What is the difference between intrinsically safe and flameproof equipment?

1. Introduction:

If a fault develops in a piece of electrical or electronic equipment located in an area where flammable gases are present the fault could cause heat or sparks sufficient to ignite the gas and cause a disaster. There are 2 systems in general use to prevent such happenings.

(a) Flameproofing:

The equipment is simply contained in a heavy protective enclosure, usually made of die cast steel, aluminium or GRP plastic. The heat or sparks from faulty equipment are contained within the enclosure.

    Advantage - simple to design the system
    Disadvantage - equipment becomes extremely heavy & expensive

(b) Intrinsically Safe:

This approach limits the energy available to the equipment by means of a zenner barrier in such a way that under no circumstance will the equipment be able to generate sufficient heat or sparks to ignite flammable gases. Both the equipment and the zenner barrier must be certified 'intrinsically safe' by BASEEFA or a similar authority.

    Advantage - considerably cheaper than flameproofing, no special cabling required
    Disadvantage - only suitable for low power equipment
        e.g. sounders, beacons and smoke detectors (which must be certified Intrinsically Safe)

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2. FLAME PROOF (BASEEFA or equivalent Exd certified equipment)

i. The terms 'explosion proof' and 'flameproof' are interchangeable

ii. Any system employing Exd rated equipment must use flameproof cabling e.g. MICC cable, and the cable MUST be terminated using flameproof glands and junction boxes. The glands and junction boxes must be approved by BASEEFA (or other European equivalent) and be rated Exd.

3. INTRINSICALLY SAFE EQUIPMENT (BASEEFA or equivalent Ex ia or Ex ib certified)

i. Here safety in hazardous areas is achieved by using a zenner barrier situated between the control panel and the device e.g. the Clifford and Snell YO5 ISA or YO4 ISA sounders, or Apollo Series 60 I.S. smoke detectors. The basic circuit is as shown:

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SAFE AREA          HAZARDOUS AREA

Control Panel

+VC

-VC

I.S safety barrier

sounder, beacon or smoke detector or other I.S. device
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The manufacturer of the I.S. device will specify the type of I.S. safety barrier.

3. CONNECTION CABLEING REQUIREMENTS

i. The wiring employed can be of any type but limited by the capacitance and inductance specified by the detector or sounder manufacturer. Generally speaking the inductance and capacitance limits need not concern installers unless exceptionally long cable runs are likely, typically 300 metres or more.

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ii. The cabling must conform to the following requirements
   a. have protection from mechanical damage
   b. have protection from chemical attack e.g. acids etc.
   c. be securely fixed
   d. have a minimum conductor size of 0.017mm²
   e. must withstand 500V insulation test
   f. circuit voltage must not exceed 60V

iii. There are no special requirements for junction boxes used in intrinsically safe circuits

iv. The following types of cables can be used:
   a. screened instrument cable
   b. multi core signal cable (e.g. telephone cable)
      subject to certain conditions relating to screening and earthing
   c. MICC cable
   d. multi core miniature electric cables
   e. conventional cables with conventional insulating sheaf e.g. PVC with a minimum
      insulation thickness of 0.3mm.

vi. Installation of cables used in intrinsically safe circuits:

   It is usually considered good practise to separate cable trays, ducts and conduits carrying
   intrinsically safe circuits from trays and ducts carrying any other cables. E.g. telephones &
   computer cables. I.E.E. wiring regulations prohibit electrical services e.g. power and
   lighting to be carried in the same conduit.

Acknowledgements & References:
The above notes are based on extracts from MTL application AN9003 " A users guide to
Intrinsic Safety". MTL Ltd is the largest UK manufacturer of intrinsically safe zenner
barriers. We express our thanks to them in the compilation of these notes.

These notes do not form part of any offer or contract. The opinions expressed in these
notes cannot take into account all the possible circumstances of a particular installation;
the ultimate responsibility for safety must inevitably remain with the end user. If there is
any doubt at all, seek expert advice on the particular problem.