1.0 PURPOSE

1.1. To inform manufacturers how to apply for Mine Safety and Health Administration (MSHA) approval of a Portable Methane Detector or a Multi-Gas Detector that has the capability of detecting methane from at least 0 to 4% methane.

1.2. To specify the documentation, equipment and components necessary to evaluate and test a methane detector for compliance with MSHA requirements.

1.3. To identify the applicant's responsibilities during the investigation process.

2.0 SCOPE

This procedure is a guide for applicants requesting approval of a Portable Methane Detector per Part 22 of Title 30 of the Code of Federal Regulations (30 CFR Part 22).

3.0 REFERENCES

3.1. 30 CFR Part 6 "Testing and Evaluation by Independent Laboratories and Non-MSHA Product Safety Standards"

3.2. 30 CFR Part 22 "Portable Methane Detectors"

3.3. ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus" for determination of intrinsic safety

3.4. APOL1009 "Application Cancellation Policy"

3.5. ASTP2203 "Methane Detector Accuracy" Test

3.6. ASTP2209 "Drop Test of Methane-Indicating Detectors"

3.7. ASTP2236 "Portable Methane Detector Bump and Jar Test"

These documents are available on www.msha.gov or by contacting the Approval and Certification Center at 304-547-0400.

4.0 DEFINITIONS

4.1. *Approval* - A formal document issued by MSHA which states that a completely assembled methane-indicating detector has met the applicable requirements of this part and which authorizes the attachment of an approval plate (label) so indicating.

4.2. *Equivalent Non-MSHA Product Safety Standard* - A non-MSHA product safety standard, or group of standards, that is determined by MSHA to provide at least the same degree of protection as the applicable MSHA product approval requirements… or which in modified form provide at least the same degree of protection. (30 CFR §6.2)

4.3. *Extension of Approval* - A formal document issued by MSHA accepting changes to the design or construction of an approved product, which have met the applicable requirements of this part. A suffix will be added to the Approval number to distinguish it from the previously accepted product.

4.4. *Independent Laboratory* - A laboratory that: (1) has been recognized by a laboratory accrediting organization to test and evaluate products to a product safety standard, and (2) is free from commercial, financial, and other pressures that may influence the results of the testing and evaluation process. (30 CFR §6.2).

4.5. *Methane-indicating detector* – A methane-indicating detector is a device that will show, within certain limits of error, on an adequate scale, the percentage of methane in a gassy atmosphere. Note: A methane-indicating detector must display readings in %-by-volume methane as opposed to %LEL. An instrument that reads in %LEL is considered a combustible gas detector to be approved under Part 18, not Part 22.

4.6. *Product Safety Standard* - A document, or group of documents, that specifies the requirements for the testing and evaluation of a product for use in explosive gas and dust atmospheres, and, when appropriate, includes documents addressing the flammability properties of products. (30 CFR §6.2)

4.7. *30 CFR Part 6* - Regulations that are contained in the Code of Federal Regulations, Title 30 that establish alternate requirements for testing and evaluation of products that MSHA approves for use in gassy underground mines. It will permit manufacturers of certain products, who seek MSHA

approval, to use an independent laboratory to perform, in whole or part, the necessary testing and evaluation for approval. This rule also permits manufacturers to have their products approved based on non-MSHA product safety standards, but only after MSHA has determined that such standards are equivalent to its applicable product approval requirements or can be modified to provide at least the same degree of protection as those MSHA requirements.

5.0 APPLICATION PROCEDURE

The application should include the following:

5.1. Application letter. This letter (Reference Enclosure A or B) should include the following information:

5.1.1. Applicant's name and address;

5.1.2. Application date;

5.1.3. A six digit Company Application Code Number assigned by the Applicant. This number is used to identify the application and should not have been assigned to an application previously submitted by the Applicant;

5.1.4. The name, address, telephone number, FAX number and e-mail address of the person MSHA is to contact regarding the application and billing;

5.1.5. The model number(s) or other designation(s) for the gas detector; and,

5.1.6. A brief description how the gas detector would be used in a gassy underground mine.

5.2. A complete technical description of the operation of each electrical circuit. This should identify components or features of the detector that are critical to the safety of the product.

5.3. An operator's manual that includes the following information:

5.3.1. Complete instructions, drawings, and diagrams for safe and proper operation and servicing of the apparatus;

5.3.2. Operating instructions and adjustment procedures;

5.3.3. Recommendations for initial checking and calibration of the apparatus on a routine basis, including instructions for the use of the field calibration kit. This shall include the requirement and method for performing a functional check with gas (bump test).

5.3.4. Details of operational limitations including, where applicable, the following:

5.3.4.1. Information that describes the sensitivities to gases other than methane,

5.3.4.2. Battery data (e.g. run time(s), recharge time(s), etc.),

5.3.4.3. Sample flow rate,

5.3.4.4. Warm-up time, and

5.3.4.5. Stabilization time.

5.3.5. Details of storage life and limitations for the detector, replacement parts, and accessories;

5.3.6. Information on the adverse effects of poisons and interfering gases or substances and oxygen-deficient atmospheres on the proper performance of the detector;

5.3.7. For aspirated detectors, indication of the minimum and maximum flow rates and pressure; also, tubing type, maximum length and size for proper operation;

5.3.8. For aspirated detectors, instructions for ensuring that the sample lines are intact and that proper flow is established;

5.3.9. Statements of the nature and significance of all alarms and fault signals, the duration of such alarms and signals (if time-limited or non-latching), and any provisions that may be made for silencing or resetting such alarms and signals, as applicable;

5.3.10. Details of any method for the determination of the possible sources of a malfunction and any corrective procedures (i.e. trouble-shooting procedures);

5.3.11. A statement that alarm devices or outputs are of the non-latching types, where applicable;

5.3.12. Installation and maintenance instructions for the batteries;

5.3.13. A recommended replacement parts list;

5.3.14. Any special conditions of use.

5.4. As per Part 6, copies of test reports from other approval agencies, as described in Section 5.11.

5.5. A copy of the UL 1642 test report for each lithium battery used in the device. A complete test report for each battery type tested by a Nationally Recognized Testing Laboratory (NRTL) that describes the test and evaluation per the requirements of this UL standard.

5.6. Drawing List. A complete list of the drawings necessary to fully describe the gas detector. The drawing list (Reference Enclosure C) should include the following information:

5.6.1. Drawing title;

5.6.2. Drawing number;

5.6.3. Revision level; and

5.6.4. MSHA File Status (NEW, REVISED, or currently ON FILE with MSHA.).

5.7. Certified Performance Statement. If the instrument is a multi-gas detector, a certified performance statement (Reference Enclosure D), signed by a company official, stating the performance accuracy of all gases the detector is capable of detecting (except methane and oxygen which will be tested for accuracy).

5.8. Drawings, Bills of Material, and Specifications. Each sheet of a drawing shall have a company name, be titled, numbered, dated, in English, and show the latest revision. The drawings shall be adequate in number and detail to identify fully the complete assembly, component parts, and subassemblies. The required documentation includes:

5.8.1. An overall assembly drawing showing the physical dimensions of the gas detector and accessories, identifying the major components.

5.8.2. A block diagram showing the major components of the assembly.

5.8.3. Subassembly drawings showing the construction of the enclosure and component assemblies.

5.8.4. Wiring diagrams of all internal wiring and connections to external circuits.

5.8.5. Schematic diagrams of each electrical circuit.

5.8.6. Layout drawings showing the physical location of each component in the circuit.

5.8.7. Printed circuit board artwork drawings, drawn to scale such that distances between electrical conductors can be determined. If coating of the board is necessary to maintain spacing, then the drawing shall indicate that the coating meets the requirements of ACRI2001, Section 6. The distance between board layers (nominal and tolerance, or minimum value) shall be specified. Note: As a supplement, an electronic file such as a Gerber file can be provided.

5.8.8. Electrical parts lists that include the following component specifications:

5.8.8.1. Batteries: Type, voltage, capacity, and manufacturer's name and part number. Note: Additional information, such as details of cell construction, may be required based on the intrinsic safety analysis.

5.8.8.2. Inductors: Either (a) Manufacturer's name and part number, inductance (nominal and tolerance, or maximum value), dc coil resistance (nominal and tolerance, or minimum value); or (b) specifications of the core type, size of wire, insulation, and number of turns.

5.8.8.3. Capacitors: Type, capacitance (nominal and tolerance, or maximum value), and working voltage. If the capacitors are used as protective components to provide intrinsic safety isolation, the maximum dielectric voltage must be specified.

5.8.8.4. Protective Current Limiting Resistors: Resistance value (nominal and tolerance or minimum value), type of construction (Reference ACRI2001 for acceptable types of construction), and wattage rating. Note:

Additional information, such as manufacturer and part number, may be required if acceptance is based on testing.

5.8.8.5. Resistors: Resistance value (nominal and tolerance or minimum value) and wattage rating. Note: Additional information, such as manufacturer and part number, may be required based on the intrinsic safety analysis.

5.8.8.6. Motors: Manufacturer's name and part number, inductance (nominal and tolerance, or maximum value), and dc resistance (nominal and tolerance, or minimum value).

5.8.8.7. Zener Diodes: Either (a) Manufacturer's name and part number; or (b) zener voltage (nominal and tolerance, or maximum value), and wattage. Note: Option (a) may be required based on the intrinsic safety analysis.

5.8.8.8. Lamp Bulbs: Manufacturer's name and part number, type, voltage, current and wattage rating.

5.8.8.9. Solid State Voltage and Current Limiting Devices: Manufacturer's name and part number, input and output voltage (nominal and maximum), current ratings, and power dissipation rating.

5.8.8.10. Heat Sinks: Manufacturer's name and part number or details of the physical dimensions and materials used.

5.8.8.11. Encapsulant: Generic name, specific type designation, voltage rating, and maximum temperature rating.

5.8.8.12. Piezoelectric Transducers and Devices: Manufacturer's name and part number and crystal capacitance (nominal and tolerance or maximum value).

5.8.8.13. Fuses and other Thermal Protection Devices: Manufacturer's name and part number, current trip rating, maximum interrupt current, voltage rating and time vs. current characteristic curves.

5.8.8.14. Catalytic Sensors: Manufacturer’s name and part number.

5.8.8.15. Electrochemical Sensors: Manufacturer’s name and part number.

5.8.8.16. Other Components: As applicable: JEDEC number; generic number of integrated circuits; power rating; electrical values with tolerances; etc.

5.8.9. Firmware: Revision level

5.8.10. Calibration Equipment: Part numbers and descriptions for all components of the field calibration equipment. This will include, at a minimum: drawings of calibration adapters; calibration gas content and tolerances; nominal regulator flow rate. Additional information for automated calibration equipment, this will include a technical description of circuit operation.

5.8.11. For Aspirated Devices: In addition to the documentation required for the aspiration apparatus, the following must be provided: minimum and maximum flow rates and pressure; tubing type, maximum length and size.

5.9. Recommendations. To assist in simplifying the submitted documentation and future modifications, the following are recommended:

5.9.1. Identify components that have no affect on intrinsic safety or required performance by a generic description rather than the specific manufacturer and manufacturer's part number.

5.9.2. If the application includes changes to drawings previously filed with MSHA, it will simplify the review process if all changes to the revised drawings are clearly identified. Duplicate drawings with explanatory notations should be submitted for this purpose in addition to a "clean" copy to be placed on file.

5.10. Equipment required for inspection and test. In general, the equipment and components will include at least:

Note: If any of these components are normally potted or encapsulated, please submit both encapsulated and unencapsulated samples for inspection purposes.

5.10.1. Five complete gas detectors in marketable form (four for performance testing and one for inspection purposes).

5.10.2. If the detector is to be approved with an optional pump, then two pumps shall also be submitted for performance testing. The maximum length of

sampling tube with the maximum ID shall also be provided for use with the pumps.

5.10.3. If the detector has alternate battery packs, then two alternate battery packs shall be provided for performance testing.

5.10.4. The manufacturer's calibration kit, probes, and battery chargers (if rechargeable). If automated calibration equipment is to be used with the approved detectors, this equipment must also be submitted.

5.10.5. One populated sample of each printed circuit board used in the gas detector.

5.10.6. One unpopulated sample of each printed circuit board used in the gas detector.

5.10.7. Ten samples of each part number catalytic sensor, with the sintered metal portion removed.

5.10.8. Five of each type inductive component rated over 100 microhenries (e.g., motors, speakers, inductors, etc.).

5.10.9. Five sets of each type battery or battery pack, in addition to the two for performance testing.

5.10.10. Ten samples of each type current limiting resistor.

Note: Samples of surface mount components should be mounted on a printed circuit board with two inch test leads connected to each component sample. The test leads must not be connected directly to the component, but rather through printed circuit board traces due to heat sinking effects.

5.10.11. Ten samples of each type lamp bulb for surface temperature testing.

5.10.12. Five samples of each type piezoelectric transducer device, with output leads connected directly to the crystal, mounted to the detector where it is normally located of a quality, design, and construction consistent with that of the final manufactured product.

Note: Mockups of the detector may be tested in lieu of the actual assembly if justified.

5.10.13. Ten samples of each type protective fuse or other thermal protection device.

5.11. Applications may be submitted that follow the requirements set forth in 30 CFR, Part 6. Under these requirements the applicant may:

5.11.1. Use an independent laboratory to perform, in whole or part, the necessary testing and evaluation for approval. MSHA will accept testing and evaluation performed by an independent laboratory for purposes of MSHA product approval provided that MSHA receives as part of the application:

5.11.1.1. Written evidence of the laboratory's independence and current recognition by a laboratory accrediting organization;

5.11.1.2. Complete technical explanation of how the product complies with each requirement in the applicable MSHA product approval requirements;

5.11.1.3. Identification of components or features of the product that are critical to the safety of the product; and,

5.11.1.4. All documentation, including drawings and specifications, as submitted to the independent laboratory by the applicant and as required by 30 CFR Part 22.

5.11.2. Request to have their product approved based on non-MSHA product safety standards, provided that MSHA has determined that such standards are equivalent to its applicable product approval requirements or can be modified to provide at least the same degree of protection as those MSHA requirements. As of the date of this document, there are no such non-MSHA standards.

5.12. Submit the application to MSHA by one of the following methods:

5.12.1. Mail to: MSHA Approval and Certification Center
Attention: IPSO
RR #1, Box 251 Industrial Park Road
Triadelphia, WV 26059

5.12.2. FAX to: 304-547-2044

5.12.3. Electronically: For information and instructions on setting up an account with MSHA go to www.msha.gov.

5.13. Additional Information. Applicants may contact the Electrical Safety Division at 304-547-0400 for additional information concerning these procedures.

6.0 RESPONSIBILITY

The Applicant is responsible for the following:

6.1. Authorizing the Fee Estimate. MSHA will review the application for completeness and send the Applicant a Fee Authorization Form including a list of administrative discrepancies that is to be returned to MSHA. This form will state the estimated maximum fee to process the application and an approximate date the application will be assigned to an investigator. If the Applicant does not authorize the fee estimate or does not return the fee authorization form including corrected discrepancies by the date specified in the fee estimate letter, the investigation of the application will be cancelled.

6.2. Responding to Discrepancy Letters. The MSHA Investigator assigned to evaluate the application will review the application and contact the person designated in the application letter to discuss any discrepancies. The Applicant will receive a discrepancy letter listing documentation deficiencies and components for evaluation and/or test necessary to continue the investigation. If the Applicant does not resolve all of the discrepancies listed in the letter within the time specified in the discrepancy letter, the investigation of the application will be cancelled per A&CC APOL1009 "Application Cancellation Policy."

6.3. Correcting Test Failures. The Applicant will be notified of all test failures and will be given the opportunity to redesign the product to successfully pass a failed test within the time specified in the discrepancy letter.

6.4. Payment. The Applicant will receive an invoice for the cost of the investigation after the investigation is either completed or cancelled.

Enclosure A

New Part 22 Approval Application Letter

Applicant name and address:

Chief, Approval and Certification Center		
RR#1 Box 251		
Industrial Park Road		
Triadelphia, West Virginia 26059		
DATE:		
SUBJECT:		

(MODEL AND TYPE OF EQUIPMENT)

Company Assigned Application Code Number:											(six digits or less)

Gentlemen:

We request MSHA approval of the subject methane-indicating detector which consists of the following major components (attach additional sheets as necessary):

Brief description of equipment and its use in mines (attach additional sheets if necessary):

This equipment is similar to the following equipment approved by MSHA (If applicable):

(MODEL AND TYPE OF EQUIPMENT)

Approval No.		, Investigation No.		as granted by
letter to		dated		

Enclosed are all the drawings, a drawing list, and a checklist for this application.

If you have any questions, contact:		Telephone:	
Email:		FAX:	

☐ I wish to have all equipment submitted for inspection and/or tests returned upon completion of the investigation.

Sincerely,

	Name:	
	Title:	

(SIGNATURE)

Enclosure B

Extension of Part 22 Approval Application Letter

Applicant name and address:

Chief, Approval and Certification Center		
RR#1 Box 251		
Industrial Park Road		
Triadelphia, West Virginia 26059		
DATE:		

Company Assigned Application Code Number:											(six digits or less)

Gentlemen:

We request an extension of MSHA approval to include the following changes made in the design of the

_____

(MODEL AND TYPE OF EQUIPMENT)

MSHA Approval Number		as granted in a letter to
	dated	

(List all changes. Attach additional sheets as necessary)

List all major components and provide a brief description of the equipment and its use in mines (attach additional sheets as necessary):

List all model(s) of this equipment to be covered by this extension (attach additional sheets as necessary):

☐ This extension does <u>not</u> change the model number or manufacturer's designation for this equipment.

-OR-

☐ This extension adds or changes the model number(s) or manufacturer's designation for this equipment.

Enclosed are all the new and revised drawings, a complete drawing list, and a checklist for this application.

If you have any questions, contact:		Telephone:	
Email:		FAX:	

☐ I wish to have all equipment submitted for inspection and/or tests returned upon completion of the investigation.

Sincerely,

	Name:	
	Title:	

(SIGNATURE)

Enclosure C

INVESTIGATION NO. (leave blank for new approvals or evaluations)

"SAMPLE" DRAWING LIST

ABC Company
Model 100 Methane Detector
Approval Number (leave blank for new approval applications)

TITLE	DRAWING NO.	REV.	MSHA FILE STATUS
Model 100 Detector Assembly	A-100 (sheet 1 of 2)	-	New
Model 100 Main PCB Assembly	A-100 (sheet 2 of 2)	B	Revised
Model 100 Main PCB Parts List	PL-101	C	Revised
Model 100 Sensor PCB Assembly	A-113	-	On file
Model 100 Sensor PCB Parts List	B-114	B	On file
T-1 Sensor Specification*	TR3456.7	5	New
PC Board Artwork	C-102 (5 sheets)	C	On file
Pump Assembly	A-123	G	New
Pump Parts List	S-124	F	New
Warning Label	L-123	-	New

Certified Performance Statement: See certified statement from John Doe dated October 15, 2006.

User's Manual: See Document Number 0123, Rev A, "Model XYZ User's Manual."

Enclosure D

SAMPLE CERTIFIED PERFORMANCE STATEMENT
(printed on company letterhead)

Company:		Date:	
Address:			
SUBJECT:			

(MODEL AND TYPE OF EQUIPMENT)

Company Assigned Application Code Number:	

I,		, certify that the	

(NAME AND TITLE) (COMPANY OR CORPORATION)

subject gas detector is capable of monitoring the following gases within the range and accuracy listed below:

Gas	Accuracy including tolerance over a specified range
Oxygen	+/- 0.40% of volume over a 0 – 25% range
Carbon Monoxide	+/- 5 ppm over a 0 – 1000 ppm range
Sulfur Dioxide	+/- 1 ppm over a 0 – 100 ppm range

In the event that the subject gas detector is found to exceed these specified accuracies, we will immediately notify MSHA of the deficiency.

Sincerely,

	Name:	
	Title:	

(SIGNATURE)

Enclosure E

CHECKLIST FOR PRODUCT APPROVAL OR EXTENSION OF APPROVAL FOR PART 22

This checklist is available for the applicant to use as a guide to ensure that the application package (drawings and specifications) submitted to MSHA is complete. It should be submitted with the application package. The following is a link to the document titled "Understanding and Expediting the MSHA Intrinsic Safety Approval Process" http://www.msha.gov/TECHSUPP/ACC/application/IS_Guide2.pdf

Administrative

_____ 1. Is the appropriate application form properly completed?

_____ 2. Is a drawing list in the proper format included in the application package?

_____ 3. Are all correspondence, specifications, and lettering on drawings in English?

_____ 4. Are all drawings and Bills of Material titled, numbered, dated, and legible?

_____ 5. Are there any pencil or ink notations on the drawings and Bills of Material? (Note: Pencil and ink notations are unacceptable.)

_____ 6. Do all revised drawings and Bills of Material show the latest revision and/or date?

_____ 7. Have all of the required samples been submitted?

Common Discrepancies

_____ 8. Does the overall assembly drawing show the location of each major component?

_____ 9. Are schematic drawings of each electrical circuit included?

_____ 10. Do the p.c. board layout drawings show the physical location of each electrical component?

_____ 11. Are all p.c. board artwork drawings included with scaling dimensions indicated?

_____ 12. Is a technical description of the circuit operation included?

_____ 13. Are all components documented in accordance with section 5.8.8?

_____ 14. Do component designations and specifications correspond between the schematic, bill of materials, and layout drawing for each circuit?

_____ 15. Is detailed documentation of the enclosure including wall thickness, specific material, and dimensions included?

_____ 16. Has there been any information required for a past approval removed from the documentation?

_____ 17. Does the documentation of components include the use of the words "or equal" or "or equivalent"? If so, these phrases must be removed and the description modified to agree with section 5.8.8.

_____ 18. Are the size and position of the approval plate specified?

<u>Investigative Part 22 Specific</u>

_____ 19. Is an operator's manual in accordance with section 5.3 included?

_____ 20. Is a certified performance statement for gases other than methane and oxygen supplied with the application in accordance with section 5.7?

_____ 21. Are all gas detectors to be submitted for testing programmed to display methane as percent by volume, as opposed to LEL? Part 22 gas detectors are required to display the methane concentration in percent by volume (30 CFR Part 75 Subpart D)

_____ 22. If the apparatus is aspirated, is it equipped with an audible or visual indication of improper flow?

_____ 23. Are the sensors documented by manufacturer and part number in accordance with section 5.8.8?

_____ 24. Is the revision level of the firmware documented in accordance with section 5.8.9?

_____ 25. Is all calibration equipment documented in accordance with section 5.8.11?

_____ 26. Is the required documentation for aspirated devices provided in accordance with section 5.8.12?

Sincerely,

	Name:	
	Title:	

(signature)