VALVE AUTOMATION & INTERLOCK SYSTEMS

COKING.COM SEMINAR 2009

VELAN

VELAN CORPORATE PROFILE

- Velan was founded in 1950
- We manufacture in 16 plants worldwide
- Our current work force is in excess of 1700 employees
- We manufacture Cast and Forged Steel Ball, Gate, Globe and Check valves in sizes 1/4 – 72”
- Velan is an ISO 9001 accredited company
  - It is approved by ASME to design and manufacture to NCA 4000 under their Nuclear program
  - TUV for design and manufacture to the German pressure vessel code TRB 801, No. 45
- Velan has maintained a technical group completely dedicated to Coker Valve technology for the past 21 years

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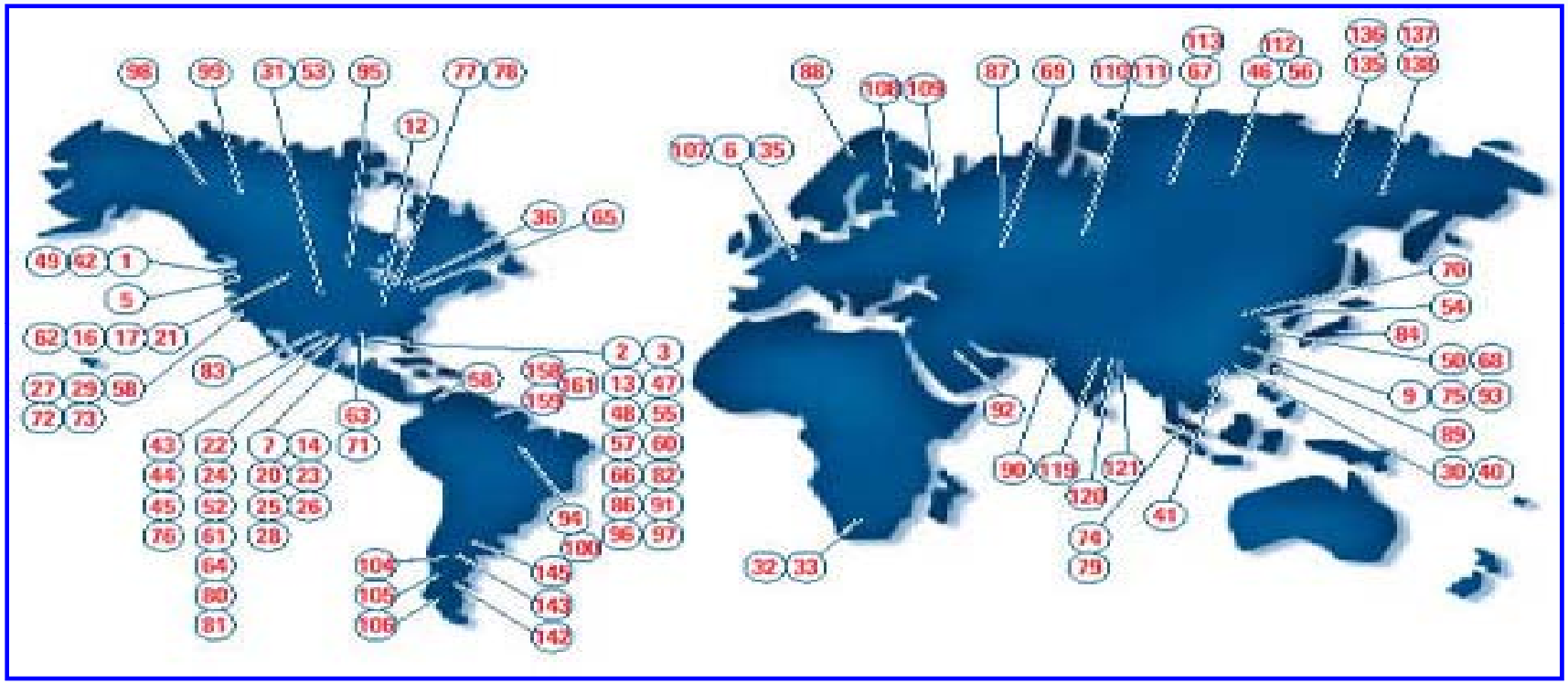
INSTALLED IN OVER 110 DELAYED COKERS WORLDWIDE

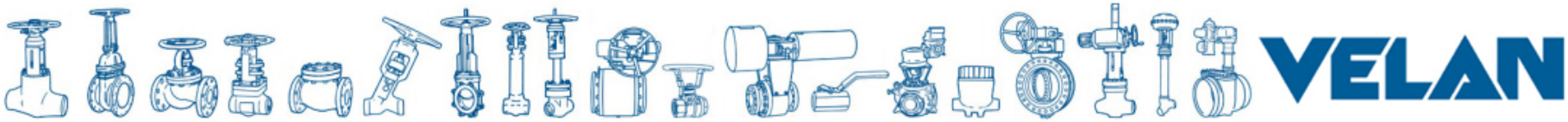


NORTH AMERICA...38 COKERS

SOUTH AMERICA...17 COKERS

ASIA...49 COKERS

EUROPE... 14 COKERS



COKER VALVE AUTOMATION HISTORY

1983 - Velan installs its first electrically operated Switch Valve in the USA
1984 – Velan installs its first hard wired Panel complete with Switch and Inlet Iso Interlocks
1998 – Velan installs its first diagnostics package on a 2- wire loop
2001 - Velan installs its first PLC driven Interlock system
2003 – Velan installs local disconnects switches to prevent spurious Valve movement
2004 – Velan incorporates remote starters into its control loop
2005 – Velan incorporates a disconnect switch without cutting power to the control circuits
2007 - Velan supplies its first intrinsically safe PLC driven control Panel system
2008 - Velan starts working on an SIL 3 rated unit for a Coker in Europe

CURRENT LIST OF CONTROL PANEL INSTALLATIONS

LOCATION	NUMBER OF DELAYED COKER FACILITIES	QT'Y OF PANELS	DIAG-NOSTICS	PLC	Intrinsic Safety
North America	21	111		1	
ASIA	46	197	5	1	
EUROPE	5	17	3	2	2
SOUTH AMERICA	14	185	5	1	
TOTAL	86	510	13	5	2

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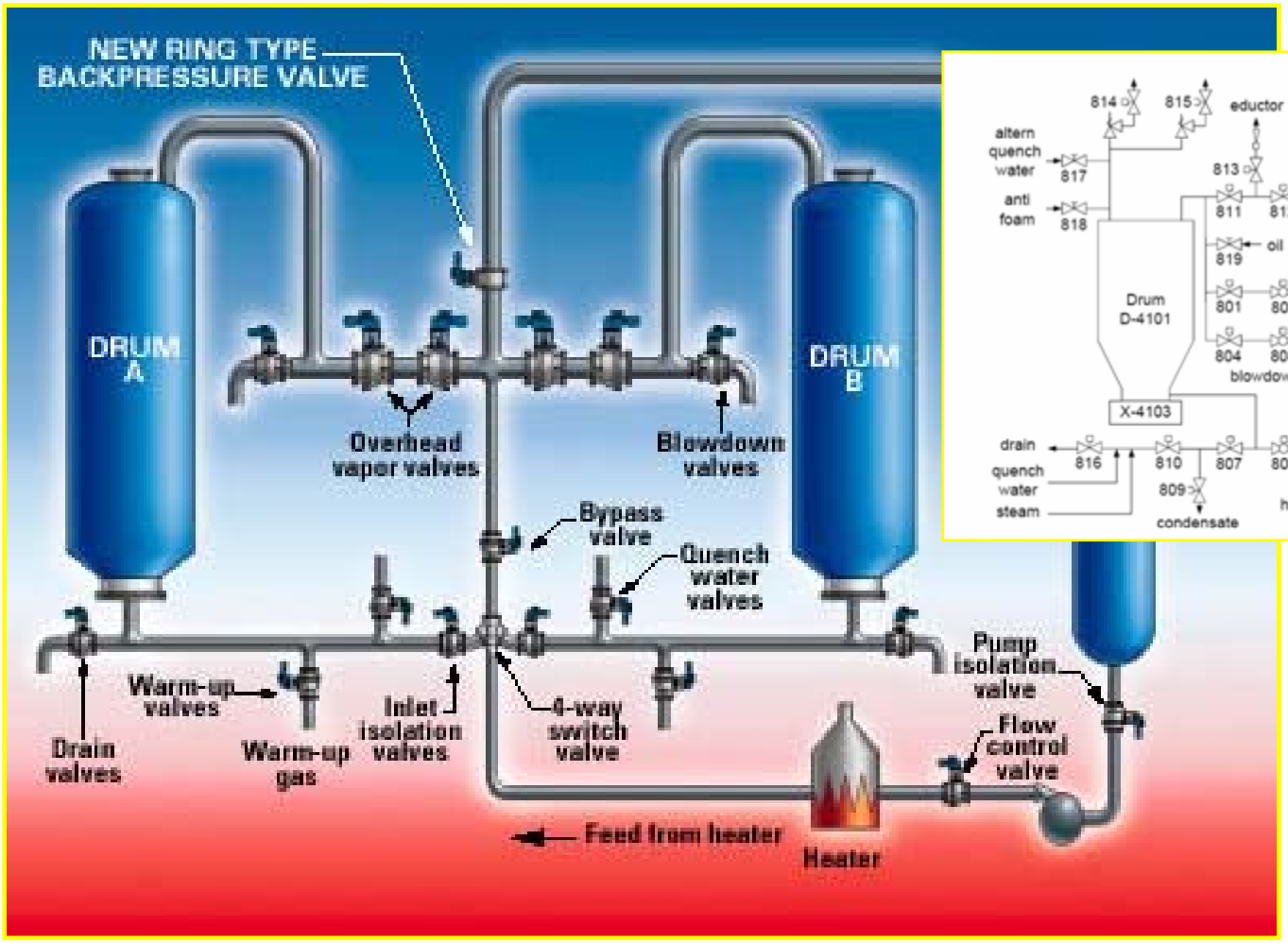
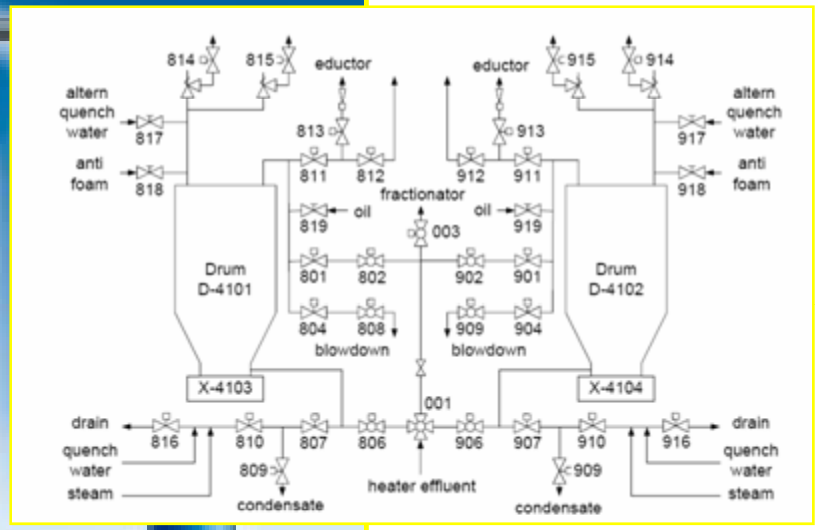
TYPICAL COKER VALVE LAYOUT





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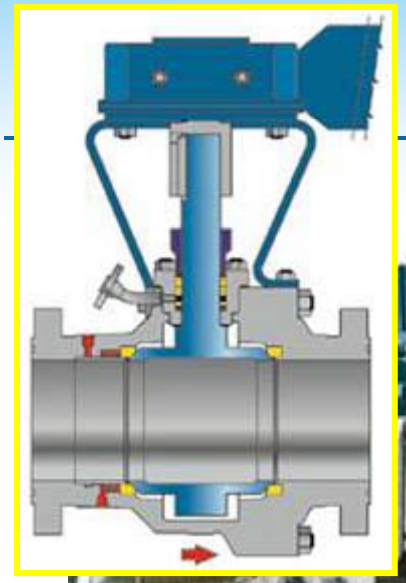
ISOLATION VALVES FOR DELAYED COKER SERVICE



1. INLET TRANSFER LINES (6-18”, CL.300-600-900)
2. QUENCH & DRAIN (3-14”, CL.300-600-900)
3. BYPASS (3-18”, CL.300-600-900)
4. OVERHEAD VAPOR (14-36”,CL.150-300)
5. BLOWDOWN (14-36”,CL.150-300)
6. BACKPRESSURE CONTROL
7. HEATER ISOLATION

OVER 1700 VALVES INSTALLED IN DELAYED COKERS WORLDWIDE

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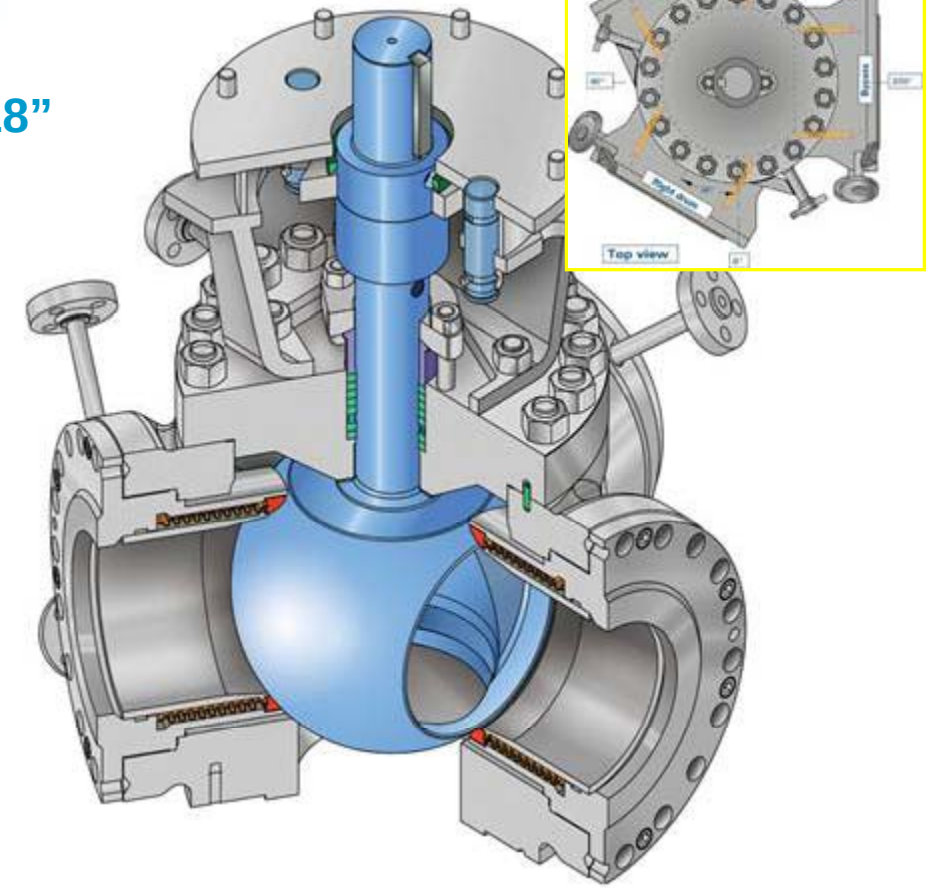
4 WAY SWITCH VALVE

6 – 18”



APPROXIMATELY 90% OF THE VALVES WE SUPPLY ARE ELECTRICALLY OPERATED

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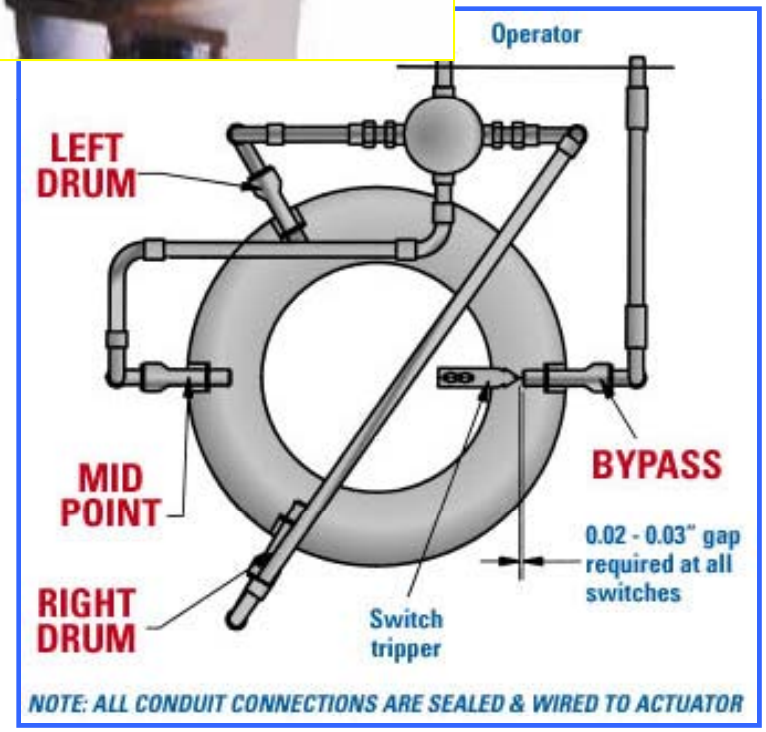
POSITION INDICATION



- Positive Positioning For Local and Remote Indication
- Typically 3 – 4 – 6 – 8 Position Indication Provided
- Positive indication directly from the stem
- Class 1, Div 1 or CENELEC Explosive Proof Construction
- Signal available for local panel and/or remote DCS location
- Signal redundancy available

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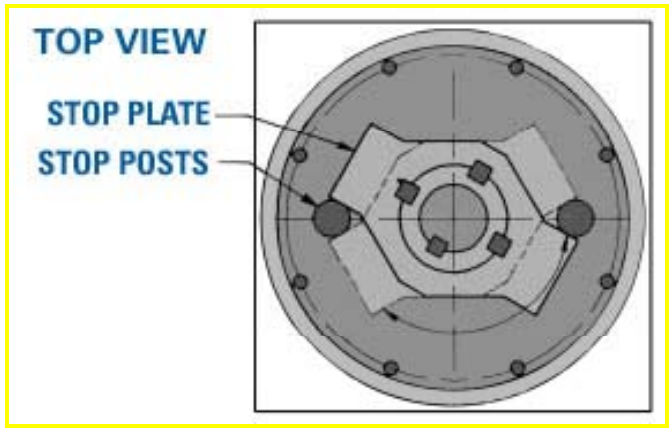
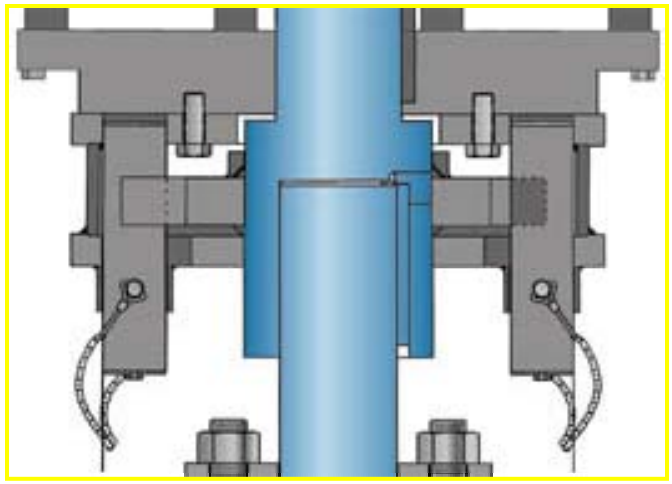
INTEGRAL MECHANICAL STOPS



- Will yield before stem is damaged
- Dissipates Process Heat: protects actuator lubrication
- Jammer Plate mechanically stops accidental switch to bypass
- Pins are easily removed to allow switch to bypass



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TYPICAL ACTUATOR REQUIREMENTS

- OVER 90% OF THE ACTUATORS WE SUPPLY ARE ELECTRIC
- ACTUATORS ARE EXPLOSION PROOF; CLASS 1, DIV 1 OR 2
- ACTUATORS ARE SUPPLIED WITH MANUAL OVERRIDES WHICH ARE PADLOCKABLE
- M.O. CAN BE SUPPLIED WITH AN OPERATING NUT TO FACILITATE PNEUMATIC WRENCH OPERATION
- ACTUATORS ARE SUPPLIED WITH A LOCAL PB STATION FOR LOCAL OPERATION

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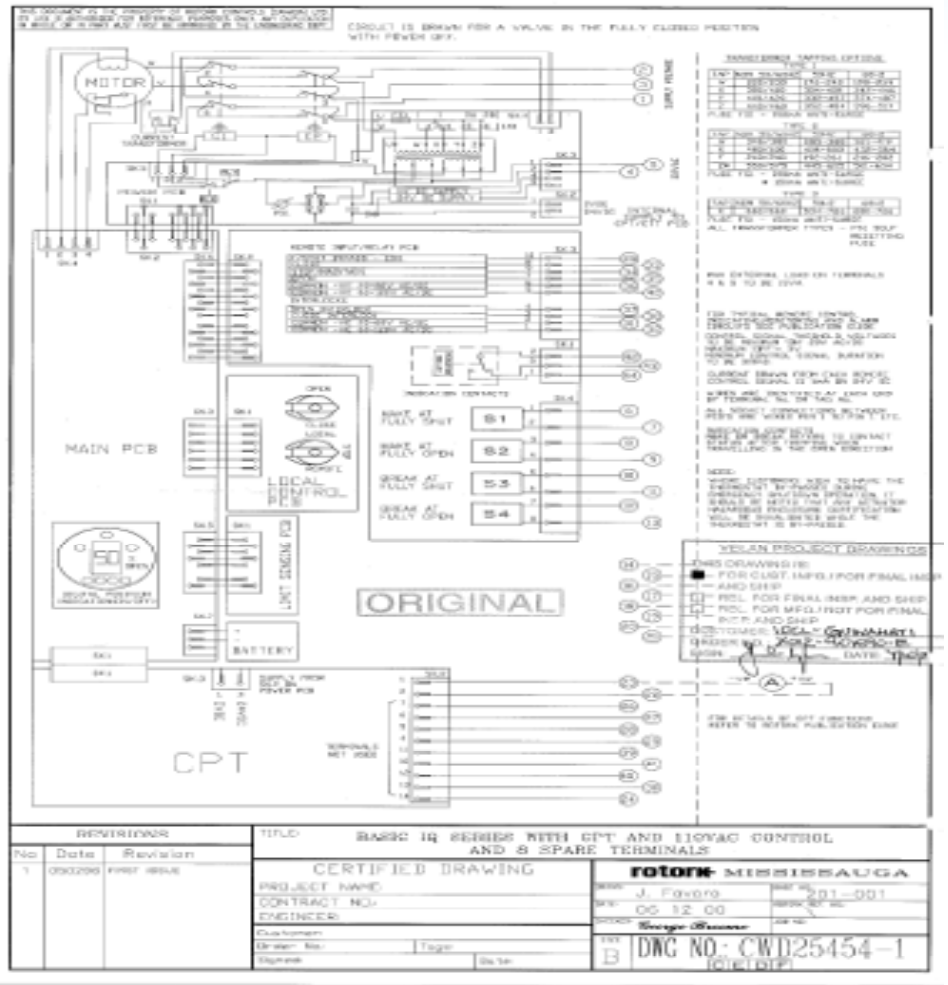
TYPICAL ELECTRIC ACTUATOR WIRING



- **ACTUATOR WIRING ALLOWS END USER TO CUT POWER LOCALLY OR REMOTELY TO INSURE THAT THERE IS NO POSSIBILITY FOR SPURIOUS MOVEMENT OF THE VALVES.**

- **SEPARATE CONTROL CIRCUIT ALLOWS FOR THE CONTINUITY OF STATUS SIGNALS AND DIAGNOSTICS DESPITE CUTTING MAIN POWER TO THE UNIT.**

- **POWER MAY BE CUT OFF FROM THE DECK, LOCAL PANEL OR THE CONTROL ROOM.**

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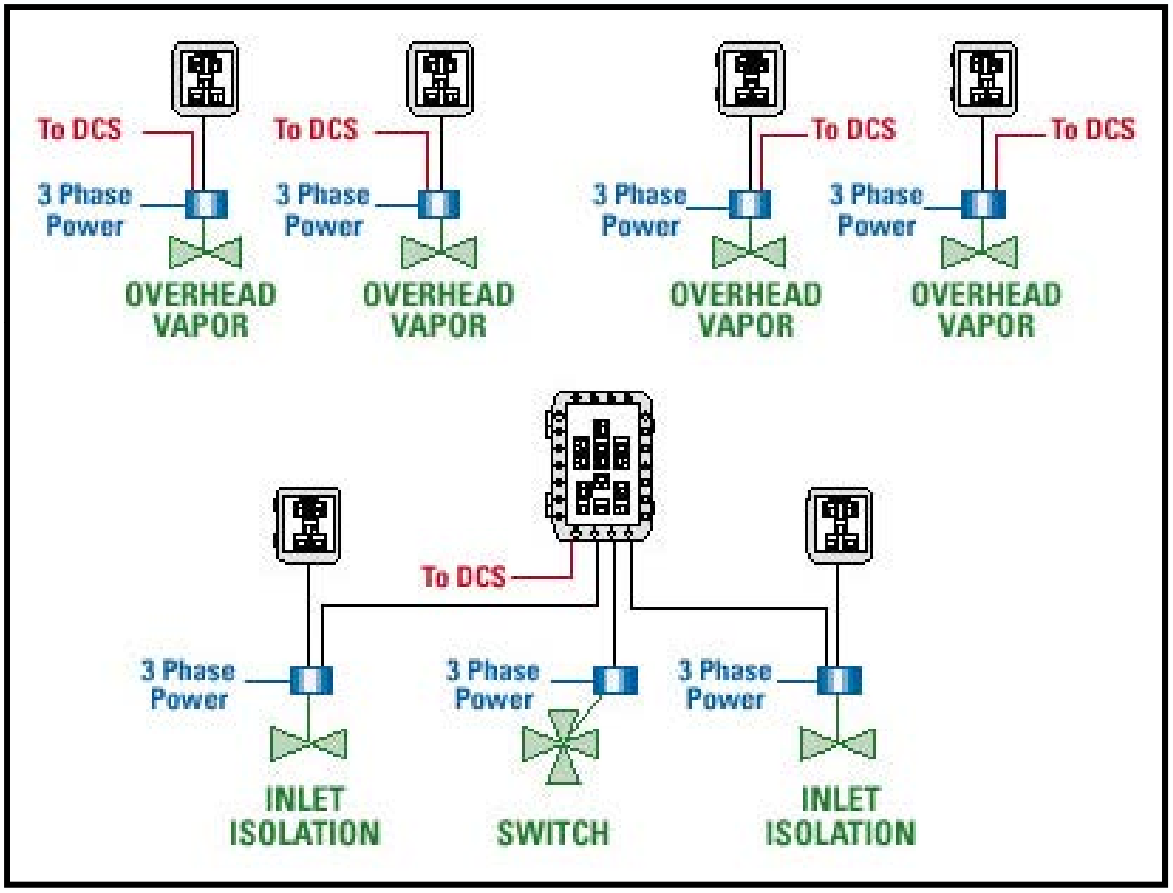
TYPICAL HARD WIRED CONTROL PANEL LAYOUT



- **Panels are Harwired and powered by the Actuator.**
- **Panels are used for (a) Very Basic Interlocking of Valves and (b) Easier access to the Valves by the operator**
- **Relays send signal back to DCS**
- **Panels are typically Explosion Proof; Class 1 Div 1 or 2 or CENELEC**
- **Interlocks are fairly basic due to the limitations on space**
- **Signals are internal from actuator or proximity type**

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EXAMPLES OF CONTROL PANELS

Classification: Class 1 Div 1, Class 1 Div 2, Class 1 Zone 1, Class 1 Zone 2
Certifications: IEC, CE, CSA, UL, ATEX, CELENEC, IEC

- **Push Buttons**
  - Open, Close, Stop
  - Signal to others
- **Selector Switch**
  - Bypass ON/OFF
  - Mid Point ON/OFF
  - Other Permissives
- **Light status**
  - Opened, Closed, MOVs
  - Permissives, Interlocks
  - Alarms
- **Analog Signals**
  - Drum Pressure
  - Drum Temperature
  - Valve Position
  - Valve Torque

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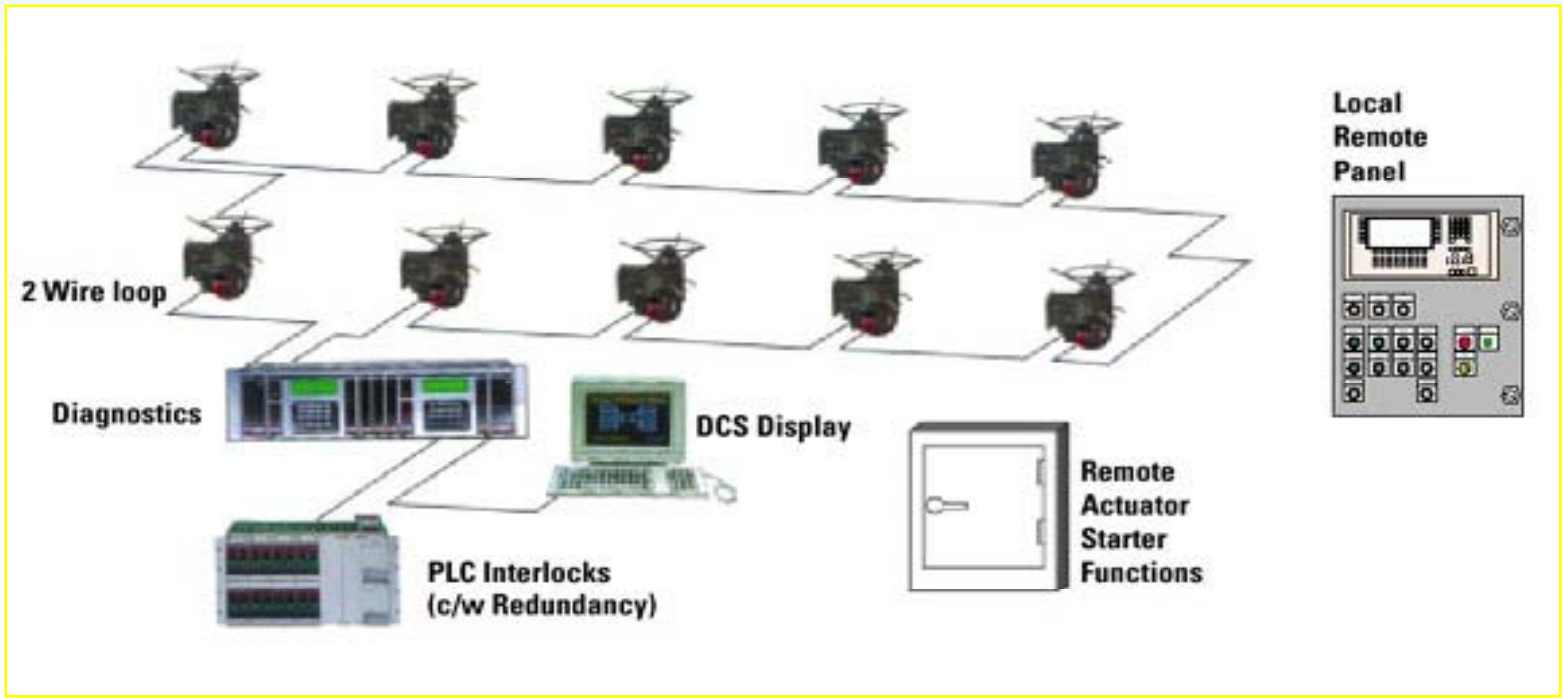
TYPICAL 2-WIRE LOOP LAYOUT



- **PROVIDES VALVE DIAGNOSTICS**
- **Valve Status/ Torque Feedback**
- **Monitors Faults**
- **Can be included as part of signal redundancy**

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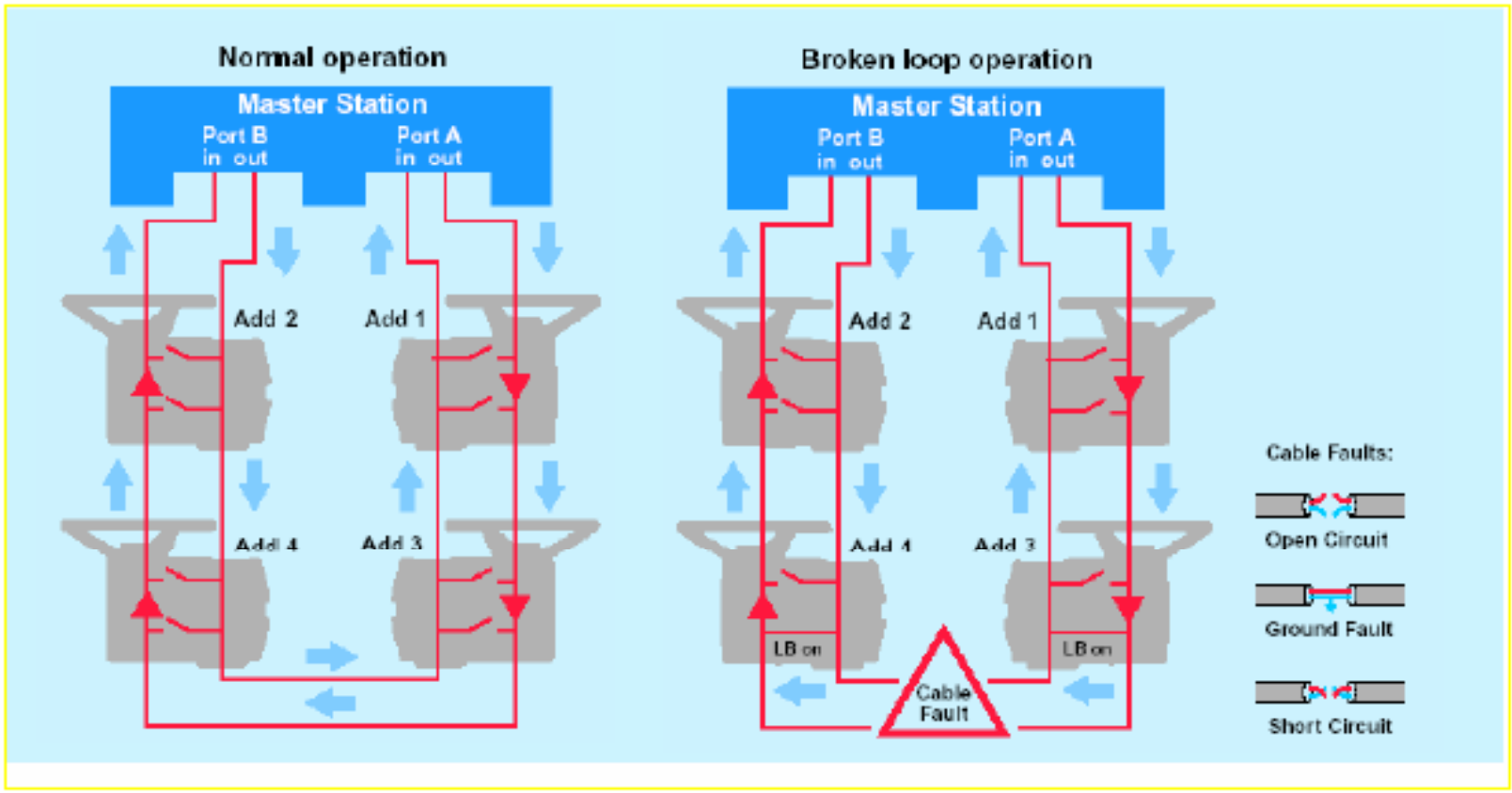

2 WIRE LOOP LAYOUT

TYPICAL PLC DRIVEN INTERLOCK SYSTEM

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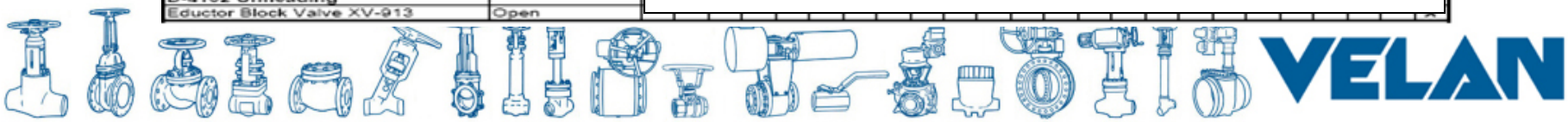
TYPICAL INTERLOCK SYSTEM

INTERLOCK MATRIX		PSV Outlet Block XV-814 Opened	PSV Outlet Block XV-815 Opened	Vent Valve XV-811 Closed	Vent Valve XV-812 Closed	Eductor Block Valve XV-813 Closed	Alternate Quench Water Valve HV-819 (by oth Closed	Switch Valve XV-001 D-4102/Bypass	Secondary Utility Manifold XV-810 Closed	Main Utility Manifold XV-807 Closed	Inlet Isolation Valve XV-806 Opened	Fractionator Valve XV-801 Opened	Fractionator Valve XV-802 Opened	Blowdown Valve XV-804 Closed	Blowdown Valve XV-808 Closed	Switch Valve XV-001 D-4101/Bypass	Coke Condensate Valve XV-909 Closed	Inlet Isolation Valve XV-906 Closed	Blowdown Valve XV-904 Closed	Blowdown Valve XV-908 Closed	Antifoam Isolation Valve HV-917 (by others) Closed	Quench Oil Isolation Valve HV-918 (by others) Closed	Vent Valve XV-911 Opened	Vent Valve XV-912 Opened	Top Unheading Device X-4106 (by others) Opened
DRUM A	PERMISSIVES																							
ACTIONS																								
D-4101 Pressure Test & Warmup																								
Eductor Block Valve XV-813	Close																							
PSV Outlet Block XV-814	Open																							
PSV Outlet Block XV-815	Open																							
Vent Valve XV-811	Close																							
Vent Valve XV-812	Close																							
Secondary Utility Manifold XV-810	Close																							
Blowdown Valve XV-804	Open																							
Blowdown Valve XV-808	Open																							
Fractionator Valve XV-801	Open																							
Fractionator Valve XV-802	Open																							
Coke Condensate Valve XV-909	Open																							
Switch from D-4102 to D-4101																								
Main Utility Manifold XV-807	Close																							
Inlet Isolation Valve XV-806	Open																							
Switch Valve XV-001	D-4102 to D-410																							
Inlet Isolation Valve XV-906	Close																							
Coke Condensate Valve XV-909	Close																							
Secondary Utility Manifold XV-910	Open																							
Main Utility Manifold XV-907	Open																							
D-4102 Switch to Blowdown																								
Blowdown Valve XV-904	Open																							
Blowdown Valve XV-908	Open																							
Fractionator Valve XV-901	Close																							
Fractionator Valve XV-902	Close																							
D-4102 Vent & Drain																								
Blowdown Valve XV-904	Close																							
Blowdown Valve XV-908	Close																							
Vent Valve XV-911	Open																							
Vent Valve XV-912	Open																							
PSV Outlet Block XV-914	Close																							
PSV Outlet Block XV-915	Close																							
D-4102 Unheading																								
Eductor Block Valve XV-913	Open																							



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TYPICAL PLC REQUIREMENTS

- CONTROL OF INTERLOCK & PERMISSIVES
- REDUNDANCY
  - POWER
  - PROCESSOR
  - I/O
  - INTRINCICALLY SAFE SIGNALS

- HMI SCREEN FOR SYSTEM MONITORING
- DCS COMMUNICATION & HANDSHAKING

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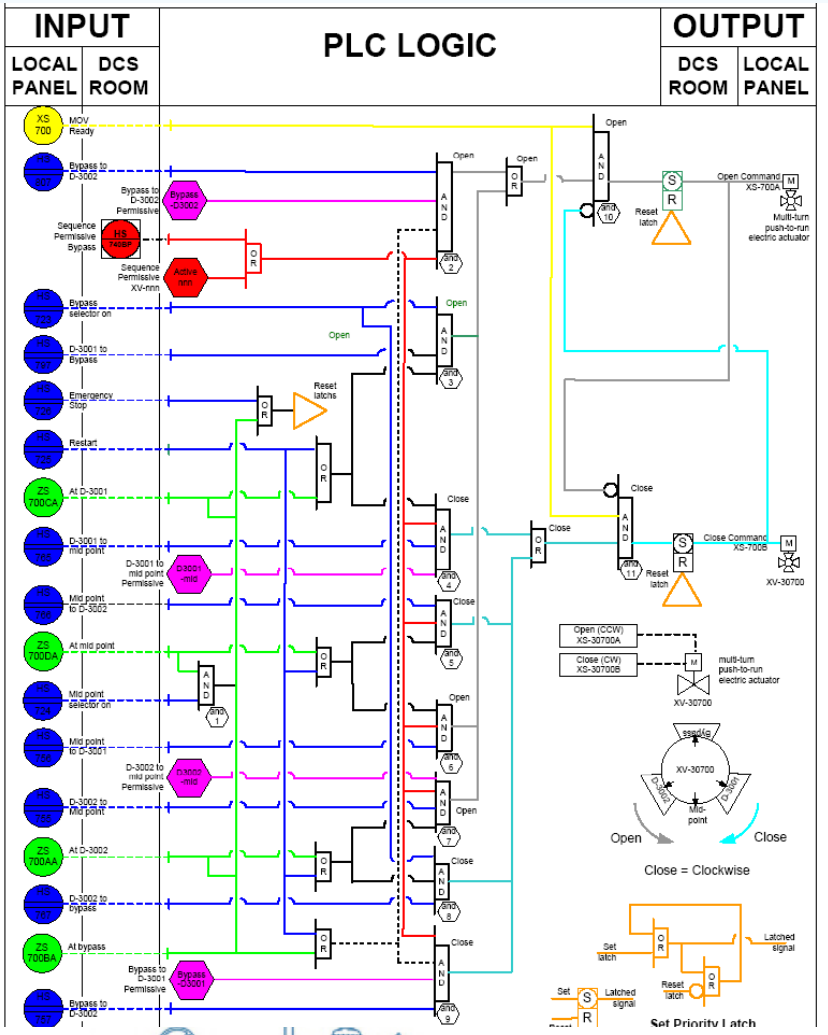
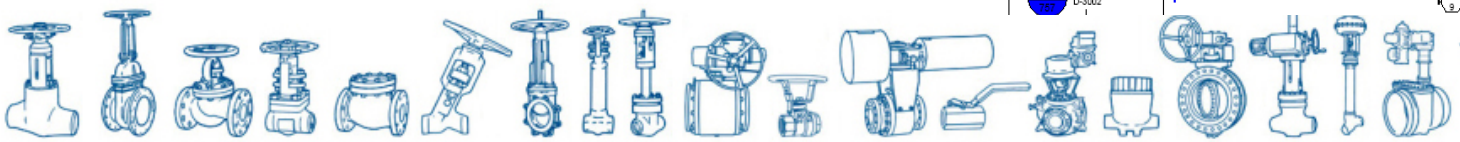
TYPICAL SYSTEM ARCHITECTURE

- **SWITCH VALVE ARCHITECTURE**

- **COMBINATORY LOGIC LEGEND:**
  - SEQUENCE PERMISSIVES
  - INTERLOCK PERMISSIVE
  - MOV READY
  - PHYSICAL POSITIONS
  - BUTTONS
  - RESET COMMAND
  - OPEN COMMAND
  - CLOSE COMMAND





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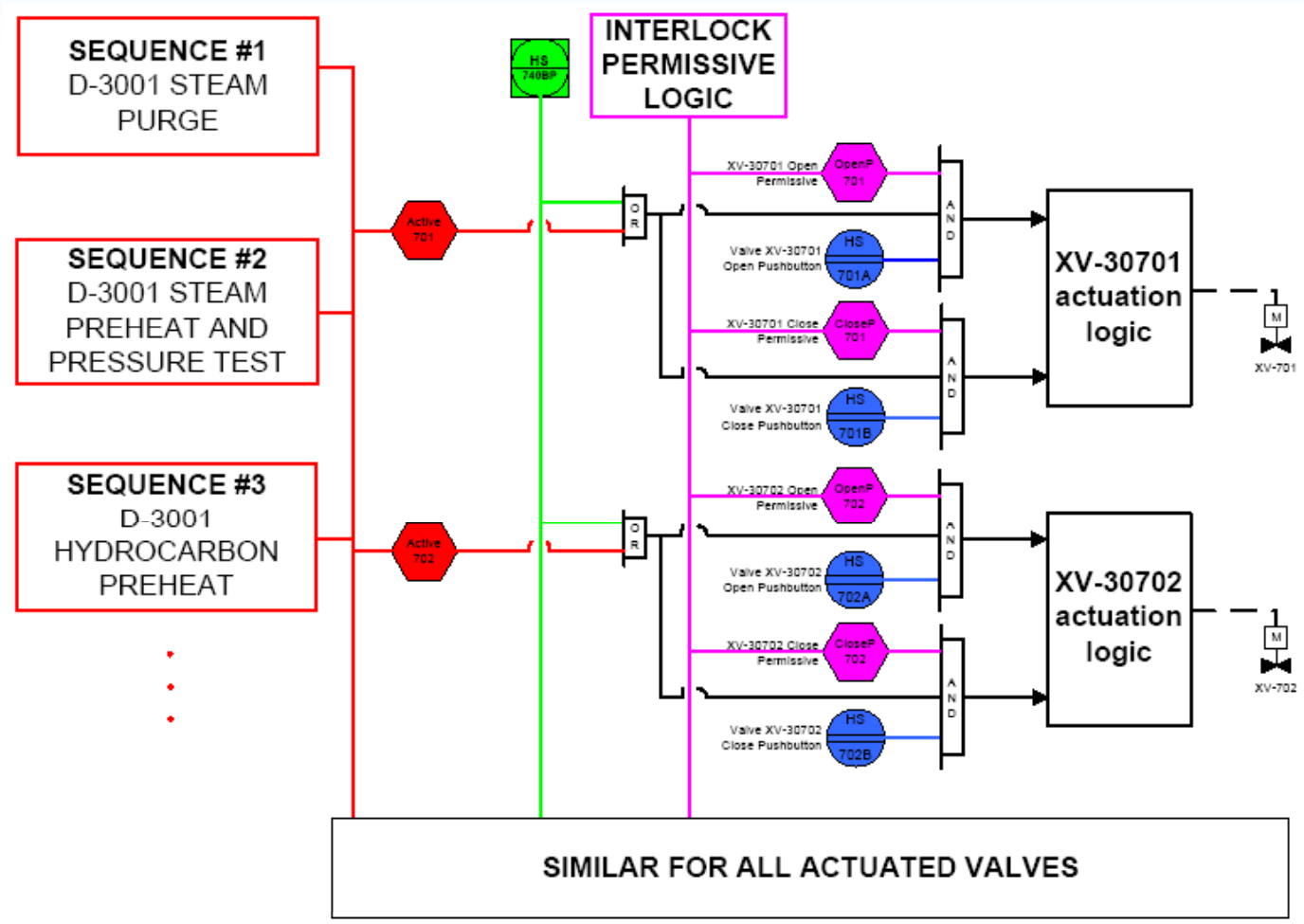
TYPICAL SYSTEM ARCHITECTURE

- **SEQUENCE PERMISSIVE ACTUATION**
- **OPEN/CLOSE INTERLOCK PERMISSIVE**
- **SEQUENCE PERMISSIVE OVERWRITE**
- **BUTTON OPEN/CLOSE**



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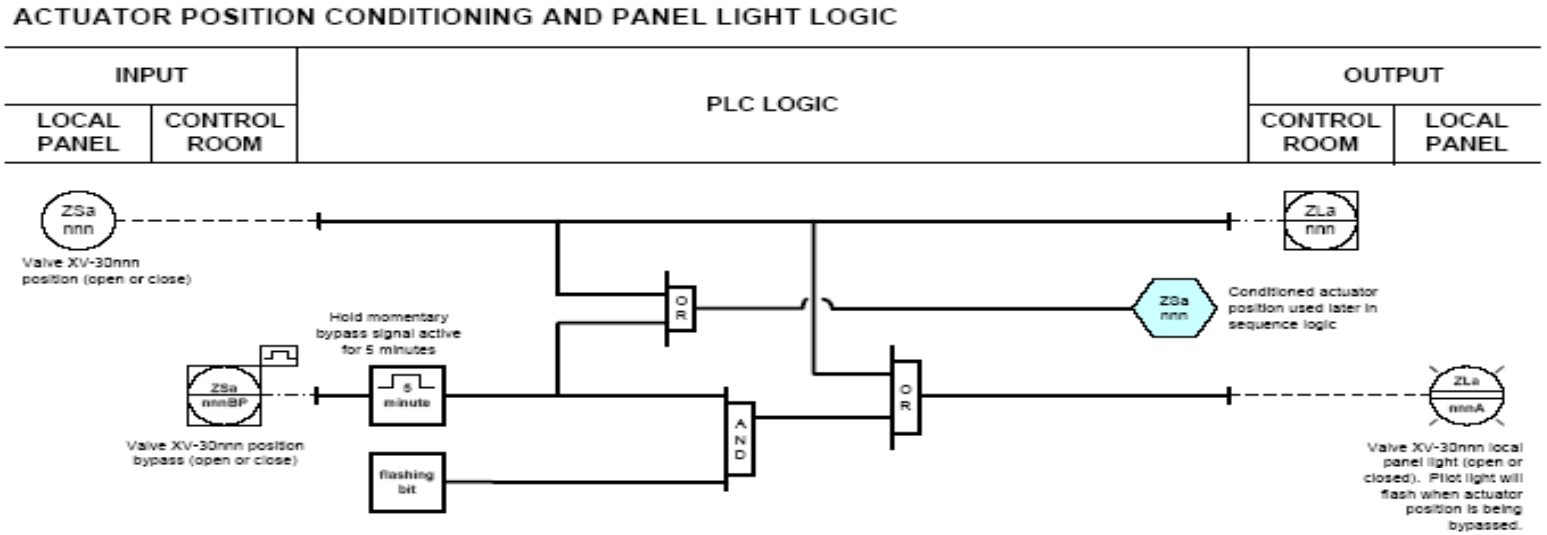
PERMISSIVE OVERRIDE

ACTUATOR POSITION CONDITIONING AND PANEL LIGHT LOGIC



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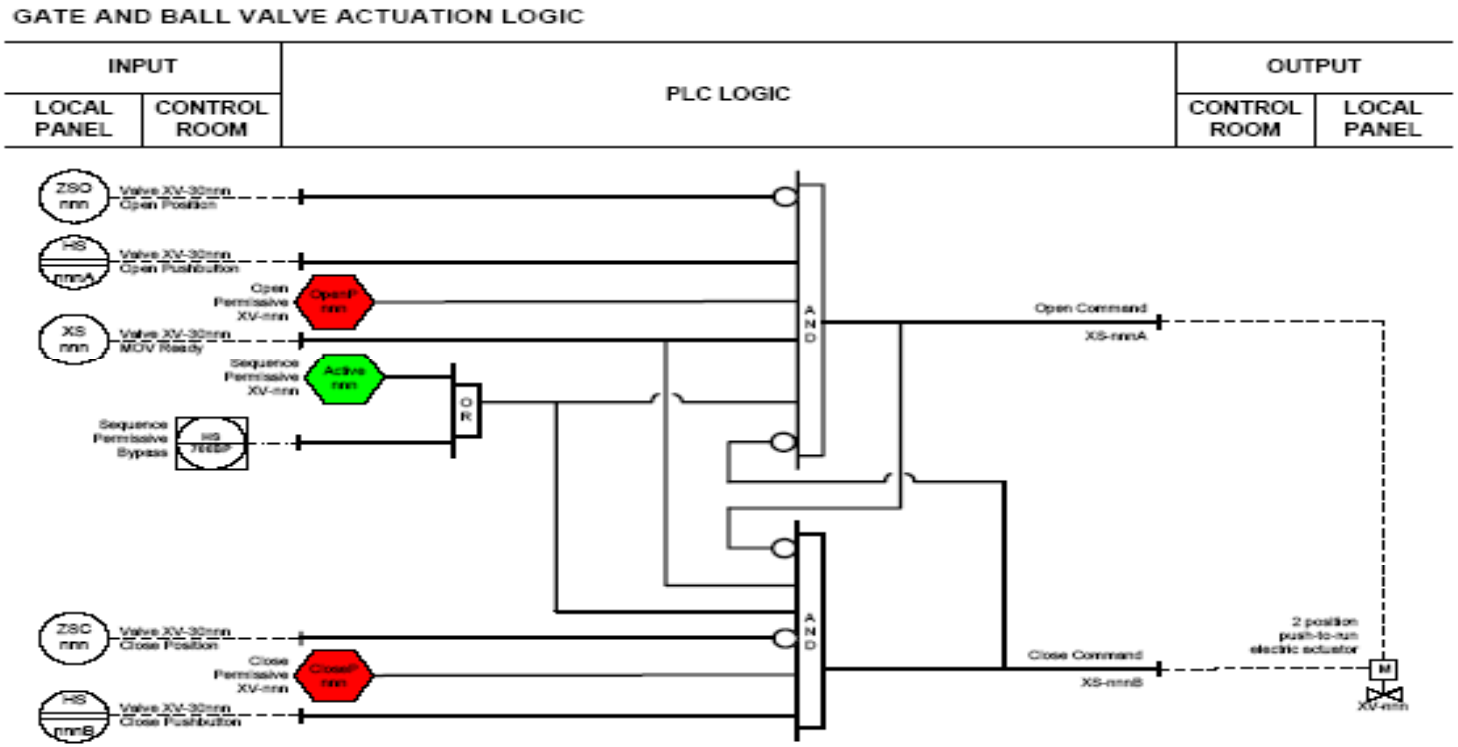
BASIC LOGIC LAYOUT

GATE AND BALL VALVE ACTUATION LOGIC



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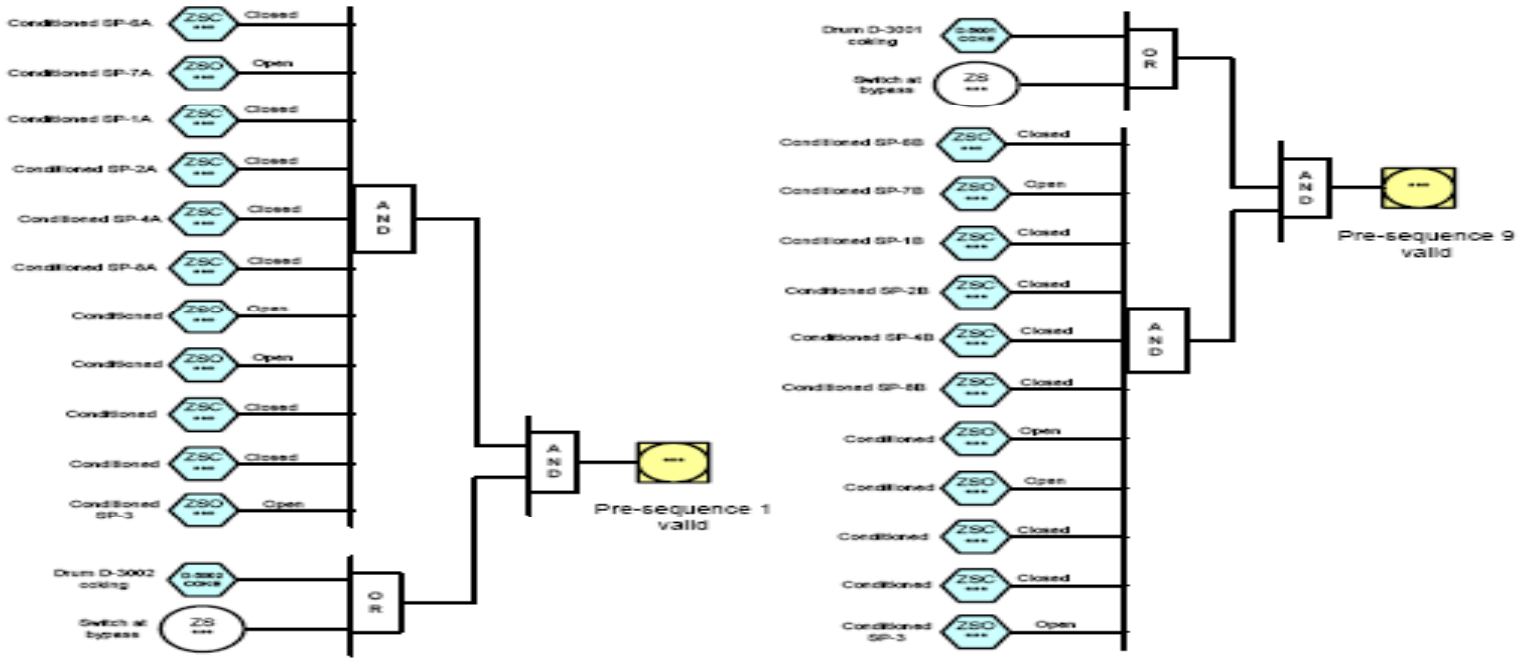
PRE INITIATION SEQUENCE

PRE-SEQUENCE VALVE POSITION VALIDATION



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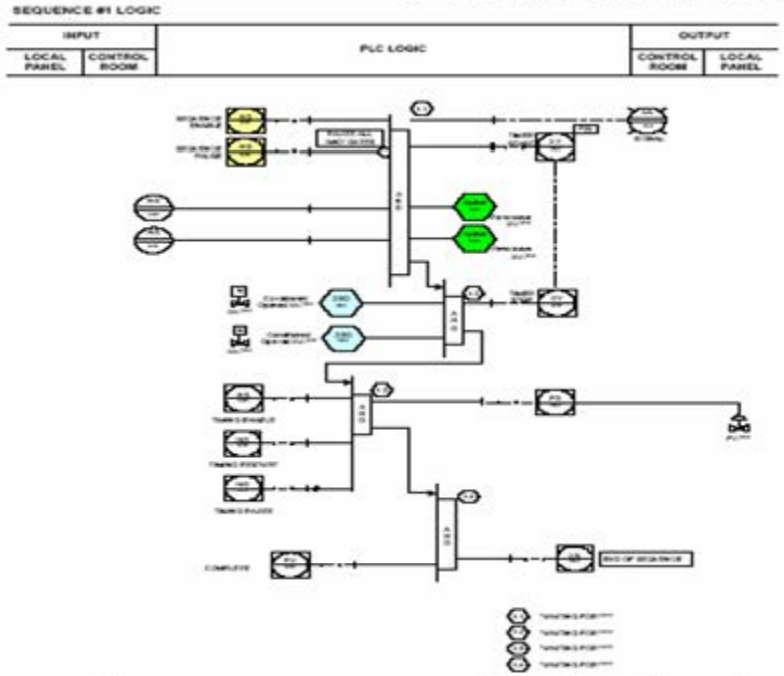
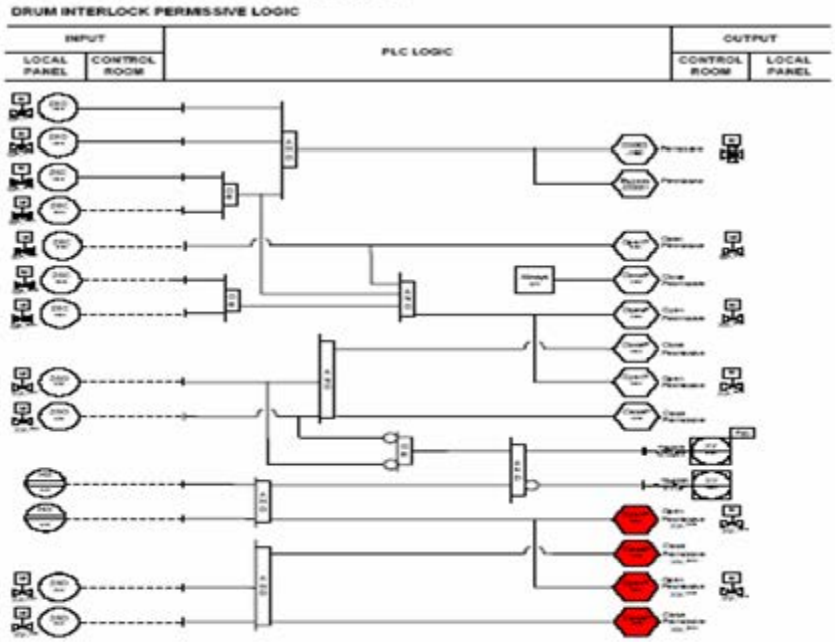
LOGIC LAYERS

SEQUENCE AND INTERLOCK PERMISSIVE LOGIC



Sequence permissive logic



Safeguard permissive logic

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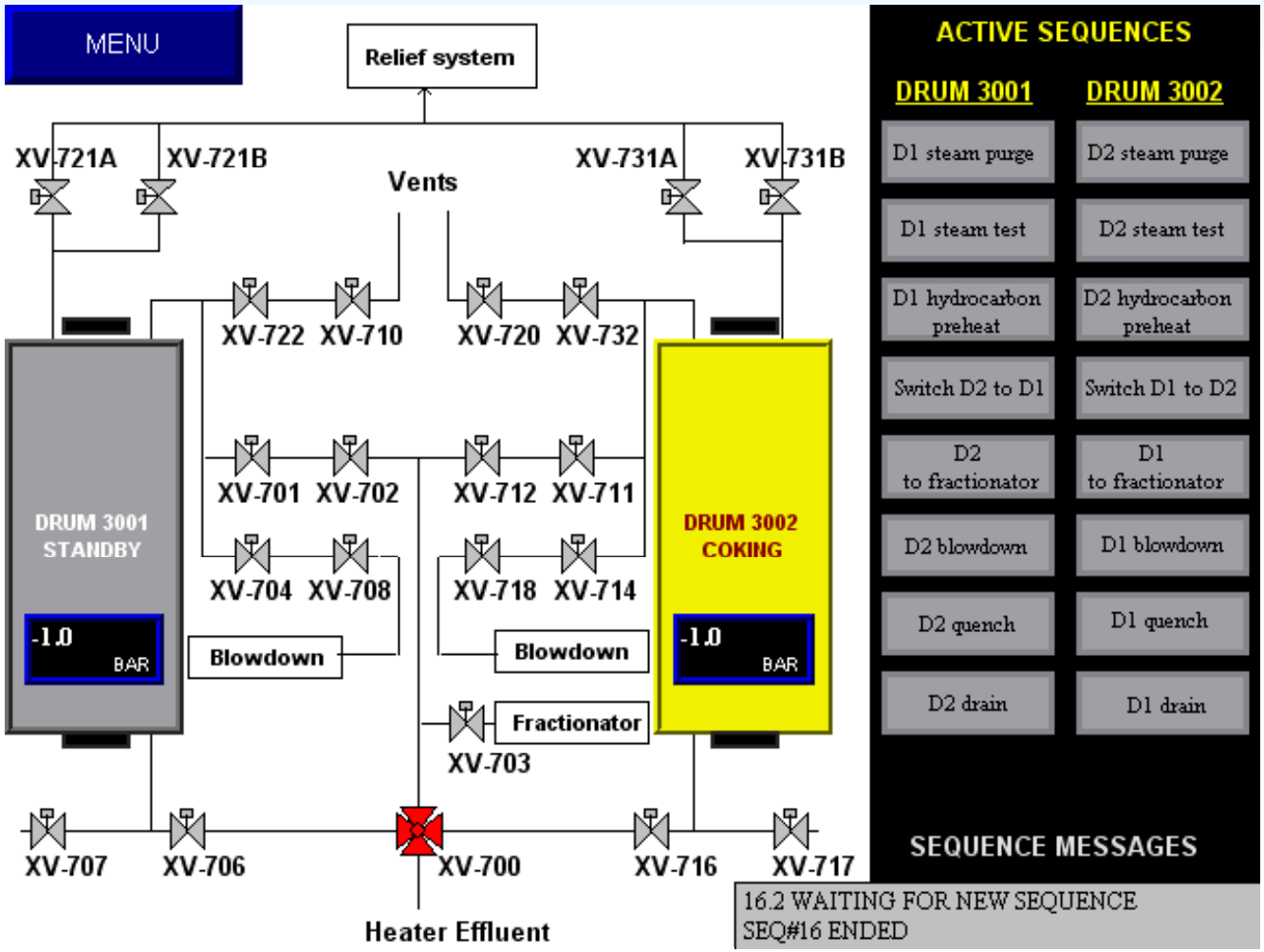
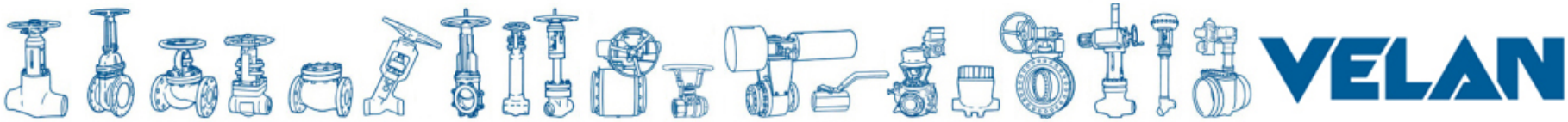
HMI SCREEN MONITORING

- Detail of Valve status & other critical equipment
- Drum Pressure & Temperature
- Sequence Monitoring
- Provides Full Diagnostic Package





FULL FACTORY ACCEPTANCE TEST

- VALVES ARE TESTED IN LOCAL AND REMOTE SETTINGS
- TORQUES ARE RECORDED TO PROVIDE A BASELINE FOR FUTURE PM
- TEST OF HARDWIRED INTERLOCKS
- TEST OF SOFTWARE INTERLOCKS
- TEST OF 2 WIRE LOOP (IF APPLICABLE)

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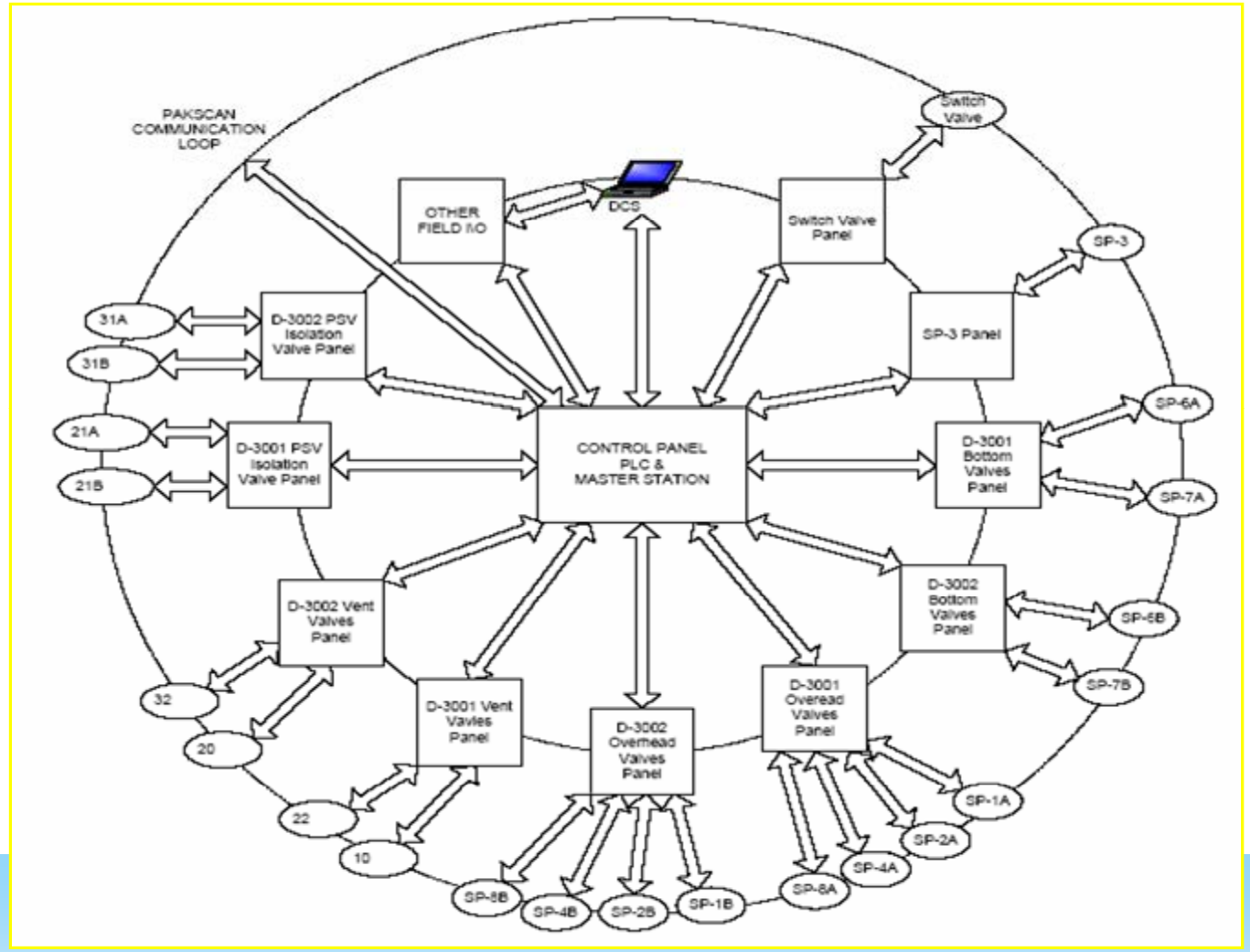

BASIC FAT LAYOUT

FULL SITE ACCEPTANCE TEST

& STARTUP ASSISTANCE

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SCOPE OF SITE ACCEPTANCE TEST

- VALVES ARE TESTED IN LOCAL AND REMOTE SETTINGS
- TORQUES ARE RECORDED TO PROVIDE A BASELINE FOR FUTURE PM
- VERIFICATION OF ALL FIELD CONNECTIONS
- TEST OF HARDWIRED INTERLOCKS
- TEST OF SOFTWARE INTERLOCKS
- TEST OF 2 WIRE LOOP (IF APPLICABLE)

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TRENDS

- SIL RATINGS ARE GAINING GREATER ACCEPTANCE AS THE MARKET'S GUIDELINES WHEN DESIGNING NEW SYSTEMS

- THE PROSPECT OF A FULL REMOTE OPERATION COKER IS BEING ENTERTAINED MORE EVERYDAY. WITH TODAY'S COKER TECHNOLOGY THIS IS BECOMING INCREASINGLY ACHIEVABLE.

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THANK YOU !

VELAN