

## 1.0 PURPOSE

To inform applicants how to apply for Mine Safety and Health Administration (MSHA) certification of a machine mounted methane-monitoring system. This document also specifies the minimum required documentation, equipment and components to evaluate and test a product for compliance with MSHA requirements; and identifies the Applicant's responsibilities during the investigation process.

## 2.0 SCOPE

This standard application procedure applies to all applications submitted for certification or extension of certification of machine mounted methane-monitoring systems pursuant to Part 27 of Title 30 of the Code of Federal Regulations (30 CFR Part 27).

## 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 27 "Methane-Monitoring Systems"
- 3.3. ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus"
- 3.4. ACRI2010 "Encapsulation Criteria"
- 3.5. ACRI2011 "Intrinsically Safe Active Voltage/Current Power Source Criteria"
- 3.6. APOL1009 "Application Cancellation Policy"
- 3.7. APOL2201 "Methane Monitor Misadjustment"
- 3.8. APOL2208 "Methane Monitoring System Action Levels"
- 3.9. ASTP2223 "Methane Monitor Vibration Test"
- 3.10. ASTP2228 "Methane Monitor Moisture Test"
- 3.11. ASTP2229 "Methane Monitor Performance Test"

- 3.12. ASTP2248 “Methane Monitor Dust Resistance Test”
- 3.13. Program Circular PC-4812-0 “Installation and Maintenance of Intrinsically Safe Field Wiring in Gassy Mines”
- 3.14. Program Information Bulletin (PIB) No. P11-24 “Continuous Mining Machine Safety Features (Main Machine Circuit-Interrupting Device, Remote Traction Motor Circuit Breaker Reset, E-stop Override, Methane Monitor Failure Override)”
- 3.15. MSHA Handbook Series Handbook No. PH13-V-1 “Coal Mine Safety and Health General Inspection Procedures Handbook”

These documents are available on [www.msha.gov](http://www.msha.gov) or by contacting the Approval and Certification Center at 304-547-0400.

#### 4.0 DEFINITIONS

- 4.1. *Associated Apparatus* - Apparatus in which the circuits are not themselves intrinsically safe, but which connect to intrinsically safe circuits. An example of an associated apparatus is a power supply, located within a certified explosion-proof enclosure, which powers an intrinsically safe display and sensor of a methane-monitoring system (ACRI2001).
- 4.2. *Certification* - Formal acceptance issued by MSHA stating that a methane-monitoring system or subassembly or component thereof: (1) Has met the requirements of this part, and (2) Is certified for incorporation in or with permissible or approved equipment that is used in gassy mines and tunnels. (30 CFR §27.2)
- 4.3. *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)
- 4.4. *Extension of Certification* - A formal document issued by MSHA accepting changes to the design or construction of a certified system, which has met the applicable requirements of this part. A suffix will be added to the Certification number to distinguish it from the previously accepted system.

- 4.5. *Hybrid Integrated Circuit* - A miniaturized electronic circuit constructed of individual semiconductor devices, as well as passive components, bonded to a substrate or circuit board.
- 4.6. *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)
- 4.7. *Methane-Monitoring System* - Methane-monitoring system means a complete assembly of one or more methane detectors and all other components required for measuring and signaling the presence of methane in the atmosphere of a mine, tunnel, or other underground workings, and shall include a power-shutoff component. (30 CFR §27.2)
- 4.8. *Power-Shutoff Component* - Power-shutoff component means a component of a methane-monitoring system, such as a relay, switch, or switching mechanism, that will cause a control circuit to deenergize a machine, equipment, or power circuit when actuated by the methane detector. (30 CFR §27.2)
- 4.9. *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)
- 4.10. *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 shall 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 (numerical only) 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 system; and,
  - 5.1.6. A brief description how the system would be used in a gassy underground mine.
  - 5.1.7. If requesting a Part 6 program evaluation, stating that it is a Part 6 application.
- 5.2. A complete technical description of the operation of each electrical circuit. This should identify components or features of the product that are critical to the safety of the product. It should also describe the gas sensing circuit (from sensing component to analog signal) and the type of technology (e.g. catalytic or infrared), and zero/span adjustment circuits. Where applicable, it should:
- 5.2.1. Include whether the circuit removes power from the sensing component in high concentrations of methane to protect the sensor,
  - 5.2.2. Describe any areas of the circuit that derive a voltage potential higher than the input voltage (e.g. negative voltage converters, switching regulators, boost converters, charge pumps, etc),
  - 5.2.3. Describe ability to communicate between components and the data communication protocol between components of the system and external machine circuits (if applicable), and

5.2.4. Describe the ability to store gas concentration data or status of the monitoring system.

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

5.3.1. Identification of the methane monitoring system model number, the manual revision level, and the manual revision date for inclusion on the MSHA drawing list (reference Enclosure C).

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

5.3.3. Operating instructions and adjustment procedures;

5.3.4. 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).

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

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

5.3.5.2. Atmospheric limitations such as operating temperature and air velocity,

5.3.5.3. Range(s) of detection capability (e.g. 0-5% and/or 0-100%) and accuracy over the various ranges,

5.3.5.4. Response time of the monitor over the various ranges,

5.3.5.5. Warm-up time,

5.3.5.6. Stabilization time,

5.3.5.7. RFI/EMI limitations,

5.3.5.8. Input voltage(s), range(s), and nominal current draw for each voltage,

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- 5.3.5.9. Maximum acceptable cable loop resistance to the sensor, and
- 5.3.5.10. Acceptable voltage and current ranges of warning and shutdown relays.
- 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. Statements of the nature and significance of all alarms (including warning and shutdown) 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;
- 5.3.8. Details of any method for the determination of the possible sources of a malfunction and any corrective procedures (i.e. trouble-shooting procedures);
- 5.3.9. A statement on whether the shutdown relay outputs are of the latching or non-latching type;
- 5.3.10. A recommended replacement parts list;
- 5.3.11. Details on user adjustable settings such as warning and shutdown set points, and acceptable differences between these settings (reference item 31 of the Checklist in Enclosure D);
- 5.3.12. Details on wiring or settings to be compatible with PIB No. P11-24 regarding Methane Monitor Failure Override (MMFO); and
- 5.3.13. Any other special requirements.
- 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 report and test record for each lithium battery used in intrinsically safe apparatus in the system. A comprehensive report and test record for each battery type tested by UL or a laboratory accredited to test to the UL 1642 standard must be submitted for cells not housed within MSHA-certified explosion-proof enclosures. These must describe the test and evaluation of the cell per the requirements of this UL standard. Complete data

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for the tests applicable to “technician-replaceable” cells must be included in the report and test record. The report must also detail the engineering considerations or conditions of safe use required for the cell(s). MSHA requires the cell(s) to be replaced by a qualified technician only.

- 5.6. Drawing List. A complete list of the drawings necessary to fully describe the system. The drawing list (reference Enclosure C) should include the following information for each drawing:
  - 5.6.1. Drawing title;
  - 5.6.2. Drawing number;
  - 5.6.3. Revision level; and
  - 5.6.4. Reference to other MSHA certifications or intrinsic safety evaluations used in their entirety, including manufacturer, model number, and complete certification number or intrinsic safety evaluation number.
- 5.7. A completed checklist (Reference Enclosure D).
- 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 show the details of the system as intended to be certified. The drawings shall be adequate in number and detail to identify fully the complete assembly, component parts, and subassemblies. The final MSHA-controlled drawings are used to identify the certified methane monitoring system and as a means of checking the future commercial product of the manufacturer. The required documentation includes:
  - 5.8.1. An overall system drawing showing the interconnection of the components of the system, quantities of the components, whether the components are optional or alternate, electrical barriers, standby power sources, cable specifications, and type of enclosure (open-type or explosion-proof). Where components or parts of the system are housed in explosion-proof enclosures, detailed installation instructions must be provided. All other drawings must be referenced through this drawing or a drawing list listing all drawings and meeting the requirements of section 5.8 must be provided. It must also reference

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other MSHA approvals, certifications, or intrinsic safety evaluations used in their entirety, including manufacturer, model number, and complete approval, certification, or intrinsic safety evaluation number.

- 5.8.2. An overall assembly drawing of the components of the system including any interconnecting cables.
- 5.8.3. A block diagram showing the major components of the system.
- 5.8.4. Subassembly drawings showing the construction of each enclosure(s) and component assemblies showing the physical dimensions of the components (including nominal and tolerance or minimum wall thicknesses), specific enclosure material, and identifying the major components.
- 5.8.5. Wiring diagrams of all internal wiring and connections to external circuits. Distances between intrinsically safe wiring and non-intrinsically safe wiring and components must be identified and specified.
- 5.8.6. Schematic diagrams of each electrical circuit.
- 5.8.7. Layout drawings showing the physical location of each component in the circuit.
- 5.8.8. 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 7.  
  
Note 1: As a supplement, it is highly recommended that an electronic file such as a Gerber file be provided which will expedite the evaluation process.  
  
Note 2: This section only applies to intrinsically safe apparatus and associated apparatus, as defined in ACRI2001.
- 5.8.9. Electrical parts lists that include the following component specifications.

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Note: Some of the information requested that is related to intrinsically safe circuits or explosion-proof enclosures may not be required at the time of certification, if, for example, the circuitry is contained within an MSHA-certified explosion-proof enclosure, or details are included on the machine approval.

- 5.8.9.1. Batteries: Type, voltage, capacity, and manufacturer's name and part number. Note: Additional information such as details of cell construction and UL 1642 listing information may be required based on the intrinsic safety analysis.
- 5.8.9.2. Cables Carrying Intrinsically Safe (IS) Energy Levels: Maximum length, conductor size, number of conductors, voltage rating, inductance per unit length, resistance per unit length, and capacitance per unit length. Documentation that the cable has an MSHA accepted flame resistant jacket or enclosed in MSHA accepted flame resistant hose conduit if not documented during the certification will be required during the machine approval. The L/R ratio may be specified in lieu of the inductance per unit length and resistance per unit length. Note: The minimum acceptable conductor sizes are those specified in PC-4812-0 (Installation and Maintenance of Intrinsically Safe Field Wiring in Gassy Mines).
- 5.8.9.3. Cables Carrying Non-IS Energy Levels: Maximum length, conductor size, number of conductors, type of cable, voltage rating, insulation temperature rating, and ampacity. Documentation of the type of cable, insulation temperature rating, and ampacity if not documented during the certification will be required during the machine approval. Documentation that the cable has an MSHA accepted flame resistant jacket or enclosed in MSHA accepted flame resistant hose conduit if not documented during the certification will be required during the machine approval. The method of protection (e.g. protected by position or by hose conduit) will be required to be documented on the machine approval.
- 5.8.9.4. Cables Entering MSHA Approved or Certified Explosion-Proof Enclosures: In addition to the above listed specifications for IS and Non-IS cables, the outer diameter of the cable with

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tolerances may also be specified. If not specified during the certification, the outer diameter will be required to be specified during the machine approval.

- 5.8.9.5. 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.
- 5.8.9.6. Catalytic Sensors: Manufacturer's name and part number.
- 5.8.9.7. Capacitors: 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 and type must be specified.
- 5.8.9.8. Encapsulant: Generic name, specific type designation, voltage rating, and maximum temperature rating.
- 5.8.9.9. Encapsulant Used to Exclude Gas per ACRI2010: In addition to the above required information for an encapsulant, the following additional information must be provided: minimum thickness of the encapsulant around the protected components and all information required by section 5.2 of ACRI2010.
- 5.8.9.10. Explosion-Proof Enclosures: Manufacturer, Model/Type number, function, electrical rating (if applicable), and certification number. Note: If no certification number was issued, indicate the approval number and extension number under which the component was accepted.
- 5.8.9.11. Explosion-Proof Gland Assemblies: Details or drawing references of the components used to pack the gland(s), documentation showing the packing nut is secured against loosening, and that the cable entering the gland is provided with insulated strain relief. Unused explosion-proof enclosure glands must be noted as being plugged and tack welded.

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- 5.8.9.12. Ferrite Beads: Either: (a) manufacturer's name and part number, (b) inductance (nominal and tolerance or maximum value), or (c) impedance (nominal and tolerance or maximum value) at a measured frequency.
- 5.8.9.13. Firmware: Revision level, date, and notation that no changes to the firmware that could affect performance may be made without changing the revision level and notifying MSHA.
- 5.8.9.14. Fuses and other Thermal Protection Devices: Manufacturer's name and part number, current trip rating, maximum interrupt current, voltage rating.
- 5.8.9.15. Heat Sinks: Manufacturer's name and part number or details of the physical dimensions and materials used.
- 5.8.9.16. Hybrid Integrated Circuits: Manufacturer's name and part number and all applicable documentation required by section 5.8 (e.g. discrete components, artwork drawings, etc.), where applicable. Alternative documentation requirements for hybrid circuits are listed in APOL2048.
- 5.8.9.17. Inductors: Inductance (nominal and tolerance, or maximum value), method of measuring inductance (except for air core inductors), dc coil resistance (nominal and tolerance, or minimum value), or; specifications of the core type, size of wire, insulation, and number of turns. Note: Additional information, such as manufacturer and part number, may be required based on the intrinsic safety analysis.
- 5.8.9.18. Lamp Bulbs: Manufacturer's name and part number, type, voltage, current and wattage rating.
- 5.8.9.19. LEDs: Voltage, current and wattage rating, as well as the method of attachment of the LED to the PCB/heatsink, if applicable. Note: Additional information, such as manufacturer and part number, may be required based on the intrinsic safety analysis.

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- 5.8.9.20. Mechanical Relays: Manufacturer's name and part number, method of measuring coil inductance (nominal and tolerance or maximum value) or stored energy (nominal and tolerance, or maximum value) at a specified voltage, and coil resistance (nominal and tolerance, or minimum value). If the relays are used as protective components to provide intrinsic safety isolation, the maximum dielectric voltage and physical separation (creepage and clearances) between coil, coil terminals, switching contacts, and contact leads must be specified.
- 5.8.9.21. Optical Isolators and Solid State Relays: Manufacturer's name and part number, maximum voltage and current ratings, dielectric strength, and internal and external spacings (clearances) between input and output.
- 5.8.9.22. Other Components: JEDEC number, generic number of integrated circuits, power rating, electrical values with tolerances, etc., whichever are applicable.
- 5.8.9.23. Piezoelectric Transducers and Devices: Manufacturer's name and part number and crystal capacitance (nominal and tolerance or maximum value).
- 5.8.9.24. Protective Current Limiting Resistors (requiring testing): Manufacturer's name and part number, resistance value (nominal and tolerance), type of construction (Reference ACRI2001 for acceptable types of construction), and wattage rating.
- 5.8.9.25. Protective Current Limiting Resistors (not requiring testing): Resistance value (nominal and tolerance or minimum value), type of construction (Reference ACRI2001 for acceptable types of construction), and wattage rating.
- 5.8.9.26. Protective Printed Circuit Board Traces (not subject to open circuit failure): Width and copper thickness. Note: The trace must also be protected by a rugged enclosure and from environmental contamination as noted in ACRI2001 section 8.11.

- 5.8.9.27.        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.
- 5.8.9.28.        Sensor Dust/Splash Guards: Mechanical drawings that include dimensions and material. The pore size of screens and filters must be documented. An assembly drawing may also be required if consisting of multiple components.
- 5.8.9.29.        Solenoids: Manufacturer's name and part number; method of measuring coil inductance (nominal and tolerance, or maximum value) or stored energy (nominal and tolerance, or maximum value) at a specified voltage, dc coil resistance (nominal and tolerance, or minimum value); or specifications of the core type, size of wire, insulation, and number of turns.
- 5.8.9.30.        Solid State Voltage and Current Limiting Devices: Manufacturer's name and part number, input and output voltage (nominal and maximum) and current ratings, and power dissipation rating.
- 5.8.9.31.        Transformers: Either (a) manufacturer's name and part number, inductance (nominal and tolerance or maximum value), method of measuring inductance, and dc resistance (nominal and tolerance or minimum value); or (b) specifications showing the physical construction of the transformer to include: core type, insulation rating, size of wire, number of turns, physical dimensions and spacing (clearances) of terminals and maximum temperature rating of insulation.
- 5.8.9.32.        Transformers (Protective and Power): Manufacturer's name and part number, inductance (nominal and tolerance or maximum value), method of measuring inductance, and dc resistance (nominal and tolerance or minimum value), and specifications showing the physical construction of the transformer to include: core type, insulation rating, size of wire, number of turns, physical dimensions and spacing (clearances) of terminals and maximum temperature rating of insulation, transformer type (Reference ACRI2001, Section 8.2), voltage and

current ratings of each winding, high potential or dielectric strength specifications and spacing between windings.

- 5.8.9.33. Vibration Dampening Components: Either (a) manufacturer's name and part number; or (b) mechanical drawings that include dimensions and material.
- 5.8.9.34. Zener Diodes: Either (a) manufacturer's name and part number; or (b) zener voltage (nominal and tolerance, or maximum value), and wattage rating. Note: Option (a) may be required based on the intrinsic safety analysis.
- 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. Submit schematics without component values accompanied by a parts list specifying the ranges of values for each non-critical component.
- 5.9.3. 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. Encapsulated units are required if a dielectric strength test is needed to determine the sufficiency of the encapsulating material and for photographs for the final records.

- 5.10.1. One complete system in marketable form. Note: A second complete system in marketable form for performance testing will be requested to be submitted at the completion of the intrinsic safety evaluation. This system must be mounted to a metal plate for attachment to a vibration test table having surface dimensions of 24 inches by 24 inches. If any

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vibration dampening components are employed between the system and the machine, these must also be included in the sample supplied for performance testing and documented on the drawings.

- 5.10.2. One complete manufacturer's calibration kit. If automated calibration equipment is to be used with the monitor, this equipment must also be submitted.
- 5.10.3. A 100 foot sample of each cable carrying intrinsically safe energy levels to be used in the system may be requested at a later time by the assigned investigator for measurement or testing.
- 5.10.4. One populated sample of each printed circuit board used in the system.
- 5.10.5. One unpopulated sample of each printed circuit board used in the system.
- 5.10.6. Five of each type inductive component rated over 100 microhenries ( $\mu\text{H}$ ) that may be the source of a spark ignition (e.g., relays, speakers, transformers, inductors, etc.).
- 5.10.7. Five sets of each type battery or battery pack.
- 5.10.8. Three samples of any protective transformer.
- 5.10.9. Ten samples of each type current limiting resistor.

Note: Samples of surface mount components must 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.

- 5.10.10. Ten samples of each type lamp bulb for surface temperature testing. If the device includes a bulb crush or disconnect safety device or design, then fifty additional samples shall be submitted.
- 5.10.11. Five samples of each type piezoelectric transducer device, with output leads connected directly to the crystal, mounted to the apparatus

assembly where it is normally located of a quality, design, and construction consistent with that of the final manufactured product.

Note: Mockups of the apparatus assembly may be tested in lieu of the actual assembly if justified. Only three samples are required for the test, however, submission of five samples is recommended in case an output waveform is not obtained due to damage of the sample.

- 5.10.12. Ten samples of each type protective fuse or other thermal protection device.
- 5.10.13. Ten samples of each type protective optical isolator.
- 5.10.14. If encapsulation is used to exclude gas, then the following samples must be submitted for testing.

Note: It is recommended that these encapsulation samples be supplied at the completion of the intrinsic safety analysis in case any changes are required to be made to the design:

- 5.10.14.1. Four 2.0 inch x 2.0 inch x 0.1 inch thick samples of the encapsulation compound for dielectric and absorption testing. Samples shall be in their solidified form with any fillers and/or additives included.
  - 5.10.14.2. Four samples of the encapsulated assembly in marketable form for impact and adhesion testing. One of these four samples will be used for the force test. One of these four samples may be the sample in marketable form requested in section 5.10.1.
  - 5.10.14.3. One sample for thermal endurance testing with one or more temperature sensors placed in the compound at the hottest places. If the sample contains windings, the temperature may be measured by the change of electrical resistance of these windings. Due to the time (4 to 6 weeks), possible addition of sensors, and the fatigue on the sample from the test, it is recommended that this sample be separate from the four samples required for impact and adhesion testing.
- 5.10.15. If active voltage- or current-limiting is utilized in the design, in addition to the one sample in marketable form required by section

5.10.1, one fully assembled version of the safety-factored power source must also be submitted. If any of the circuitry is encapsulated, the submitted sample shall be unencapsulated for measurements and application of faults (reference ACRI2011 section 5.4.2 for construction requirements of the safety-factored power source). Note: It is recommended that this power source be supplied upon request in case any changes are required to be made to the design.

5.11. Applications may be submitted that follow the requirements set forth in 30 CFR, Part 6. For procedures on submitting a Part 6 application refer to the following link:

<http://www.msha.gov/Techsupp/ACC/Approvals/ESD/ASOP2024.pdf>

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 23.
- 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.

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  
765 Technology Drive  
Triadelphia, WV 26059
- 5.12.2. FAX to: 304-547-2044
- 5.12.3. Electronically: For information on emailing your application or instructions on setting up an FTP (File Transfer Protocol) account with MSHA go to:  
<http://www.msha.gov/techsupp/acc/application/online.htm>

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 additional documentation 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.



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 27 Certification Application Letter

Applicant name and address:

Chief, Approval and Certification Center  
765 Technology Drive  
Triadelphia, West Virginia 26059

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DATE: \_\_\_\_\_

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

Gentlemen:

We request an extension of MSHA Part 27 certification to include the following changes made in the design of the

\_\_\_\_\_  
(MODEL AND TYPE OF EQUIPMENT)

MSHA Certification 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 not 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.





## Enclosure D

### CHECKLIST FOR PRODUCT CERTIFICATION OR EXTENSION OF CERTIFICATION FOR PART 27

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. Use N/A to signify when an item is not applicable to your product. 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](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 all drawings traceable to a single drawing or is there a drawing list with all the required drawing information noted in section 5.8?
- \_\_\_ 6. Are there any pencil or ink notations on the drawings and Bills of Material? (Note: Pencil and ink notations are unacceptable.)
- \_\_\_ 7. Do all revised drawings and Bills of Material show the latest revision and/or date?
- \_\_\_ 8. Have all the required samples been submitted?

#### Common Discrepancies

- \_\_\_ 9. Are all components documented in accordance with section 5.8.9?
- \_\_\_ 10. Does the overall system drawing list the quantities of components, and which components are alternate and/or optional?
- \_\_\_ 11. Does the overall assembly drawing of each component of the methane monitoring system show the location of each major component?
- \_\_\_ 12. Do the wiring diagrams and/or schematic diagrams clearly show which circuits are intrinsically safe, encapsulated to exclude gas, or housed in MSHA-certified explosion-proof enclosures?
- \_\_\_ 13. Are schematic drawings of each electrical circuit included?

- \_\_\_\_ 14. For intrinsically safe circuits do the p.c. board layout drawings show the physical location of each electrical component?
- \_\_\_\_ 15. For intrinsically safe circuits are all p.c. board artwork drawings included with scaling dimensions indicated?
- \_\_\_\_ 16. Is a technical description of the circuit operation in accordance with section 5.2 included?
- \_\_\_\_ 17. Do component designations and specifications correspond between the schematic, bill of materials, and layout drawing for each circuit?
- \_\_\_\_ 18. Is detailed documentation of the open-type enclosure(s) including wall thickness, specific material, and dimensions included?
- \_\_\_\_ 19. For RAMP or extension of certification applications, has there been any information required for past extensions removed from the documentation?
- \_\_\_\_ 20. Does the documentation of the components include the use of words "or equal" or "or equivalent"? If so, these phrases must be defined and the component description must conform to the requirements of section 5.8.9.
- \_\_\_\_ 21. Are the size and position of the certification plate specified?
- \_\_\_\_ 22. Is the output of any voltage generating IC (e.g. minus voltage converters, switching regulators, boost converters, charge pumps, etc) limited to a safe level in the event of an external component failure such as the resistors used to set the output voltage? An example of an unsafe condition would be a load capacitor being charged to an unsafe level.

Investigative (Part 27 Specific)

- \_\_\_\_ 23. Is a complete operator's manual on the installation, use and maintenance of the product in accordance with section 5.3 included?
- \_\_\_\_ 24. Does the overall system drawing show the use of an auxiliary warning light (recommended)?
- \_\_\_\_ 25. If multiple sensors are permitted, does the system drawing detail if a single display is allowed, or does each sensor require its own display?
- \_\_\_\_ 26. Does the overall system drawing detail how many components may be powered by a single power supply?
- \_\_\_\_ 27. Is it possible to adjust the zero and span potentiometers such that the monitor will not respond to methane? (ref. APOL2201)
- \_\_\_\_ 28. Is the methane monitor capable of storing methane concentration data (recommended)?

- \_\_\_\_ 29. Is the methane monitor capable of meeting the requirements of PIB P11-24 (Methane Monitor Failure Override) by indicating sensor failure to the machine control circuitry (recommended)?
- \_\_\_\_ 30. Does the monitor fail in a safe manner with any open circuit or short circuit faults of the wires to the sensor?
- \_\_\_\_ 31. Are the ranges of alarm and shutdown settings of the system documented, if adjustable? If adjustable, the acceptable warning and shutdown ranges as well as minimum and maximum difference between warning and shutdown must be documented. The following is a summary of 30 CFR settings from Parts 57 and 75 (ref. APOL2208):

	Minimum	Maximum
Warning	0.5	1.0
Shutdown	1.0	2.0
Difference between warning and shutdown	0.5	1.0

Note: All settings must comply with MSHA enforcement requirements.

- \_\_\_\_ 32. Is the system equipped with a test button to test the operation of the shutdown component?
- \_\_\_\_ 33. Is a method to test the complete system with a known concentration of gas capable of being applied in the field documented (ref. inspector handbook PH13-V-1)?
- \_\_\_\_ 34. Is the system capable of meeting the requirements of the MSHA Coal Mine Safety and Health General Inspection Procedures Handbook, PH13-V-1 (e.g. read 2.3 to 2.7% with 2.5% applied; and have a test cap, sleeve, or adapter capable of applying gas to the entire sensor including any filters/screens)?
- \_\_\_\_ 35. Are the acceptable calibration adapter, dust caps, and splash guards fully documented on both drawings and the user manual?

Sincerely,

\_\_\_\_\_  
(SIGNATURE)

Name: \_\_\_\_\_

Title: \_\_\_\_\_