

Protection Concepts Overview

Proper installation of bus networks in hazardous areas is critical to fully realize cost savings and improve plant safety. Below is a summary of the protection concepts suitable for networking applications to aid in selecting the optimal

methodology for your requirements. Before making a final decision in hazardous area conformance methodologies, please consult with your local inspection authority.

Protection Concepts

	Protection Concept	Brief Description	Applicable Areas
pages 16-17	Explosion/Flame Proof Ex	<ul style="list-style-type: none"> Contain ignition inside conduit system. Cool vented gases to prevent ignition outside containment vessel. 	NEC - Class I & II, Division 1 & 2 IEC - Ex d, Zone 1 & 2
pages 18-19	Nonincendive Equipment NIE	<ul style="list-style-type: none"> Nonincendive equipment must not create arcs or sparks or must have arcing components contained in an hermetically sealed chamber. Nonincendive equipment must not have surface temperatures exceeding vapor-air or dust-air ignition temperatures. 	NEC - Class I & II, Division 2 IEC - Ex nA, Zone 2 Ex nC, Zone 2
pages 20-21	Tray Cabling Tr Cbl	<ul style="list-style-type: none"> Current and voltage limited power supplies. Cabling is rated for ITC and/or PLTC and supported by cable tray or with special mechanical means. IEC allows elastomeric and thermoplastic sheathed cable. 	NEC - Class I & II, Division 2 IEC - Ex n, Zone 2
pages 22-23, 28	Nonincendive Wiring Drops & Associated Apparatus NIW	<ul style="list-style-type: none"> PLTC/ITC systems (above) may be combined with nonincendive field wiring. Nonincendive field wiring and associated apparatus are not capable, under normal operation, of igniting the gas, vapor or dust-air mixture under normal conditions. Normal conditions include opening, shorting or grounding the field wiring. Energy storage in nonincendive wiring associated apparatus must be limited and coordinated with nonincendive current and voltage limiting device. 	NEC - Class I & II, Division 2 IEC - Ex nL, Zone 2
pages 24-27	Intrinsically Safe IS	<ul style="list-style-type: none"> Prevents ignition of gas, vapor or dust-air mixture under normal and abnormal conditions. Energy limited into circuits under fault conditions by barriers. Potential inductive and capacitive energy in circuit components must be limited and coordinated with barrier. Fieldbus intrinsically safe concept (FISCO) allows more flexibility and higher energy levels in bus networks. 	NEC - Class I & II, Division 1 & 2 IEC - Ex ia, Zone 0, 1 & 2 Ex ib, Zone 1 & 2

Hazardous Area Protection Concepts

PROTECTION CONCEPTS	DIVISION 1 AREAS		DIVISION 2 AREAS
	ZONE 0	ZONE 1	ZONE 2
Ex		●	●
NIE			●
Tr Cbl			●
NIW			●
IS ia	●	●	●
IS ib		●	●

Fieldbus Protocols	Segment Power Availability	Enclosure Requirements	Conduit/Cabling Requirements	Cost Analysis/Comments
All	Not Limited	Explosion Proof/Flameproof Housing with Approvals	<ul style="list-style-type: none"> Rigid metal conduit MI (Mineral Insulated, Metal Sheathed) or MC (Metal Clad) where flexibility required Sealing components for all enclosures (except those with special ratings) 	Wiring costs are high. However, number of devices per segment is maximized holding down installation cost per device. Device power must be removed for maintenance. Seal components must be used if removing individual device from network.
All	Not Limited	<ul style="list-style-type: none"> Nema 4/IP54 Enclosures with Nonincendive Component Approvals IP54 or better with Ex nA or Ex nC component ratings 	<ul style="list-style-type: none"> Rigid metal conduit MI, MC or Liquidtight Flexible conduit IEC allows thermoplastic or elastomeric sheathed cable 	Wiring costs are moderate and number of devices per segment is maximized, dramatically reducing installed cost per device. Devices may be opened under power but power must be removed before manipulating wiring. Field devices may be removed without sealing off remainder of network.
All	<ul style="list-style-type: none"> PLTC: 100 watts or 3.3 Amps @ 30VDC ITC: may be up to 5 Amps IEC cable maybe up 6 Amps 	<ul style="list-style-type: none"> Same as Nonincendive Equipment or Explosion Proof Compression fitting may be used on enclosures with terminations for ITC or PLTC cable 	<ul style="list-style-type: none"> PLTC or ITC in Cable Tray PLTC or ITC as open wiring up to 15m (50 ft) protected by angles, struts or messenger wire. MC Flexible conduit or Liquidtight where flexibility is required. No restrictions on IEC 	Wiring costs are low. Number of devices per segment is typically not limited, resulting in very low installed cost per device. Current limited power supplies are required for PLTC and ITC.
<ul style="list-style-type: none"> AS-Interface Foundation Fieldbus H1 Profibus PA 	<ul style="list-style-type: none"> Typically up to 100mA @ 30VDC 	<ul style="list-style-type: none"> Nema 4/IP54 with Nonincendive Wiring Associated Apparatus Approvals IP 54 with Ex nL energy limited components per entity or FNICO 	<ul style="list-style-type: none"> General purpose cabling IEC cabling less restrictive 	Wiring costs are very low. Voltage and current limiting are required with "entity" parameters coordinated with field devices. Installed device cost is very low. Field device wiring may be manipulated and devices removed without dropping power.
<ul style="list-style-type: none"> Foundation Fieldbus H1 Profibus PA 	<ul style="list-style-type: none"> Typically up to 100mA @ 24VDC with FISCO method 	<ul style="list-style-type: none"> Nema 4/IP54 Enclosure with Intrinsically Safe Apparatus approvals IP 54 with Ex ib or ia rated components per entity or FISCO 	<ul style="list-style-type: none"> General purpose cabling 	Wiring costs are low. However, number of devices per segment is typically a maximum of 4 to 6 (Power Delivery Limitations) and IS barriers are required for each segment resulting in higher installation costs per device.

Optimize Protection Concepts to Reduce Costs and Increase Safety

Different protection concepts may be used in the plant's hazardous areas to improve the communication network's performance. For example in a zone 2 area tray cabling may be used for the bus trunk and nonincendive field wiring and associated apparatus used for each individual drop. The trunk, which is rarely disconnected, carries up to 5 amps with the individual drops limited to less than 100mA for safety and wiring flexibility. See the "Protection Concepts" section (pages 16 to 29) to review common protection combinations used for communication networks in hazardous areas.

