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MEEN 402-900 Bray Team

**Standards for Capstone Project**

1. US Federal Code Section 49, CFR 195.116 - Transportation of Natural and Other Gas by Pipeline

* States how valves must be designed for safety in contact with gasses.
* We included this because many types of liquids will be flowing through our valves, so we need to make sure that our embedded sensors don’t cause the valves to violate these standards.
* <https://www.valvemagazine.com/articles/piping-codes-and-valve-standards>

1. ASME B16.34 - Valves, Flanges, Fittings, and Gaskets

* <https://www.asme.org/codes-standards/find-codes-standards/b16-34-valves-flanged-threaded-welding-end>
* Covers pressure-temperature ratings, dimensions, tolerances, materials, nondestructive examination requirements, testing and marking for cast, forged, and fabricated flanged, threaded, and welding end and wafer or flangeless valves of steel, nickel-base alloys, and other alloys.
* Our sensors must function in the same temperatures and pressure the valves are subjected to.

1. SAE J1739:2021 - FMEA Analysis

* Covers failure modes and effects analysis standards for engineering projects.
* This is included because we must perform an in-depth failure analysis for the project and we used this template.
* <https://www.sae.org/standards/content/j1739_202101/>

1. ISO 5210:2023 - Industrial Valves and Actuator Attachments

* Covers the requirements for the attachment of multi-turn actuators to valves, including the flange dimensions, intermediate support requirements, and torque & thrust values for actuator output for multiple sizes of connections.
* These standards define the connection point between the valves and actuators we are working with for our project, which must be adhered to while designing the final smart system.
* [ISO 5210:2023 - Industrial valves — Multi-turn valve actuator attachments](https://www.iso.org/standard/86752.html)

1. ASME PTC 19.22 - 2007(R2023) - Data Acquisition Systems

* The scope of this Code includes signal conditioning, signal multiplexing, analog-to-digital conversion, and data processing
* This is included because for this project we are using sensors and collecting data from them, and we are using analog to digital conversions, which this code covers.
* It also covers standard instrumentation which will be useful when using the Raspberry Pi to collect data.
* <https://www.asme.org/codes-standards/find-codes-standards/ptc-19-22-data-acquisition-systems/2007/drm-enabled-pdf>