable to N.I.S.T.

6.2.2 Initiate the Instrument Service Record Ludlum Model 2929/43-10-1 (ATGF-009) by completing Section 1. Attach the old Calibration Data Sticker to the new ATGF-009 form.

6.2.3 Check the physical condition of the instrument for defects that could affect instrument operation. If necessary, complete the "AS FOUND DATA" and arrange for repair before proceeding to record your findings on ATGF-009.

6.2.4 Steps 6.2.4.1, 6.2.4.2, and 6.2.4.3 should be performed only upon initial calibration or repair which may affect the scaler or proper operation of the scaler in question.

6.2.4.1 Amp/Disc Board Calibration

(a) Apply a negative pulse of 10mV amplitude to the DETECTOR input of the Model 2929. A count rate greater than 25,000 CPM should be used.

(b) Connect an oscilloscope probe to the AMP OUT connector located on the back panel of the Model 2929.

(c) Adjust the GAIN control located internally to and on the righthand side of the instrument for a positive pulse amplitude of 250mV (at the AMP OUT connector). This amplitude has been decreased from the initial value of 400mV.

(d) This completes the amplifier gain calibration. The optimum amplifier gain should be 25 V/V.

6.2.4.2 B-G Threshold and Width Calibration

(a) Apply a negative pulse of 200mV amplitude.

(b) Attach an oscilloscope probe to pin 7, U5 (CD4098) and adjust B-G THS WIDTH (R6) for a 5 micro-second wide negative 5 volt pulse.

(c) Move the oscilloscope probe to pin 9, U5 (CD4098) and adjust B-G WIN WIDTH (R5) for a 10 micro-second wide positive 5 volt pulse.

(d) Now move the oscilloscope to pin 9, U6 (CD4098) and apply a negative pulse of 4mV amplitude.

(c) Adjust B-G THS (R3) until negative 5 volt pulses just appear.

(f) Apply a negative pulse of 50mV amplitude and adjust B-G WIN (R2) until negative 5 volt pulses just disappear.

(g) Apply a negative pulse of 175mV amplitude and adjust ALPHA THS (R4) until a 5 volt positive pulse appears at pin 6 of U6 (CD4098).

NOTE: **Steps (a), (b), and (c) above do not** normally require re-adjustment. These steps may be accomplished without the use of an oscilloscope by using the audio speakers.

Beta-Gamma audio should only be present for any applied pulse amplitude from 4mV to 50mV. Alpha audio should only be present for pulse amplitudes of 175mV and above.

6.2.4.3 High Voltage Power Supply Calibration

(a) Using a high voltage meter of at least 100 megohm input impedance adjust the front panel HV control for 1000 VDC at the DETECTOR connector.

(b) Adjust R5 (brd 5170-011-00) for a front panel meter reading of 1 Kilovolt (Note: if adjustment is necessary, a 10-pin extender board will be required).

(c) With no detector attached, turn the HV dial to maximum (fully clockwise) and adjust R13 for 1500 Volts (higher limits may be necessary depending upon the type of detector being used).

6.2.5 Counter Verification

6.2.5.1 Connect an Eberline minipulser or equivalent to the input connector of the Model 2929. Increase the minipulser amplitude enough to make the Model 2929 count and use the pulse inputs signified on ATGF-009 as the inputs. Record your findings on ATGF-009.

6.2.5.2 If the readings are within the acceptance ranges record the "AS FOUND" readings as the "AS LEFT" readings. If the readings are out of specification, then disposition the unit for repair. Note accordingly, in the remarks section of ATGF-009, your findings.

6.3 Counter Quality Control Checks

Quality control testing and evaluation shall be performed semi-annually (± 15 days). The routine frequency may be extended by up to one additional month with written approval of the ATG Radiation Safety Officer. In addition to the routine frequency of performance, quality control testing and evaluation shall be performed under the following conditions:

a. Prior to placing a new counting system into service.

b. After any major repair or alteration to the counting system or detectors.

6.3.1 Detector Voltage Plateau

6.3.1.1 Obtain a radiation source with a known counting rate in the region of 1000 to 20,000 counts per minute (cpm).

6.3.1.2 Record the following information on the Plateau Data Sheet, Form ATGF-HPQA01:

a. Scaler/counter ID Number
b. Detector ID Number, if external/separate
c. Source ID Number

6.3.1.3 Place the source in the detector chamber.

6.3.1.4 Set the high voltage adjustment of the counting system to the lowest possible setting.

NOTE

DO NOT exceed the manufacturer's limitations or restrictions on voltage for either the detector or the power supply.

6.3.1.5 Gradually increase the high voltage until a rapid increase in count rate is obtained. Note the high voltage setting.

6.3.1.6 Reduce the high voltage to approximately 100 volts below the noted increase point.

6.3.1.7 Obtain, and record on the Plateau Data Sheet, a series of one minute counts at appropriate voltage increments, usually equal increments of 20 to 50 volts are convenient, until EITHER no further voltage increase is possible, OR a second sharp increase in count rate is noted.

6.3.1.8 Using the Voltage Plateau Graph, plot a curve of count rate (vertical axis) versus voltage (horizontal axis).

6.3.1.9 Record the following on the Voltage Plateau Graph, Form ATGF-HPQA02.

a. Scaler/counter ID Number
b. Detector ID Number, if external/separate
c. Source ID Number

6.3.1.10 The relatively flat portion of the plot is the plateau. The correct operating voltage is located one-third to one-half the distance up the plotted plateau. Pick a point within this range with a convenient value of high voltage. Use whole numbers, if possible a multiple of 10, only.

6.3.1.11 Record this operating voltage on the Voltage Plateau Graph.

6.3.1.12 Perform the following:

a. Enter the date, time and printed name of the individual performing the test on both the data sheet and the graph sheet.

b. Sign both the data sheet and the graph sheet.

6.3.1.13 The plateau data and graph MAY be submitted to the ATG Project Manager or Health Physics Supervisor at this time for review. Review should be performed at this time if:

a. Any of the data were anomalous, or
b. The entire Quality Control evaluation is not being performed at this time.

6.3.2 Determination of System Background

6.3.2.1 Prerequisites

A valid voltage plateau or operating voltage has been determined and documented.

6.3.2.2 Record the following information on the Background Data Sheet, Form ATGF-HPQA03:

a. Scaler/counter ID Number
b. Detector ID Number, if external/separate
c. Source ID Number

6.3.2.3 Data Accumulation

a. Place a clean, empty planchet in the sample holder.
b. Insert the sample holder in the detector chamber.
c. Set the instrument for a timed count of 2 minutes.
d. Count the empty planchet.
e. Divide the total counts by two (2) and record the total counts on the Background Data Sheet. Form ATGF69~~5~~HPQA03.

NOTE

The instrument/system may remain in service, using the "old" background during the accumulation of data for the new determination of background. The repetitive counts may be accumulated over several days, however all counts shall be completed within 10 days of the initial count.

6.3.2.4 Repeat Section 6.3.2.3 nine additional times.

6.3.2.5 Remove the empty planchet from the detector chamber.

6.3.3 Calculations:

a. Total the values of the individual counts. Enter the value in the Total box on the data sheet.

b. Divide the total by the number, 10, of determinations and enter this value in the Mean Count, $\overline{x}$, box on the data sheet.

c. Subtract the mean count, x , from each of the individual counts. Enter the values found in the column labeled $(x - \overline{x})$ on the data sheet.

d. Square each of the deviations, $(x - \overline{x})$, and enter the values found in the column labeled $(x - \overline{x})^2$ on the data sheet.

e. Total the values of the squared deviations column, and enter this value in the Sum of Squares, box on the data sheet.

f. Divide the Sum of Squares, by nine (9). Enter this value in the Variance, box on the data sheet.

g. Extract the square root of the Variance, and enter the value in the Standard Deviation (σ) (Counts), box on the data sheet.

h. The Background Count Rate $\pm 2\sigma$ is the acceptable background range.

i. Enter the background range in the appropriate blocks of Form ATGF-013.

j. Perform the following:

1. Enter the date, time, and (printed) name (of the individual performing the test) on the Background Data Sheet.

2. Sign the data sheet.

k. The Background data MAY be submitted to the cognizant Health Physics Supervisor at this time for review. Review should be performed at this time if:

1. Any of the data were anomalous, or

2. The entire Quality Control evaluation is not being performed at this time.

6.3.4 Chi-Squared Test of Reliability

6.3.4.1 Prerequisites

a. A valid voltage plateau, or operating voltage, has been determined and documented.

b. A well determined background value has been obtained and documented.

6.3.4.2 Ensure that the counting system is set up for operation according to the applicable Instrument Calibration and Use Procedure and/or the manufacturer's technical literature.

6.3.4.3 Obtain a NIST Traceable Standard Source with isotopic content appropriate to the detector being evaluated.

a. The source should be of sufficient activity to yield a counting rate of 1000 to 20,000 counts per minute.

b. The source shouldl not exceed 20,000 cpm.

6.3.4.4 Record the following information on the Chi-squared Data Sheet, Form ATGF-HPQA04:

a. Scaler/Counter ID Number.
b. Detector ID Number, if external/separate.
c. Source ID Number.

6.3.4.5 Place the source in the detector chamber.

6.3.4.6 Collect ten (10) counts of two (2) minutes duration each. Divide Gross CPM by two (2) and record the results, in counts per minute, in the column labeled "Gross cpm, C_G".

6.3.4.7 Subtract the background count rate, C_B, from each count to obtain the net count rate. Record the results in the column labeled "Net cpm, C_i".

6.3.4.8 Calculations:

a. Sum the ten C_i values and record the result in the box labeled:

$$\sum_{i}^{10} C_i = \text{Total} = _____ .$$

b. Divide the total by 10 and record the result obtained in the box labeled:

$$\frac{\text{Total}}{10} = \bar{c} = ____ .$$

c. Subtract the mean count rate, $\bar{c}$ from each of the C_i values, recording the results in the column, "$(C_i - \bar{c})$".

d. Square each of the $(C_i - \bar{c})$ values obtained, record the results in the column labeled, "$(C_i - \bar{c})^2$.

e. Sum the "$(C_i - \bar{c})^2$ values and record the results in the box labeled

$$\frac{\sum_{i}^{10} (C_i - \bar{c})^2}{____}$$

f. Calculate the Observed Standard Deviation by extracting the square root of the Sum of Squares divided by 9 $\{(C_i - \bar{c})^2/9$.

Standard Deviation $(\sigma) = \text{SQRT} \Sigma (C_i - \bar{c})^2/9$

6.3.4.9 Calculate the Theoretical Standard Deviation (σ_t) by: $\sigma_t = \sqrt{c}$

6.3.4.10 Calculate the resulting Reliability Factor (R.F.) by:

$$\text{R.F.} = \frac{\sigma}{\sigma_t}$$

a. Record the Reliability Factor (R.F.) in the box labeled: (R.F.)

b. R.F. should be between 0.64 and 1.22 when calculated. This indicates the instrument/detector is operating reliably. An R.F. that falls between 0.50 and 0.64 or 1.22 and 1.40 shall be investigated by the ATG Project Manager or Health Physics Supervisor. An R.F. less than 0.50 or greater than 1.40 is unsatisfactory.

6.3.4.11 Perform the following:

a. Enter the date, time, and (printed) name (of the individual performing the test) on the Chi-squared Data Sheet.

b. Sign the data sheet.

c. The Chi-squared data MAY be submitted to the ATG Project Manager or Health Physics Supervisor at this time for review. Review should be performed at this time if:

1. Any of the data were anomalous, or

2. The entire Quality Control evaluation is not being performed at this time.

6.3.5 Counting System Efficiency

6.3.5.1 Prerequisites

a. A valid voltage plateau, or operating voltage, has been determined and documented.

b. A well determined background value has been obtained and documented.

c. A successful Chi-squared test has been performed and documented.

6.3.5.2 Non-routine isotopes

a. In addition to the routine frequency of determination, counting system efficiencies SHOULD be determined when isotopes with energies significantly different from the calibration energy must be analyzed.

6.3.5.3 Enter the following information on the Efficiency Data Sheet:

a. Scaler/Counter ID Number.

b. Detector ID Number, if external/separate.

c. Source ID Number.

d. Source Present Activity (μCi/dpm)

e. The mean counting rate, c, of the source.

6.3.5.4 Calculation:

a. Complete the following calculation on the Efficiency Data Sheet:

$$E = \frac{(\text{NET CPM})\ (4.5\text{E-}7)}{(\text{Source } \mu\text{Ci})} = _____$$

NOTE

Non-routine sources and/or geometries should be calculated only at the direction of the Health Physics Technical Supervisor or designee.

6.3.5.5 Alpha Channel

a. Obtain a 1 7/8" dia Th-230 reference source greater than 1,000 dpm.

b. Place the source in the detector chamber and count for a period of one minute.

c. Determine the net count rate from the source.

d. Determine the specific efficiency, Ei

NOTE

Detection efficiencies for different sample types (i.e., geometry, mass, etc.) must be calculated separately.

e. Calculation:

$$E = \frac{(\text{NET CPM})\ 4.5\text{E-}7}{(\text{Source } \mu\text{Ci})}$$

Note: 4.5E-7 is conversion from μCi to dpm. It is not needed if source activity is expressed in dpm.

f. Record the result on the data sheet.

6.3.5.6 Perform the following:

a. Enter the date, time, and (printed) name (of the individual performing the test) on the Efficiency Data Sheet.

b. Sign the data sheet.

c. The Efficiency data MAY be submitted to the ATG Radiation Safety Officer at this time for review. Review SHOULD be performed at this time if:

1. Any of the data were anomalous, or
2. The entire Quality Control evaluation is not being performed at this time.

6.3.5.7 Beta Channel

a. Obtain a 1⅞" dia Tc-99 reference source greater than 1,000 dpm.

b. Perform Steps 6.3.5.5 (b) through (f).

6.4 Performance Test

6.4.1 Background Check

6.4.1.1 Remove any source or sample from the detector tray.

6.4.1.2 Place the appropriate clean blank in clean counting planchet.

6.4.1.3 Lock the drawer closed.

6.4.1.4 Perform a 20 minute timed background count.

6.4.1.5 Divide the total counts for the alpha and beta-gamma channels by twenty (20) to obtain results in CPM.

6.4.1.6 Record the Alpha and Beta-Gamma results in cpm, in the respective columns on the Daily Background and Efficiency Form ATGF-013.

6.4.1.7 Compare each background to its background and & range.

6.4.1.8 If either background rate exceeds its limits, clean the sample drawer and recheck background.

6.4.1.9 If either background remains out of range, remove the instrument from service and arrange for repeiar. Notify Health Physics Supervision.

6.4.2 Alpha Source Check (Th-230)

6.4.2.1 Retrieve from storage the check source identified in the 'SOURCE ID#" spce at the top of form ATGF-013.

6.4.2.2 Place the source in an empty counting planchet.

6.4.2.3 Open the sample drawer and place the source/planchet in the sample tray.

6.4.2.4 Close and lock the drawer in the count position, and perform a 1-minute timed count, record the results on Form ATGF-013.

6.4.2.5 Record the result of the source count in the "SOURCE COUNTS" (CPM): column of the form.

6.4.2.6 If the net response is within +/- 10% of the source activity multiplied by the efficiency of the instrument, initial the "Initials" column of Form ATGF-013.

6.4.3 Beta Source Check (Tc-99)

6.4.3.1 Repeat the steps of Section 6.4.2 using the beta check source specified in the "SOURCE ID#" space at the top of form ATGF-013.

6.4.3.2 Record the data in the applicable columns of form ATGF-003 and complete the entry on form ATGF-013.

6.4.3.3 Initial ATGF-003 and ATGF-013 in the appropriate columns. Initial thePerformance Test Daily Check Sticker.

6.4.3.4 Return the check sources to their designated storage locations.

6.4.4 Determination of MDA

6.4.4.1 Prerequisites

a. A valid voltage plateau has been performed and documented for those instruments or systems with a variable high voltabe capability.

b. A well determined background is avilable, unless an exception is amde in the specific instrument procedure.

c. A successful Chi-squared test has been performed and documented.

d. Counting efficiency for the appropriate emmission has been determined and documented.

e. The daily checks have demonstrated that the instrument is in statistical control; OR; where directed by specific procedure, a daily working background has been determined.

6.4.4.2 Calculation

a. Calculate MDA by performing a count of a paired blank for counting time equal to the sample counting time. A paired balnk means a sample which is identical, chemically and physically, to the samples to be counted, except that no isotope is present (e.g., for smear samples a smear of a clean surface could be used as a paired blank for smears of potentially contaminated surfaces).

6.4.4.3 MDA may be calculated from the following formula:

$$\text{MDA (dpm)} = \frac{2.71 + 4.65\sqrt{C_B/T_B}}{E}$$

where:

C_B= Background Counts for the paired blank (CPM)
T_B= Sample Count Time for the paired blank (Minutes)
E = Instrument Efficiency for the isotope expected, expressed as a decimal

6.4.4.4 Record the MDA value for each channel (beta-gamma and alpha) on form ATGF-006.

6.5 Maintenance

6.5.1 No special storage requirements.

6.5.2 Electronic maintenance (except external adjustments and cable replacements) shall be performed by a Health Physics Instrumentation Technician or by the manufacturer or an approved vendor.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form ATGF-009 Instrument Service Record-Ludlum Model 2929/43-10-1

7.2 Form ATGF-013 Ludlum Model 2929 Daily Background and Efficiency

7.3 Form ATGF-003 Daily Instrument Performance Test Log Sheet

7.4 Calibration Data Sticker

7.5 Performance Test Daily Check Sticker

8.0 FORMS AND EXHIBITS

8.1 Forms

8.1.1 Form ATGF-009 Instrument Service Record- Ludlum Model 2929/43-10-1

8.1.2 Form ATGF-013 Ludlum Model 2929 Daily Background and Efficiency

8.1.3 Form ATGF-003 Daily Instrument Performance Test Log Sheet

8.1.4 Form ATGF-006 Smear Counting Analysis Report

8.1.5 Form ATGF-HPQA01 Plateau Data Sheet

8.1.6 Form ATGF-HPQA02 Voltage Plateau Graph

8.1.7 Form ATGF-HPQA03 Background Data Sheet

8.1.8 Form ATGF-HPQA04 Chi-Squared Data Sheet

8.1.9 Form ATGF HPQA05 Efficiency Data Sheet

8.2 Exhibits

8.2.1 Performance Test Daily Check Sticker

8.2.2 Calibration Data Sticker

EXHIBIT 8.2.1

PERFORMANCE TEST DAILY CHECK STICKER

ATGL-DCK

DAILY INSTRUMENT CHECK

INSTRUMENT	SERIAL NUMBER

CHECK MONTH

J	F	M	A	M	J	J	A	S	O	N	D

DAY	INITIALS	DAY	INITIALS	DAY	INITIALS
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	
				31	

TECHNICIAN INITIALS INDICATE BATTERY & SOURCE CHECKS OK

EXHIBIT 8.2.2

CALIBRATION DATA STICKER

ATG Inc. Form ATGF-00D
Survey Meter Calibration

Model _____ Serial Number

Range +/- 10% CF within +/- 20%

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

X_____ ☐ _____

Dedicated Check Source S/N _____

Activity_____ Date ____ Reading _____

Calibration Date _____

Next Calibration Due _____

Calibrated By _____

DAILY INSTRUMENT PERFORMANCE TEST LOG SHEET

Page _____ of _____

.OJECT:

DATE	MODEL/TYPE	S/N	PHYSICAL DAMAGE Y/N	CAL DUE DATE	SOURCE I.D.	READING	PASS/FAIL P/F	TECH. INIT.

ATGS #:_____

SMEAR COUNTING ANALYSIS REPORT

Date:_____ Analysis Performed by:_____

COUNTING SYSTEM DATA

INSTRUMENT ID:_____ DETECTOR ID:_____
EFICIENCIES: α_____ $\beta\gamma$_____
MDA: α_____ $\beta\gamma$_____
PERFORMED BY: _____

Sample Count Time:_____ Activity Report In: □ dpm □ μCi

α Background:_____ cpm $\beta\gamma$ Background:_____ cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS $\beta\gamma$	NET COUNTS α	NET COUNTS $\beta\gamma$	ACTIVITY α	ACTIVITY $\beta\gamma$

Remarks:_____

Reviewed by:_____ Date:_____

INSTRUMENT SERVICE RECORD - LUDLUM MODEL 2929/43-10-1

SECTION 1 - INSTRUMENT DATA:		
2929 Serial No.	Calibration Due Date:	
43-10-1 Serial No.	Calibration Due Date:	
Minipulser M&TE No.	Calibration Due Date:	
Voltmeter M&TE No.	Calibration Due Date:	
Th^{230} Reference Source ID No.	Th^{230} Activity:	Assay Date:
Tc^{99} Reference Source ID No.	Tc^{99} Activity:	Assay Date:

SECTION 2 - CALIBRATION DATA:		
HIGH VOLTAGE	As Found :	As Left:

PULSE GENERATOR	SURVEY METER		ACCEPTANCE
	AS FOUND	AS LEFT	
100			90 - 110
400			360 - 440
1,000			900 - 1,000
4,000			3,600 - 4,400
10,000			9,000 - 11,000
40,000			36,000 - 44,000
100,000			90,000 - 110,000
400,000			360,000 - 440,000

LUDLUM MODEL 2929
DAILY 20 MINUTE BACKGROUND AND EFFICIENCY

For _____ 199_____

Instrument ID: _____ Detector ID: _____

Sources Used: Alpha: S/N:_____ Activity _____
Beta: S/N: _____ Activity _____

Acceptable Range of Background: α _____ cts to _____ cts
$\beta\gamma$ _____ cts to _____ cts

Date	20-min Bkgd α	20-min Bkgd $\beta\gamma$	1-min Alpha Source Counts	Eff. Alpha	1-min Beta-Gamma Source Counts	Eff Beta/ Gamma	Initials

ALLIED TECHNOLOGY GROUP, INC.
VOLTAGE PLATEAU DATA SHEET

.istrument Model:		Instrument Serial No.
Last Calibration Date:	Detector Model	Detector Serial No.
Today's Date		Source ID No.
Data Collected By:		

Count Number	Voltage (Volts)	Count
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

ALLIED TECHNOLOGY GROUP
VOLTAGE PLATEAU GRAPH FORM

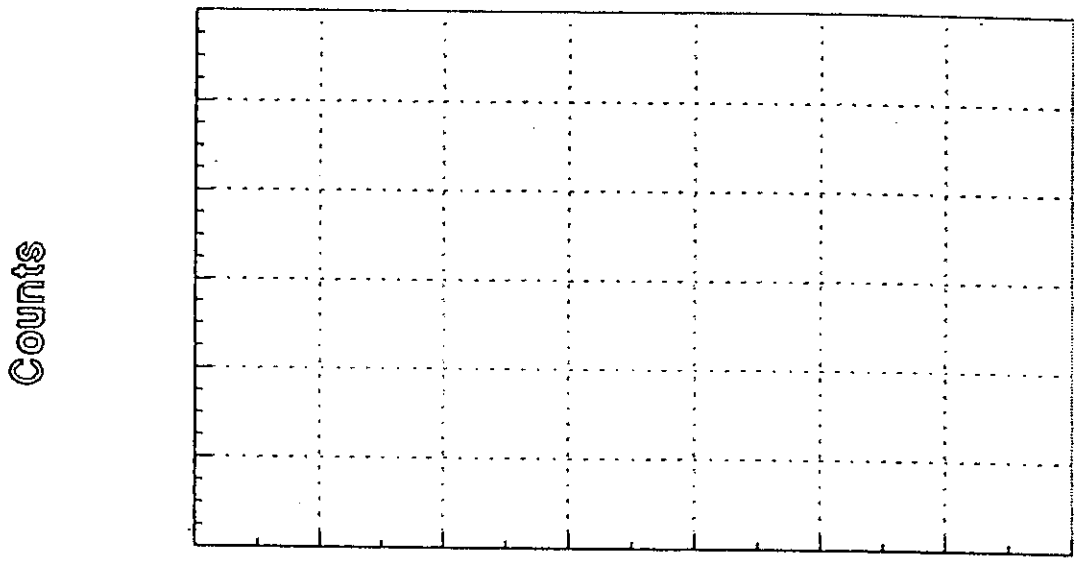
Instrument Model:_____ Instrument Serial No._____

Detector Model:_____ Detector Serial No._____

Today's Date:_____ Source ID No._____

Data Plotted by:_____

Voltage Plateau



Record the count and voltage scales as needed based on the data from the plateau data sheet. Plot the curve of counts v.s. voltage as you increase the voltage 50 volts per data point. A rapid increase in response indicates a voltage beyond the detector's design voltage - do not allow operation at a voltage in this continuous discharge range as it will damage the detector.

Follow instructions in the QA procedure to determine the optimum range for operating voltage of the detector. Record the optimum voltage below.

Optimum operating voltage:_____ volts

Technician:_____ Date:_____

ALLIED TECHNOLOGY GROUP, INC.
BACKGROUND DETERMINATION DATA SHEET

Instrument Model:		Instrument Serial No.
Last Calibration Date:	Detector Model	Detector Serial No.
Today's Date:		
Data Collected By:		

Alpha Beta-Gamma **(Circle One)**

Count Number	Count (X)	$(X - \bar{x})$	$(X - \bar{x})^2$
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total		= Σ (X)	
Mean Count ($\bar{x}$)		= Σ (X) /10	

Sum of Squares = $\Sigma (X - \bar{x})^2$ =	
Variance = Σ = $(X - \bar{x})2$ /9 =	
Standard Deviation (σ) = SQRT ($\Sigma (X_i - \bar{x})^2$ /9) =	
Background Count Rate = Mean (x)	CPM ± 2σ:
Calculations Completed By:	Date:
Data and Calculations Reviewed By:	Date:

ALLIED TECHNOLOGY GROUP, INC.
CHI-SQUARED TEST OF RELIABILITY DATA SHEET

Instrument Model:	Instrument Serial No.	Background Count Rate C_B:
Last Calibration Date:	Detector Model	Detector Serial No.
Today's Date:	Data Collected By:	Source ID No.

Count Number	CPM Gross (C_G)	CPM Net (C_i)	($C_i - \overline{c}$)	($C_i - \overline{c}$)^2
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
Sum		Σ (C_i)		
Mean ($\overline{c}$)		Σ (C_i)/10		

Sum of Squares = Σ (Ci - $\overline{c}$)^2	
Standard Deviation (σ) = SQRT Σ (Ci - c)^2/9	
Theoretical Standard Deviation (σ_i) = $\sqrt{\ }$ c	
Reliability Factor (R.F.) = σ/σ_i	

Calculations Completed By:	Date:
Data and Calculations Reviewed By:	Date:

ALLIED TECHNOLOGY GROUP, INC.
COUNTING SYSTEM EFFICIENCY DATA SHEET

Instrument Model		Instrument Serial No.
Last Calibration Date	Detector Model	Detector Serial No.
Today's Date		Data Collected By
Alpha Beta-Gamma Channel **(Circle One)**		
Source number:		
Source activity (μCi/dpm) =		on (A_o)
Source decay time to today		days (t)
Source radionuclude half life		days ($t_{1/2}$)
ource radionuclide decay constant = ln(s)/($t_{1/2}$) =		/day (λ)
(today) = $A_o * e^{-\lambda t}$ = (μCi/dpm)		
Net count rate = source count rate (CPM) - background count (CPM)		
Efficiency = $\frac{\text{Net Count rate} * 4.5E\text{-}7}{\text{A(today - μCi/dpm)}}$ counts/disintegration		
Efficiency = counts/disintegration		
Calculations Completed By:		Date:
Data and Calculations Reviewed By:		Date: