PIP RESE001
General Purpose Skid-Mounted
Packaged Equipment Specification
PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice. This Practice is subject to revision at any time.

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# PIP RESE001
General Purpose Skid-Mounted Packaged Equipment Specification

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## Data Sheets

- **RESE001-DM** – General Purpose Skid-Mounted Packaged Equipment Data Sheet (Metric Units)
- **RESE001-D** – General Purpose Skid-Mounted Packaged Equipment Data Sheet (US Customary Units)
- **RESE001-R** – Documentation Requirements Sheet
1. Scope

This Practice provides the minimum requirements for mechanical design and manufacturing of skid-mounted packaged equipment. Skid-mounted units are self-contained units consisting of equipment, their auxiliary systems, interconnecting piping, electrical and instrument components, controls, and support structures normally fabricated and skid-mounted in one or more sections.

Skid-mounted packaged equipment may include a broad range of designs for process and utility applications, such as refrigeration units, vacuum pumps, chemical injection systems, and filter packages. This Practice is intended to address basic requirements that are common to most skid-mounted packages.

*Comment:* The purchaser shall ensure that specifications are invoked and provided for specific applications that exceed the scope of this Practice. The purchaser may also provide data sheets, P&IDs, process data and any other supplemental specifications to define the requirements for specific packaged equipment.

2. References

Applicable parts of the following Practices, industry codes and standards, and references shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

2.1 Process Industry Practices (PIP)

- PIP ELSPS01 – Electrical Requirements for Packaged Equipment
- PIP INSC1000 – Cold Service Insulation Materials and Installation Specification
- PIP INSH1000 – Hot Service Insulation Materials and Installation Specification
- PIP PCSPS010 – Small, General Purpose Packaged Equipment Instrumentation Specification
- PIP REIE686 – Recommended Practices for Machinery Installation and Installation Design
- PIP RECE002 – Design of Piping Loads on Rotating Machinery Nozzles
- PIP REEE003 – General Purpose Non-Lubricated Flexible Couplings
- PIP RESE001-DM – General Purpose Skid-Mounted Packaged Equipment Data Sheet (Metric Units)
- PIP RESE001-D – General Purpose Skid-Mounted Packaged Equipment Data Sheet (US Customary Units)
- PIP RESE001-R – Documentation Requirements Sheet for General Purpose Skid-Mounted Packaged Equipment
- PIP VECV1001 – Vessel Design Criteria, ASME Code Section VIII, Divisions 1 and 2
- PIP VESSM001 – Specification for Small Vessels and Heat Exchangers with Limited Design Conditions
2.2 **Industry Codes and Standards**

American National Standards Institute/Rubber Manufacturers Association (ANSI/RMA)
- ANSI B1.20.1 – Pipe Threads, General Purpose (Inch)
- ANSI B1.20.3 – Dryseal Pipe Threads (Inch)
- ANSI/RMA IP-20 – Drives Using Classical V-Belts and Sheaves
- ANSI/RMA IP-24 – Specifications for Drives Using Synchronous Belts

American Petroleum Institute (API)
- API RP520 – Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries

American Society of Civil Engineers (ASCE)
- ASCE 7 – Minimum Design Loads for Buildings and Other Structures

American Society of Mechanical Engineers (ASME)
- *ASME Boiler and Pressure Vessel Code*, including all mandatory addenda in effect on the date of the purchase order
  - Section VIII – Pressure Vessels, Division 1
  - Section VIII – Pressure Vessels, Division 2 – Alternative Rules
  - Section IX – Welding and Brazing Qualifications
- ASME B16.5 – Pipe Flanges and Flanged Fittings
- ASME B16.11 – Forged Fittings, Socket-Welding and Threaded
- ASME B16.42 – Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300
- ASME B16.47 – Large Diameter Steel Flanges
- ASME B31.3 – Process Piping

American Society for Testing and Materials (ASTM)
- ASTM A269 – Seamless and Welded Austenitic Stainless Steel Tubing for General Service

American Welding Society (AWS)
- AWS D1.1 – *Structural Welding Code-Steel*

National Electrical Manufacturers Association (NEMA)
- NEMA MG1 – *Motors and Generators*

2.3 **Government Regulations**

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)
- OSHA – 29 CFR, Part 1910 – Occupational Safety and Health Standards
3. Definitions

**Code: ASME Boiler and Pressure Vessel Code, Section VIII, Division 1**

*construction:* An all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification (i.e., for Code, Code stamp and manufacturer’s data report; for ASME Boiler and Pressure Vessel Code, Section VIII, Division 2, manufacturer’s design report), and pressure relief

*National Board:* The National Board of Boiler and Pressure Vessel Inspectors, an organization comprised of chief inspectors of various governmental jurisdictions in the United States and Canada. Vessels meeting requirements of the Code, except those stamped with the Code “UM” symbol, may be registered with the National Board.

*owner:* The party who owns the facility wherein the skid-mounted packaged equipment will be used

*purchaser:* The party who awards the contract to the supplier. This party may be the owner or the owner’s authorized agent.

*purchase order:* Written requirements and drawings used for the purchase of skids or other equipment that the purchaser has transmitted or otherwise communicated and integrated into the agreement between the purchaser and the supplier

*supplier:* The party responsible for manufacturing the skid-mounted packaged equipment

*vessel:* A nonspecific reference to a pressure vessel or a shell-and-tube heat exchanger

4. Requirements

4.1 General

4.1.1 The supplier shall assume unit responsibility for all equipment and all auxiliary systems included in the scope of the purchase order. Unit responsibility shall include the following:

a. Coordinating the technical aspects of the equipment, including pressure retaining items and all auxiliary systems.

b. Expediting of subvendors and assurance that all equipment, including that provided by subvendors, is provided to the applicable requirements.

c. Assuring that the complete package provides reliable operation and meets the performance guarantee.

4.1.2 Subvendors and subcontractors shall be subject to a written approval by the purchaser before placement of suborders.

4.1.3 Unless otherwise specified on the purchaser’s *PIP RESE001-DM* or *PIP RESE001-D* Data Sheet, system components not addressed specifically in this Practice shall be in accordance with recognized industry standards for each specific component.
4.1.4 Unless specifically approved in writing by the purchaser, substitution for material, equipment, or components shall not be permitted.

4.1.5 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, all equipment and auxiliaries shall be suitable for unprotected outdoor operation in the environment specified by the purchaser on the purchaser’s Data Sheet.

4.1.6 The unit shall be shop-assembled to the maximum extent practical to minimize on-site erection work.

4.1.7 All skids and equipment that mate directly (without interconnecting piping by the purchaser) shall be trial fitted in the supplier’s shop.

4.1.8 All loose-shipped components requiring field installation shall be identified in the proposal.

4.1.9 **Safeguards and Relief Devices**

4.1.9.1 Safeguards and relief devices on equipment shall be provided where necessary to protect personnel, equipment, and piping.

4.1.9.2 Over pressure protection for piping and equipment shall be in accordance with API RP520, Parts I and II, or the Code, at a minimum.

4.1.9.3 Documentation that explains the basis for application and sizing of safeguards and relief devices shall be provided.

4.1.9.4 Code-stamped vessels shall have Code “UV-” or “UD-” stamped relief devices as applicable.

4.1.9.5 Unless specifically approved by the purchaser, rupture disks shall not be used as pressure relief devices.

4.1.10 **Sound Level**

4.1.10.1 The expected sound levels at a distance of 3 feet (unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet) shall be provided for the skid as a single source and for major noise generating components such as pumps, motors, fans and control valves.

4.1.10.2 If sound pressure level (SPL) exceeds data sheet requirements, information shall be provided with the proposal indicating additional sound treatment required to obtain the conditions specified.

4.1.10.3 Control of the SPL of all equipment provided shall be a joint effort of the purchaser and the supplier.

4.1.11 The arrangement of the equipment shall provide adequate clearance areas and safe access for operation and maintenance. Specific requirements are stated in Section 4.9 of this Practice.

4.1.12 The purchaser shall review and approve the arrangement of the equipment, including piping and auxiliaries.

4.1.13 Wind loading design requirements shall be in accordance with ASCE 7.
4.1.14 All structures and equipment shall be designed to resist earthquake forces in accordance with local regulatory requirements.

4.1.15 Cast iron parts shall not be repaired.

4.1.16 Unless otherwise specified, the minimum nozzle connection size shall be 19 mm (3/4 inch).

4.1.17 Unless otherwise specified, the nominal corrosion allowance for all components shall be:
   a. 0.0 mm (0.0 inch) for stainless steels and all non-ferrous alloys
   b. 1.6 mm (1/16 inch) for carbon and alloy steels

4.1.18 The purchaser shall clearly specify on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet all criteria in accordance with site-specific laws, rules, and regulations.

4.1.19 Deviations
   4.1.19.1 All deviations from the requirements of this Practice introduced by the purchaser shall be clearly indicated on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet and engineering notes in the purchase order.
   4.1.19.2 All deviations from this Practice introduced by the supplier shall be clearly indicated in the original proposal and priced as an exception.
   4.1.19.3 In addition to the base proposal, alternative designs may be offered, provided the supplier submits specific, detailed exceptions to this Practice for approval by the purchaser. The commercial impact for each exception shall also be provided.
   4.1.19.4 Any conflicting requirements shall be referred to the purchaser in writing for approval. The purchaser shall issue confirming documentation if needed for clarification.

4.2 Scope of Supply
   4.2.1 Except for items specifically stated and agreed upon as “purchaser-furnished” items, all materials and documentation necessary for a complete system shall be provided in accordance with this Practice and the purchase order.
   4.2.2 In addition to the primary equipment, the supplier’s scope shall include, but not be limited to, the following:
      a. Skid steelwork and supporting structures
      b. All permanent platforms, ladders, stairs, and walkways
      c. Skid lifting provisions, if applicable
      d. Piping, pipe supports, fittings, and valves (within confines of skid or as designated by the purchaser on the data sheet)
      e. Flanged piping terminations for all owner piping interfaces, unless otherwise specified.
f. Instrumentation including all necessary hardware for shutdown systems, programmable logic controllers, and any necessary single-loop controllers

g. Local control panel including indicating lights and switches

h. Control and electrical wiring and conduit or cable trays contained on the skid

i. Grounding system within the package leading to a single terminal grounding point

j. Surface preparation and finish painting, as specified

k. Insulation, as specified

l. Sound attenuation enclosures, if required

m. Necessary quantities of catalysts, chemicals, desiccant, molecular sieve, etc., required for start-up and initial operation of the package

n. Required testing

o. Special tools

p. Preservation and packing

q. Drawings and data in accordance with purchaser’s PIP RESE001-R Documentation Requirements Sheet

r. Spare parts, as specified

s. Terminal boxes and devices that are provided loose for installation by the purchaser

4.3 Furnished by Others

The supplier’s scope of supply shall exclude the following:

a. Installation of skid

b. Start-up and commissioning site work

   Comment: Supervision rates and expected duration shall be furnished with the supplier’s proposal.

c. Design for foundations, underground, and trenches

d. Foundations

e. Foundation bolts

f. Fireproofing

g. Electrical power cabling and support trays external to the skid

h. Electrical power cables to motors

i. Electrical wiring between the purchaser furnished devices and the supplier’s terminal boxes

j. Motor starters

k. Conduit seals for the purchaser’s wiring

l. Area lighting
m. Distributed control system hardware
n. Electricity, steam, cooling water, and other utilities to the skid

### 4.4 Purchaser Interfaces

4.4.1 The purchaser shall indicate on the *PIP RESE001-DM* or *PIP RESE001-D* Data Sheet if a coordination meeting is required.

4.4.2 The purchaser reserves the right to reject any equipment that is not in accordance with this Practice or is otherwise unfit for use.

### 4.4.3 Interconnecting Piping

4.4.3.1 Unless otherwise specified, the purchaser shall provide all of the interconnecting piping required between skids or separate equipment items.

4.4.3.2 If the supplier provides interconnecting piping, the piping shall be match-marked for easy installation.

4.4.3.3 The purchaser and the supplier shall mutually determine routing, the location of supports, and final fit-up welds for the interconnecting piping.

4.4.4 All purchaser piping interfaces shall be impression-stamped or permanently tagged in accordance with the supplier’s connection table or general arrangement drawing. Service or utility connection designations shall be clearly indicated.

4.4.5 Piping connections shall be flanged in accordance with *ASME B16.5*, *ASME B16.42*, or *ASME 16.47*, as applicable.

4.4.6 Flange bolt holes shall straddle the centerline.

4.4.7 Connections of sizes NPS 1-1/4, 2-1/2, 3-1/2, 5, 7, and 9 shall not be permitted.

4.4.8 Each auxiliary piping system including cooling water supply, cooling water return, flush oil, instrument air, nitrogen purge, blowdown lines, waste drains, etc., shall be routed to a single connection at the edge of the skid.

### 4.5 Design of System Components

#### 4.5.1 Pressure Vessels

4.5.1.1 Unless otherwise specified on the purchaser’s *PIP RESE001-DM* or *PIP RESE001-D* Data Sheet, all pressure vessels and heat exchangers shall be in accordance with *PIP VECV1001*, *PIP VESSM001*, or *PIP VESV1002*, as applicable.

4.5.1.2 All pressure vessels and heat exchangers within the scope of the Code shall have Code construction in accordance with the Code.

4.5.1.3 Code documentation shall be provided to the purchaser for all Code pressure vessels and heat exchangers.

4.5.1.4 Unless otherwise specified on the purchaser’s *PIP RESE001-DM* or *PIP RESE001-D* Data Sheet, Code-stamped vessels shall be registered and stamped with the National Board symbol.
4.5.1.5 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the supplier shall be responsible for providing the Code stamp and securing National Board registration number(s).

4.5.1.6 The supplier shall identify the design code for vessels and tanks that are outside the scope of the Code.

4.5.1.7 If specified for non-Code vessels, the allowable stress values and weld joint efficiency factors shall be in accordance with the Code.

4.5.1.8 When specified as being in cyclic service on the datasheet, all pressure vessels determined to be in cyclic service shall have a fatigue stress analysis performed.

Comment: PIP VECV1001, Section 5.7, shall be the method used to determine if the vessel should be considered to be in cyclic service.

4.5.1.9 All covers and blind flanges 23 kg (50 pounds) and greater shall be provided with a davit. Hinges may be used on nozzles.

4.5.1.10 All equipment piping connections handling flammable or toxic fluids shall be flanged in accordance with ASME B16.5 or ASME B16.47. Welded connections shall be approved by purchaser. Screwed connections shall not be permitted.

4.5.1.11 The purchaser and supplier shall agree upon the type and class of flanges to be used on pressure vessels.

4.5.1.12 Flange types shall be specified on the data sheet.

4.5.1.13 For stainless steel and high alloy construction, the use of lap-joint flanges shall be permitted.

4.5.1.14 For utility services such as nitrogen, air, low pressure steam, and process water, the use of slip-on and socket-weld type flanges shall be permitted for ANSI 300# flanges or lower.

4.5.2 Heat Exchangers

4.5.2.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, heat exchangers/coolers shall be configured as follows:

a. Shell-and-tube heat exchangers
b. Inhibited admiralty tubes
c. Cooling fluid shall be on the tube side to facilitate cleaning.
d. Minimum tube size shall be 16 mm (5/8-inch) outside diameter.
e. Minimum tube wall thickness shall be 1.5 mm (18 BWG).

4.5.2.2 Heat exchanger shells shall be Code-stamped if the Code applies.
4.5.2.3 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, heat exchangers shall be designed for the following conditions:

a. 8°C (15°F) approach temperature
b. Maximum gas pressure drop of 0.07 bar (1 psi)
c. Maximum fluid pressure drop of 1 bar (15 psi)
d. Tube side fouling factor of 0.35m²-K/kW (0.002 hr-ft²-F/BTU)
e. Cooling fluid design pressure of 8 bar G (100 psig)
f. Minimum tube side velocity of 1.2 m/s (4 ft/s) in the tubes

4.5.2.4 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, an inlet and outlet temperature indicator shall be provided in the piping to monitor the process side of each heat exchanger service.

4.5.2.5 The cooling fluid outlet of each heat exchanger shall have a local temperature indicator.

4.5.2.6 All heat exchangers shall be provided with both vent and drain valves.

4.5.2.7 Unless otherwise specified, the low-pressure side of shell and tube heat exchangers shall be designed for a minimum of two-thirds of the high-pressure side design pressure.

4.5.2.8 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, all heat exchangers shall have removable heads with removable tube bundles.

4.5.3 Rotating Equipment

4.5.3.1 All rotating equipment shall be in accordance with standards and specifications as specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet.

4.5.3.2 The rotating equipment data sheets shall be completed by the original equipment manufacturer (OEM) provided by the supplier, and reviewed and approved by the purchaser.

4.5.4 Cooling Water Systems

4.5.4.1 Cooling water system components shall be rated as specified by the purchaser on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet and shall not be less than a minimum of 8.0 bar (100 psig).

4.5.4.2 Water to the coolers shall be supplied from a single cooling water supply manifold connection and returned by way of a single cooling water manifold connection.

4.5.4.3 Suitable valves for balancing water flows through the cooler(s) shall be installed.
4.6  Materials

4.6.1 Materials of construction for the skid shall be specified by the supplier on the applicable data sheets for final approval by the purchaser.

4.6.2 The supplier shall be responsible for ensuring that material of construction for the skid is suitable for the environment, as specified by the purchaser on the PIP RESE001-DM or PIP RESE001-D Data Sheet.

4.6.3 If the supplier’s material specification standard is not ASTM, ASME, or AISI (e.g., DIN, JIS, etc.), the package specification shall indicate the nearest equivalent ASTM specification, along with specific deviations. A list of the material’s mechanical properties, alloy composition, and special test requirements shall also be provided.

4.6.4 To preclude heat affected zone (HAZ) corrosion, all austenitic stainless steel components fabricated, hard faced, overlaid, or repaired by welding shall be made of low-carbon or stabilized grades.

4.6.5 Cast-iron pressure-containing parts shall not be permitted in flammable or toxic services.

4.6.6 Unless otherwise specified by the purchaser or by an applicable code as noted on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, material test reports shall not be required.

4.6.7 If applicable codes allow for certificates of compliance, certificates shall be provided for the following:
   a. Heat treatment information if missing from the Material Test Reports
   b. Bolting materials and pressure and main structural parts for which Material Test Reports are not available
   c. If the markings of materials are missing or are removed during fabrication operations

4.6.8 For piping components manufactured in accordance with the standards listed in ASME B31.3, Table 326.1, records shall not be required unless specified by the Code or the material standard, provided the components are marked with the name or trademark of the manufacturer and any other markings required by the material standard. Certificates of compliance shall be required if the markings are removed during fabrication.

4.7  Welding

4.7.1 Backing rings shall not be permitted.

4.7.2 Pipe welding shall be in accordance with ASME B31.3.

4.7.3 Weldable grades of steel pressure parts may be repaired by welding, using qualified welding procedures based on the requirements of the Code, Section IX.

4.7.4 All weld repaired parts shall be inspected and documented in accordance with Section 4.12 of this Practice.

4.7.5 All welds and repairs shall be properly heat treated and nondestructively examined for compliance with the applicable qualified procedures.
4.7.6 All structural steel welds shall be in accordance with *AWS D1.1* and shall be continuous.

4.7.7 Unless otherwise approved by the purchaser, skip or stitch welding (a series of intermittent fillet welds) shall not be permitted.

### 4.8 Skid Nameplates and Rotation Arrows

4.8.1 A nameplate for the skid shall be securely attached, easily readable, and located on the outside perimeter of the skid.

4.8.2 The nameplate shall show as a minimum the following information:
   a. Skid Packager’s (i.e., supplier’s) Name
   b. Skid Packager’s Job Number
   c. Purchase Order Number
   d. Service name and capacity
   e. Weight of skid

4.8.3 Each item of equipment shall include the supplier’s standard nameplate.

4.8.4 If the purchaser’s tag numbers are assigned to equipment, the tag number shall be shown on the supplier’s nameplate or on a supplemental tag.

4.8.5 Rotation arrows shall be either cast in or permanently attached to all rotating equipment at a readily visible location.

4.8.6 Nameplates and rotation arrows shall be made of 300 series stainless steel. If attachment pins are used, the pins shall be of the same material as the nameplate. Welding of nameplates shall be performed using the same weld material.

### 4.9 Clearance and Access Requirements

4.9.1 If specified on the *PIP RESE001-DM* or *PIP RESE001-D* Data Sheet, the purchaser shall approve equipment layout for operation, in-place maintenance, and removal of equipment components.

4.9.2 Platforms, walkways, and other main access routes shall have clear headroom of 200 cm (78 inches) minimum.

4.9.3 The final skid assembly shall provide unobstructed access to all equipment requiring periodic maintenance, including the layout of conduits, piping, and instrumentation.

4.9.4 Components that are operated or serviced on a regular or emergency basis shall be located less than 183 cm (6 feet) above grade or platform. Each instance of nonconforming locations shall require specific approval by the purchaser.

*Comment:* Examples of components that are operated or serviced on a regular or emergency basis include control valves, valves adjusted during operation, pressure gauges, instrument block valves, thermocouples, gauge glasses, gauge glass columns, and differential pressure cells.
4.9.5 Components that are maintained, operated, or serviced only occasionally shall be located within 4.25 m (14 feet) of grade, with unobstructed access using a portable ladder or scaffolding, or less than 183 cm (6 feet) above platform.

Comment: Examples of components that are maintained, operated, or serviced only occasionally include maintenance blinds, relief valves, and orifice flanges.

4.9.6 If applicable and as specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the final skid installation shall maintain a minimum clearance of 30 cm (12 inches) between conduit and equipment or piping, taking into account the installation of thermal insulation.

4.9.7 Space shall be provided for insulation systems furnished and installed by the purchaser.

4.9.8 Spacing for valve actuation, equipment maintenance, and other component functionality shall be considered.

4.9.9 The routing of rigid conduit and piping shall be arranged to avoid the following locations:

a. Over the cases of rotating machinery or other equipment
b. Over or in front of removable heads of vessels and heat exchangers
c. Where the functionality of inspection openings or panel doors can be impaired

4.9.10 Access shall be provided for the removal of heat exchanger bundles.

4.9.11 If possible, equipment that requires maintenance in 12 months or less shall be installed at the skid edge for easy access.

4.10 Skid Components

4.10.1 Drivers

4.10.1.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, electric motors shall be provided in accordance with PIP ELSPS01.

4.10.1.2 As a minimum, driver power shall be equal to the rated shaft power at rated operating condition multiplied by the percentage shown in Table 1.

<table>
<thead>
<tr>
<th>KW</th>
<th>Bhp</th>
<th>% of Rated Shaft Power</th>
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<td>0 – 22</td>
<td>0 – 30</td>
<td>125</td>
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<td>22 – 75</td>
<td>30 – 100</td>
<td>115</td>
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<td>&gt;75</td>
<td>&gt;100</td>
<td>110</td>
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4.10.1.3 Steam turbines shall be provided in accordance with the standard specified on the purchaser’s PIP RESE001-D Data Sheet.
4.10.1.4 Steam turbines shall be capable of carrying 110% of the brake power required for the rated operating conditions based on the normal steam conditions.

4.10.1.5 Steam turbines shall be capable of meeting the specified normal operating conditions with minimum inlet and maximum exhaust steam conditions.

4.10.2 Couplings and Coupling Guards

4.10.2.1 Unless otherwise specified on the purchaser’s PIP RESEE001-DM or PIP RESEE001-D Data Sheet, drive coupling(s) shall be in accordance with PIP REEEE003.

4.10.2.2 Couplings outside of the scope of PIP REEEE003 shall be in accordance with the standard specified on the purchaser’s PIP RESEE001-DM or PIP RESEE001-D Data Sheet.

4.10.2.3 Coupling guards in accordance with OSHA regulations shall be provided over all moving parts that could be hazardous to personnel and shall be installed by the equipment vendor.

4.10.2.4 Guards shall be properly ventilated to prevent excessive heat build-up.

4.10.2.5 Unless otherwise specified, guards shall be supported from the base plate or sole plate.

4.10.2.6 Guards shall be made of nonsparking material if specified on the purchaser’s PIP RESEE001-DM or PIP RESEE001-D Data Sheet.

4.10.2.7 Coupling guard shall provide access to bearing housing of rotating equipment for vibration monitoring.

4.10.3 Belt Drives

4.10.3.1 Unless otherwise specified, belt drives shall not be permitted for applications with greater than 110 kW (150 shaft horsepower).

4.10.3.2 Unless otherwise specified on the purchaser’s PIP RESEE001-D Data Sheet, belt drives shall be synchronous in accordance with RMA IP-24.

4.10.3.3 If more than one banded multiple V-belt is required, matched belt lengths shall be provided.

4.10.3.4 All drive belts shall be oil resistant and have Neoprene or equivalent covers.

4.10.3.5 Unless otherwise specified on the purchaser’s PIP RESEE001-DM or PIP RESEE001-D Data Sheet, the drive system rating shall be based on a service factor of 1.75 times the driver nameplate power rating.

4.10.3.6 Belt drives shall be in accordance with ANSI/RMA IP-20 and this Practice.

4.10.3.7 Minimum recommended motor sheave diameters shall be in accordance with NEMA MG1.

4.10.3.8 Adjustable sheaves shall not be permitted.
4.10.3.9 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, sheaves shall be balanced to primary equipment balance specification.

4.10.3.10 Belt Tension Adjustment

1. Belt drives shall have a motor adjustment mechanism to allow belt tension adjustment.
2. Slide rails shall have a dual adjustment.
3. The adjustable mounts shall not cause the motor and support to be resonant at 1X run speed or any multiple of that speed.

4.10.3.11 If service in a hazardous area is specified, belt drives of the static conducting type shall be provided.

4.10.4 Skid Construction

4.10.4.1 A rigid structural steel skid(s) shall be provided that is designed as a single-lift package with all equipment, hardware, control panel, and instrumentation installed.

4.10.4.2 The skid shall be provided with lifting lugs for a four-point lift.

4.10.4.3 Lifting and transport of the skid, complete with all equipment mounted, shall not permanently distort or otherwise damage the skid or the machinery mounting surfaces.

4.10.4.4 Specifications for spreader bars if required shall be provided.

4.10.4.5 Piping or conduit shall not be located below the top of the skid deck.

4.10.4.6 Projections of equipment outside the perimeter of the skid shall not be permitted.

4.10.4.7 The ends of tubular steel shall be capped and seal-welded.

4.10.4.8 Skids shall be provided with vertical leveling screws located next to the anchor bolt holes.

4.10.5 Machinery Mounting

4.10.5.1 Unless otherwise specified, all equipment shall be installed on mounting plates.

4.10.5.2 Mounting plates shall extend at least 25 mm (1 inch) beyond the outer three sides of equipment feet.

4.10.5.3 All mounting plate anchor bolt holes shall have a minimum 3 mm (1/8-inch) annular clearance with the anchor bolt to permit field alignment of mounting plates.

4.10.5.4 Equipment base plate mounting surfaces shall be machined flat to within 0.025 mm per 30 cm. (0.001 inch per foot) of length with a maximum allowable difference of not greater than 0.254 mm (0.010 inch) out of plane between any two mounting surfaces on the skid.

4.10.5.5 The surface finish of the equipment base plate mounting surface shall be 3.2 micrometer RA (125 microinch RMS).
4.10.5.6 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, equipment base plate mounting surfaces shall be leveled longitudinally and transversely to within 0.40 mm per 1.0 m (0.005 inch per foot).

4.10.5.7 If the skid mounting plate is to be grouted, the skid shall be designed and installed in accordance with PIP REIE686, Chapter 5.

4.10.5.8 For drive train components 100 kg (200 pounds) and greater, the equipment feet shall be provided with vertical and horizontal jackscrews and shall be drilled with pilot holes that are accessible for use in final doweling.

4.10.6 Rotating Machinery Alignment

4.10.6.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, rotary machinery alignment criteria shall be in accordance with this section.

4.10.6.2 The supplier shall demonstrate that final alignment can be achieved in the shop before shipping.

4.10.6.3 For foot-mounted motor-driven equipment, shims shall be provided in accordance with the following:

1. Maximum number of shims under any equipment support foot shall be five.

2. A minimum of 3 mm (0.125 inch) of 300 series stainless steel shims shall be provided.

3. Maximum shim stack height shall not be greater than 12 mm (0.5 inch).

4. Only one 3 mm (0.125 inch) or thicker shim per mounting foot shall be permitted.

5. Shims thinner than 0.05 mm (0.002 inch) shall not be permitted.

4.10.6.4 For equipment not specified in Section 4.10.6.3, the shim configuration shall be provided and specified on the data sheet.

4.10.6.5 All shims shall be full bearing.

4.10.6.6 All shims shall be provided by the equipment manufacturer.

4.10.6.7 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, all equipment hold-down bolts for the skid shall be provided.

4.10.6.8 Unless otherwise approved by the purchaser, slotted hold-down bolt holes shall not be permitted.

4.10.6.9 Unless otherwise approved by the purchaser, through bolting of equipment feet shall not be permitted.

4.10.6.10 Unless otherwise approved by the purchaser, undercutting of hold-down bolts to achieve alignment shall not be permitted.
4.10.6.11 Lock washers shall not be permitted at machinery hold-down bolts.

4.10.6.12 Hold-down bolting shall not be bolt-bound. This will prevent the movement of the equipment in a direction due to the lack of clearance between the hold-down bolt and the side of the bolt hole in the equipment feet through which they pass.

In the equipment’s final aligned position, a minimum of 0.8 mm (1/32 inch) of clearance shall be provided between the hold-down bolts and the sides of the bolt holes in the equipment feet.

4.10.6.13 Soft Foot Checks

1. The soft foot checks shall be performed during the final alignment on each equipment foot (not at the coupling).

2. Piping shall be disconnected from the equipment and all hold-down bolts shall be tightened and loosened one at a time.

3. Maximum permissible movement shall be 0.05 mm (0.002 inch) measured at each foot with a dial indicator.

4.10.6.14 Final shaft alignment checks shall be performed before and after connecting piping and conduit.

4.10.6.15 Final alignment checks shall not be performed until the process piping has been hydrostatically tested. If the piping is disturbed after the purchaser has accepted final alignment, train alignment shall be rechecked and approved by the purchaser.

4.10.6.16 Unless specific alignment acceptance criteria are specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the supplier shall demonstrate that the equipment manufacturer’s standard alignment can be achieved, accounting for thermal offset and alignment bracket sag.

4.10.6.17 For detailed alignment procedures, see PIP REIE686/API RP686, Chapter 7.

4.10.7 Piping and Appurtenances

4.10.7.1 Unless otherwise specified, all piping shall be designed, fabricated, tested, and inspected in accordance with ASME B31.3.

4.10.7.2 Piping systems shall be designed for the most severe conditions of coincident pressure and temperature expected during normal operating conditions, and short-time variations from normal operating conditions. Considerations of increased stresses for short-time variations shall be in accordance with the applicable codes.

4.10.7.3 Piping systems designs shall achieve the following:

a. Proper support and protection to prevent vibration damage during shipment, operation, or maintenance

b. Proper flexibility and normal accessibility for operation, maintenance, and thorough cleaning
c. Elimination of air pockets by piping configuration or valved vents at high points

d. Complete drainage through low points without disassembly of piping to avoid dead legs

4.10.7.4 Piping shall be fabricated by bending and welding to minimize the use of flanges and fittings.

4.10.7.5 Unless otherwise specified, flanges shall be provided at equipment connections, at the edge of any skid, and where required for maintenance.

4.10.7.6 Blinded purge and steam out connections shall be provided for all vessels in hydrocarbon or volatile organic chemical service.

4.10.7.7 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, socket welding shall be limited to sizes NPS 2 and less.

4.10.7.8 For utility services, threaded connections, and fittings, sizes NPS 2 and smaller may be used and shall be in accordance with ANSI B1.20.1 (standard threads) and ANSI B1.20.3 (dryseal types) or ASME B16.11.

4.10.7.9 The supplier shall indicate in his proposal where screwed connections shall be provided.

4.10.7.10 The minimum nominal wall thickness for threaded pipe shall be Schedule 80.

4.10.7.11 Tubing

1. For process systems, tubing shall be a minimum of 12 mm (1/2 inch).

2. For water, nitrogen, instrument air, and steam service only, tubing size 10 mm (3/8 inch) shall be permitted.

3. All tubing shall be in accordance with ASTM A269, welded Type 304/304L or Type 316/316L.

4.10.7.12 Recommendations for the piping sizes, layouts, and any limitations for elevation, pressure drop, etc., shall be provided.

4.10.7.13 Unless specified otherwise on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, limits on loads imposed by piping systems on rotating equipment nozzles shall be in accordance with PIP RECE002.

4.10.8 Special Tools

4.10.8.1 Any special tools, test equipment, or fixtures required to properly install and maintain the equipment shall be provided.

Comment: These are items specifically designed for the equipment that are not available in plant standard maintenance tools inventory.

4.10.8.2 Special tools shall be clearly identified in the supplier’s proposal.
4.10.8.3 Special tools shall be packaged separately and marked “special tools for (item number).”

4.10.8.4 Each special tool shall be stamped or tagged to indicate the intended use.

4.11 System Controls, Instrumentation, Control Panel, and Electrical

4.11.1 System Controls

4.11.1.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, system controls shall be provided for automatic operation as described in the specific component data sheets.

4.11.1.2 If microprocessor control is specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, it shall have the following features:

a. Graphic display with U.S. customary units unless otherwise specified
b. First out annunciation freeze screen display with manual reset
c. “Save program” memory for restart after power failure
d. Common alarm contacts for connection to the purchaser’s remote alarm or alarm signals
e. Capability of two-way communication with the purchaser’s Distributed Control System (DCS) or other microprocessors when specified
f. Battery back up to maintain set-points during periods of no power

4.11.1.3 Alarm and shutdown contact position (fail open or fail close) shall be defined by the purchaser and listed on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet.

4.11.1.4 Critical system variables shall be recommended for the purchaser’s trend monitoring.

4.11.2 Instruments

4.11.2.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, skid instrumentation shall be provided in accordance with PIP PCSPS010.

4.11.2.2 If PIP PCSPS010 is not used, the minimum condition monitoring instrumentation requirements, alarms, and shutdowns for the skid shall be provided in accordance with the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet.

4.11.2.3 Any additional instrumentation required for safe operation shall be provided.

4.11.2.4 A complete description of all instrumentation, including manufacturer and model, shall be provided in the maintenance manuals.
4.11.3 Control Panel

4.11.3.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, control panels shall be provided in accordance with PIP PCSPS010.

4.11.3.2 The control and monitoring panel shall be mounted on the skid and visible from any reasonable position on the skid.

4.11.4 Electrical

Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, skid electrical requirements shall be in accordance with PIP ELSPS01.

4.11.5 Utilities

4.11.5.1 Purchaser shall specify any site utility limitations or preferences on the PIP RESE001-D Data Sheet.

4.11.5.2 All utility requirements shall be specified on the PIP RESE001-DM or PIP RESE001-D Data Sheet.

4.12 Inspection, Testing, Alloy Verification, and Preparation for Shipment

4.12.1 General

4.12.1.1 If specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the skid shall be inspected by the purchaser or purchaser’s designated agent for workmanship and functionality. Any reliability or maintainability problems identified shall be corrected before shipment.

4.12.1.2 Documentation of all inspections shall be maintained for the duration of the longest warranty period for any component on the skid.

4.12.1.3 Surfaces of pressure containing parts shall not be coated until the specified inspection of that part and hydrostatic testing (if specified) are completed.

4.12.2 Testing

4.12.2.1 Unless otherwise specifically approved in writing by the purchaser, pressure-containing components (including auxiliaries) shall be hydrostatically tested with liquid at a minimum of 1-1/2 times the MAWP (new and cold).

4.12.2.2 The test metal temperature shall be at a temperature 17°C (30°F) higher than the nil-ductility transition temperature of the material being tested.

4.12.2.3 Austenitic stainless steel equipment shall be tested with water having the chloride content not greater than 50 ppm.

4.12.2.4 The assembled piping system of each package shall be hydrostatically tested with liquid at a minimum of 1-1/2 times the MAWP.

4.12.2.5 Instrumentation that may be damaged by a hydrostatic test shall be removed or adequately isolated before the test.
4.12.2.6 If the component tested is to operate at a temperature at which the strength of a material is below the strength of that material at room temperature, the hydrostatic test pressure shall be multiplied by a factor obtained by dividing the allowable working stress for the material at room temperature by that at operating temperature. The stress values used shall be in accordance with those given in ASME B31.3 for piping or in the Code for pressure vessels. The pressure thus obtained shall then be the minimum pressure at which the hydrostatic test shall be performed.

4.12.2.7 Actual hydrostatic test pressures shall be shown on the data sheet.

4.12.2.8 All pressure tests shall be in accordance with the requirements of the Code.

4.12.2.9 In the event a discrepancy exists between the Code test pressure and the test pressure in this Practice, the higher pressure shall govern.

4.12.2.10 Tests shall be maintained for a sufficient period of time, but not less than 1 hour to permit complete examination of all parts under pressure.

4.12.2.11 The hydrostatic test shall be considered satisfactory when no leak or drop in pressure is observed.

4.12.2.12 As the system is assembled, vessels, piping, and all associated components shall be surface-cleaned, internally inspected, and/or flushed.

4.12.2.13 All foreign material shall be removed from the pipe before connecting to the equipment.

4.12.2.14 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the equipment manufacturer’s specific pipe cleaning procedures and acceptance criteria shall be followed.

4.12.2.15 If specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, a factory or site performance test shall be performed to verify compliance with the stated or guaranteed performance.

4.12.2.16 Continuity tests shall be performed on all electrical circuits before final inspection.

4.12.2.17 All operational alarms and safety devices shall be functionally tested by simulating the condition(s) required for actuation.

4.12.2.18 The purchaser shall specify additional testing requirements on the PIP RESE001-D Data Sheet.

4.12.3 Positive Material Identification (PMI)

4.12.3.1 If specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, PMI and associated documentation shall be provided.

4.12.3.2 If PMI is specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the purchaser and the supplier shall mutually agree upon the methods to be used and the materials to be examined.
4.12.4 Coatings

4.12.4.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, all coatings shall be the supplier’s standard.

4.12.4.2 The type of coating, the coating manufacturer, and the application specification shall be provided as part of project documentation.

4.12.4.3 Except for field touchups as necessary after installation, all coatings shall be shop-applied.

4.12.4.4 Surfaces that cannot be accessed for coating after assembly shall be prepared, primed, and coated before the final assembly.

4.12.4.5 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, exposed alloy equipment and piping shall not be painted.

4.12.5 Insulation

4.12.5.1 Unless otherwise specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the supplier shall design all thermal insulation.

4.12.5.2 Unless otherwise specified on the PIP RESE001-DM or PIP RESE001-D Data Sheet, the purchaser shall provide and install insulation.

4.12.5.3 If insulation is to be provided by the supplier, the purchaser shall provide the following completed data sheets in the bid package:

<table>
<thead>
<tr>
<th>Hot Service Insulation</th>
<th>Cold Service Insulation</th>
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<tbody>
<tr>
<td>PIP INSH1000</td>
<td>PIP INSC1000</td>
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</table>

4.12.5.4 If specified on the purchaser’s PIP RESE001-DM or PIP RESE001-D Data Sheet, the supplier’s standard insulation specification shall be submitted with the proposal for purchaser’s approval.

4.12.5.5 The insulation shall not be applied until the hydrostatic testing has been successfully completed and accepted.

4.12.6 Winterization/Heat Tracing

4.12.6.1 If winterization or heat tracing is specified, steam tracing, resistance heating, and/or insulation shall be installed in the shop to provide freeze protection.

4.12.6.2 Piping that conveys water, liquids containing water, or liquids with freezing points higher than minimum ambient temperature shall not have stagnant pockets and dead ends in normally flowing lines.

4.12.6.3 Lines, equipment, and steam traps where liquids may collect and freeze during shutdown or after hydrostatic test shall have low-point drains and high-point vents.
4.12.7 Preparation for Shipment

4.12.7.1 Special shipping requirements shall be agreed upon between the supplier and the purchaser before shipment.

4.12.7.2 Recommendations shall be provided for storage and protective care of the skid and all skid components, including parts shipped loose.

4.12.7.3 If supplier’s recommendations are not available, *PIP REIE686/API RP686*, Chapter 3, shall serve as minimum requirements for protecting skid machinery and components.

4.12.7.4 All flanges less than 10 cm (NPS 4) shall have plastic flange covers secured with plastic drive bolts or gasketed wooden covers held by a minimum of four bolts. Wooden covers shall have a minimum thickness of 12 mm (1/2 inch).

4.12.7.5 All flanges sized 10 cm (NPS 4) and larger shall have gasketed wooden covers or metal covers installed and held by a minimum of four bolts. Wooden covers shall have a minimum thickness of 12 mm (1/2 inch). Metal covers shall have a minimum thickness of 3 mm (1/8 inch) and shall be supplied with gaskets.

4.12.7.6 Unpainted, machined metal surfaces shall be coated with a rust preventative coating.

4.12.7.7 After testing, all skid components, including piping, shall be drained and dried before preservation.

4.12.7.8 The purchaser shall specify the length of storage.

4.12.7.9 Specific storage requirements shall be specified.

4.12.7.10 Bearing housing internals shall be coated with a suitable vapor space inhibitor preservative before shipment.

4.12.7.11 Components shipped loose to prevent damage during transit shall be boxed and properly tagged for reassembly in the field.

4.12.7.12 A diagram indicating center of gravity of the skid shall be provided.

4.13 Documentation

4.13.1 All data and documents specified on purchaser’s *PIP RESE001-R* Documentation Requirements Sheet shall be provided.

4.13.2 If specified by the purchaser on *PIP RESE001-R* Documentation Requirements Sheet, documentation shall be provided for the proper field installation, pre-commissioning, start-up, and field repair of the package and equipment supplied within the scope of the purchase order.

4.13.3 The specified documentation shall be attached to the skid in a prominent location and supplied in watertight packaging.

4.13.4 The equipment manufacturer shall provide completed data sheets for all equipment.
### ASSOC. PIP RESE001

#### DATA SHEET

**GENERAL PURPOSE SKID-MOUNTED PACKAGED EQUIPMENT**

**RESE001-DM**

**ISSUED FOR:** PROPOSAL

**FACILITY NAME/LOCATION:**

**ITEM NAME:**

**ITEM TAG NO.:**

**SERVICE:**

**UNIT:**

**P&ID NO.:**

**DATA PROVIDED BY:** PURCHASER SUPPLIER

**SUPPLIER IF NOT BY PURCHASER**

---

### GENERAL:

- **SYSTEM COMPONENTS IN ACCORDANCE WITH (4.1.3):**
  - [ ] RECOGNIZED INDUSTRY STANDARDS
  - [ ] OTHER APPLICABLE SPECIFICATIONS:

- **LOCATION, SITE DATA (4.1.5):**
  - **LOCATION:**
    - [ ] INDOOR
    - [ ] HEATED
    - [ ] UNDER ROOF
    - [ ] OUTDOOR
    - [ ] UNHEATED
    - [ ] PARTIAL SIDES
    - [ ] GRADE
    - [ ] MEZZANINE
  - **ELEVATION:** M
  - **BAROMETER:** BARA/mm. HG A
  - **TEMPERATURE:** °C MAX. °C MIN.
  - **RELATIVE HUMIDITY:** %
  - **UNUSUAL CONDITIONS:**
    - [ ] DUST
    - [ ] FUMES
    - [ ] CORROSIVE
    - [ ] OTHER:
  - **NOISE REQUIREMENTS FOR SKID (4.1.10):**
    - dBA MAX. _______ dB A EXPECTED: _______
    - dB A MEASURED: _______
    - **MINIMUM NOZZLE CONNECTION SIZE (4.1.16):**
      - [ ] 12 mm
      - [ ] STD. HEAT EXCHANGER DESIGN PER PIP RESE001, PARA. 4.5.2.3
    - [ ] OTHER:
  - **NOMINAL CORROSION ALLOWANCE:**
    - [ ] PER RESE001, PARA. 4.1.17
    - [ ] OTHER:
  - **APPLICABLE SITE-SPECIFIC REGULATIONS (4.1.19.1):**

---

### PURCHASER INTERFACES:

- **INTERCONNECTING PIPING BY (4.4.3):**
  - [ ] PURCHASER
  - [ ] SUPPLIER:
  - [ ] COORDINATION MEETING REQUIRED (4.4.1)

---

### DESIGN OF SYSTEM COMPONENTS:

#### PRESSURE VESSELS:

- **APPLICABLE SPECIFICATIONS (4.5.1.1):**
  - [ ] PIP VECV1001
  - [ ] PIP VESV1002
  - [ ] PIP VESSM001
  - [ ] OTHER:
  - [ ] ASME CODE-DESIGNED (4.5.1.2)
  - [ ] ASME CODE-STAMPED/REGISTERED (4.5.1.4 & 4.5.1.5)
  - [ ] OTHER DESIGN CODE:
  - [ ] FATIGUE STRESS ANALYSIS PERFORMED (4.5.1.8)
  - [ ] UNUSUAL CONDITIONS:
    - [ ] FLANGES (4.5.1.11):
      - TYPE:
      - CLASS:
    - [ ] OTHER:
  - [ ] EXCHANGERS:
    - [ ] STANDARD EXCHANGER PER PIP RESE001, PARA. 4.5.2.1
    - [ ] STD. HEAT EXCHANGER DESIGN PER PIP RESE001, PARA. 4.5.2.3
    - [ ] STANDARD TEMP. INDICATORS PER PIP RESE001, PARA. 4.5.2.4
    - [ ] LOW-PRESSURE SIDE DESIGN PER PIP RESE001, PARA. 4.5.2.7
    - [ ] REMOVABLE HEADS AND TUBE BUNDLES (4.5.2.8)

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### NO. DATE REVISION DESCRIPTION

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<th>NO.</th>
<th>DATE</th>
<th>REVISION DESCRIPTION</th>
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<th>APVD.</th>
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**MAY 2017**

**DATA SHEET**

**ASSOC. PIP**

**RESE001**

**RESE001-DM**
### Rotating Equipment Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
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### Cooling Water Systems

- **Cooling Water Component Pressure Ratings (4.5.4.1):**
  - Minimum 7 BarG
  - Other: 

### Materials

- **Material of Construction for Skid (4.6.1):**

### Welding

- **Skip or Stitch Welding Permitted (4.7.7):**

### Clearances and Access

- **Equipment Layout Approval by Purchaser Required (4.9.1):**
  - Minimum of 30 cm
  - Other: 

### Skid Components

- **Drivers:**
  - Motor Specification (4.10.1.1):
    - PIP ELSPS01
    - Other: 
  - Steam Turbine (4.10.1.3):
    - Manufacturer Standard
    - API 611

- **Couplings and Coupling Guards:**
  - Coupling Specification (4.10.2.1):
    - PIP REEE003
    - Other: 
  - Guard Support (4.10.2.5):
    - From Base/Sole Plate
    - Other: 
  - Guard Material (4.10.2.6):
    - Manufacturer Standard
    - Nonsparking Material

### Belt Drives

- **Belt Drives Permitted**
- **Power Limitations (4.10.3.1):**
  - 110 KW
  - Other: 

### Synchronous Belt Applications (4.10.3.2):**

- **Synchronous Construction**
- Other: 

### Cooling Water Component Pressure Ratings (4.5.4.1):**

- **Minimum 7 BarG**
- **Other:**

### Sheave Balance Requirement (4.10.3.9):**

- **To Primary Equipment Balance**
- Other: 

### Material Test Reports (4.6.6):**

- None Required
- Following Required: 

### Machine Mounting

- **Equipment Installation (4.10.5.1):**
  - On Mounting Plates
  - Other: 

### Mounting Surface Machining

- **PIP RE001, PARA. 4.10.5.4, & 4.10.5.5**
- Other: 

### Mounting Surface Level

- **PIP RE001, PARA. 4.10.5.6**
- Other: 

### Rotating Machinery Alignment

- **Alignment Specification:**
  - PIP RE001, PARA. 4.10.6
  - Other: 

### Equipment Hold-Down Bolts Provided by (4.10.6.7):**

- **Supplier**
- Other: 

### Alignment Acceptance Criteria (4.10.6.16):**

- **Equipment Manufacturer Standard**
  - PIP RE00001
  - API 612
  - Other: 

---

**General Purpose Skid-Mounted Packaged Equipment**

**May 2017**
PIPING AND APPURtenances:
- Piping Specification (4.10.7.1):
  - ASME B31.3
  - Other:
- Equipment Nozzle Loading Specification (4.10.7.13):
  - PIP RECE002
  - Other:

**SYSTEM CONTROLS:**
- System Controls for Automatic Operation (4.11.1.1):
  - See this data sheet page 4
  - Other (describe):

- Microprocessor Controller Required (4.11.1.2)

**INSTRUMENTS:**
- Specification (4.11.2.1):
  - PIP PCSPS010
  - Other:

**CONTROL PANEL:**
- Specification (4.11.3.1):
  - PIP PCSPS010
  - Other:

**ELECTRICAL:**
- Specification (4.11.4.1):
  - PIP ELSPS01
  - Other:

**UTILITIES (4.11.5):**
- Site Utility | Availability | Requirements
  - Cooling Water:
  - Steam:
  - Natural Gas:
  - Nitrogen:
  - Plant Air:
  - Instrument Air:
  - Condensate:

- Insulation Provision and Installation (4.12.5.2):
  - Provided by Purchaser
  - Provided by Supplier
  - Supplier Std. Spec. Req’d for Purchaser Approval (4.12.5.4)

**INSECTION TESTING GENERAL:**
- Skid Inspection and Approval by Purchaser Req’d. (4.12.1.1)

**TESTING:**
- Factory or Site Performance Test (4.12.2.15):
  - Not Required
  - Factory Test Required
  - Performance Test Required
  - Additional Purchase Testing Requirements (4.12.2.18):

**POSITIVE MATERIALS IDENTIFICATION (PMI):**
- PMI Required (4.12.3.1)
- PMI Methods and Materials to be Examined (4.12.3.2):

**COATINGS:**
- Supplier Standard (4.12.4.1)
  - Other:
- Painting Exposed Alloy Equipment and Piping Permitted (4.12.4.5)

**INSULATION:**
- Thermal Insulation Design by (4.12.5.1):
  - Supplier
  - Other:

- Insulation Provisions and Installation (4.12.5.2):
  - Provided by Purchaser
  - Provided by Supplier
  - Supplier Std. Spec. Req’d for Purchaser Approval (4.12.5.4)

**WINTERIZATION/HEAT TRACING:**
- Winterization Required (4.12.6)
- Winterization Temperature: _________ °C
- Heat Tracing Required (4.12.6)
- Heat Tracing Design and Installation:
  - Manufacturer Standard
  - For Resistance Tracing, Use IEEE 515
  - For Steam Tracing, See Attached Details
  - Other:
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## GENERAL

- **System Components in Accordance with (4.1.3):**
  - Recognized Industry Standards
  - Other Applicable Specifications

- **Location, Site Data (4.1.5):**
  - **Location:**
    - Indoor
    - Outdoor
    - Heated
    - Unheated
    - Under Roof
    - Partial Sides
    - Mezzanine
  - **Grade:**
    - Site Data:
      - Elevation: ___________ FT
      - Barometer: ___________ PSIA/IN. HG A
      - Temperature: ___________ °F MAX. ___________ °F MIN.
      - Relative Humidity: ___________%
  - Unusual Conditions:
    - Dust
    - Fumes
    - Corrosive
    - Other:

- **Noise Requirements for Skid (4.1.10):**
  - Dba Max: ___________  DBA Expected: ___________  DBA Measured: ___________

- **Minimum Nozzle Connection Size (4.1.16):**
  - 3/4 Inch
  - Other:

- **Nominal Corrosion Allowance:**
  - Per RESE001, Para. 4.1.17
  - Other:

- **Applicable Site-Specific Regulations (4.1.19.1):**

## PURCHASER INTERFACES

- **Interconnecting Piping by (4.4.3):**
  - Purchaser
  - Supplier:

- **Coordination Meeting Required (4.4.1):**

## DESIGN OF SYSTEM COMPONENTS

### Pressure Vessels:

- **Applicable Specifications (4.5.1.1):**
  - PIP VecV1001
  - PIP VesusV1002
  - PIP VesselM001
  - Other:

- **ASME Code-Designed (4.5.1.2):**

- **ASME Code-Stamped/Registered (4.5.1.4 & 4.5.1.5):**

- **Other Design Code:**

- **Fatigue Stress Analysis Performed (4.5.1.8):**
  - Flanges (4.5.1.11):
    - Type:
    - Class:

- **Unusual Conditions:**
  - Corrosive Type:
  - Other:

- **Noise Requirements for Skid (4.1.10):**
  - Standard Exchanger Per PIP RESE001, Para. 4.5.2.1
  - Exceptions:

- **Std. Heat Exchanger Design Per PIP RESE001, Para. 4.5.2.3**
  - Exceptions:

- **Standard Temp. Indicators Per PIP RESE001, Para. 4.5.2.4**
  - Exceptions:

- **Low-Pressure Side Design Per PIP RESE001, Para. 4.5.2.7**
  - Exceptions:

- **Removable Heads and Tube Bundles (4.5.2.8)**
  - Exceptions:
GENERAL PURPOSE SKID-MOUNTED PACKAGED EQUIPMENT

ROTATING EQUIPMENT COMPONENTS:

APPLICABLE COMPONENT SPECIFICATIONS (4.5.3.1):

COMPONENT: SPECIFICATION:

COOLING WATER SYSTEMS:

COOLING WATER COMPONENT PRESSURE RATINGS (4.5.4.1):

- MINIMUM 100 PSIG
- OTHER:

MATERIALS:

- MATERIAL OF CONSTRUCTION FOR SKID (4.6.1):

WELDING:

- SKIP OR STITCH WELDING PERMITTED (4.7.7)

CLEARANCES AND ACCESS:

- EQUIPMENT LAYOUT APPROVAL BY PURCHASER REQUIRED (4.9.1)
- MINIMUM OF 12 INCHES
- OTHER:

SKID COMPONENTS:

DRIVERS:

- MOTOR SPECIFICATION (4.10.1.1):
- PIP ELSPS01
- OTHER:

STEAM TURBINE (4.10.1.3):

- MANUFACTURER STANDARD
- API 611

COUPLINGS AND COUPLING GUARDS:

- COUPLING SPECIFICATION (4.10.2.1):
- PIP REE003
- OTHER:

GUARD SUPPORT (4.10.2.5):

- FROM BASE/SOLE PLATE
- OTHER:

GUARD MATERIAL (4.10.2.6):

- MANUFACTURER STANDARD
- NONSPARKING MATERIAL

BELT DRIVES:

- BELT DRIVES PERMITTED
- HORSEPOWER LIMITATIONS (4.10.3.1):
  - 150 HP
  - OTHER:

MULTIPLE BELT APPLICATIONS (4.10.3.2):

- SYNCHRONOUS CONSTRUCTION
- OTHER:

DRIVE SYSTEM RATING (4.10.3.5):

- SERVICE FACTOR 1.75
- OTHER:

SHEAVE BALANCE REQUIREMENT (4.10.3.9):

- TO PRIMARY EQUIPMENT BALANCE
- OTHER:

MACHINERY MOUNTING:

- EQUIPMENT INSTALLATION (4.10.5.1):
  - ON MOUNTING PLATES
  - OTHER:

MOUNTING SURFACE MACHINING:

- PIP REE001, PARA. 4.10.5.4, & 4.10.5.5
- OTHER:

MOUNTING SURFACE LEVEL:

- PIP REE001, PARA. 4.10.5.6
- OTHER:

ROTATING MACHINERY ALIGNMENT:

- ALIGNMENT SPECIFICATION:
- PIP REE001, PARA. 4.10.6
- OTHER:

SHIM CONFIGURATION (4.10.6.4):

- EQUIPMENT HOLD-DOWN BOLTS PROVIDED BY (4.10.6.7):
  - SUPPLIER
  - OTHER:

ALIGNMENT ACCEPTANCE CRITERIA (4.10.6.16):

- EQUIPMENT MANUFACTURER STANDARD
- PIP REIE686
- API 612
- OTHER:
PIPING AND APPURtenANCES:

- PIPING SPECIFICATION (4.10.7.1):
  - ASME B31.3
  - OTHER:

- EQUIPMENT NOZZLE LOADING SPECIFICATION (4.10.7.13):
  - PIP RECE002
  - OTHER:

SYSTEM CONTROLS:

- SYSTEM CONTROLS FOR AUTOMATIC OPERATION (4.11.1.1):
  - SEE THIS DATA SHEET PAGE 4
  - OTHER (DESCRIBE):

- MICROPROCESSOR CONTROLLER REQUIRED (4.11.1.2)

ALARM AND SHUTDOWN CONTACT POSITION (4.11.1.3):

- FAIL TO OPEN
- FAIL TO CLOSE

SUPPLIER RECOMMENDED TREND MONITORING VARIABLES:

INSTRUMENTS:

- SPECIFICATION (4.11.2.1):
  - PIP PCSPS010
  - OTHER:

CONTROL PANEL:

- SPECIFICATION (4.11.3.1):
  - PIP PCSPS010
  - OTHER:

ELECTRICAL:

- SPECIFICATION (4.11.4):
  - PIP ELSPS01
  - OTHER:

UTILITIES (4.11.5):

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INSPECTION TESTING GENERAL:

- SKID INSPECTION AND APPROVAL BY PURCHASER REQ'D. (4.12.1.1)
## Minimum Condition Monitoring Instrumentation Requirements

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### Definitions

1. **Approval:** Submitted for purchaser review and comment.
2. **Certified:** Certified correct by purchaser/supplier and incorporates comments by purchaser from approval copy.
3. **As Built:** Incorporates modifications made during fabrication.

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## DOCUMENTATION REQUIREMENTS SHEET

### GENERAL PURPOSE SKID-MOUNTED PACKAGED EQUIPMENT

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### DOCUMENT TYPE LEGEND

- **X** = ORIGINAL
- **H** = HARD COPY
- **N** = NATIVE FILE
- **E** = ELECTRONIC MEDIA FILE (READ-ONLY)

### TIME LEGEND

- **A** = [   ] WEEKS AFTER CONTRACT AWARD
- **B** = [   ] WEEKS BEFORE WORK STARTS
- **C** = [   ] WEEKS AFTER WORK COMPLETE
- **D** = WEEKLY
- **E** = AT TIME OF SHIPMENT

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1. Statement of compliance or list of exceptions to data sheets and specifications
2. Dimensional outline drawings including mounting and foundation dimensions
3. Lube oil schematics, including component sizing criteria
4. Shipping weight, assembled weight, and center of gravity of skid
5. Maintenance and disassembly clearances
6. Performance curves and data for skid equipment
7. Completed equipment data sheets
8. Catalog information sheets for auxiliary equipment
9. Connection information: flange location, size, dimension details with tie-in points specified, junction box locations
10. Bills of materials
11. Flow schematic
12. Itemized list of special tools
13. Guaranteed (calculated) sound power level dB
14. Allowable nozzle loads
15. Shaft seal details
16. Component detail, cross-section, and P&I diagrams
17. Expected (measured) sound pressure level dBA
18. Skid assembly details
19. Complete spare parts list with prices (including generic manufacturer’s identification numbers) with recommended spare parts identified
20. Approved OEM after-market repair facilities
21. Code manufacturer’s data reports
22. Pressure vessel fabrication drawings
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<td>27.</td>
<td>Subvendor components bills of materials with full description</td>
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<td>28.</td>
<td>Installation, operation, maintenance, and lubrication manuals (include recommended preventative maintenance [PM] intervals)</td>
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<td>30.</td>
<td>Test data, curves, and reports</td>
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