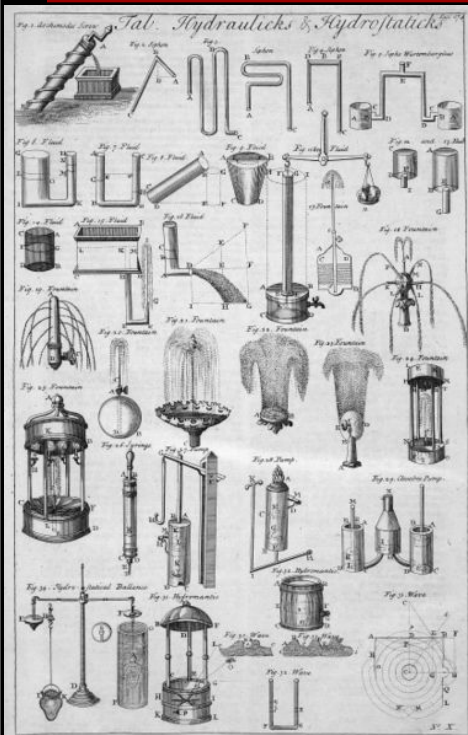


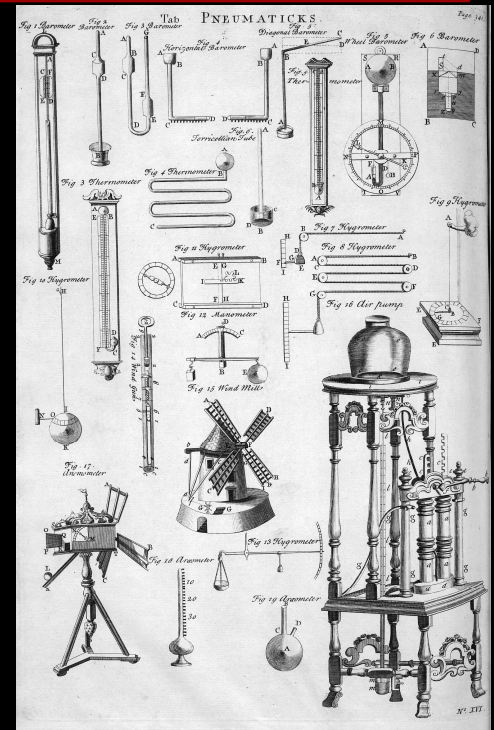
Pneumatic and Hydraulic Drawing Information



Justin Ovson

MECH 4250: Comprehensive Design 2

Professor: Dr. David Beale



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

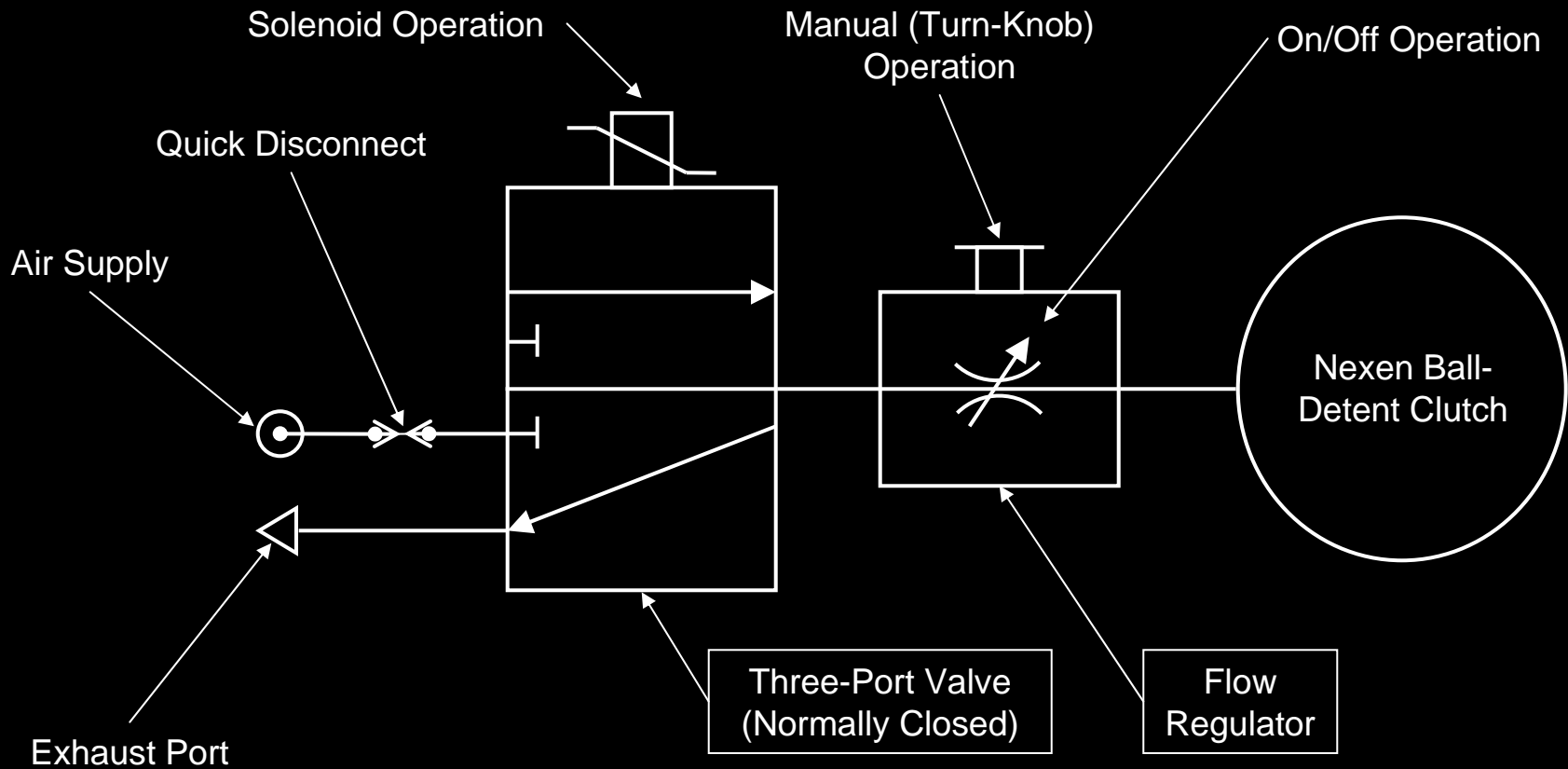
■ Manual/Non-C.A.D. Method

- 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

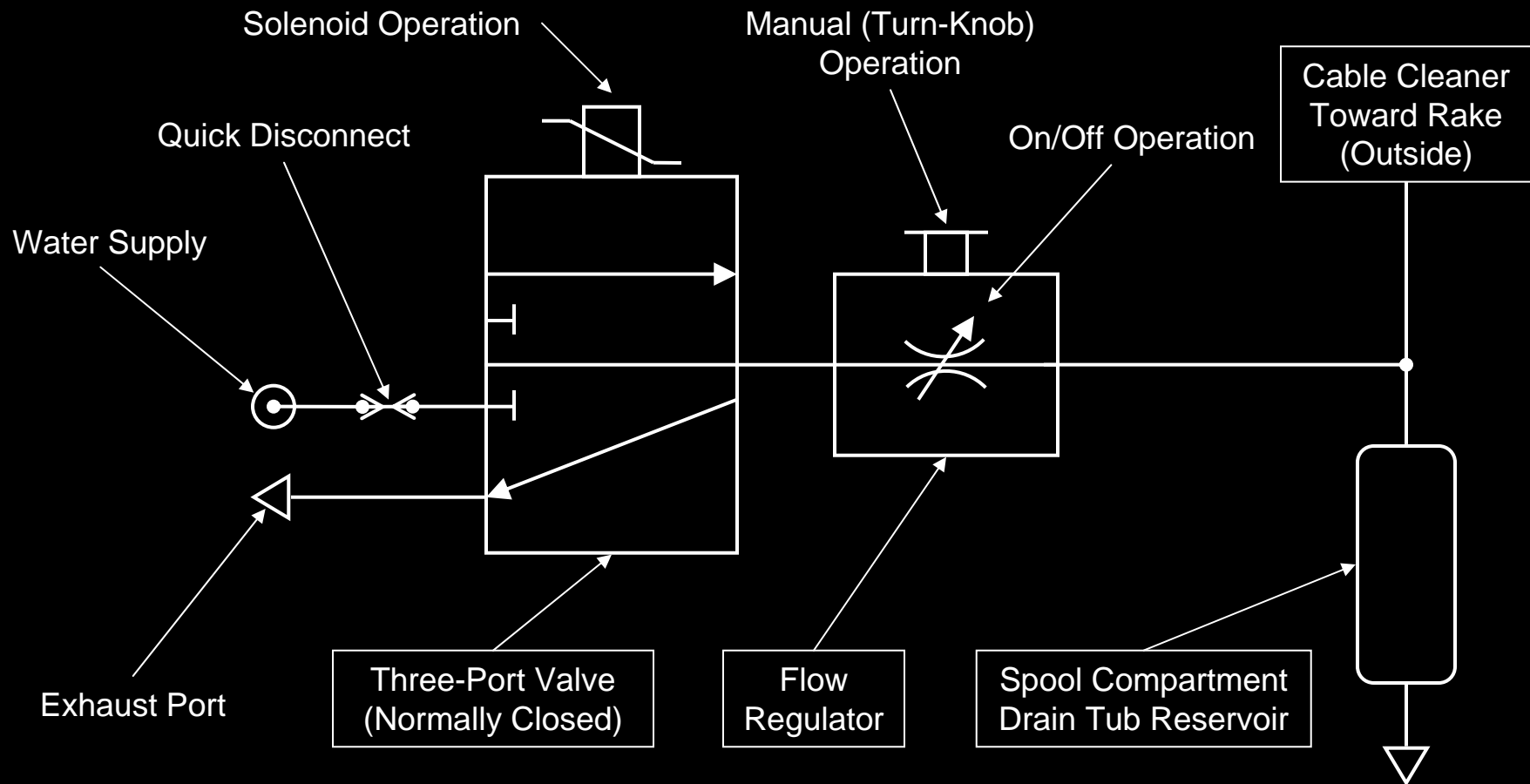
Budweiser Project Specific Schematics

- 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

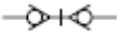
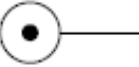
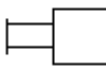
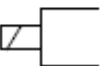
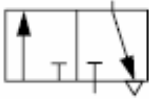

2-D Air Pneumatic Schematic



2-D Water Hydraulic Flow Schematic



Overview of Symbols Used in Preceding Budweiser Schematics

Symbol	Designation	Explanation
		Connected, with mechanically opening check valves
	Pressure source	
	Manual operation	General (without specifying type of control)
	Electrical actuation	By solenoid with one winding
	3/2-way valve	In 1st switch position inlet is closed (e. g. single acting cylinder is exhausted or connected to return flow line)
	Flow control valve	With adjustable flow control

Pictorial Representation of Devices



Nexen Ball-
Detent Clutch



Asco 3-Way
Solenoid
























Quick
Disconnect
Fitting



Regulator
Valve

Symbol Library: Basic Symbols

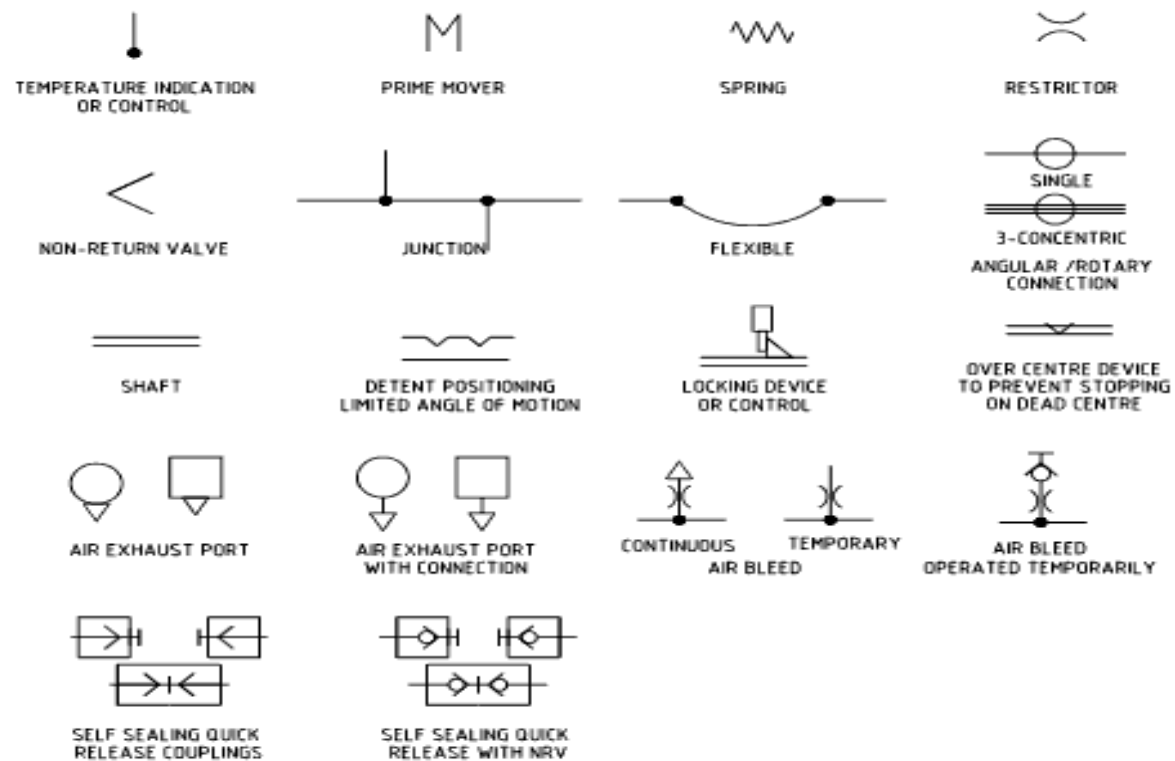
- Basic Symbols # 1:
- ISO 1219

			
ENERGY CONVERSION UNIT PUMP, MOTOR ETC	MEASURING INSTRUMENT	FOLLOWER	MOTOR/PUMP WITH LIMITED ANGLE OF MOTION
			
CONTROL COMPONENT	FILTER/LUBRICATOR SEPARATOR/HE	WEIGHT IN ACCUMULATOR	CYLINDER VALVE
			
PISTON	CONTROL METHOD	CUSHIONING IN ACTUATOR	PRESSURISED RESERVOIR ACCUMULATOR/ TANK
	 		
RESERVOIR /TANK	PNEUMATIC HYDRAULIC DIRECTION/NATURE OF FLUID	PATH OF FLUID THROUGH VALVE	ROTARY MOTION
			
VARIABILITY PUMP, MOTOR ETC	ELECTRIC	CLOSED PATH OR PORT	OPPOSING LINEAR ACTUATORS LIMITED ANGLE OF MOTION

BASIC SYMBOLS -1

Symbol Library: Basic Symbols

- Basic Symbols # 2:
- ISO 1219

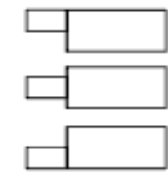


BASIC SYMBOLS - 2

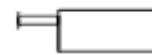
Symbol Library:

ISO 1219

Valve Operators



OPTIONAL POS'NS
FOR VALVE CONTROLS



NON-SPECIFIC
CONTROL



PUSH BUTTON
CONTROL



PULL BUTTON
CONTROL



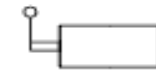
PUSH-PULL BUTTON
CONTROL



PEDAL
CONTROL



TREADLE
CONTROL



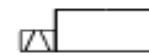
LEVER
CONTROL



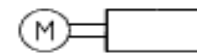
ROLLER
CONTROL



SOLENOID CONTROL
1 - WINDING

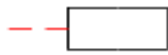


SOLENOID CONTROL
2 - WINDING



SOLENOID CONTROL
2 - WINDING

VALVE OPERATORS - 1



PRESSURE CONTROL



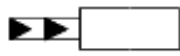
OPERATE VALVE BY
DIFFERENTIAL PRESSURE AREA



INTERNAL-PILOT
PATH



EXTERNAL PILOT
PATH



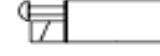
2-STAGE HYDRAULIC
PILOT



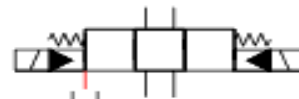
SOLENOID & PILOT STAGE
EXHAUST PILOT STAGE



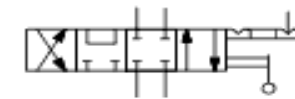
PNEUMATIC & PILOT STAGE
+ PILOT DRAIN



2- INDEPENDENT
CONTROLS



SOLENOID CONTROL + HYDRAULIC PILOT
+ SPRING CENTRED
EXTERNAL PILOT SUPPLY + DRAIN



PORTS SHOW
DETENTED POSITION OF VALVE



LEVER OPERATED
SPRING CENTRED

VALVE OPERATORS - 2

Symbol Library:

ISO 1219

Energy Conversion Devices

Instruments



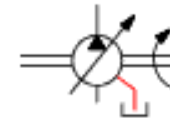
HYDRAULIC MOTOR



PNEUMATIC MOTOR



COMPRESSOR



HYDRAULIC MOTOR
ONE WAY
EXTERNAL DRAIN



PNEUMATIC MOTOR
FIXED DISPLACEMENT
TWO DIRECTIONS

PUMPS / MOTORS



PRESSURE MEASURE



PRESSURE INDICATION



DIFFERENTIAL PRESSURE
INDICATION



THERMOMETER



LIQUID LEVEL
INDICATION



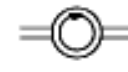
FLOW INDICATION



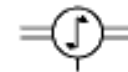
FLOW METER



INTEGRATING FLOW METER



TACHOMETER



TORQUE METER



PRESSURE SWITCH



LIMIT SWITCH

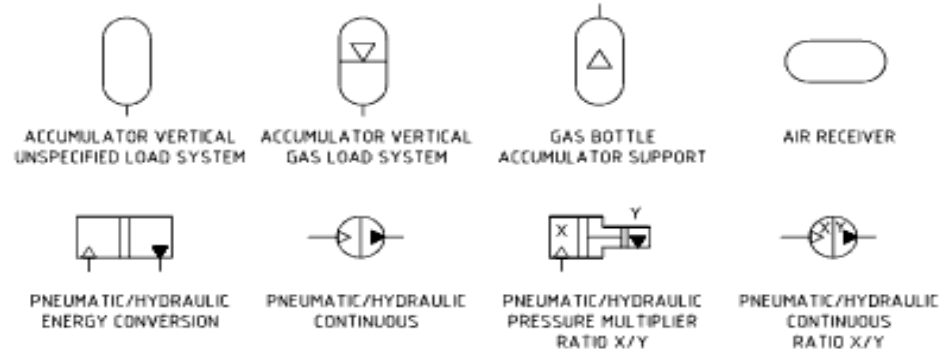
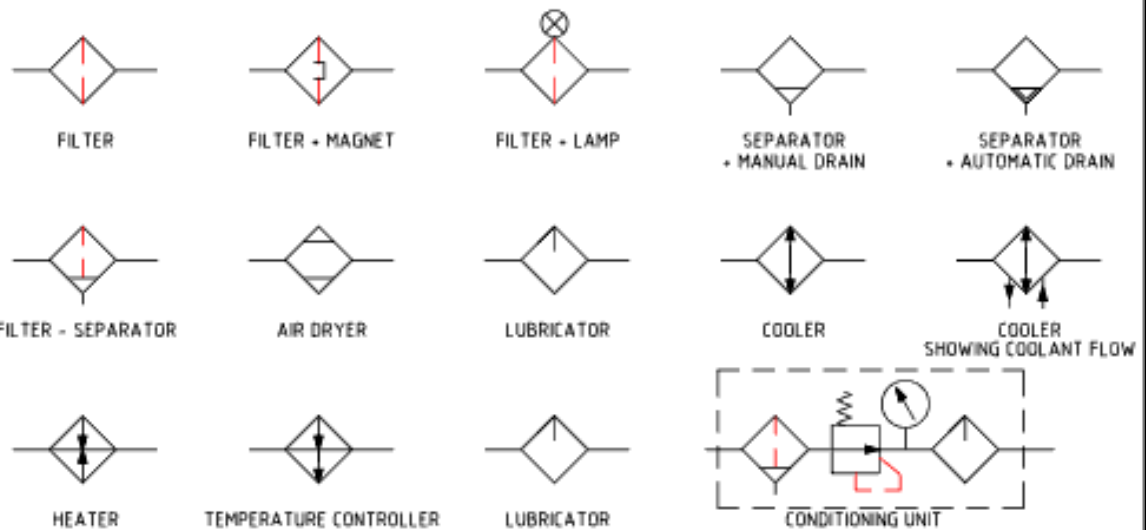
INSTRUMENTS

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.kuhnkeusa.com/pdf/pneumatics/symbols.pdf>
 - http://www.roymech.co.uk/Useful_Tables/Drawing/Hyd_Pnue_s_ym_bols.html
- General Information:
 - <http://www.hydraulicspneumatics.com/>
- Software Options:
 - <http://www.pneumatic-source.com/search2/manuf/Software/>