The use of Process and Instrumentation Drawings for Accelerator and Beamline Control Applications at the Canadian Light Source

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Abstract: In 2001 at the start of the Canadian Light Source Project, the CLS began to adopt the use of Process and Instrumentation Drawings (P&ID) not only for process systems but also for accelerator and beamline optical components. Given existing industry standards have only been formulated for process applications this posed unique challenges. This paper describes the internal standards that were adopted, how they evolved over the past nine years and operation benefits we have been able to achieve through the use of P&ID drawings. The paper also examines the benefits from using AutoCAD scripts to standardise and automate the implementation of P&IDs.

Key advantage:

- Capture design information in one location that is usable by place that can be used by engineering, controls and scientific staff
- Based on process industry standards augmented with accelerator and beamline specific symbolism
- Defines the control system interface to the machine
- Defines interlock logic and control loops
- Supports operations staff in understanding how the control system functions.

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Low conductivity water supply is shown in blue, return water in red. Instrumentation on the water system is also shown.

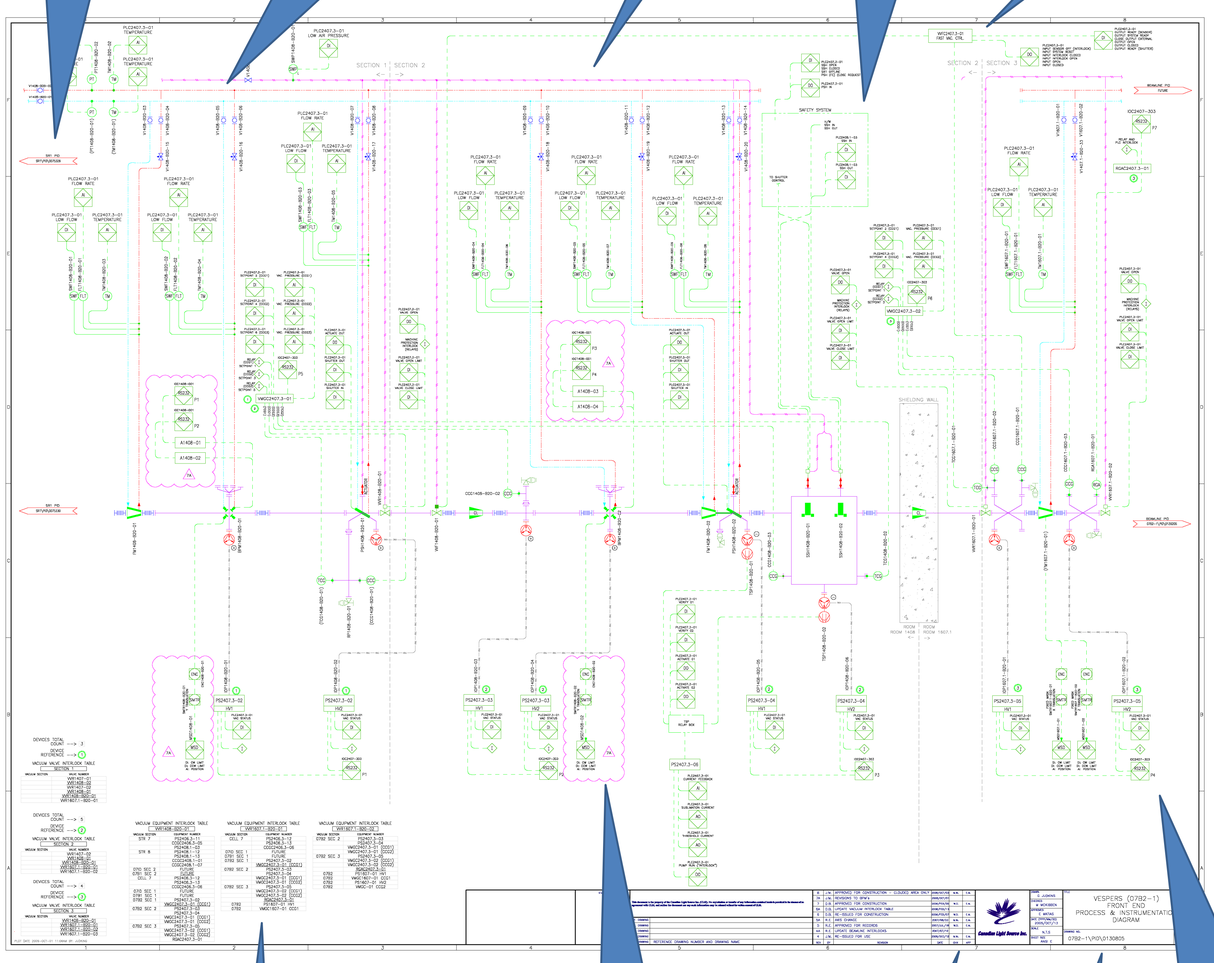
Instrument air is shown in pink

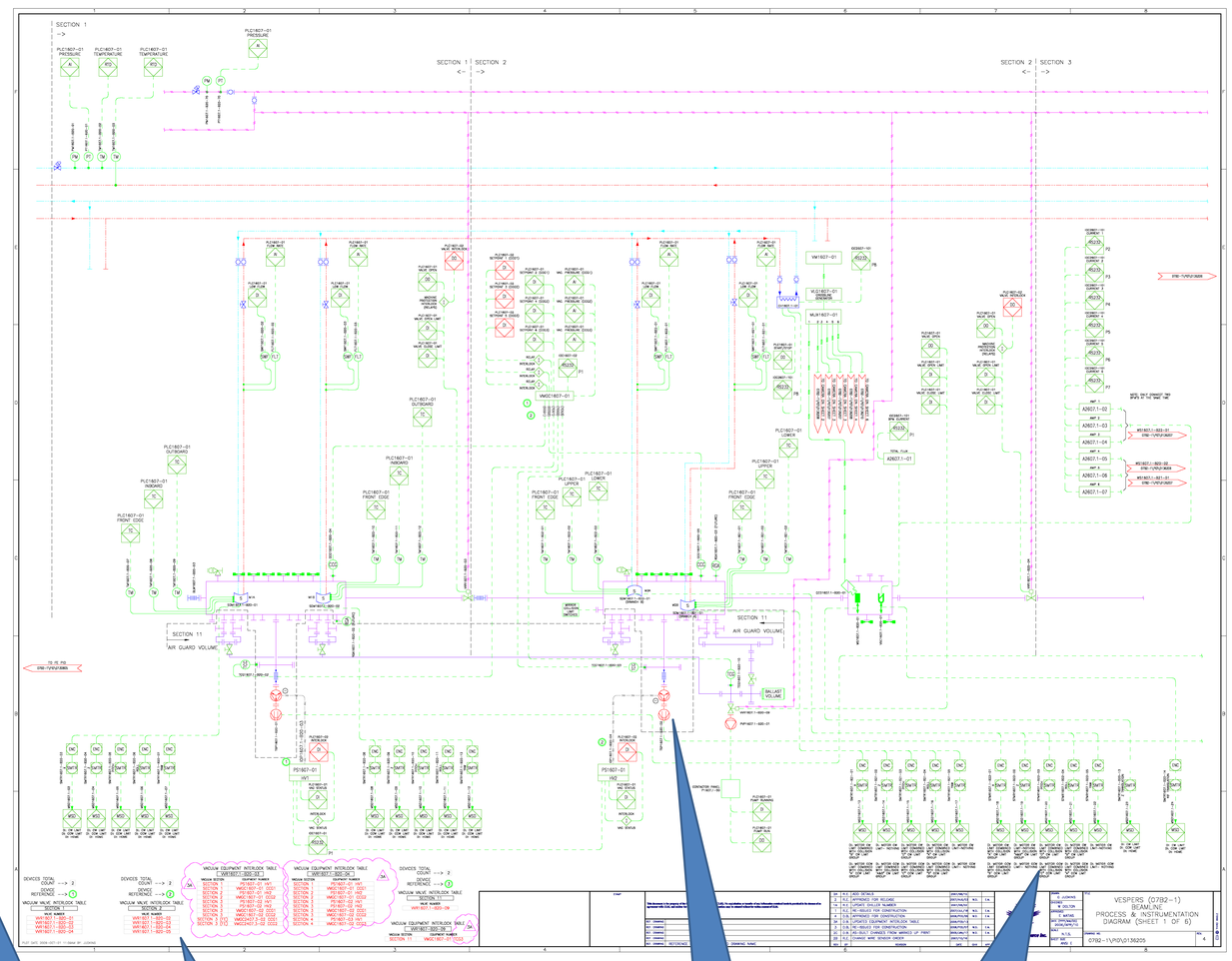
Safety systems Interfaces are called out separately

PID loops, custom fast electronics, fast vales, triggers are also identified

Beam runs from left to right along the centre of the drawing.

Vacuum, water, pneumatics, optical elements, diagnostics, detectors, motion control, custom electronics all individually called out





Clouding is used to identify recent changes, with revision number.

Control system Interfaces are Identified as AI, AO, DO, DI, RS-232, GPIB, Firewire etc

Tables of Interlocks are identified on each drawing, relating sensors to actuators

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Revision and versioning is maintained on each drawings

Each drawing is uniquely identified and managed by a common CAD group

Each motor is called out and the control system interface defined. Special attributes of a motor (e.g., limit switches, encoders, brakes) are identified as attributes

Vacuum gauges, pumps, are called out, with high voltage feeds, hardwired controls and serial controls interfaces identified