Background of Pneumatics and Hydraulics

- **Pneumatics:**
  - Definition: the use of pressurized gas, especially air, to do work

- **Hydraulics:**
  - Definition: Of, the use of a pressurized fluid, especially water, to do work
Industrial Applications

- Construction
- Entertainment
- Agricultural
- Marine & Offshore
- Mining
- Plastics & Injection Molding
- Food Processing
- Forestry & Lumber
- Material Handling Packaging
- Recycling / Waste Management
- Rail & Trucking
Pneumatic Schematic Generation Methods

- **Computer Aided Method**
  - HyPneu Fluid Power Software
  - Company: BarDyne, Inc.
  - Pros:
    - Comprehensive Symbol Library that Meets ISO Standards
    - Capable of Running Complex Simulations
    - Automatically Generates a Bill of Materials
    - Technical Support Staff
  - Cons:
    - Expensive Software
    - Steep Learning Curve

- **Manual/Non-C.A.D. Method**
  - PowerPoint AutoShape Editor
  - Company: Microsoft
  - Pros:
    - Readily Available Software
    - Easy to Learn User Interface
  - Cons:
    - Draftsman Must Look Up all Symbols
    - Extremely Tedious and Time Consuming
    - No Automatic Symbol Library
Budweiser Project Specific Schematics

- Generated Manually Via the PowerPoint Method
- Comply with the ISO 1219-1 Standard
  - ISO 1219-1:2006 establishes basic elements for symbols. It lays down rules for devising fluid power symbols for use on components and in circuit diagrams.
- Budweiser Air and Water System Schematics are on the Next Two Slides
2-D Air Pneumatic Schematic

- Solenoid Operation
- Manual (Turn-Knob) Operation
- On/Off Operation
- Quick Disconnect
- Air Supply
- Exhaust Port
- Three-Port Valve (Normally Closed)
- Flow Regulator
- Nexen Ball-Detent Clutch
2-D Water Hydraulic Flow Schematic

Solenoid Operation

Quick Disconnect

Water Supply

Exhaust Port

Three-Port Valve (Normally Closed)

Flow Regulator

Spool Compartment Drain Tub Reservoir

Manual (Turn-Knob) Operation

On/Off Operation

Cable Cleaner Toward Rake (Outside)
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Connected, with mechanically opening check valves</td>
<td></td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td>Pressure source</td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="Symbol" /></td>
<td>Manual operation</td>
<td>General (without specifying type of control)</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol" /></td>
<td>Electrical actuation</td>
<td>By solenoid with one winding</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol" /></td>
<td>3/2-way valve</td>
<td>In 1st switch position inlet is closed (e.g. single acting cylinder is exhausted or connected to return flow line)</td>
</tr>
<tr>
<td><img src="image6" alt="Symbol" /></td>
<td>Flow control valve</td>
<td>With adjustable flow control</td>
</tr>
</tbody>
</table>
Pictorial Representation of Devices

- Asco 3-Way Solenoid
- Nexen Ball-Detent Clutch
- Quick Disconnect Fitting
- Regulator Valve
Symbol Library: Basic Symbols

- Basic Symbols # 1:
- ISO 1219
Symbol Library: Basic Symbols

- Basic Symbols #2:
- ISO 1219
Symbol Library:
ISO 1219
Valve Operators
Symbol Library:

ISO 1219

Fluid Conditioning

Pressurization Method
Helpful Reference Web Pages

- For Additional Information on Pneumatic and Hydraulic Schematics Click on the Following Links:

- Common Symbols:
  - [http://www.rosscontrols.com/symbols2.htm](http://www.rosscontrols.com/symbols2.htm)
  - [http://www.roymech.co.uk/Useful_Tables/Drawing/Hyd_Pnue_symbols.html](http://www.roymech.co.uk/Useful_Tables/Drawing/Hyd_Pnue_symbols.html)

- General Information:

- Software Options: