



II. Process Safety Information (PSI)

Nevada Division of Environmental Protection

Chemical Accident Prevention Program

Data Form

Process Safety Information Compilation

The purpose of this extensive data form is to assist the facility with the compilation, organization and evaluation of the information that is required to be gathered under the Process Safety Information (PSI) element of CAPP. Having complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program. The compiled information is a necessary resource for developing and implementing the remainder of the program requirements. Most notably, the following activities would be impossible without complete PSI:

1. The conduct of a thorough process hazard analysis (PHA),
2. The development of adequate standard operating procedures,
3. The identification of the need to conduct a management of change, and the ability to evaluate the change, and
4. The ability to develop a mechanical integrity program.

The following pages consist of tabular information listing data sources, equipment, and instruments that must be compiled and evaluated pursuant to the requirements of PSI. As this data form primarily contains lists, the detailed documentation that is referenced here must be readily available for use by the employees responsible for implementing the CAPP program requirements and for review by the facility employees through the employee participation program.

The information is compiled on these forms in four sections:

- I. Hazards of Highly Hazardous Substances or Explosives
- II. Technology of the Process
- III. Equipment of the Process
- IV. Design & Construction Code Definition & Compliance Evaluation Checklist



SECTION I – HAZARDS OF THE HIGHLY HAZARDOUS SUBSTANCES OR EXPLOSIVES

Information about the substances must be gathered to evaluate the potential hazards posed by its use in the regulated process. Some of this information will be available in the manufacturer's Material Safety Data Sheets (MSDS). Much of the information will be available in other sources (information for some substances can be found on the CAPP website at http://ndep.nv.gov/bapc/capp/docs/chem/substance_data.html). This information must be available for evaluation required under this PSI program element, for use by the PHA team, and for use in implementing other program elements such as the MOC program.

Identifying the appropriate MSDS sheets is the best way to commence this effort. Note that CAPP does not specifically require the facility to have MSDS sheets, but other regulatory entities do have this requirement. Regardless of the existence of MSDS sheets, the data must be compiled. The following table will prompt the user to locate all of the applicable information and identify the location of the information. It starts with listing the relevant MSDS sheets and identifying the information that is available on those documents.

While these data are required to be compiled for the regulated substances, compiling the same information for other substances that may potentially impact the process would be recommended under this effort as well. Generally, if the impact of a non-regulated substance may need to be considered during the PHA evaluation, the data should be compiled.



SECTION I – HAZARDS OF THE HIGHLY HAZARDOUS SUBSTANCES OR EXPLOSIVES
Material Safety Data Sheet Summary Form

Information on the Highly Hazardous Substances or Explosives required to be accessible onsite pursuant to NAC 459.95412(2a)

Facility: _____

Process: _____

| Substance | CAS Number | Company Name on MSDS | MSDS Revision No. | MSDS Revision Date | Required Information (see legend) | | | | | | | |
|--|------------|----------------------|-------------------|--------------------|-----------------------------------|-----|----|----|----|-----|-----|--|
| | | | | | TI | PEL | PD | RD | CD | T&C | HEM | |
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| For Items Answered "O" Above List Where Required Information is Available Onsite: | | | | | | | | | | | | |
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Required Information Legend:

- TI - Toxicity Information PD - Physical Data CD - Corrosivity Data
- PEL - Permissible Exposure Limits RD - Reactivity Data T&C - Thermal & Chemical stability data
- HEM - Foreseeable Hazardous Effects of inadvertent Mixing of different materials

For each of the required information elements, note one of the following:

- M - Indicates required information is available onsite on the denoted MSDS sheet
- O - Indicates required information is available onsite in sources other than the MSDS sheet
- N/A - Indicates required information does not apply to this particular substance
- X - Indicates required information is not available onsite and it must be obtained



SECTION II – TECHNOLOGY OF THE PROCESS

Identification of the applicable documents and/or drawings that define the technology of the process required pursuant to NAC 459.95412(2b)

Thorough development of the following drawings and data is crucial to conducting a quality process hazard analysis. Without this information, the consequences of many process deviations cannot be adequately defined:

Block or Simplified Process Flow Diagram: This diagram must provide an overview of the process flow. The simplified process flow diagram would replace the blocks of a block flow diagram with major pieces of equipment and major system controls. Either a block or process flow diagram is allowed by regulation. However, it should be noted that a process flow diagram would lend itself better to being linked to a heat and material balance.

Process Chemistry: For any process that involves chemical reactions, a thorough process chemistry description must be developed. This description not only includes the normal reactions, but also must thoroughly address any potential abnormal situations. The description must include primary, secondary, side and intermediate reactions. It is particularly important to define any undesired reactions that may adversely impact process safety. If catalysts are used, the composition and properties of the catalyst should be known. The potential to form hot spots in a reactor should be identified as, should the potential for runaway reactions. Kinetic data may also be important as this may impact process safety systems, including pressure relief.

Maximum Intended Inventory: This must be defined along with identification of how the inventory is limited. If the inventory is limited by physical storage capacity, the container capacities plus in-process quantities should be identified. If administrative controls are used to limit the inventory, this must be stated in some type of policy or procedure. For example, the tank filling capacity or the number of railcars of material allowed on site could be limited by such a policy. The maximum on-site quantities need to be identified as the potential for onsite and offsite impacts will have to be assessed through the hazard analysis.



Safe Upper and Lower Limits: Safe upper and lower limits define the maximum and minimum parameters that must not be exceeded. Exceeding these limits could result in a catastrophic failure. Knowledge of these limits is critical to enable adequate evaluation of consequences in the process hazard analysis. These limits could be either mechanical or process-related.

Safe Mechanical limits are typically defined by codes, standards or equipment vendors and are applied to piping, equipment and instruments. Examples include design temperatures and pressures, often expressed as maximum allowable working pressure (MAWP) at a specified temperature. Another example would be upper and lower temperature limits that are defined by materials of construction. It must be noted that pressure and temperature limits are usually defined by coincident conditions (i.e. as temperature varies, the MAWP would vary).

Safe mechanical limits do not necessarily represent the exact value beyond which catastrophic failure will occur. These limits usually incorporate engineered safety factors. Practically speaking, these limits are capable of being exceeded, such as during non-destructive testing activities in the construction phase, without consequence. For example, piping and pressure vessels are often hydrostatically pressure tested at 1-½ times the MAWP after construction. The engineered safety factor is intended to account for unpredictable variations in parameters such as material strength properties and construction quality. *The facility is not permitted to minimize or eliminate the engineered safety factor.* Accordingly, the catastrophic failure must be assumed to occur at the limits that are dictated by codes, standards or equipment vendors and these limits are the ones that must be used as the safe limits.

Safe Process limits may not be as well defined in literature as *safe mechanical limits*. These limits may be defined in select industry publications or may require definition by the facility for their specific process. **An example** of a *safe process limit* would be the oxidation-reduction potential (ORP) value in a manufactured sodium hypochlorite batch. Exceeding the safe upper ORP value, would result in release of chlorine gas from the solution, which would be considered a catastrophic failure. Other safe process limits could be defined by variables such as the concentration of a reactant or the temperature of a chemical reaction. If exceeding a select limit would result in a catastrophic failure, that limit would be a safe limit.

A word about Operating Limits: Operating limits are not safe limits as defined under CAPP. Operating limits are functional values and are typically process parameters such as temperature, pressure or flow. Exceeding these limits would typically result in reduced product quality or in a process upset, not catastrophic failure. Operating limits are provided in operating procedures along with further instruction on the consequence of exceeding the limits and the steps to correct the exceeded limits. Operating limits must always be within the safe limits defined under PSI.

Applying Safe Upper and Lower Limits: The safe upper and lower limits must be known for all piping, equipment and instruments. Additionally, any relevant safe limits as applied to process variables must be known. To identify the *safe mechanical limits*, identify the weakest components in the process. **For example**, if the piping system has the narrowest range of allowable pressure and temperature and all equipment and instrumentation within that piping system is capable of operating outside the allowable piping pressure and temperatures, then the safe mechanical limits are defined by the piping system. In this case, the safe upper and lower limits would be the limits of the piping system. The limits of the piping system would render the broader limits of the other system components irrelevant since the piping would fail first. When evaluating this system through the PHA process, any deviation that would result in a pressure or temperature outside the piping system limits would indicate that a safe limit had been exceeded, hence prompting the need to implement some type of safeguard or mitigation measure.



Safe Upper and Lower Limits (continued):

Determining the Extent of Mechanical Safe Upper and Lower Limits: Once the safe limits for each component are defined, the *safe mechanical limits* should be defined for specific sections of a process, rather than for each component. For example, in a pumped liquid system, the process could conceivably be split into two sections; the pump suction section and the pump discharge section. Evaluation of the design limits for piping, equipment and instruments in each of the sections could then proceed as noted above. The weakest component in each section would then be used to define the safe mechanical limits for that section.

Evaluation of the Consequence of Deviation from the Safe Limits: Understanding how the consequence of deviation from a safe limit is applied in the process hazard analysis helps to explain how the consequence is defined.

The consequence of deviation from a *safe mechanical limit* is typically some type of component failure, coupled with the consequence of both the component failure and the hazardous substance release. For example, the consequence of exceeding the upper pressure limit in a process where a pressure vessel is the limiting factor, would be vessel rupture along with the associated personnel impacts and other offsite and onsite impacts. The consequence in this case **would not** be pressure relief valve discharge. The pressure relief valve is a safeguard that is intended to prevent the safe limit from being exceeded. In a process hazard analysis, this consequence would be ranked very severe. The presence of an appropriately sized and maintained pressure relief valve would make the likelihood of the severe consequence occurring very remote, hence, minimizing the overall risk. Assigning the appropriate consequence helps to ensure that any existing or proposed safeguard is adequately scrutinized.

The consequence of deviation from a *safe process limit* must be thoroughly defined as with *safe mechanical limits*. The consequence must not only describe the direct result of the deviation, such as chlorine release to atmosphere, but must also describe the associated personnel impacts and other offsite and onsite impacts.

Determining the Appropriate Variables for Safe Limits: There is no prescribed number of variables for which *safe limits* must be defined. By evaluating sections of a process for *safe limits*, the actual number of defined limits can be minimized to a practical level. **For example**, in the previously mentioned pump suction and discharge example, if all components are capable of withstanding a full vacuum, there would be no need to list a lower *safe mechanical limit* for pressure. Hence, there would be no need to define a safe lower pressure limit. By way of **further example**, if a process is not capable of producing a temperature below which all components are rated, then there would be no need to list a lower temperature limit.

There is no way to provide generic guidance for *safe process limits*, as these variables are process-specific.



SECTION II – TECHNOLOGY OF THE PROCESS

Identification of the applicable documents and/or drawings that define the technology of the process required pursuant to NAC 459.95412(2b)

Facility: _____

Process: _____

| Technology Document | Drawing / Document Title and/or Description | Drawing / Document No. | Current Revision | Current Revision Date |
|--|--|-------------------------------|-------------------------|------------------------------|
| Block Flow Diagram of Simplified Process Flow Diagram | | | | |
| | | | | |
| Process Chemistry | | | | |
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| Maximum Intended Inventory | | | | |
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| Safe Upper and Lower Limits | | | | |
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| Evaluation of the Consequence of Deviation from Safe Limits | | | | |
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Note: Safe Upper and Lower Limits must be provided for any applicable process variable, including temperature, pressure, flow and composition. Note that operating limits are different from the safe limits defined pursuant to PSI. The operating limits are typically in a narrower range than the safe limits and are set to keep a process within an effective operating range. The safe limits in PSI either define the safe mechanical design limits of the system, or the safe process variable limits.



SECTION III – EQUIPMENT IN THE PROCESS

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Materials of construction must be compiled for the equipment in the process. Equipment includes pressure vessels, storage tanks, piping systems, pressure relief valves, pumps, compressors and instrumentation. Commensurate with compiling this information is the requirement that the process and equipment comply with recognized and generally accepted good engineering practices (NAC 459.95412(3)). In order to facilitate both activities, information identified in the following tables should be compiled to provide:

1. A list of all equipment, piping and instrumentation
2. Materials of construction for the fluid-wetted components
3. Maximum and minimum design parameters for variables such as pressure, temperature and any other pertinent parameters
4. Other equipment design variables that result in impacts on rest of the process (examples would include centrifugal pump shut-in head and pressure relief valve set pressure and relief capacity).

These tables summarize information that should be available from the supporting information. All supporting information should be readily accessible.



SECTION III – EQUIPMENT IN THE PROCESS

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Piping | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|--------|--|------------|------------|----------------------------|---------------------------|------------------|-----------------------|
| | | MAWP (psi) | Temp. (°F) | | | | |
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| Valves Type & Size Range | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|--------------------------|--|------------|------------|----------------------------|---------------------------|------------------|-----------------------|
| | | MAWP (psi) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Pressure Vessels (MAWP > 15 psi) | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|-------------------------------------|---|---------------|---------------|----------------------------------|------------------------------|---------------------|-----------------------------|
| | | MAWP (psi) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Pressure Vessels (MAWP ≤ 15 psi) | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|-------------------------------------|---|---------------|---------------|----------------------------------|------------------------------|---------------------|-----------------------------|
| | | MAWP (psi) | Temp. (°F) | | | | |
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| Storage Tanks (non-pressure vessels) | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|---|---|---|---------------|----------------------------------|------------------------------|---------------------|-----------------------------|
| | | MAWP (psi or inches H ₂ O) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Liquid Pumps | Specification / Drawing / Document Title and No. | Pump Type | Design | | | Casing Design Pressure & Temperature | Materials of Construction | Current Revision | Current Revision Date |
|--------------|--|---|------------------------|-----------------------|------------|--------------------------------------|---------------------------|------------------|-----------------------|
| | | Centrifugal Screw Diaphragm Piston Etc. | Max. Suct. Pres. (psi) | Max. Diff. Head (psi) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Vapor Compressors | Specification / Drawing / Document Title and No. | Compressor Type | Design | | | Casing Design Pressure & Temperature | Materials of Construction | Current Revision | Current Revision Date |
|-------------------|---|---|---------------------------------|--------------------------------|---------------|---|------------------------------|---------------------|-----------------------------|
| | | Centrifugal Screw Diaphragm Piston Etc. | Max. Suct. Pres. (psi) | Max. Diff. Head (psi) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Other Equipment | Specification / Drawing / Document Title and No. | Design | | Design & Construction Code | Materials of Construction | Current Revision | Current Revision Date |
|-----------------|--|------------|------------|----------------------------|---------------------------|------------------|-----------------------|
| | | MAWP (psi) | Temp. (°F) | | | | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Materials of Construction – Design information: design parameters (e.g., temperature, pressure, etc.) and compatibility with process fluids required pursuant to NAC 459.95412(2c1)

Facility: _____

Process: _____

| Instrument Type (i.e. Pressure Gauge, Diff Pres Cell, Gauge Glass, Control Valve, Pressure Relief Valve, etc.) | Instrument Tag(s) | Design | | Materials of Construction for Fluid-Wetted Parts |
|---|-------------------|---------------|---------------|--|
| | | MAWP (psi) | Temp. (°F) | |
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

Control Logic required pursuant to NAC 459.95412(2c2)

Facility: _____

Process: _____

| Control Logic | Drawing / Document Title and/or Description | Drawing / Document No. | Current Revision | Current Revision Date |
|---------------|---|------------------------|------------------|-----------------------|
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Note: If control logic is not readily evident from the P&IDs, it must be documented in a separate format such as ladder logic diagrams, wiring schematics, SAFE charts, or narrative description.

Electrical Classification required pursuant to NAC 459.95412(2c3)

| Electrical Classification Area | Drawing / Document Title | Reference Standard (Article 500 of the NEC) | Current Revision | Current Revision Date |
|--------------------------------|--------------------------|---|------------------|-----------------------|
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SECTION III – EQUIPMENT IN THE PROCESS (continued)

The design of the **ventilation system** required pursuant to NAC 459.95412(2c5)

Facility: _____

Process: _____

| Ventilation System | Drawing / Document Title | Uniform Fire Code, Article 80 Or Other Nationally Recognized Standard | Current Revision | Current Revision Date |
|--------------------|--------------------------|--|---------------------|--------------------------|
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SECTION III – EQUIPMENT IN THE PROCESS

Safety systems, such as interlocks, detection or suppression systems, required pursuant to NAC 459.95412(2c8)

| Drawing / Document Title and/or Description | Drawing / Document No. | Current Revision | Current Revision Date |
|---|------------------------|---------------------|--------------------------|
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SECTION IV - Design & Construction Code Definition and Compliance Evaluation Checklists

Definition of applicable design & construction codes required pursuant to NAC 459.95412(2c6)

Definition of applicable design and construction codes under CAPP is limited to applicable codes for the regulated processes. Building structures are not typically of concern under this section of the NAC, as it is assumed that local building codes are fully enforced by the appropriate state, county or municipal agency. However, if a defect in the design or construction of a building structure could adversely affect the regulated process and the building did not receive review by building officials and did not obtain permits to construct and occupy, those codes should be noted as being applicable under this section.

Design and construction codes must be differentiated from material specifications, such as those developed by the American Society for Testing and Materials (ASTM). Materials specifications for the process-specific equipment and instruments should be compiled and evaluated pursuant to section 4 of this audit checklist.

The defined design and construction codes must include those that apply to the following process components:

Foundations, Structural Steel, Pressure Vessels, Piping Instruments and Controls, Electrical Systems, and Storage Tanks

The design and construction codes may cover all or part of the following:

Design parameters & calculation procedures, Materials of construction, Construction personnel qualifications, Construction requirements, Inspection requirements, and Testing requirements

Not all design and construction codes that apply to a process regulated under CAPP, have been adopted by local building officials. CAPP requires the regulated facility to design and construct in accordance with applicable codes and standards, or best engineering practices. While compliance with these codes or engineering practices may not be mandatory per local building officials, they become mandatory under CAPP, and full compliance is required. The correct list of applicable codes and standards vary, based upon the type of process and the industry. The list below denotes codes and standards that may apply to the process. While it is not comprehensive, it does present a significant number of codes and standards that could apply. Actual definition of applicable codes and standards is the responsibility of the facility, as is compliance confirmation. Documented codes, standards or engineering practices must apply to the design and construction of each of the process components listed below.



COMMON DESIGN CODES AND STANDARDS USED IN THE CHEMICAL AND PETROLEUM INDUSTRIES

| CODE | RESOURCE | COVERAGE OF CODE |
|--|---|--|
| Foundations | | |
| American Concrete Institute 318 Building Code Requirements for Structural Concrete and Commentary | American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333 248-848-3700 www.concrete.org | Design and construction of structural concrete. |
| Structural Steel | | |
| American Welding Society D 1.1 Structural Welding Code - Steel | The American Welding Society 550 NW LeJeune Road Miami, FL 33126 800-443-9353 www.aws.org | Includes structural steel weld design, prequalification & testing procedures. |
| Pressure Vessels | | |
| American Society of Mechanical Engineers Boiler & Pressure Vessel Code Section VIII, Divisions 1 - 3, Pressure Vessels | American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-THE-ASME www.asme.org | Design, fabrication, inspection, testing & certification of pressure vessels operating at internal or external pressures exceeding 15 psi. (These requirements are usually met by the pressure vessel manufacturer and a vessel code plate certifying compliance with ASME BPV Section VIII must be affixed.) Also prescribes requirements for pressure relief. Refer to Instruments & Controls section for codes and standards related to pressure relief. |

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| CODE | RESOURCE | COVERAGE OF CODE |
|---|---|--|
| Chlorine Institute Pamphlet 5 Bulk Storage of Liquid Chlorine | The Chlorine Institute, Inc. 1300 Wilson Boulevard Arlington, VA 22209 703-741-5760 www.chlorineinstitute.org | Design, construction, location, installation and operation of non-refrigerated liquid chlorine storage systems. Requires compliance with ASME BPV Section VIII, but also specifies additional requirements. |
| American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. ASHRAE/ANSI 15 Safety Code for Refrigeration Systems | American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400 www.ashrae.org | Requires pressure vessels to comply with ASME BPV Section VIII. |
| National Fire Protection Association NFPA-58 Liquefied Petroleum Gas Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Prescribes requirements for LP Gas system design and installation. Refers to ASME pressure vessels and DOT containers. |
| Piping | | |
| American Society of Mechanical Engineers ASME/ANSI B31.3 Process Piping | American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-THE-ASME www.asme.org | Design, installation, construction inspection & testing of process piping in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, & cryogenic plants; and related processing plants & terminals. Prescribes requirements for: Materials Pipe design criteria Fabrication (incl. welding procedures & welder qualification) Pipeline inspection during construction Pipeline testing prior to operation Inspection & testing record keeping |

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| CODE | RESOURCE | COVERAGE OF CODE |
|---|---|--|
| <p>American Society of Mechanical Engineers ASME/ANSI B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids</p> | <p>American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-THE-ASME www.asme.org</p> | <p>Design, installation, construction inspection & testing of process piping in transportation corridors between facility's plants, terminals, tank farms, etc. Prescribes requirements for: Materials Pipe design criteria Fabrication (incl. welding procedures & welder qualification) Pipeline inspection during construction Pipeline testing prior to operation Inspection & testing record keeping</p> |
| <p>American Society of Mechanical Engineers ASME/ANSI B31.5 Refrigeration Piping and Heat Transfer Components</p> | <p>American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-THE-ASME www.asme.org</p> | <p>Design, installation, construction inspection & testing of refrigerant & secondary cooling piping systems. Prescribes requirements for: Materials Pipe design criteria Fabrication (incl. welding procedures & welder qualification) Pipeline inspection during construction Pipeline testing prior to operation Inspection & testing record keeping</p> |
| <p>American Society of Mechanical Engineers Boiler & Pressure Vessel Code Section IX, Welding & Brazing Qualifications</p> | <p>American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 800-THE-ASME www.asme.org</p> | <p>Contains rules related to qualification of welding procedures and qualification of welders. This section required pursuant to ASME/ANSI B31.3 and in some cases B31.4.</p> |
| <p>American Petroleum Institute API Standard 1104 Welding of Pipelines and Related Facilities</p> | <p>American Petroleum Institute 1220 L Street, NW Washington, DC 20005 202-682-8000 www.api.org</p> | <p>Contains the welding standards that are required pursuant to ASME/ANSI B31.4.</p> |

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| CODE | RESOURCE | COVERAGE OF CODE |
|--|--|---|
| <p>Chlorine Institute Pamphlet 6 Piping Systems for Dry Chlorine</p> | <p>The Chlorine Institute, Inc. 1300 Wilson Boulevard Arlington, VA 22209 703-741-5760 www.chlorineinstitute.org</p> | <p>Recommends piping and piping component materials for use in dry chlorine systems. Requires welding & inspection comply with ASME/ANSI B31.3 and ASME Boiler & Pressure Vessel Code, Section IX.</p> |
| <p>American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. ASHRAE/ANSI 15 Safety Code for Refrigeration Systems</p> | <p>American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400 www.ashrae.org</p> | <p>Requires piping & piping components having maximum internal or external design pressure greater than 15 psi to: Be listed either by component, or as an assembly, by an approved nationally recognized laboratory; or Comply with ASME/ANSI B31.5 (where applicable. See code for explanation)</p> |
| <p>National Fire Protection Association NFPA-58 Liquefied Petroleum Gas Code</p> | <p>National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org</p> | <p>Prescribes requirements for LP Gas system design and installation. Requires compliance with ASME/ANSI B31.3 and ASME BPV Code Section IX for pipe design and installation.</p> |
| <p>U.S. Department of Transportation 49CFR, Parts 192 / 195 Transportation of Natural and Other Gas by Pipeline/ Transportation of Hazardous Liquids by Pipeline</p> | <p>U.S. Government Printing Office 732 N. Capitol Street NW Washington, DC 20401 866-512-1800 www.gpoaccess.gov</p> | <p>These federal regulations do not generally apply within the CAPP-covered process boundary; however, if a process receives material from a DOT-covered pipeline, DOT jurisdiction may extend into a portion of the CAPP-covered process.</p> |

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| CODE | RESOURCE | COVERAGE OF CODE |
|--|---|--|
| Instruments & Controls | | |
| ISA Numerous Publications & Standards | ISA 67 Alexander Drive Research Triangle Park, NC 27709 919-549-8411 www.isa.org | This is the International Society for Measurement & Control. Numerous publications and standards exist. Publications exist related to P&ID and loop diagram preparation. Numerous standards include those related to performance standards for many toxic gas sensors and the operation & maintenance of select instrumentation. |
| American Petroleum Institute API Recommended Practice 520 Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries (Parts I & II) | American Petroleum Institute 1220 L Street, NW Washington, DC 20005 202-682-8000 www.api.org | Sizing, selection and installation of pressure relieving devices. |
| Chlorine Institute Pamphlet 5 Bulk Storage of Liquid Chlorine | The Chlorine Institute, Inc. 1300 Wilson Boulevard Arlington, VA 22209 703-741-5760 www.chlorineinstitute.org | Provides pressure relief valve sizing criteria for non-refrigerated chlorine storage tanks. |
| American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. ASHRAE/ANSI 15 Safety Code for Refrigeration Systems | American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400 www.ashrae.org | Provides pressure relief valve requirements for entire refrigeration system, including the sizing criteria. Also provides requirements for some system instrumentation. |

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| CODE | RESOURCE | COVERAGE OF CODE |
|---|--|---|
| National Fire Protection Association NFPA-58 Liquefied Petroleum Gas Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Prescribes requirements for LP Gas system design and installation. Pressure relief valve installation criteria and sizing information is provided. |
| National Fire Protection Association NFPA-30 Flammable and Combustible Liquids Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Prescribes requirements for the design of flammable & combustible liquid storage tanks and associated piping systems. Defines storage tank venting requirements. |
| Electrical Systems | | |
| National Fire Protection Association NFPA-70 National Electric Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Safety in the specification and installation of electrical wiring and equipment in all types of installations. Most specifically related to CAPP, the code defines hazardous (classified) locations and the requirements for electrical installations in these areas. |

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| CODE | RESOURCE | COVERAGE OF CODE |
|---|--|---|
| National Fire Protection Association NFPA-497 Recommended Practice of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Provides recommendations on determining the extent of classified locations as defined in the National Electric Code. It can be used to evaluate processes where flammable liquids, gases or vapors are present. |
| American Petroleum Institute API Recommended Practice 500 Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I Division 1 and Division 2 | American Petroleum Institute 1220 L Street, NW Washington, DC 20005 202-682-8000 www.api.org | Provides recommendations on determining the extent of classified locations as defined in the National Electric Code. It can be used to evaluate processes in petroleum facilities. |
| National Fire Protection Association NFPA-58 Liquefied Petroleum Gas Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Prescribes requirements for LP Gas system design and installation. Defines extent of classified areas in LP Gas systems. |
| Storage Tanks | | |
| National Fire Protection Association NFPA-30 Flammable and Combustible Liquids Code | National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471 800-344-3555 www.nfpa.org | Prescribes requirements for design of flammable & combustible liquid storage tanks and associated piping systems. Cross references API Standard 650, ASME BPV code Section VIII and various Underwriters Laboratory standards for tank manufacture. |
| American Petroleum Institute API Standard 650 Welded Steel Tanks for Oil Storage | American Petroleum Institute 1220 L Street, NW Washington, DC 20005 202-682-8000 www.api.org | Prescribes requirements for the design, fabrication, erection and testing of welded steel atmospheric storage tanks. |



GENERAL DESIGN AND CONSTRUCTION SPECIFICATIONS

General design and construction specifications are typically used by facilities and engineering & construction firms in conjunction with the nationally recognized design codes and standards noted on the previous table. These general specifications are used to define specific company requirements related to design and construction, such as company policies and practices (like purchasing, document control, etc.) and site-specific design and construction parameters (such as pipe/pressure vessel corrosion allowances, soil compaction requirements, weld inspection criteria, etc.). These general specifications are also used to define specifically which nationally recognized design codes and standards apply. The following table lists general specifications that may apply to a facility process.

COMMON GENERAL SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF FACILITY PROCESSES

| GENERAL SPECIFICATION | CONTENTS |
|--|---|
| Site Grading | Applicable codes, site clearing, importing/exporting requirements related to cut & fill, site compaction requirements, examination & testing, required documentation. |
| Foundations | Applicable codes, base & sub base requirements, concrete & reinforcing design requirements, base compaction and concrete testing requirements, inspection requirements, required documentation. |
| Drawing & Documentation | Project management requirements related to drawing & document development, approvals, document control. |
| Piping | Applicable codes, piping design criteria, material selection, layout and equipment connection, required documentation. |
| Piping Fabrication | Applicable codes, piping fabrication, welding, heat treatment, examination and testing, required documentation. |
| Pressure Vessels | Applicable codes, design criteria, materials of construction, fabrication requirements, required documentation. |
| Installation of Instruments & Controls | Installation requirements, materials of construction, approved vendors. |
| Steel Structures | Applicable codes, materials of construction, required documentation. |
| Structural Welding & Weld Inspection | Applicable codes, weld procedures, welder qualification, production weld inspection & testing, required documentation. |
| Electrical Installation | Applicable codes, operating voltage levels, specific electrical equipment & wiring requirements, required documentation. |
| Protective Coatings | Paint systems, surface preparation, paint application, inspection, required documentation. |

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Once applicable codes and specifications have been defined, compliance with those codes and specifications must be evaluated. In general, the process must be in compliance with the version of the code in place at the time of construction, unless dictated otherwise by authorities having jurisdiction.

Although not mandatory, differences between current code versions and the version in place at the time of construction should be understood. As an additional hazard identification step, the process should be reviewed to determine compliance with the current code version, and if not in compliance, determine if any additional hazards exist. The facility should then implement further safeguards or mitigation measures as warranted by the code deficiency.



Code Compliance Evaluation Checklist

Facility: _____

Process: _____

| Applicable Code or General Specification | In Compliance With Code or General Specification? | Available Documentation Supporting Compliance | Current Revision | Current Revision Date |
|--|---|---|------------------|-----------------------|
| Foundations | | | | |
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| Structural Steel | | | | |
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Code Compliance Evaluation Checklist

Facility: _____

Process: _____

| Applicable Code or General Specification | In Compliance With Code or General Specification? | Available Documentation Supporting Compliance | Current Revision | Current Revision Date |
|--|---|---|------------------|-----------------------|
| Pressure Vessels | | | | |
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| Piping | | | | |
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Code Compliance Evaluation Checklist

Facility: _____

Process: _____

| Applicable Code or General Specification | In Compliance With Code or General Specification? | Available Documentation Supporting Compliance | Current Revision | Current Revision Date |
|--|---|---|------------------|-----------------------|
| Instruments & Controls | | | | |
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| Electrical Systems | | | | |
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Code Compliance Evaluation Checklist

Facility: _____

Process: _____

| Applicable Code or General Specification | In Compliance With Code or General Specification? | Available Documentation Supporting Compliance | Current Revision | Current Revision Date |
|--|---|---|------------------|-----------------------|
| Storage Tanks | | | | |
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