

OVERVIEW OF INDIAN HAZARDOUS LOCATION SYSTEM

By B K Gupta

This paper is being presented to project overview of Hazardous Location system as prevailing at present in India. The Indian system for the manufacture, certification, installation, use & inspection of Hazardous Location equipments (called as Ex Equipments) is a complex topic. In an attempt to understand this system, we will go through the role of various parts of the system involved as listed below.

1. Product Code
2. Product Testing & Certification
3. Product Quality Control
4. Acts & Rules
5. Product Installation & maintenance
6. Interface Issues

PRODUCT CODE

Bureau of Indian Standards (BIS) is the National code laying body in India. The role of BIS code in Indian Hazardous location system is to cover all the aspects relating to Area Classification, equipment construction, testing, selection, installation & maintenance of Ex equipments. IEC is the international body for code laying. NEC takes up this role in USA & CENELEC in Europe. Wide part of world including India accepts these international codes for Ex Equipments of imported origin.

At present, various BIS codes pertaining to Ex equipments are very old. Although many of these codes are based on IEC, BS & VDE standards prevailing at the time of adoption of these codes, they have not undergone changes in spite of the fact that reference codes (i.e. IEC, BS & VDE) themselves have undergone changes many times since then. EU countries have adopted CENELEC codes, which are identical to IEC as CENELEC & IEC have cooperation agreement for harmonization of standards. This has led to the situation where BIS codes are not at par with International codes like IEC/ CENELEC. Due to this Ex equipments of Indian origin are not acceptable in International market.

In this era of globalization this situation is ringing death bell for Indian Manufacturers. With removal of negative list for import of items, no non-tariff barrier is possible under GATT regime & Indian Industry has to be ready for global competition. Relevance of small-scale industry is lost, as they have to compete with global players having mass production base. Only option left for Indian industry is to produce world-class goods conforming to International standards & compete with global players not only on home turf but in International Market also.

Let us see, what IEC says about importance of International Standards. It says, "IEC's International Standards facilitate world trade by, effectively, removing technical barriers to trade, leading to new markets and economic growth. Put simply, a component or system manufactured to IEC standards and manufactured in country A can be sold & used in countries B through Z."

Due to non-adoption of IEC codes, Indian manufacturers & users of Ex equipments are at disadvantage vis-à-vis International manufacturers & users. Two prominent examples being:

1. IEC permits use of Increased Safety equipments in Group II Zone 1 locations whereas BIS does not permit this & restricts its use in Group II Zone 2 only. This stipulation covers major Ex equipments like luminaries, motors & terminal housing.
2. IEC permits type testing of Exd IIC equipments like Exd IIA & IIB equipments whereas BIS requires batch testing.

Above stipulation leads to:

1. Multiple inventory & related cost as International manufacturer is manufacturing only Exd IIC equipments to be used in Group II Zone 1 area, whereas Indian manufacturers are forced to make Exd IIC and Exd IIA&IIB equipments separately.
2. Exd IIC equipments are not available readily & additional cost to users due to batch testing. Additional cost is due to testing fee, transportation charges on material to & fro from manufacturer's works to testing lab & related overheads.
3. Additional cost to users due to use of Exd equipments in place of Exe equipments in Zone 1.

It has been a practice for BIS to align BIS codes with IEC codes. One of the prominent & closely related example being IS 5780: 2002, which is identical to IEC 60079-11: 1999 for Electrical Apparatus for explosive gas atmospheres – Intrinsic safety 'I'-specification. BIS as representative of INDIA is a participating member to IEC Committee no TC31 responsible for preparation of IEC codes for Ex equipments.

In view of above, it is essential that remaining BIS codes/standards pertaining to Ex equipments be modified so as to bring them in line with relevant IEC codes/standards by adopting identical codes to IEC as in case of IS 5780 above. This would ensure acceptability of Indian products at par with international products & shall also remove above cited dis-advantage to Indian manufacturers.

I am happy to note that due to strong stand taken by IFMA in the matter, following decisions have been taken in recently held ET22 committee meeting (held on 8 May 2003 at BIS, Mumbai).

A. To adopt following IEC code as Indian Standards without any change.

1. IEC 60079-0 – Electrical Apparatus for explosive gas atmospheres –Part 0- General Requirement
2. IEC 60079-1- Electrical Apparatus for explosive gas atmospheres – Part 1- Flameproof Enclosure “d”
3. IEC 60079-1-1 Electrical Apparatus for explosive gas atmospheres –Part 1-1 Flameproof Enclosure “d”- Method of test for ascertainment of maximum experimental safe gap
4. IEC 60079-2 – Electrical Apparatus for explosive gas atmospheres –Part 2- Pressurized Enclosure “p”
5. IEC 60079-2 – Electrical Apparatus for explosive gas atmospheres –Part 5- Powder filling “q”
6. IEC 60079-2 – Electrical Apparatus for explosive gas atmospheres –Part 6- Oil Immersion “o”
7. IEC 60079-7- Electrical Apparatus for explosive gas atmospheres –Part 7- Increased Safety “e”
8. IEC 60079-15 –Electrical Apparatus for explosive gas atmospheres –Part 15- Type of protection “n”
9. IEC 60079-18- Electrical Apparatus for explosive gas atmospheres –Part 18- Encapsulation “m”
10. IEC 62013-1 –Cap lights for use in mines susceptible to fire damp- Part 1- General Requirement- Construction and testing in relation to the risk of explosion
11. IEC 62013-2 –Cap lights for use in mines susceptible to fire damp-Part 1- Performance & other safety related matters

B. Batch testing of IIC apparatus will not be required.

However adoption of IEC codes is taking a long time due to procedural formalities of circulation of draft codes for comments and approval in ET 22 meeting, which is held with long gap of around one year.

There is no logic in the said procedure as IEC codes are to be adopted without any change for bringing Indian Standards at par with IEC codes. It will be appropriate to reprint all the IEC codes as Indian standards without loss of time. It is illogical to review IEC codes after adoption by IEC as it has already been scrutinized, commented, discussed & adopted with full consent of BIS. The role of ET 22 should be to review draft IEC codes/ proposals before it is voted at IEC. The BIS should represent the recommendation of ET 22 regarding draft IEC/ proposals in IEC for discussion & adoption.

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Once the IEC code is revised & adopted, it should be adopted as BIS standard (without any change) thus bringing Indian Standards at par with International Standards.

A list of prevailing IS codes & IEC codes are enclosed in Annexure A.

Product Testing & Certification

Central Mining Research Institute (CMRI), Dhanbad, Central Power Research Institute (CPRI), Bangalore & ERTL, Kolkata has product testing & certification facilities for Ex equipments. UL & FM in USA, CSA in Canada and EECS, PTB and many more agencies in Europe have testing & certification facility.

IEC gives recognition to Ex Testing Laboratories (ExTL) for testing & certification of Ex equipments under IECEx scheme. This scheme will be dealt in more detail under next heading of product quality control.

It is essential that all the above test labs (CMRI, CPRI & ERTL) get the recognition from IEC as ExTL under IECEx scheme, so that products tested & certified by them will have International acceptability.

Product quality control

BIS is entrusted with powers to license manufacturers for Quality Mark for Ex equipments and is governed by provisions of the Bureau of Indian Standards Act 1986. However only Exd Group I, IIA & IIB and Exi Ex equipments are covered under Quality mark and Exd Group IIC or other type of Ex equipments are not covered under Quality mark scheme by BIS.

BIS mark is notified as mandatory for Exd Group I equipments for use in coalmines under clause 157(4) of Coalmines regulations vide Chief Inspector of Mines Circular No 22 of 1966 dated 23.4.1966. (This information is as per BIS website). It is interesting to note that regulation 157(4) of Coal Mines regulation 1957 refers to glass of a safety lamp & it has nothing to do with type of Ex equipments required. It is not understood as to how BIS mark can be mandated under this clause. BIS mark is optional for Exd IIA & IIB and is not available for Exd IIC and other types of Ex equipments.

The aim of ISO 9000 QMS certification is to make products & services acceptable in all countries on the basis of a single assessment & approval in any one country. ISO 9000 QMS certification creates confidence among potential customers that certified manufacturer could meet their quality requirements. ISO 9000 QMS certification being internationally recognized, the certified firm's product quality has world-wide acceptance. Products manufactured by Indian manufacturers conforming to International Standards under ISO 9000 Quality Management System Certification shall make their products acceptable in International Market. ISO 9000 QMS certification is being used for quality control of Ex equipments in EU under ATEX directive. ISO 9000 is prerequisite for quality control under IECEx scheme.

Scheme of Testing & Inspection of flameproof enclosures of electrical apparatus according to IS 2148 (Document No STI/2148/6 July 1997) with reference to quality control states that efforts should be made to gradually introduce a quality management system in accordance with the quality system modules as per IS/ ISO 9002 or IS/ ISO 9003 as appropriate to the activities of the organization.

ISO 9000 QMS certification should be given preference over BIS Mark as ISO 9000 has world wide recognition & secondly it covers full range of Ex equipments conforming to Indian & International Standards, whereas BIS mark covers only Exd type of Ex equipments conforming to Indian Standard.

Manufacturers in USA are normally having UL mark. UL is an independent body framing product standards, testing & certifying product to these codes and allow manufacturer to use UL mark and ensure quality control by way of surveillance.

Manufacturers in Europe normally have CE as quality mark. CE marking is manufacturers claim that the product meets the requirement of EU directives. ISO 9000 QMS certification from accredited QMS certifiers is one of the options for production control under ATEX directive to achieve CE marking.

Manufacturers in UK have option of being covered by Conformity Assurance Programme (CAP) by EECS. Under this scheme their production quality assurance system is assessed for conformity with the EECS quality assurance schedule based on ISO 9002. A license is issued for BASEEFA mark following satisfactory assessment and is maintained subject to the results of periodic audit of the system & product sample.

CMRI, CPRI & ERTL should also start Conformity Assurance Programme based on ISO 9002 like EECS. With setting up of Quality Council of India, India now has its own accreditation agency, which is recognized world over. Accreditation from Quality Council of India for such services is possible & can be utilized by these certification agencies.

IEC facilitates the IECEx certification scheme for Ex equipments. The objective of the scheme is use of one international certificate & mark accepted by all participating countries. It gives recognition to Accepted Certification Bodies (ACB) who controls use of IECEx mark by manufacturers.

For adoption of IECEx, it will be necessary for CMRI, CPRI & ERTL to take steps to become ExTL as brought out in earlier para as also ACB. Internationally there is concept of segregation of Code laying & Quality control body e.g. in UK, BSI is code-laying body and EECS & SIRA Certification services are ExTL & ACB. Similarly in India BIS is code laying body & CMRI, CPRI & ERTL should become ExTL & ACB.

In view of above, the manufacturer should have option for BIS mark or ISO 9000 QMS certification for Product quality control immediately & option of Conformity Assurance Programme or IECEx, when implemented. This step will ensure International acceptability of Indian manufactured Ex equipments.

In spite of concerted & continuous efforts of IFMA, no headway has been made in this field due to non-cooperation of BIS. The matter was discussed threadbare in all India review meeting of BIS licensees of IS2148 & IS5780 but BIS is neither listening nor taking any action in the matter.

Acts & Rules

Factories Act 1948

Statutory Authority: Director General of Factory Advice & Labour Institute, Mumbai

Installation of Ex equipments in Factories is governed by Factories Act 1948. Chief Inspector of Factories is a statutory authority entrusted to enforce this Act. However, DGFASLI is granting product approval for Ex equipments, although there is no such provision in Factories Act.

In view of several difficulties being faced for product approval from DGFASLI, non-cooperation of them regarding simplification of product approval despite representation by Industry association (IFMA) & in view of the fact that they do not have any power for product approval under Factories Act, 1948, all the manufacturers have stopped applying to DGFASLI for product approval wef July'2001.

The Petroleum Act 1934 & The Petroleum Rules 2002
Statutory Authority: Chief Controller of Explosives, Nagpur

Installation of Ex equipments in areas producing, refining, blending, storage of petroleum is governed by The Petroleum act 1934 & Petroleum Rules 2002. Chief Controller of Explosives (CCOE) is a statutory authority entrusted to enforce these acts & rules.

The Petroleum Rules 2002 stipulates types of Ex equipments, which can be used in Hazardous areas with approval of CCOE in writing (Refer rule 106). The approval has been further elaborated as “ Where applied to an appliance or fitting bears a label of a designated test organization certifying conformity with a specification approved by the Chief Controller or with a laboratory test report accepted by the Chief Controller” (Refer rule 2). The essence of the rule is that for Indian Manufacturer the approval shall be granted based on Test report, of CMRI & such other Test organization, which are approved by CCOE, certifying product to be in conformity with BIS Codes, or such other specification approved by CCOE. For Foreign manufacturer it means that approval shall be granted based on Test report, of such Test organizations, which are approved by CCOE, certifying product to be in conformity with such specification approved by CCOE.

In view of above, the CCOE approval of Ex equipments should be automatic for products having certificate in conformity to Standards (A list may be circulated by CCOE, this may include BIS/ IEC / EN / UL/ NEC for both Indian & foreign Manufacturers) from Test organization (A list may be circulated, this may include CMRI, CPRI, ERTL & any lab in India approved by NABL, EECS, PTB etc).

However, at present product approval for IIA&IIB equipments are granted by CCOE based on Test certificate & BIS License. Product approval for Ex d IIC is granted based on batch test certificate but without BIS license because BIS license does not cover Ex d IIC apparatus. For other type of Ex equipments, CCOE grants approval based on test certificate as BIS Mark scheme is not available. This discriminatory practice is applicable to Indian Manufacturers only. CCOE is granting approval to Ex equipments of foreign origin based on test certificate only. As per petroleum rules the approval is to be granted based on test certificate only, however in spite of several representation from IFMA, CCOE is continuing with its discriminatory practice.

IFMA is of the view that essence of rules is to prevent use of unsuitable equipments from safety point of view, CCOE has converted this to enforce his powers in approving suitable equipments. As BIS code is already available for selection & use of Ex equipments in all types of Hazardous location, this exercise is unnecessary. The rules should refer to concerned BIS code for selection of Ex equipments rather than giving discretionary powers to statutory authority, which invariably causes practical problems to the Industry by way of cumbersome procedures for approval. As far as check on quality is concerned CCOE can specify that Ex equipments shall be BIS Marked or IEC Ex or produced by manufacturer under ISO 9000 QMS certification or under Conformity Assurance Programme.

The Coal Mines Regulation 1957 & Oil Mines Regulation 1984
Statutory Authority: Director General of Mines Safety, Dhanbad

Under coalmines regulations 1957, it is specified “In every gassy seam of the second or third degree, only flameproof electrical apparatus & equipments shall be used below ground unless otherwise provided for under the Indian Electricity Rules, 1956.” This rule was inserted by GSR 32 Dated 14.12.1978. (Refer rule 181-2)

Under the Oil Mines Regulations, 1984 (Rule 75-2) Chief Inspector of Mines has been empowered to grant product approval for Ex equipments to be used in Zone 1 & 2.

Although essence of rules is to prevent use of unsuitable equipments from safety point of view, DGMS has converted this to enforce his powers in approving suitable equipments. As BIS code is already available for selection & use of Ex equipments in all types of Hazardous location, this exercise is unnecessary. The rules should refer to concerned BIS code for selection of Ex equipments rather than giving discretionary powers to statutory authority, which invariably causes practical problems to the Industry by way of cumbersome procedures for approval.

In the instance case, DGMS is granting approval for field-testing & after successful testing & receipt of field trial report from users is granting product approval. For granting field test approval re-testing from CMRI is required. Whereas certificates issued by CMRI are valid without any time limit. Thus there is no reason why retesting is required by DGMS for granting approval for field-testing.

Wherever, products of a particular manufacturer is already under use in a mine, even without DGMS approval, there is no reason why field-testing is required, as product performance in field is already established.

Group II apparatus of various manufacturers are operating satisfactorily in Installation under CCOE jurisdiction. The performance certificate of it should be acceptable to DGMS for granting approval under Oil Mines regulation. As Plant & installations are of similar nature, there is only difference in Statutory Authority.

In view of above, DGMS should refer to related BIS code for selection of Ex equipments in Mines area both Coal and Oil Mines and allow use of such Ex equipments. As far as check on quality is concerned DGMS can specify that Ex equipments shall be BIS Marked or IEC Ex or produced by manufacturer under ISO 9000 QMS certification or under Conformity Assurance Programme.

Product Installation & maintenance

Users are dependent on consultants to a large extent for implementation of new projects or major expansion & modification. They rely on their in-house expertise for maintenance needs. BIS has already issued guides/ codes of practice for selection, installation & maintenance of Ex equipments as under:

IS 9559-1980: Guide for selection of electrical & electronic equipments for coalmines

IS 4051-1967: Code of practice for installation & maintenance of electrical equipments in mines.

IS 13408 (Part 1)- 1992: Code of practice for selection, installation & maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining application or explosives processing & manufacture)

Approval of installation of Ex equipment from statutory authority i.e. DGFASLI, CCOE & DGMS is a major task for the users. Comprehensive guidelines need to be issued by BIS laying down all the requirement & procedures in respect of all the statutory authorities for approval of installation of Ex equipments.

BIS should also issue recommended practice for Technical audit of Ex equipment installation & maintenance by third party inspection agencies in consultation with user industries, statutory authorities, third party inspection agencies & manufacturers. Statutory authorities should grant approval based on report of inspection & recommendation for approval of installation from third party inspection agencies having ISO 9000 accreditation for rendering such services. This will promote self-regulation by Industry & expedite statutory approvals.

Interface Issues

During ET 22 meeting held on 20.3.2002, due to procedural constraints no points other than code laying was discussed. A co-ordination meeting convened by CMRI having representatives from Statutory authorities, BIS, Testing Labs, Consultants, Users & manufacturers to discuss various interface issues was held on 26.7.2002. All the interface issues related with Codes, Type examination, Quality Control & Statutory approvals were discussed threadbare. There was a consensus to form a co-ordination committee having representation from statutory authorities, BIS, Testing Labs, Consultants, Users & Manufacturers with CMRI as convener to hold meetings regularly to sort out interface issues. However there is no further progress in the matter in spite of relentless efforts of IFMA in this direction.

Conclusion/ Recommendation

Product Codes

- IEC Codes should be reprinted as dual numbered (IEC/IS) Indian Standards.
- Role of ET 22 should be to examine & comment on draft IEC codes. BIS in TC 31 of IEC should represent these comments.

Product Testing & Certification

- Indian Test Labs (CMRI, CPRI, ERTL) should become ExTL under IECEX scheme.

Product Quality Control

- ISO 9000 QMS certification should be accepted for product quality control.
- Indian Labs should implement Quality mark scheme in line with BASEEFA / MECS Mark given by EECS in UK.
- Indian Labs should implement IECEX by becoming ExTL & ACB

Acts & Rules

DGFASLI

- DGFASLI should confirm to Industries Association (IFMA) that they do not have power for product approval.

DGMS

- Oil Mines Regulations 1984 & Coal Mines Regulations 1957 should be amended to stipulate that BIS Codes should be referred for selection & use of Ex equipments thus dispensing with product approval.
- Till this amendment is effected, DGMS should give approval based on CMRI certificate plus quality control (Option to manufacturers: Any one of these - ISO 9000, BIS Mark, Quality Mark by testing labs, IECEX)

CCOE

- Petroleum Rules 2002 should be amended to stipulate that BIS Codes should be referred for selection & use of Ex equipments thus dispensing with product approval.
- Till this amendment is effected, CCOE should give approval based on CMRI certificate plus quality control (Option to manufacturers: Any one of these - ISO 9000, BIS Mark, Quality Mark by testing labs, IECEX)

Product Installation & maintenance

- Recommended code of practice for installation & maintenance needs to be strengthened.
- Guidelines for statutory approval of Installations needs to be streamlined & third party certifiers need to be given due role in this to obtain self regulation free from bureaucratic control.

Interface Issues

- The co-ordination committee to be formed for resolving interface issues needs to be supported by Statutory authorities, BIS, Testing Labs, Consultants, Users, Manufacturer & Third Party certifiers by active participation & acceptance/ implementation of its recommendations for benefit of all.

B K Gupta
Area Manager, Ex-Protecta
Consultant to IFMA
President, ISA-Patalganga Section
Member ET 22 & 24 Committee of BIS

Tel 022-7579071 Telefax 022-7575832 email b_gupta@vsnl.com

Useful links

ISO- <http://www.iso.ch/> IEC- <http://www.iec.ch/> CENELEC- <http://cenelec.org>
 UL-<http://www.ul.com> BSI- <http://www.bsi-global.com> BASEEFA- <http://www.baseefa.com>
 DNV- <http://www.dnvsea.com> Quality Council of India- <http://qcin.org>
 BIS-<http://www.bis.org.in> ILAC-<http://www.ilac.org> IATCA-<http://www.iatca.com>