

1.0 PURPOSE

To inform applicants as how to apply for Mine Safety and Health Administration (MSHA) approval or intrinsic safety evaluation of an intrinsically safe or associated apparatus (and extensions). This document also: specifies the documentation, equipment and components necessary to evaluate and test a product for compliance with MSHA requirements; and identifies the Applicant's responsibilities during the investigation

2.0 SCOPE

This standard application procedure applies to all applications submitted for approval or intrinsic safety evaluation of an intrinsically safe or associated apparatus (and extensions) pursuant to Part 18 of Title 30 of the Code of Federal Regulations (30 CFR Part 18).

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 18 "Electric Motor-Driven Mine Equipment and Accessories"
- 3.3. ACRI2001 "Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus"
- 3.4. APOL1009 "Application Cancellation Policy"
- 3.5. Program Circular PC-4812-0 "Installation and Maintenance of Intrinsically Safe Field Wiring in Gassy Mines"
- 3.6. ASAP2029 "Standard Application Procedures for the Approval of Portable Methane-Indicating Detectors per 30 CFR Part 22"

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. Applicant - An individual, partnership, company, corporation, organization or association that designs, manufactures, assembles, or controls the

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assembly of an electrical machine or accessory and seeks approval.... (30 CFR §18.2). Per Part 6, an Applicant is an individual or organization that manufactures or controls the assembly of a product and applies to MSHA for approval of that product.

- 4.2. Approval - A formal document issued by MSHA which states that a completely assembled electrical machine or accessory has met the applicable requirements of this part and which authorizes the attachment of an approval plate (label) so indicating (30 CFR §18.2). Only complete intrinsically safe instruments or systems will be approved by MSHA under Part 18.
- 4.3. 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 on a mining machine, which powers an intrinsically safe control circuit (ACRI2001).
- 4.4. 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)
- 4.5. Extension of Approval or Extension of Intrinsic Safety Evaluation - A formal document issued by MSHA accepting changes to the design or construction of an approved and or evaluated product, which have met the applicable requirements of this part. A suffix will be added to the Approval or Intrinsic Safety Evaluation number to distinguish it from the previously accepted product.
- 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. Intrinsic Safety Evaluation - A formal document issued by MSHA which states that an intrinsically safe apparatus or associated apparatus has been evaluated for intrinsic safety per specific conditions of use and issued an

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Intrinsic Safety Evaluation Number. These are intrinsically safe components that are connected to or designed to be installed on MSHA approved equipment.

- 4.8. 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)
- 4.9. 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 permits 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 product; and,
- 5.1.6. A brief description how the product 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 product that are critical to the safety of the product.
- 5.3. Adequate instructions for the installation, connection and proper use and maintenance of the product.
- 5.4. As per Part 6, copies of test reports from other approval agencies, as described in Section 5.12
- 5.5. A copy of the UL 1642 test report for each lithium cell and/or multi-cell pack used in the instrument or system. A complete test report and test record for each cell type tested by a Nationally Recognized Testing Laboratory (NRTL) that documents the test results in accordance with the UL1642 standard. Complete data for the tests applicable to “technician-replaceable” cells must be included in the test report and/or test record, including conditions of use and/or engineering considerations.
- 5.6. Drawing List. A complete list of the drawings necessary to fully describe the equipment. 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;
 - 5.6.4. MSHA File Status (NEW, REVISED, or currently ON FILE with MSHA.); and,
 - 5.6.5. Reference to other MSHA intrinsic safety evaluations used in their entirety, including manufacturer, model number, and complete intrinsic safety evaluation number.

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- 5.7. A Factory Inspection Form in accordance with 30 CFR, Part 18; or, a certified statement (Reference Enclosure D) in lieu of the Factory Inspection Form.
- 5.8. A completed checklist (Reference Enclosure E).
- 5.9. Drawings, Bills of Material, and Specifications. Each sheet of a drawing shall have a company name, be titled, numbered, dated, be in English, show the latest revision, and include the warning statement "DO NOT CHANGE WITHOUT APPROVAL OF MSHA". The drawings shall be adequate in number and detail to identify fully the complete assembly, component parts, and subassemblies (30 CFR §18.6(e)). The required documentation includes:
- 5.9.1. For Part 18 I.S. Evaluations, an overall system drawing showing the interconnection of the system components, location of the components with respect to the mine (e.g. located in hazardous location or non-hazardous location), electrical barriers, cable specifications, and types of enclosures (open type or explosion proof). Where parts of circuits being evaluated for intrinsic safety are housed in explosion-proof enclosures, detailed installation instructions must be provided. This drawing must either reference all other drawings or a drawing list meeting the requirements of section 5.6 be provided.
- 5.9.2. For Part 18 approvals, an overall assembly drawing showing the physical dimensions of the apparatus (including nominal and tolerance or minimum wall thicknesses), specific enclosure material, and identifying the major components. This drawing must either reference all other drawings or a drawing list meeting the requirements of section 5.6 be provided.
- 5.9.3. A block diagram showing the major components of the assembly.
- 5.9.4. Subassembly drawings showing the construction of the enclosure and component assemblies.
- 5.9.5. Wiring diagrams of all internal wiring and connections to external circuits. Distances between intrinsically safe wiring and other machine wiring must be identified and specified. Each wiring diagram shall include the following warning statement "Any change(s) in the intrinsically safe circuitry or components may result in an unsafe condition" and must clearly identify intrinsically safe and non-intrinsically safe circuits.

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- 5.9.6. Schematic diagrams of each electrical circuit. Each schematic diagram should include the following warning statement "Any change(s) in the intrinsically safe circuitry or components may result in an unsafe condition" and should clearly identify intrinsically safe and non-intrinsically safe circuits.
- 5.9.7. Layout drawings showing the physical location of each component in the circuit.
- 5.9.8. 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 6. Note: As a supplement, an electronic file such as a Gerber file can be provided.
- 5.9.9. Electrical parts lists that include the following component specifications:

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.

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.

Protective and Power Transformers: 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 7.2), voltage and current ratings of each

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winding, high potential or dielectric strength specifications and spacing between windings.

Inductors: Manufacturer's name and part number; 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.

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) and; specifications of the core type, size of wire, insulation, and number of turns.

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.

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.

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

Resistors: Resistance value (nominal and tolerance or minimum value) and wattage rating. Note: Additional information, such as

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manufacturer and part number, may be required based on the intrinsic safety analysis.

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.

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

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.

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

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.

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

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

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

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.

Cables Carrying Intrinsically Safe (IS) Energy Levels: Maximum length, conductor size, number of conductors, voltage rating, inductance per unit length, resistance per unit length, capacitance

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per unit length, and a flame resistant jacket or enclosed in flame resistant hose conduit. 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).

Hybrid Integrated Circuits: Manufacturer's name and part number and all applicable documentation required by section 5.9 (e.g. discrete components, artwork drawings, etc.), where applicable.

Explosion Proof Enclosures: Manufacturer, Model/Type number, function, electrical rating (if applicable), and certification or approval number.

Catalytic Sensors: Manufacturer's name and part number.

Electrochemical Sensors: Manufacturer's name and part number.

Other Components: JEDEC number, generic number of integrated circuits, power rating, electrical values with tolerances, etc., whichever are applicable.

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

5.10.1. 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.

5.10.2. Submit schematics without component values accompanied by a parts list specifying the ranges of values for each non-critical component.

5.10.3. 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.

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

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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.

- 5.11.1. One complete instrument or system in marketable form. If any part is potted, submit one additional unpotted sample.
- 5.11.2. One populated sample of each printed circuit board used in the instrument or system.
- 5.11.3. One unpopulated sample of each printed circuit board used in the instrument or system.
- 5.11.4. Five of each type inductive component rated over 100 microhenries that may be the source of a spark ignition (e.g., motors, relays, solenoids, speakers, transformers, inductors, etc.).

Notes: (1) If the maximum number of relays and/or solenoids powered by the same power source used in the circuitry exceeds five, submit the maximum specified quantity. (2) At least two of the solenoids shall be unpotted in order to apply faults. (3) Solenoids that employ circuits that lower current draw after initial pull-in shall have these circuits disabled for spark testing purposes.

- 5.11.5. Five sets of each type battery or battery pack. If any part of the battery pack is potted, submit one additional unpotted sample.
- 5.11.6. 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.

- 5.11.7. Ten samples of each type lamp bulb for surface temperature testing.
- 5.11.8. Five samples of each type piezoelectric transducer device with output leads connected directly to the crystal, mounted to the apparatus assembly

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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.

- 5.11.9. Ten samples of each type protective fuse or other thermal protection device.
- 5.11.10. Ten samples of each type protective optical isolator.
- 5.12. Applications may be submitted that follow the requirements set forth in 30 CFR, Part 6. Under these requirements the applicant may:
- 5.12.1. 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:
- 5.12.1.1. Written evidence of the laboratory's independence and current recognition by a laboratory accrediting organization;
- 5.12.1.2. Complete technical explanation of how the product complies with each requirement in the applicable MSHA product approval requirements;
- 5.12.1.3. Identification of components or features of the product that are critical to the safety of the product; and,
- 5.12.1.4. All documentation, including drawings and specifications, as submitted to the independent laboratory by the applicant and as required by 30CFR Part 18.
- 5.12.2. 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.
- 5.13. Submit the application to MSHA by one of the following methods:

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

5.13.2. FAX to: 304-547-2044

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

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

6.0 RESPONSIBILITY

6.1. The Applicant is responsible for the following:

- 6.1.1. 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.
- 6.1.2. 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."

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- 6.1.3. 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.
- 6.1.4. Payment. The Applicant will receive an invoice for the cost of the investigation after the investigation is either completed or cancelled.

Enclosure A

New Approval or Intrinsic Safety Evaluation Application Letter

Applicant name and address:

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

DATE: _____

SUBJECT: (CHOOSE ONE) New approval -OR- Intrinsic safety evaluation of the

(MODEL AND TYPE OF EQUIPMENT)

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

Gentlemen:

We request MSHA approval or intrinsic safety evaluation of the subject equipment 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 Approval or Intrinsic Safety Evaluation Application Letter

Applicant name and address:

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

DATE: _____

SUBJECT: (CHOOSE ONE) Extension of Approval No. _____
 Extension of Intrinsic Safety Evaluation No. _____

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

Gentlemen:

We request an extension of MSHA approval or intrinsic safety evaluation to include the following changes made in the design of the

(MODEL AND TYPE OF EQUIPMENT)

MSHA Investigation 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.

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 Valve Control Circuit

<u>TITLE</u>	<u>DRAWING</u>	<u>REV.</u>	<u>MSHA FILE STATUS</u>
Model 100 Assembly	A-100 (sheet 1 of 2)	-	New
Model 100 Assembly	A-100 (sheet 2 of 2)	B	Revised
Model 100 Parts List	PL-101	C	Revised
PS 12V Assembly	A-113	-	On file
PS 12V Schematic	B-114	B	On file
T-1 Transformer Specification*	TR3456.7	5	New
PS PC Board Artwork	C-102 (5 sheets)	C	On file
Parts List - PS 12V	PL-114	A	On file
SOL Solenoid Assembly	A-123	G	New
SOL Specifications	S-124	F	New
Warning Label - SOL	L-123	-	New

Factory Inspection Form: See certified statement from John Doe dated October 15, 1998.

Enclosure D

SAMPLE CERTIFIED STATEMENT

Company: _____

Date: _____

Address: _____

SUBJECT: _____

(MODEL AND TYPE OF EQUIPMENT)

Company Assigned Application Code Number: _____

I, _____, certify that the _____

(NAME AND TITLE)

(COMPANY OR CORPORATION)

will conduct regular inspections of all MSHA approved or evaluated devices manufactured by this company/ corporation to ensure that these products are made and assembled in strict accordance with the drawings and specifications approved by MSHA.

Sincerely,

Name: _____

Title: _____

(SIGNATURE)

Enclosure E

CHECKLIST FOR INSTRUMENT APPROVAL, EXTENSION OF APPROVAL, INTRINSIC SAFETY EVALUATION OR EXTENSION OF INTRINSIC SAFETY EVALUATION

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 a complete factory inspection form (if not previously accepted), or a certified statement in lieu of a factory inspection form, and caution statement specified and included in the application package? (Sec. 18.6 (j&k))
- ___ 4. Are the placement and method of attachment of the approval marking specified? (Sec. 18.11 (b))
- ___ 5. Are all correspondence, specifications, and lettering on drawings in English? (Sec. 18.6 (1))
- ___ 6. Are all drawings and Bills of Material titled, numbered, dated, and legible? (Sec. 18.6 (e))
- ___ 7. Are there any pencil or ink notations on the drawings and Bills of Material? (Note: Pencil and ink notations are unacceptable.)
- ___ 8. Do all documents include a note "Do not change without approval of MSHA" on each page or sheet? (Sec. 18.6 (e))
- ___ 9. Do all revised drawings and Bills of Material show the latest revision and/or date? (Sec. 18.6 (e))
- ___ 10. Do all wiring diagrams showing intrinsically safe circuits include a warning statement "Any change(s) in the intrinsically safe circuitry or components may result in an unsafe condition"? (Sec. 18.6(e))
- ___ 11. Have all of the required samples been submitted?

Investigative

- ___ 1. Does the overall assembly drawing show the location of each major component?
- ___ 2. Are schematic drawings of each electrical circuit included?
- ___ 3. Are all components documented in accordance with section 5.9.9?
- ___ 4. Do the p.c. board layout drawings show the physical location of each electrical component?
- ___ 5. Are all p.c. board artwork drawings included with scaling dimensions indicated?

- ____ 6. Is a block diagram included?
- ____ 7. Is a technical description of each circuit operation included?
- ____ 8. Is a complete operator's manual on the use and maintenance of the unit included?
- ____ 9. Do the schematic diagrams clearly show which circuits must be located in fresh air or housed in an MSHA certified explosion-proof enclosure?
- ____ 10. Do the wiring diagrams clearly show which circuits must be located in fresh air or housed in an MSHA certified explosion-proof enclosure?
- ____ 11. If an explosion-proof enclosure is to be supplied by the user, are detailed installation instructions provided?
- ____ 12. Do component designations and specifications correspond between the schematic, bill of materials, and layout drawing for each circuit?
- ____ 13. Is detailed documentation of the enclosure including wall thickness, specific material, and dimensions included?
- ____ 14. Has there been any information required for a past approval removed from the documentation?

Sincerely,

(SIGNATURE)

Name: _____
Title: _____