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An American National Standard

# Standard Classification for Hierarchy of Equipment Identifiers and Boundaries for Reliability, Availability, and Maintainability (RAM) Performance Data Exchange[1]

This standard is issued under the fixed designation F2446; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This classification is to serve as an international standard for marine equipment nomenclature, taxonomy, hierarchical data structure, unique identifiers, and boundary definition for the consistent acquisition and exchange of equipment RAM performance data. The standard addresses the classification of mechanical and software products.

1.2 RAM in an acronym for Reliability, Availability, & Maintainability where:

1.2.1 Reliability is the probability that an item can perform a required function under given conditions for a given time interval (t1, t2). It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval.

1.2.2 Availability is the probability that an item is in a state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided.

1.2.3 Maintainability is the probability that a given active maintenance action, for an item under given conditions of use can be carried out within a stated time interval, when the maintenance is performed under stated conditions and using stated procedures and resources.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

## 2. Referenced Documents

2.1 *ISO Standards:*[2]

ISO 3166-1 :1997, Codes for the Representation of Names of Countries and Their Subdivisions—Part 1: Country Codes, 1997

ISO 10303 , Industrial Automation Systems and Integration—Product Data Representation and Exchange

ISO 13584 , Industrial Automation Systems and Integration—Parts Library

ISO/IEC TR 12182 , Information Technology—Categorization of Software, Technical Report, 1998

ISO/TC 67/WG 4 , ISO/FDIS 14224:1998(E), Petroleum and Natural Gas Industries—Collection and Exchange of Reliability and Maintenance Data for Equipment, 1998

2.2 *Other Standards:*

Center for Chemical Process Safety of the American Institute of Chemical Engineers, Guidelines for Improving Plant Reliability through Data Collection and Analysis, 1998[3]

IEC 60050-191 , International Electrotechnical Vocabulary, Chapter 191, Dependability and Quality of Service[4]

International Maritime Organization (IMO) Circular letter No. 1886/Rev. 2, Implementation of Resolution A.600(15)—IMO Ship Identification Number Scheme, 2002[5]

Naval Sea Systems Command, Expanded Ship Work Breakdown Structure (ESWBS) for All Ships and Ship/Combat

[1] This classification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.05 on Computer Applications.

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[2] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

[3] Available from American Institute of Chemical Engineers, 3 Park Ave, New York, N.Y. 10016-5991.

[4] Available from International Electrotechnical Commission (IEC), 3 rue de Varembé, Case postale 131, CH-1211, Geneva 20, Switzerland, http://www.iec.ch.

[5] Available from International Maritime Organization (IMO), 4 Albert Embankment, London, SE1 7SR, U. K.

Systems, Volumes 1 and 2, 1985[6]

## 3. Terminology

3.1 *Definitions:*

3.1.1 *boundary*—item boundaries define the subordinate components that are to be included in the item. The purpose of the boundary definition is to ensure a common understanding of which components are to be included within a specific item.

3.1.2 *class*—a concept to group objects with similar characteristics, with the purpose of describing common properties.

3.1.2.1 *Discussion*—The ISO 10303 definition of a class is "a concept to group items with similar characteristics, with the purpose of describing the common properties of the class members. Each item belongs to at least one class. A class usually has a criterion for inclusion or exclusion of items." A class is only an abstraction that helps the categorization of objects.

3.1.3 *instance*—the physical representation of the member of an object class. For example, the main propulsion diesel engine of vessel XYZ is an instance of the diesel_engine object class.

3.1.4 *object*—any item that has properties and functions.

3.1.5 *product identification*—this classification proposes that products be uniquely identified using the following combination: Manufacturer Country Code—Manufacturer National Tax ID—Manufacturer Model Number—Manufacturer Model Type. The manufacturer country code must be the ISO 3166-1 code for the manufacturer's country of origin.

3.1.6 *property*—an object's attribute whose value characterizes a specific class instance. The process of initializing a set of properties for a specific instance is called instantiation.

3.1.7 *string*—any list of ACSII characters with variable length.

3.1.8 *string array*—a dimensionless array of string values.

3.1.9 *unique component identification*—this classification proposes that components be uniquely identified using the following combination: Site ID—Generic ID—Location ID. The description of the various identifiers is as follows:

3.1.9.1 *site ID*—unique vessel identifier. In some cases, shipping organizations manage their inventory at the fleet level in such a way that pieces of equipment are removed from one vessel to be brought back to shore for repairs or overhauls while already serviced pieces of equipment previously installed on board another vessel are used as replacements. This method of managing inventory makes it impractical to associate a specific component with a vessel ID. The following two alternatives are acceptable: *(1)* keeping the ID of the first vessel on which it was installed throughout the component's entire life time, and *(2)* assigning a warehouse ID to components that can potentially be installed on multiple vessels.

3.1.9.2 *generic ID*—the name or code of the object class to which the component belong. Standard implementers are free to use either the class name or code, depending on data storage preferences given that class names are string values whereas class codes are numeric values.

3.1.9.3 *location ID*—when multiple identical components are located on the same site, the location ID identifies a specific piece of equipment within the site. Examples of location IDs include bolt hole location and deck/port-to-starboard/aft-to-forward sequencing. The method used for setting up location IDs is irrelevant for the standard. It is useful to the standard implementer only and thus it is left to the standard implementer's discretion.

3.1.10 *unique vessel identification*—unique equipment identification requires a unique site or vessel identifier. This classification proposes that commercial vessels be identified by their International Maritime Organization (IMO) number. IMO assigns a unique number to every commercial vessel in the world to be used for the vessel tracking. The structure of the IMO number comprises two parts: a variable seven-digit numeric number (the Lloyd's Register number) and a constant alpha prefix "IMO" (for example, IMO 1234567). The constant 3-alpha prefix by definition contributes nothing to the identification of the ship. Therefore, only the variable seven-digit numeric element of the IMO number is used. The seven-digit numeric number is maintained by Lloyd's Register which assigns a number to a ship at any time following the initiation of its construction. This classification also proposes that navy vessels be identified by Navy Specific Identification (Hull) Number preceded by the country code. The structure comprise of two parts: a variable 3-alpha prefix country code followed by five to seven digit alphanumeric hull number (for example, USA LPD17). The five to seven digit alphanumeric hull numbers are maintained by corresponding country navies.

## 4. Significance and Use

4.1 Capturing high quality Reliability, Availability, and Maintainability (RAM) performance data requires careful and consistent collection of equipment failure and repair data, operating hours, and repair time. A standard hierarchy of equipment boundaries has been needed for machinery data exchange among the stakeholders in shipbuilding, ship classification, and ship operations.

4.2 Industry and government will use a world standard method for setting the hierarchy of indentures and boundaries required for assigning failure and repair events to equipment for the tracking and calculation of equipment RAM performance.

4.3 Agreed boundaries and equipment identifiers make it possible to share equipment data among organizations, benchmark equipment performance, perform modeling and simulation of current and proposed systems, or use performance data to improve operations of commercial and Naval vessels.

4.4 RAM analysis is primarily based on the observation of individual components among which identical items contribute to the same data sample. This classification is designed to be used for the identification of individual (unique) components in such a way that identical components can be identified within a given data sample.

[6] Available from Naval Sea Systems Command, 1333 Isaac Hull Avenue, S. E. Washington Navy Yard, Washington D.C. 20376.

## 5. Basis of Classification

5.1 The class library constitutes a generic list of objects to be used as a toolbox for the development of specific ship breakdown structures as shown in Fig. 1. Instances of object classes will be created by assigning specific properties, including custom-designed properties serving organization specific functions and required properties aimed at facilitating global identification and RAM assessment.

5.1.1 The class library includes systems, pieces of equipment, elementary items (with some exceptions, elementary items can be seen as parts), and software products. It is that standard implementers use the class library to build specific ship breakdown structures by using a parent/child relationship linking object class instances.

5.1.2 Each item has a parent to which it belongs. The parent of any item can be any other type of items. For example, the parent of a system is likely to be the ship, although in some instances it is another system. The ship is an item of the class library because it is the primary ancestor of all items and the direct parent of most systems. As a primary ancestor, a ship has no parent.

5.1.3 The parent of an elementary item is a system, a piece of equipment or another elementary item. Elementary items do not have children. An item is always defined with respect to its parent. As a result, the identification of the parent is a required property for all items. Within a given ship structure, the combination of an item identifier and its parent identifier is not unique. Indeed, several identical items with identical functions are commonly found on board a specific ship. A location ID (such as the bolt hole location, for example) is thus required to uniquely identify each item. Consequently, an item of a specific ship breakdown structure is fully identified by its own ID, the ID of its parent, and a location ID.

5.2 Equipment RAM data exchange will take place through the exchange of object class instances, that is, objects with populated properties, including the list of required properties for RAM data exchange. Class names are meant to be transparent to end-users once a specific hierarchy is established. They will only facilitate the data exchange. End-users are expected to be presented with customized label names that are dependent on business logic, culture, and language. Label names are optional object properties populated by the standard implementer.

5.3 Existing ship breakdown structures and identification systems will be made compatible by adding a reference to the object class for each component. Standard implementers will be required to collect and store a minimum set of properties, identified as "required properties." The storage structure of the object class properties (for example, manufacturer, model number, Mean Time Between Failures, and so forth) is not imposed by this classification . Standard implementers are free to use their own storage structure. Implementers are also able to create private data exchange for data that is to stay within the organization (see Appendix X1).

5.4 This classification provides a list of generic criteria to be used for the definition of equipment boundaries. Each boundary criterion specifies whether a particular item is included in the definition of pieces of equipment. Excluded items must not be used when compiling the identification and RAM properties to be exchanged.

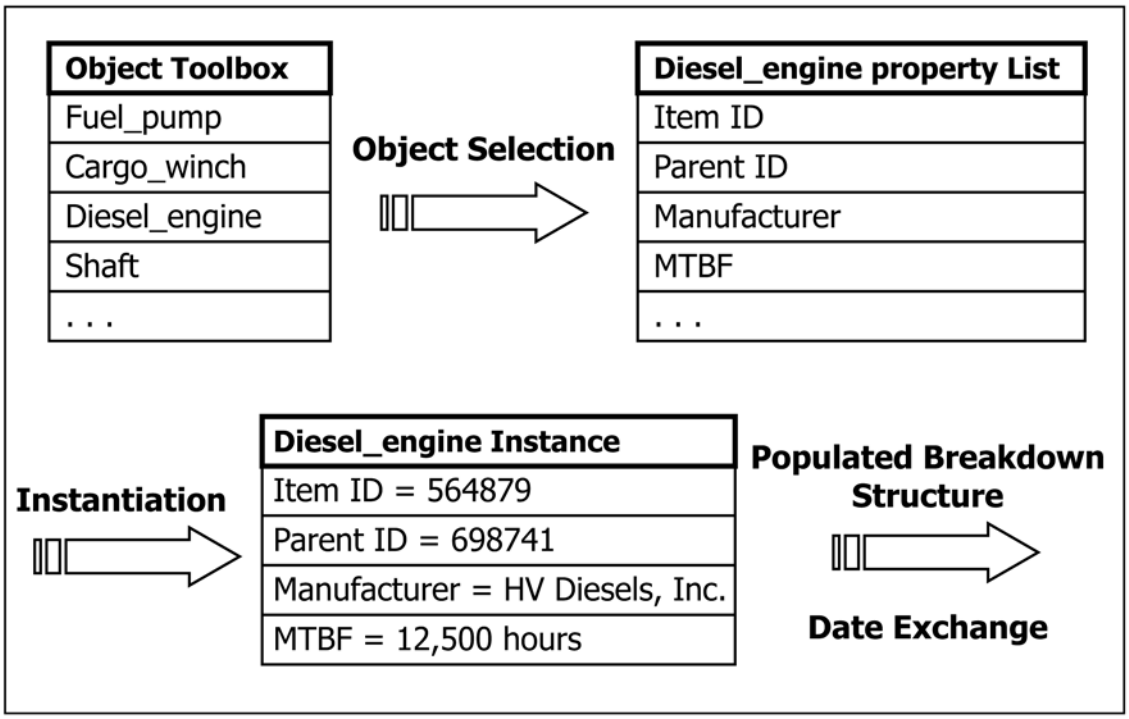


**FIG. 1 Object Instantiation Process for Population and Data Exchange**

## 6. Keywords

6.1 availability; boundary; equipment; hierarchy; maintainability; maintenance; reliability; ship; shipboard; shipboard equipment; ship reliability; vessel

# ANNEX

**(Mandatory Information)**

## A1. MECHANICAL AND SOFTWARE PRODUCT CLASS LIBRARY

A1.1 See Table A1.1, Table A1.2, Table A1.3, Table A1.4, and Table A1.5.

**TABLE A1.1 Boundary Criteria**

| Boundary Code | Boundary Element | Included in Parent? | Element Description |
|---|---|---|---|
| b_00001 | associated valves | yes | a valve that is required for the proper operation of the product |
| b_00002 | attached indicating instruments | yes | an integrated part of the product used for measuring and displaying a variable |
| b_00003 | built-in tanks | yes | an integrated part of the product that is a container used for holding a liquid or gas |
| b_00004 | coils | yes | one or more turns of wire through which an electric current travels |
| b_00005 | cooling device | yes | a device used to lower or maintain the temperature of the product or one of its components |
| b_00006 | electric motors | yes | a motor that is powered by electricity |
| b_00007 | electrical hull fittings | yes | any hull-attached element that is electrical in nature and used for the product (for example, a plug) |
| b_00008 | electronic signal cabling | dedicated branch circuit only | a set of cables used to transport an electronic signal |
| b_00009 | filters | yes | a device through which a gas or liquid is passed in order to remove solids or impurities |
| b_00010 | flex connections | yes | a bendable device that joins two internal components of the product or the product with its environment |
| b_00011 | handwheels | yes | a circular object that is turned to control a quantity |
| b_00012 | hull fasteners | yes | a structural connection between the product and the hull |
| b_00013 | hull structural foundations | no | a hull structure that is used as the product's foundation |
| b_00014 | hydraulic control valves | yes | a valve that controls the flow of a fluid within an hydraulic device |
| b_00015 | hydraulic cylinders | yes | the cylindrical chamber of a device that produces hydraulic energy |
| b_00016 | hydraulic pumps and motors | yes | a pump and motor assembly used to provide a source of hydraulic energy |
| b_00017 | inserts into structural members | yes | an integrated part of the product that is inserted into the ship's structural elements |
| b_00018 | integrated foundations | yes | the foundation elements that come with the product (for example, support legs) |
| b_00019 | label plates | yes | a piece of paper, metal, or other material that is attached to the product to provide information on it |
| b_00020 | mechanical hull fittings | yes | any hull-attached element that is mechanical in nature and used for the product (for example, a hinge) |
| b_00021 | motor controllers | yes when not mounted on a group control switchboard | a device that governs an electric motor in some predetermined manner |
| b_00022 | motor foundations | yes | the foundation elements of a motor |
| b_00023 | non-built in tanks | no | a liquid or gas container that is required by the product and that is not an integrated part of the product |
| b_00024 | penetrations into structural members | yes | an integrated part of the product that penetrates the ship's structural elements |
| b_00025 | pipe hangers | yes | a device which lends support to a pipe |
| b_00026 | pipe markings | yes | a mark or series of marks on the surface of a pipe |
| b_00027 | piping | up to the flanged integral part of the unit only | a system of pipes used to carry a fluid |
| b_00028 | power supply | dedicated branch circuit only | a source of electrical energy |
| b_00029 | remote indicating instruments | no | a separate device remotely connected to the product used for measuring and displaying a variable |
| b_00030 | resilient and sound mounts | yes | a device which lends flexible support to a product in order to reduce vibration and minimize noise |
| b_00031 | strainers | yes | a porous or screen medium used ahead of the product to filter out harmful solid objects and particles from a fluid stream |
| b_00032 | valve actuators | yes | a device used to control the rate of a fluid flow by opening or closing a valve |
| b_00033 | wiring | dedicated branch circuit only | a system of wires used to carry electricity |

**TABLE A1.2 Mechanical and Software Product Class Library**

| Class Code | Class Name | Class Description |
|---|---|---|
| 1 | ship | a large vessel which travels over the seas, rivers, or lakes |
| 2 | system | an assembly of one or more items, with functional and physical relationships between them, which performs or can perform a clearly identified function as a whole. A system has both physical and functional properties. |
| 201 | accommodation_system | a group of interacting components designed for the crew and passenger living quarters |
| 202 | alarm_system | a means of warning to the operator if abnormal operating conditions are detected in the equipment |
| 203 | anchoring_and_mooring_system | a system designed for securing a ship by attaching it to a fixed object or a mooring buoy with chains or lines, or with anchors or other devices. |
| 204 | azimuth_thruster | a propulsor consisting of a propeller driven from a vertical shaft, which rotates about its vertical axis |
| 205 | ballast_system | a system designed to ensure stability by adjusting the list, trim, and draft of a ship |
| 206 | brake_system | a system that applies friction to a moving surface to slow it down or bring it to rest |
| 207 | cargo_system | a system designed to process cargo |
| 208 | condition_and_monitoring_system | a system that records and processes salient operating data from equipment so that trends in its performance characteristics can be assessed for appropriate action to avoid failures |
| 209 | control_and_monitoring_system | a device for controlling a process or activity |
| 210 | data_logging_system | a system used to measure and record a set of data over time |
| 211 | electric_power_distribution_system | a system used to provide a black box representation of all ship machinery electrical transmission systems with limited internal details of such systems |
| 212 | electric_power_generation_system | a group of interacting components that generate electric power |
| 21201 | combined_cycle_plant | a plant comprised of a mix of diesel engines, gas turbines, and steam turbines |
| 21202 | diesel_electric_plant | an electric power plant which uses only a diesel engine as a prime mover |
| 21203 | gas_turbine_plant | an electric power plant that uses only gas turbine engines as prime movers |
| 21204 | shaft_generator_system | a marine electric generator that uses part of the ship main engines as its prime mover |
| 21205 | steam_power_plant | a power plant that uses a steam turbine for generating electrical energy |
| 213 | electrical_system | a group of interacting electrical components |
| 214 | fire_fighting_system | a system designed for extinguishing fires |
| 21401 | carbon_dioxide_system | a fire extinguishing system in which the extinguishing agent is carbon dioxide |
| 21402 | halon_system | a fire extinguishing system in which the extinguishing agent is halon |
| 21403 | nitrogen_system | a fire extinguishing system in which the extinguishing agent is nitrogen |
| 21404 | sprinkling_system | a system in which water flows through a nozzle that transforms water into a spray pattern of fine droplets |
| 215 | garbage_and_solid_waste_system | a system designed to process garbage and solid waste material |
| 216 | gland_seal_system | a system that provides steam to the labyrinth packing glands located at turbine casing penetrations |
| 217 | hydraulic_system | a system composed of machinery and auxiliary components which function to generate, transmit, control, and utilize hydraulic energy |
| 218 | lifting_system | a system designed to carry objects from a lower position to a higher position |
| 219 | maneuvering_system | a system used to perform planned movement or change from the straight steady course and speed of a ship |
| 220 | mechanical_transmission_system | a system used to transmit torque at fixed or variable speed between prime movers and energy absorbers |
| 221 | oil_mist_detection_system | a system used in the diesel engines to prevent crankcase explosions |
| 222 | piping_system | a group of interacting piping components |
| 22201 | air_system | a system designed to process air |
| 22202 | bilge_water_system | a system used to drain liquid from machinery-space bilges, tank tops, shaft alleys, and watertight compartments located throughout a vessel |
| 22203 | bleed_air_system | a system designed to let air escape under controlled conditions from a pipe, tank, or the like through a valve or outlet |
| 22204 | compressed_air_system | a system used to supply compressed air to locations throughout a vessel |
| 22205 | drainage_system | a piping system designed to remove water from surfaces or structures via gravity or pumps |
| 22206 | exhaust_system | a system designed for the escape of gases, fumes, combustion products, and odors from a mechanical device or an enclosure |
| 22207 | feed_water_system | a system used to regulate the flow of water into the steam drum of a boiler |
| 22208 | flush_system | a system designed to remove lodged deposits of rock fragments and other debris by water flow at high velocity |
| 22209 | fresh_water_system | a group of interacting mechanical and electrical components that control fresh water |
| 22210 | fuel_injection_system | a group of interacting piping components that control fuel injection |
| 22211 | fueling_system | a group of interacting piping components that control fuel oil |
| 22212 | fuel_supply_system | a system used to purify, store, and deliver fuel to ship prime movers and auxiliary machinery |
| 22213 | inert_gas_system | a system used to handle inert gas |
| 22214 | lubrication_system | a system used to provide a film of lubricant in order to control friction and wear |
| 22215 | potable_water_system | a group of interacting mechanical and electrical components that produces, distributes, and control potable water |
| 22216 | sea_water_system | a system that provides sea water to another system |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 22217 | sewage_treatment_system | a system used to separate, modify, remove, and destroy objectionable, hazardous, and pathogenic substances carried by wastewater in solution or suspension |
| 22218 | vacuum_system | a system used to remove air or gas from an enclosed space |
| 22219 | ventilation_system | a system that provides movement, circulation, and quality control of air in an enclosed space |
| 223 | process_system | a system that is involved in part of a process |
| 22301 | air_conditioning_system | a system designed for the maintenance of certain aspects of the environment within a defined space to facilitate the function of that space; aspects controlled include air temperature and motion, radiant heat level, moisture, and concentration of pollutants such as dust, microorganisms, and gases |
| 22303 | chemical_treatment_system | a system used to treat a fluid by the addition of chemicals |
| 22304 | combustion_air_system | a system used to provide air to a combustion process |
| 22305 | condensate_system | a system designed to transform a gas to a liquid |
| 22306 | cooling_system | a heat transfer system that is used for cooling processed fluids |
| 2230601 | air_cooling_system | a heat transfer system that is used for processing cooled air |
| 2230602 | water_cooling_system | a heat transfer system that is used for reducing the water temperature |
| 22307 | demineralizer_system | a system designed to remove mineral constituents from water |
| 22308 | distilling_system | a system that distills fresh water from sea water |
| 22309 | exhaust_gas_treatment_system | a system used to treat exhaust gas by capturing or reducing undesirable emissions |
| 22310 | filtration_system | a system used to filter a gas or liquid in order to remove solids or other impurities |
| 22311 | heating_system | a system used to increase the temperature of a fluid |
| 22312 | refrigeration_system | a system designed for the cooling of a space or substance below the environmental temperature |
| 224 | propeller_system | a system that creates the required thrust for ship movements using a screw propeller |
| 225 | propulsion_system | a system that produces the required thrust for ship movement using fuel as the primary energy source |
| 22501 | electrical_propulsion_system | a system where the propulsor is driven by an electric motor via a mechanical transmission system |
| 22502 | mechanical_propulsion_system | a system where the propulsor is driven by a prime mover via a mechanical transmissions system |
| 226 | pump_jet_propulsor | a propulsor that accelerates a large volume of water, drawn in from beneath the ship, and expels it as a high speed horizontal jet, setting up a sufficient reaction force to propel the vessel |
| 227 | rudder_system | a system comprised of the rudder, shaft, bearings, and associated components that are part of the ship maneuvering system |
| 228 | safety_system | a means for automatically altering the operating conditions of piece of equipment in order to prevent damage to it |
| 229 | starting_system | a system used to set a piece of machinery into motion, until it can sustain its motion via its internal processes |
| 22901 | electric_starting_system | a system used to electrically set the machinery into motion, until it can sustain its motion via its internal processes |
| 22902 | manual_starting_system | a system used to manually set the machinery into motion, until it can sustain its motion via its internal processes |
| 22903 | pneumatic_starting_system | a system that uses pneumatic pressure to set the machinery into motion, until it can sustain its motion via its internal processes |
| 230 | steam_generation_system | a group of interacting components that generate steam |
| 231 | steering_control_mechanism | a mechanism used to control the steering of a ship |
| 232 | steering_system | a means for altering the direction of propulsor thrust to control ship direction of movement |
| 233 | water_jet_propulsor | a machine which takes in water by means of a suitable inlet and ducting system and accelerates the mass of water using an impeller and nozzle |
| 234 | workshop_system | a group of interacting components used for manufacturing and repairing using machines and tools |
| 3 | equipment | a mechanical product that carries out a generally self contained function and to a large extent is treated as a single mechanical product for the purpose of design, acquisition, or operation. A piece of equipment has both physical and functional properties |
| 301 | control_equipment | a piece of equipment that directs a function of the mechanical product |
| 30101 | actuator | a mechanical control device used to move or control another mechanical device |
| 3010101 | electric_actuator | a control device that is electrically operated |
| 3010102 | hydraulic_actuator | a control device that is hydraulically operated |
| 3010103 | manual_actuator | a control device that is manually operated |
| 3010104 | pneumatic_actuator | a control device that is pneumatically operated |
| 30102 | analyzer | an instrument that is used for making electronic measurements |
| 30103 | flame_controller | A device that governs the condition of a flame in some predetermined manner |
| 30104 | regulator | a control device designed to maintain the value of some quantity at a relatively constant value |
| 30105 | signal_conditioner | used in control and measurement systems to improve or transform measured signals for later use |
| 302 | electrical_equipment | a piece of equipment that is electrically operated |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 30201 | motor_starter | a piece of equipment used for driving an engine from standstill in order to initiate the engine combustion process and attain its self-sustained rotation |
| 30202 | switch_board | a large panel of assembled switches, circuit breakers, meters, fuses and terminals that are primary to the operation of electric or electronic equipment |
| 30203 | transformer | a device that reduces or increases the voltage and current of the input electricity , while keeping the same frequency |
| 303 | galley_equipment | a piece of equipment used in the galley for the storage, processing and distribution of food and beverages |
| 30301 | batter_breader_machine | a machine designed to apply coating to food items before deep frying |
| 30302 | beverage_and_food_dispenser | a device that automatically dispenses food and beverage |
| 30303 | blender | an electric machine used for breaking down foods or making smooth liquid substances from soft foods and liquids |
| 30304 | broiler | an open metal container, often with a frame of metal bars inside, on which food is cooked under a heat source |
| 30305 | can_opener | a tool for opening cans of food |
| 30306 | coffee_maker | an apparatus that brews coffee |
| 30307 | deep_fryer | a device used to fry food in which it is completely covered by oil |
| 30308 | dishwasher | a machine that washes and cleans dirty plates, glasses and flatware |
| 30309 | food_cutter | a device used to cut food into pieces |
| 30310 | food_processor | a machine that cuts, slices and mixes food quickly |
| 30311 | food_warmer | a device that brings and maintains food to a certain temperature through a heating process |
| 30312 | freezer | an insulated unit or compartment in which perishable foods are maintained at or below freezing temperatures |
| 30313 | french_fry_extruder | a device that forms French fries from potatos by forcing or pushing them through a grid |
| 30314 | galley_saw | a tool with a blade and a row of sharp points along one edge, which is used for cutting food |
| 30315 | griddle | a piece of metal used for cooking over a fire or cooker |
| 30316 | grill | a metallic surface which can be heated to very high temperatures and on which food is put in order to be cooked |
| 30317 | grinder | a device used for breaking food into smaller particles |
| 30318 | hot_food_table | a table equipped with heater wells designed to keep food hot |
| 30319 | hotplate | a small movable cooker on which pans of food are heated |
| 30320 | ice_making_machine | a device that produces ice cubes using water |
| 30321 | kettle | a covered container used for boiling water |
| 30322 | microwave | a device used to heat food by means of electromagnetic waves |
| 30323 | mixer | a device that mixes food and liquids |
| 30324 | oven | an enclosed space with a door which is used to cook food or heat other substances |
| 30325 | peeler | a device used to remove the skin of fruit and vegetables |
| 30326 | pressure_cooker | a cooking pan with a tightly fitting lid which allows food to cook quickly in steam under pressure |
| 30327 | proofer | a device used for the proofing (raising) of breads and baked goods |
| 30328 | refrigerator | an insulated unit or compartment in which perishable foods are maintained at cool temperatures |
| 30329 | salad_bar | a type of table where different prepared salads are served |
| 30330 | slicer | a machine used for cutting food into flat, thin pieces |
| 30331 | steam_table | a table that uses steam to maintain the temperature of food items |
| 30332 | steamer | a container, with holes in its bottom, which can be placed over boiling water in order to allow steam to cook food |
| 30333 | tenderizer | a device used to make food easy to cut or chew |
| 30334 | toaster | a device that makes sliced bread warm, crisp and brown by putting it near a high heat |
| 30335 | vaccum_cleaning_equipment | a piece of equipment used for sucking dirt from floors and other surfaces |
| 30336 | ventilator | a device that causes fresh air to enter and move around an enclosed space |
| 30337 | waffle_iron | a device used to cook waffles |
| 304 | laundry_and_dry_cleaning_equipment | a piece of equipment involved in the process of washing and dry cleaning laundry |
| 30401 | dry_cleaner | a machine used for dry cleaning clothes |
| 30402 | dryer | a machine used for drying clothes |
| 30403 | ironer | a device used for making clothes smooth |
| 30404 | laundry_dispenser | a device that dispenses laundry |
| 30405 | laundry_press | a device used for making or keeping clothes smooth by pressing them between two boards |
| 30406 | sleever | a machine used to finish shirt sleeves |
| 30407 | washer | a machine used for washing clothes |
| 30408 | washer_and_dryer | a machine used for washing and drying clothes |
| 305 | lifting_equipment | an equipment that carries objects from a lower position to a higher position |
| 30501 | cargo_handling_equipment | a device designed to move cargo |
| 30502 | conveyor | a materials-handling device designed to move individual articles such as solids or free-flowing bulk materials over a horizontal, inclined, declined, or vertical path of travel with continuous motion |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 30503 | crane | a power-oriented hoisting machine with lifting and pivoted boom that allows movement of loads horizontally as well as vertically |
| 3050301 | deck_crane | a crane that is located on the deck of a ship |
| 30504 | elevator | a platform or enclosure that is raised and lowered in a vertical hoistway to transport freight or people |
| 30505 | hoist | a device designed to lift from a position directly above the load |
| 30506 | lift_machinery | a unit assembly used to operate a lift |
| 306 | machine_shop_equipment | a machine used in workshops for manufacturing and repairing items |
| 30601 | bending_machine | a machine used to bend metals |
| 30602 | cutting_machine | a machine designed to cut pieces of material |
| 30603 | drill_machine | a machine which makes holes |
| 30604 | electric_hammer | a hammer in which electricity is utilized for producing the impacting blow |
| 30605 | electrode_oven | a machine designed to dry and store electrodes |
| 30606 | forming_machine | a machine used to form or shape pieces of metal |
| 30607 | grinding_machine | a machine used to make something into small pieces or a powder by pressing between hard surfaces |
| 30608 | hydraulic_intensifier | a device which increases the power of a signal in a hydraulic servomechanism or other system through the use of fixed and variable orifices |
| 30609 | hydraulic_press | a combination of a large and a small cylinder connected by a pipe and filled with a fluid so that the fluid pressure created by a small force acting on the small-cylinder piston will result in a large force on the large piston |
| 30610 | lathe | a machine for shaping a workpiece by turning it while a sharp tool is pressed against it |
| 30611 | milling_machine | a machine used for the removal of metal by feeding a workpiece through the periphery of a rotating circular cutter |
| 30612 | painting_machine | a machine used to paint |
| 30613 | pneumatic_hammer | a hammer in which compressed air is utilized for producing the impacting blow |
| 30614 | power_saw | a power-operated saw |
| 30615 | press_machine | a machine used to make something firm and flat or to put weight on something to push it down |
| 30616 | reeling_machine | a machine used to pull in, take or give out by turning something round and round |
| 30617 | sanding_machine | a machine that uses a moving sheet or disc of rough paper to abrade other surfaces in order to maker them smoother |
| 30618 | sewing_machine | a mechanism that stitches cloth, leather, or other material by means of a double-pointed or eye-pointed needle |
| 30619 | shearing_machine | a machine for cutting cloth or bars, sheets, or plates of metal or other material |
| 30620 | sheet_metal_working_machine | a machine used to process sheet metal |
| 30621 | thermal_drying_oven | a closed chamber for drying an object by heating at relatively low temperatures |
| 30622 | threading_machine | a machine used to cut or form threads inside or outside a cylinder or cone |
| 30623 | welding_machine | a machine used to join two pieces of metal together permanently by melting the parts that are in contact with one another |
| 307 | machinery | a reciprocating or rotating equipment that performs some sort of energy conversion as its underlying function |
| 30701 | electrical_machinery | a working electrical part of a machine |
| 3070101 | electric_generator | a machine that generates electricity by transforming mechanical energy |
| 307010101 | electric_generator_AC | an electric generator that produces alternating current |
| 307010102 | electric_generator_DC | an electric generator that produces direct current |
| 3070102 | electric_motor | a motor that is powered by electricity |
| 307010201 | electric_motor_AC | an electric motor that uses alternating current |
| 307010202 | electric_motor_DC | an electric motor that uses direct current |
| 30702 | mechanical_machinery | a piece of machinery that is primarily used in mechanical systems |
| 3070201 | inboard_motor | a unit assembly of engine, propeller, and vertical drive shaft used to propel a boat and located inside the hull perimeter |
| 3070202 | outboard_motor | a unit assembly of engine, propeller, and vertical drive shaft used to propel a boat and usually clamped to the boat transom |
| 3070203 | reciprocating_machinery | a working part of a machine that works complementary to the machine |
| 307020301 | diesel_engine | an internal combustion engine operating on the compression ignition principle |
| 3070204 | rotating_machinery | a non-electrical working part of a machine that moves in a circular motion |
| 307020401 | air_charger | a device in the intake system of an internal combustion engine used to increase the air-charge weight and therefore boost the amount of fuel that can be burned in the cylinder |
| 307020402 | anchor_windlass | a machine designed to raise or lower an anchor and generally consisted of a horizontal barrel that is fitted with gearlike projections that engage the links of the anchor chain |
| 307020403 | compressor | a device used to increase the pressure of a gas |
| 307020404 | garbage_grinder | a machine designed for grinding garbage material |
| 307020405 | gas_turbine_engine | a device that expands a compressed gas through nozzles thereby changing its pressure to velocity and directing the gas into the turbine blades in order to convert the energy to rotational work |
| 307020406 | gear_assembly | an assembly of toothed cylinders that are used to transmit torque from one shaft to another |
| 307020407 | gear_box | a housing for gears that are used to transmit power between shafts rotating at different speeds |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 307020408 | propulsion_shafting | a group of interacting shafts and shaft components that are used for the propulsion of a ship |
| 307020409 | pump | a device used to add energy to liquids to produce flow or increase pressure |
| 30702040901 | ballast_pump | a pump used to transfer seawater into and out of a vessel's ballast tanks in order to adjust list, trim, and draft |
| 30702040902 | bilge/ballast_pump | a pump which is used to discharge water ballast and remove water that collects in the bottom of a ship |
| 30702040903 | bilge_pump | a pump used to drain liquid from machinery-space bilges, tank tops, shaft alleys, and other watertight compartments |
| 30702040904 | booster_pump | a pump used to increase pressure in a water or compressed-air pipe |
| 30702040905 | brine_ pump | a pump used for a ship brine system |
| 30702040906 | cargo_pump | a pump used to load and discharge liquid cargo |
| 30702040907 | circulating_pump | a pump used to circulate a fluid |
| 30702040908 | cleaning_pump | a pump used to move a cleaning fluid |
| 30702040909 | condensate_ pump | a pump used to move condensate |
| 30702040910 | cooling_pump | a pump used to move a cooling fluid |
| 30702040911 | discharge_pump | a pump used to discharge a fluid |
| 30702040912 | distillate_pump | a pump used to move distillate |
| 30702040913 | distilled_water_pump | a pump used to move distilled water |
| 30702040914 | dosage_pump | a pump used to move a specified dosage of fluid |
| 30702040915 | drinking_water_pump | a pump used to circulate drinking water |
| 30702040916 | ejector_pump | a pump with no internal moving parts that moves a fluid |
| 30702040917 | engine_fuel_pump | a pump used to supply fuel to an engine |
| 30702040918 | feed_pump | a pump used to supply water to a steam boiler |
| 30702040919 | fire_pump | a pump used to supply water to shipboard fire-fighting systems |
| 30702040920 | fire/bilge/ballast_pump | a pump used to supply fire-fighting water, to remove water from bilges, and to discharge water ballast |
| 30702040921 | fire/general_service_pump | a pump used to supply fire-fighting water and general service water |
| 30702040922 | fresh_water_pump | a pump used to circulate fresh water |
| 30702040923 | fuel_oil_pump | a pump used to circulate fuel oil |
| 30702040924 | fuel_oil_transfer_pump | a pump user to transfer fuel oil |
| 30702040925 | gear_oil_pump | an oil pump that uses gears to move oil |
| 30702040926 | general_service_pump | a pump used for general service |
| 30702040927 | generic_pump | a pump that is not specific to any area |
| 30702040928 | hydraulic_oil_pump | a pump used to circulate hydraulic oil |
| 30702040929 | lube_oil_pump | a pump used to circulate lube oil |
| 30702040930 | lube_oil_transfer_pump | a pump user to transfer lube oil |
| 30702040931 | priming_pump | a pump used to provide priming to a system |
| 30702040932 | process_pump | a pump involved in a specific process |
| 30702040933 | return_pump | a pump used to return a fluid |
| 30702040934 | sea_water_pump | a pump used to circulate sea water |
| 30702040935 | scavenging_air_pump | a pump used to supply scavenging air to a diesel engine |
| 30702040936 | sewage_pump | a pump used for a sewage system |
| 30702040937 | sludge_pump | a pump capable of handling sand- and gravel-laden liquids without clogging or wearing unduly used to extract mud and cuttings from a borehole |
| 30702040938 | stripping_pump | a pump used to perform stripping operations on tanks |
| 30702040939 | supply_pump | a pump used to supply a fluid |
| 30702040940 | trimming_pump | a pump involved in a trimming process |
| 30702040941 | vacuum_pump | a pump used to remove air or gas from an enclosed space |
| 307020410 | screw_propeller | a device that creates the required thrust for ship movements while rotating in the water |
| 307020411 | turbine | a device for generating rotary mechanical power from the energy in a stream of fluid. |
| 307020412 | steam_turbine_engine | a machine used to convert the energy of high-pressure steam into the mechanical energy of a rotating shaft that performs work |
| 307020413 | steering_unit | a unit used for directional control |
| 307020414 | winch | a device having a drum on which to coil a rope, cable, or chain for hauling, pulling, or hoisting |
| 30702041401 | anchor_winch | a winch designed to raise or lower an anchor |
| 30702041402 | cargo_winch | a winch designed to move cargo |
| 30702041403 | crane_winch | a winch utilized as part of a crane machinery |
| 30702041404 | hoisting_winch | a winch that is part of a hoisting machine for raising and lowering material with intermittent motion while holding the material freely suspended. Hoisting machines are capable of picking up loads at one location and depositing them at another anywhere within a limited area |
| 30702041405 | lifeboat_winch | a winch designed to raise or lower a lifeboat |
| 30702041406 | mooring_winch | a winch used for the mooring system of a ship |
| 30702041407 | portable_winch | a winch capable of being easily and conveniently transported |
| 30702041408 | slewing_winch | a winch which permits rapid traverse or change in elevation |
| 30702041409 | topping_winch | a winch with a topping mechanism |
| 30702041410 | topping/slewing_winch | a winch that performs the functions of both a topping winch and a slewing winch |
| 30702041411 | towing_winch | a winch used by a towing system |
| 30702041412 | windlass_winch | a winch used by a windlass system |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 30702041413 | windlass/mooring_winch | a winch used by a windlass/mooring system |
| 30703 | process_machinery | a machinery that is involved in part of a process |
| 3070301 | agitator | a mechanical device used to maintain fluidity, plasticity, and prevent segregation of liquids and liquid solutions |
| 3070302 | centrifuge | a rotating device that uses centrifugal force to separate substances of different densities |
| 3070303 | clarifier | a device that clears liquid from suspended particles through filtration or centrifugation |
| 3070304 | homogenizer | a device in which substances are emulsified by being forced through an energetic shear field |
| 3070305 | purifier | a device that clears an area or object of all undesirable matter |
| 3070306 | separator | a pressure vessel used to separate the gaseous and liquid components of reservoir fluids into gas, oil, and water |
| 308 | mechanical_equipment | a non-machinery equipment that is primarily used in mechanical systems |
| 30801 | blower | a device used to supply a relatively large volume of a gas at a low pressure |
| 30802 | clutch | a device for engagement and disengagement of mechanical power |
| 3080201 | electro_magnetic_clutch | a clutch that uses electromagnetic forces to engage and disengage |
| 3080202 | hydraulic_clutch | a clutch that uses hydraulic power to engage and disengage |
| 3080203 | pneumatic_clutch | a clutch that uses pneumatic pressure to engage and disengage |
| 30803 | damper | a device used to lessen torsional or axial vibrations in a shaft line |
| 30804 | dryer | a device whose primary function is to accomplish drying |
| 3080401 | air_dryer | a device for drying an air flow |
| 3080402 | gas_dryer | a device for drying a gas flow |
| 30805 | hydraulic_accumulator | a pressure vessel which operates as a fluid source device or shock absorber |
| 30806 | hydraulic_power_unit | a power transmission unit comprising machinery and auxiliary components which function to generate, transmit, control, and utilize hydraulic energy |
| 30807 | lifeboat_launching_equipment | a unit assembly used to launch a lifeboat |
| 30809 | mechanical_transmission | a device by which motive power from a prime mover is made available at a load |
| 30810 | pneumatic_positioner | a pneumatic servomechanism used to improve operating characteristics of valves by reducing hysteresis |
| 30811 | reducer | a device designed to reduce a quantity |
| 3081101 | reduction_gear | a train of gears designed to reduce the speed with which power is transmitted |
| 3081102 | speed_reducer | a train of gears placed between a motor and the machinery which it will drive, to reduce the speed with which power is transmitted |
| 30812 | scrubber | a device for the removal, or washing out, of entrained liquid droplets or dust, or for the removal of an undesired gas component from process gas streams |
| 30813 | shaft_coupling | a device used to connect coaxial shafts for power transmission from one to the other |
| 3081301 | flexible_coupling | a coupling used to connect two shafts with a certain amount of flexibility and allowance in their axial or radial alignment. It usually contains a resilient member such as a metal spring or rubber disk |
| 3081302 | fluid_coupling | a device in which a fluid transmits torque from input shaft to output shaft |
| 3081303 | solid_coupling | a rigid connection between two shafts |
| 308130301 | flanged_solid_coupling | a coupling in which two flanged ends are connected directly together by bolting |
| 308130302 | muff_solid_coupling | a coupling in which there is a sleeve type connection without any flange |
| 30814 | silencer | a device used to reduce or eliminate the sound made by exhaust gas that is discharged from the engine, by reducing the exhaust gas pressure waves |
| 30815 | thruster_unit | a unit that produces a driving force |
| 30816 | trash_compactor | a machine that compresses solid waste material for convenience in disposal |
| 308708 | mechanical_governor | a device that automatically regulates the speed of an engine or machine by varying the supply of fuel or steam according to the power demand |
| 309 | piping_equipment | a piping supply that is needed to complete a certain function |
| 30901 | drainage_unit | a unit designed to remove water from surfaces or structures by gravity or pumping |
| 30902 | pressure_vessel | a container for fluids that can withstand pressure above or below atmospheric pressure |
| 30903 | sprinkler | a device used for delivering a fire extinguishing liquid or gas |
| 30904 | tank | a large vessel used for holding a fluid such as water, low pressure gas, gasoline, or other fuel |
| 30905 | valve | a device used to start, stop, divert, or regulate the flow rate of a fluid |
| 3090501 | ball_valve | a valve that uses a spherically shaped plug, or ball, with a round hole passing through it that can be moved from fully open to fully closed position by rotating the valve stem 90 degrees |
| 3090502 | butterfly_valve | a valve that uses an internal disk is rotated from a fully closed position to a fully open position with a quarter turn of the attached stem |
| 3090503 | check_valve | a valve used to prevent reverse flow |
| 3090504 | diaphragm_valve | a valve that uses a flexible diaphragm to form the upper pressure boundary of the valve's body |
| 3090505 | gate_valve | a valve that uses a flat or wedge-shaped gate that is lowered or raised to control the straight-through flow of a fluid |
| 3090506 | globe_valve | a valve that uses a disk that is mounted on the end of a threaded stem |
| 3090507 | plug_valve | a valve that uses a stem-mounted plug resembling a cylinder |
| 3090508 | solenoid_valve | a valve that is actuated by a magnetic field that is produced in a solenoid |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 310 | process_equipment | a piece of equipment that is used in a part of a process |
| 31001 | afterburner | a device used for burning additional fuel |
| 31002 | air_conditioning_unit | a unit designed for the maintenance of certain aspects of the environment within a defined space to facilitate the function of that space; aspects controlled include air temperature and motion, radiant heat level, moisture, and concentration of pollutants such as dust, microorganisms, and gases |
| 31003 | boiler | a pressurized device in which water is vaporized to steam by heat transferred from a source of higher temperature |
| 31004 | burner | the part of a fluid- burning device at which the flame is produced |
| 31005 | chemical_treatment_equipment | a device that uses chemicals to treat a fluid |
| 31006 | cleaner | a device designed to remove particles and aerosols from air |
| 31007 | condenser | a heat transfer equipment consisting of an array of tubes into which the exhaust steam from a steam engine is distributed and condensed by the circulation of cooling water through the tubes |
| 31008 | deaerating_feed_tank | a pressure vessel in high-pressure steam systems that removes dissolved gases, particulary oxygen, from boiler feed water in order to prevent boiler tube corrosion |
| 31009 | defroster | a device designed to keep free of ice or to remove ice |
| 31010 | dehumidifier | a device designed to reduce the amount of water vapor in the ambient atmosphere |
| 31011 | dehydrator | a vessel or process device for the removal of liquids from gases or solids by the use of heat, absorbents, or adsorbents |
| 31012 | deoiler | a device used to separate mixed oil from water |
| 31013 | distilling_plant | a machine that distills fresh water from sea water |
| 31014 | eductor | a jet pump that uses water as a motive force |
| 31015 | ejector | a jet pump that uses steam or air as a motive force |
| 31016 | evaporator | a device in which liquid is changed to the vapor state by the addition of heat |
| 31017 | exhaust_gas_boiler | a boiler that uses exhaust gas as a heating medium |
| 31018 | filter | a device through which a gas or liquid is passed in order to remove solids or impurities |
| 3101801 | air_filter | a filter that removes impurities from the air |
| 3101802 | catalytic_filter | a device that contains a catalyst capable of converting pollutants into harmless or less harmful products |
| 3101803 | chlorine_filter | a filter that removes impurities using chlorine |
| 3101804 | drying_filter | a filter that removes impurities while accomplishing a drying process |
| 3101805 | fuel_filter | a filter through which fuel is passed in order to remove solids or impurities |
| 3101806 | galley_ventilation_filter | a filter that removes impurities from galley exhaust fumes |
| 3101807 | ion_exchange_filter | a filter that removes impurities using the ion exchange principle |
| 3101808 | lube_oil_filter | a filter through which lubrication oil is passed in order to remove solids or impurities |
| 3101809 | magnetic_filter | a filter that removes impurities using a magnetic field |
| 3101810 | softening_filter | a filter that removes impurities from water while softening it by removing or trapping calcium and magnesium ions |
| 3101811 | suction_filter | a filter that removes impurities using a process involving suction |
| 31019 | heat_exchanger | a device where two moving fluid streams exchange heat without mixing |
| 3101901 | cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce the temperature of a fluid |
| 310190101 | after_cooler | a heat exchanger which cools air that has been compressed |
| 310190102 | air_cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce the temperature of air |
| 310190103 | brine_cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce the temperature of brine |
| 310190104 | fuel_cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce the temperature of fuel |
| 310190105 | inter_cooler | a heat exchanger for cooling fluid between stages of a multistage compressor |
| 310190106 | oil_cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce temperature of lubricating oil |
| 310190107 | water_cooler | a device, where two moving fluid streams exchange heat without mixing, used to reduce the temperature of the water |
| 3101902 | economizer | a device, where two moving fluid streams exchange heat without mixing, used to warm flux gases to preheat feedwater |
| 3101903 | heater | a device, where two moving fluid streams exchange heat without mixing, used to increase the temperature of a fluid |
| 310190301 | air_heater | a device, where two moving fluid streams exchange heat without mixing, used to increase the temperature of air |
| 310190302 | brine_heater | a device, where two moving fluid streams exchange heat without mixing, used to increase the temperature of brine |
| 310190303 | fuel_heater | a device, where two moving fluid streams exchange heat without mixing, used to increase the temperature of fuel |
| 310190304 | oil_heater | a device, where two moving fluid streams exchange heat without mixing, used to increase temperature of lubricating oil |
| 310190305 | preheater | a device for preliminary heating of a material, substance, or fluid that will undergo further use or treatment by heating |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 31019030501 | fuel_preheater | a device, where two moving fluid streams exchange heat without mixing, used to increase the temperature of the fuel |
| 310190306 | water_heater | a device, where two moving fluid streams exchange heat without mixing, used to increase the water temperature |
| 3101904 | recuperator | a device, where two moving fluid streams exchange heat without mixing, used to transfer heat from combustion products to cool air |
| 3101905 | regenerator | a device, where two moving fluid streams exchange heat without mixing, that is using cool expanded gases to cool incoming compressed air |
| 31020 | incinerator | a furnace or other container in which materials are burned |
| 31021 | lubricator | a device used to apply lubricant |
| 31022 | oil_conditioning_unit | a unit designed for maintaining or restoring the quality of oil |
| 31023 | ozonizer | a device that converts oxygen, O2, into ozone, O3, by subjecting the oxygen to an electric-brush discharge |
| 31024 | precipitator | a device used to remove liquid droplets or solid particles from a gas in which they are suspended |
| 31025 | radiator | a device, unit, or surface that emits heat, primarily by radiation, to objects in the space in which they are installed |
| 31026 | reheater | a device in which heat is added to a fluid which has given up some of its energy through a previous process |
| 31027 | refrigeration_unit | a unit designed for the cooling of a space or substance below the environmental temperature |
| 31028 | reverse_osmosis_equipment | a piece of equipment that is used to convert sea water into fresh water via a reverse-osmosic process |
| 31029 | sewage_treatment_unit | a unit used to separate, modify, remove, and destroy unwanted substances carried by wastewater in solution or suspension |
| 31030 | sterilizer | a device for sterilizing by dry heat, steam, or water |
| 4 | elementary_item | an elementary part of a mechanical or electrical complex |
| 401 | connecting_elementary_item | a part of a mechanical or electrical complex that is used for connecting separate parts |
| 40101 | bolt | a fastener having a threaded pin or rod with a head at one end, designed to be inserted through holes in assembled parts and secured by a mated nut |
| 40102 | bracket | a device, usually L-shaped, that is fastened to a structure and used to support a component |
| 40103 | chock | a heavy metal or wood fitting with two inward curving jaws through which a rope or cable can be run |
| 40104 | coupling | a mechanical fastening device for connecting the ends of two shafts together |
| 40105 | nut | a small block of wood or metal that is designed to fit around or secure a bolt or screw |
| 40106 | pin | a cylindrical piece of metal that is used in the fastening of two parts |
| 40107 | rod | a component used as a structural part that is usually subject to tensile stress only |
| 40108 | screw | a fastener with continuous ribs on a cylindrical or conical shank and a slotted, recessed, flat, or rounded head. |
| 40109 | seal | a component used to prevent leakage in fluid systems |
| 40110 | structural_item | a part of a ship structure or equipment casing |
| 402 | connector_elementary_item | a part of a mechanical or electrical complex which is a connector |
| 40201 | electrical_connector | an electrical component used to connect mechanical products |
| 4020101 | electrical_connector_cable_end | an end part of an electrical cable that is used for connecting the cable to a device |
| 4020102 | electrical_connector_plug | a male connector that is inserted into an electric socket |
| 4020103 | electrical_connector_socket | a female connector into which an electric plug is inserted |
| 4020104 | electrical_connector_welded_end | a connection that is made by applying heat to two metal components |
| 40202 | mechanical_connector | a mechanical component used to unite mechanical products |
| 4020201 | shaft_bearing_interface | a mechanical connection that is an interface between a shaft and a bearing |
| 4020202 | shaft_elementary_item_connection | a mechanical connection that is between a shaft and another elementary item |
| 4020203 | shaft_end | a part of the shaft that is used for connecting the shaft to another device |
| 402020301 | shaft_flanged_end | a protruding rim used to attach one mechanical product to another |
| 402020302 | shaft_keyed_end | a specially cut end used to attach one mechanical product to another |
| 402020303 | shaft_welded_end | a connection that is made by applying heat to two metal components |
| 4020204 | shaft_journal | the portion of a shaft that is machined in order to contact the bearing that allows it to rotate |
| 4020205 | shaft_connection | a mechanical connection that is between two shafts |
| 40203 | piping_connector | a piping component used to connect two sections of piping together |
| 4020301 | butt_piping_connector | a type of piping connection |
| 4020302 | flanged_piping_connector | a type of piping connection |
| 4020303 | flared_piping_connector | a type of piping connection |
| 4020304 | piping_item_end | an end part of the pipe that is used for connecting the pipe to another device |
| 402030401 | piping_item_flanged_end | a protruding rim used to attach one mechanical product to another |
| 402030402 | piping_item_flared_end | a skirt shaped end used to attach one mechanical product to another |
| 402030403 | piping_item_socketed_end | an opening to which a part is designed to attach one mechanical product to another |
| 402030404 | piping_item_welded_end | a connection that is made by applying heat to two metal components |
| 4020305 | screwed_piping_connector | a type of piping connection |
| 4020306 | socketed_piping_connector | a type of piping connection |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 4020307 | union_piping_connector | a type of piping connection |
| 4020308 | welded_piping_connector | a type of piping connection |
| 40204 | structural_connector | a device used to connect structural components |
| 4020401 | bedplate | a platform functioning as a base or support for a machine |
| 4020402 | elementary_item_mounting | a type of structural connection |
| 4020403 | equipment_mounting | a type of structural connection |
| 4020404 | equipment_support | a type of structural connection |
| 4020405 | hinge | a joining device on which an attached part swings |
| 4020406 | insulation_attachment | a type of structural connection |
| 4020407 | locking_device | a device which prevents something from being opened |
| 4020408 | pipe_support | a type of structural connection |
| 403 | control_elementary_item | a part of a mechanical or electrical complex that controls the functions of a mechanical product |
| 40301 | control_instrument | an instrument which measures changes and directly or indirectly controls the sources affecting these changes |
| 4030101 | humistat | an instrument which measures changes in humidity and directly or indirectly controls the sources affecting humidity to maintain a desired value |
| 4030102 | pressurestat | an instrument which measures changes in pressure and directly or indirectly controls the sources affecting this pressure to maintain a desired value |
| 4030103 | thermostat | an instrument which measures changes in temperature and directly or indirectly controls sources of heating and cooling to maintain a desired temperature |
| 40302 | detector | a device used to detect the presence of an object, radiation, chemical compound, or such |
| 40303 | gauge | a control component used in control and instrumentation systems for observing a measured parameter |
| 40304 | glass | a glass molded into shapes for product parts, such as a gauge glass |
| 40305 | indicator | an instrument used to provide a measurement |
| 40306 | meter | a device for measuring the value of a quantity under observation |
| 4030601 | content_meter | a device for measuring content |
| 4030602 | flowrate_meter | a device for measuring flowrate |
| 4030603 | power_meter | a device for measuring power |
| 4030604 | pressure_meter | a device for measuring pressure |
| 4030605 | purity_meter | a device for measuring purity |
| 4030606 | salinity_meter | a device for measuring salinity |
| 4030607 | speed_meter | a device for measuring speed |
| 4030608 | temperature_meter | a device for measuring temperature |
| 4030609 | torsion_meter | a device for measuring torsion |
| 4030610 | viscosity_meter | a device for measuring viscosity |
| 40307 | sensor | a device that detects and responds to a signal or stimulus |
| 4030701 | flowrate_sensor | a device that detects and responds to a signal or stimulus for measuring the flow of a fluid |
| 4030702 | pressure_sensor | a device that detects and responds to a signal or stimulus for measuring fluid pressure |
| 4030703 | salinity_sensor | a device that detects and responds to a signal or stimulus for measuring salinity |
| 4030704 | speed_sensor | a device that detects and responds to a signal or stimulus for measuring the rate of motion |
| 4030705 | temperature_sensor | a device that detects and responds to a signal or stimulus for measuring the degree of hot and cold |
| 4030706 | torque_sensor | a device that detects and responds to a signal or stimulus for measuring torque |
| 4030707 | viscosity_sensor | a device that detects and responds to a signal or stimulus for measuring the viscosity of a fluid |
| 404 | mechanical_elementary_item | a type of elementary item that is mechanical |
| 40401 | anti_slack_device | a device designed to control looseness or play in a mechanism |
| 40402 | balance_weight | a lumped mass of material added to a rotating shaft or component to counteract forces that cause disproportion and vibration |
| 40403 | bearing_element | a surface within a bearing that supports a rotating load |
| 40404 | brake_disc | a disc attached to a rotating axle or against the inner surfaces of a rotating housing and pressed against another disk or a pad attached to the fixed frame of a braking device |
| 40405 | brake_pad | a component that provides lining on its outside surface that comes into frictional contact with a brake disk |
| 40406 | combustion_chamber | a chamber in which a fuel is burned to release energy |
| 40407 | connecting_rod | a nearly cylindrical bar that connects a piston or crosshead to the crankshaft in a reciprocating pump or engine |
| 40408 | crane_jib | an extension that is hinged to the upper end of a crane boom |
| 40409 | crankcase | a box-like casing enclosing the crankshaft and connecting rods of reciprocating machinery such as diesel engines and reciprocating pumps |
| 40410 | crankshaft_web | an area of a web, usually a flat, rectangular section, connecting the crankshaft pin to a shaft |
| 40411 | crosshead_pin | a journal supported in the crosshead for the small end bearing of a connecting rod |
| 40412 | crutch | a forked support |
| 40413 | cylinder | a cylindrical chamber in which the combustion energy of the fuel is converted to increased fluid pressure |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 40414 | cylinder_liner | a hollow cylindrical casting made of special material that is fixed to internal walls of a cylinder to provide resistance against friction |
| 40415 | diffuser | a duct, chamber, or section in which a high-velocity, low-pressure stream of fluid is converted into a high-velocity, high-pressure flow |
| 40416 | equipment_casing | a protective covering that encloses equipment, separating its internal components from a surrounding environment |
| 40417 | inducer | a device that induces the pre-determined motion of a fluid |
| 40418 | injector | a device containing a nozzle in an actuating fluid which is accelerated and thus entrains a second fluid, so delivering the mixture against a pressure in excess of the actuating fluid |
| 4041801 | air_injector | a device that sprays air into a volume |
| 4041802 | fuel_injector | a device that sprays fuel into an engine cylinder |
| 4041803 | steam_injector | a device that sprays steam into a volume |
| 4041804 | water_injector | a device that sprays water into a volume |
| 40419 | nozzle | a conduit with a variable cross-sectional area in which a fluid accelerates into a high-velocity stream |
| 40420 | piston | a circular section component that acts as the working part of reciprocating machinery such as diesel engines and reciprocating pumps |
| 40421 | ring | a sealing ring fitted around a piston and extending to the cylinder wall to prevent leakage |
| 40422 | rocker_arm | a lever that is pivoted near its center and operated by a pushrod at one end |
| 40423 | rudder | a flat piece of wood or metal that is attached vertically to the stern of a ship and controls a ship's direction |
| 40424 | shaft_brake | a device designed to slow or stop the rotation of a shaft by the use of friction |
| 40425 | spring | an elastic, stressed, stored-energy element that, when released, will recover its basic form or position. |
| 40426 | stabilizer | a device which is designed to prevent imbalances |
| 40427 | tension_rod | a structural component that is subjected to only tensile stress |
| 40428 | valve_cage | an enclosing structure within a reciprocating engine that houses all the components of a valve |
| 405 | piping_elementary_item | a part primarily made of piping elements which is used with other mechanical products to create a whole system |
| 40501 | air_cowl | a chimney covering designed to improve the draft |
| 40502 | bypass | an alternating, diversionary flow path in a fluid system |
| 40503 | diaphragm | an opening, sometimes adjustable in size, which is used to control the flow of a fluid |
| 40504 | drain | a device which carries off a fluid |
| 40505 | duct | a pipe used to allow for passage of a fluid |
| 40506 | expansion_chamber | a volume designed for the expansion of a fluid |
| 40507 | expansion_joint | a joint that expands the use and connection of one or more pipes in a piping system |
| 40508 | fitting | a small part that is used to join or adapt to other parts |
| 40509 | manifold | a branch pipe arrangement that collects a fluid |
| 4050901 | exhaust_manifold | a pipe or chamber that has multiple openings to allow passage of exhaust gases from the exhaust valves of a reciprocating engine to the atmosphere |
| 4050902 | intake_manifold | a pipe or chamber that has multiple openings to allow passage of air from the atmosphere to the cylinder of an engine |
| 40510 | overflow | a device that conducts excess fluid from a conduit or container |
| 40511 | pipe | a hollow cylinder for conveying a fluid or gas |
| 40512 | receiver | a vessel, container, or tank used to receive and collect a fluid from a process unit |
| 40513 | trap | a sealed passage in a pipe or pump that prevents the return flow of liquid or gas |
| 40514 | tube | a long cylindrical body with a hollow center used especially to convey fluid |
| 4051401 | boiler_tube | a tube in a boiler that carries water to be heated by the high-temperature gaseous products of combustion or that carries combustion products to heat the boiler water that surrounds them |
| 4051402 | condenser_tube | a tube in a condenser that carries one of the two fluids involved in condensing process |
| 4051403 | heat_exchanger_tube | a tube in a heat exchanger that carries one of the two fluids involved in the heat exchange process |
| 4051404 | stern_tube | a long, circular device which supports the propeller shaft where it emerges from the stern of a ship |
| 40515 | tunnel | a tubal passage through a barrier |
| 40516 | vent | a piping component for providing airflow to or from a drainage system or for circulating air within the system to protect trap seals from siphonage and back pressure |
| 406 | process_elementary_item | an elementary item that is used in a part of a process |
| 40601 | arrester | a device which prevents sparks or burning material from escaping |
| 4060101 | flame_arrester | an assembly of screens, perforated plates, or metal-gauze packing attached to the breather vent on a flammable-product storage tank. |
| 4060102 | spark_arrester | a device that prevents the escape of sparks from an area |
| 40602 | coil | a device in a container which brings a fluid to a suitable viscosity |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 4060201 | cooling_coil | a device in a container which brings a fluid to a suitable viscosity through a cooling process |
| 4060202 | heating_coil | a device in a container which brings a fluid to a suitable viscosity through a heating process |
| 40603 | membrane | a medium through which a fluid stream is passed for purposes of filtration |
| 40604 | strainer | a porous or screen medium used ahead of equipment to filter out harmful solid objects and particles from a fluid stream |
| 407 | rotating_elementary_item | a type of mechanical elementary item that moves in a circular motion |
| 40701 | bearing | a mechanical device for supporting a rotating load |
| 4070101 | big_end_bearing | a journal bearing by which the connecting rod is attached to the crank pin on the crankshaft |
| 4070102 | crank_pin_bearing | a crank pin bearing of a diesel engine |
| 4070103 | cross_head_bearing | a cross head of a diesel engine |
| 4070104 | journal_bearing | a type of journal bearing |
| 4070105 | small_end_bearing | a journal bearing by which the connecting rod is attached to the crosshead pin or the gudgeon pin |
| 40702 | belt | a flexible band used to connect pulleys or to convey materials by transmitting motion and power |
| 40703 | blade | a broad, flat arm of a fan, turbine, or propeller |
| 40704 | camshaft | a rotating shaft to which a number of cams are fastened and used to actuate the fuel pump or cylinder valves |
| 40705 | capstan | a rotating vertical spindle-mounted drum on which cable is wound for raising an anchor or other heavy weight |
| 40706 | chain | a flexible series of metal links or rings fitted into one another; used for supporting, restraining, dragging, or lifting objects or transmitting power |
| 40707 | crank_shaft | a structure composed of a series of throws offset at angles from each other around the central axis |
| 40708 | drum | a cylindrical machine or mechanical device |
| 40709 | fan | a device for producing currents in order to circulate, exhaust, or deliver large volumes of air or gas |
| 40710 | flywheel | a heavy wheel for opposing and moderating by its inertia any fluctuation of speed in the machinery with which it revolves |
| 40711 | gear_stage | a pair of toothed wheels mounted on different shafts |
| 40712 | gear_wheel | a disc with external or internal teeth, which forms one half of a gear stage |
| 40713 | impeller | a shaft-mounted component that rotates within a stationary casing and transfers energy to a fluid |
| 40714 | laundry_tumbler | a device or mechanism in which clothes are tumbled as part of a washing or drying process |
| 40715 | rotor | the rotating member of an electrical machine or device |
| 40716 | shaft | a circular section beam transmitting rotary motion between its driven end and load |
| 40717 | tensioner | a device that controls the tension of a rotating element |
| 40718 | turning_gear | a gear driven unit used to rotate the propulsion system for inspection, maintenance, star-up and shutdown procedures |
| 40719 | wheel | a circular frame with a hub at the center for attachment to an axle, about which it revolves and bear a load |
| 6 | software | a program or series of programs, procedures, and documents usable on a particular kind of computer. |
| 601 | software_suite | a suite of programs, procedures, and documents usable on a particular kind of computer. A software suite includes multiple program executables packaged together for distribution under a global name and sometimes a unique version identifier. |
| 60101 | business_solutions_software | a software suite that is used for the operation and management of a business and that is not specifically designed for a branch of the industry. Examples include human resources software, accounting and finance software, business intelligence, customer service, engineering, logistics and procurement, manufacturing and process management, project management, sales and marketing, and so forth. |
| 60102 | entertainment_software | a suite of software applications designed for amusement and enjoyment. |
| 60103 | industry_specific_software | a software suite that is specifically used by a particular branch of the industry including aerospace and defense, agriculture, automotive, banking, education, engineering, food and beverage, government, healthcare, insurance, manufacturing industry, publishing, pharmaceutical industry, real estate, telecommunications, transportation and shipping, utilities, and so forth. |
| 60104 | system_and_infrastructure_software | a suite of software applications whose primary function is to manage and coordinate the operation and resources of a computer as well as its data storage, transmission and interconnectivity with other computers and hardware devices. Examples include operating systems, database software, networking and communications software, web services, middleware, security software, servers, and so forth. |
| 60105 | web_and_application_development software | a suite of software applications used to create other software applications. |
| 602 | software_application | a program usable on a particular kind of computer and its associated procedures and documentations. When distributed as part of a suite, a software application is the lowest component of a software package with its own marketable name and version identifiers. |

**TABLE A1.2** *Continued*

| Class Code | Class Name | Class Description |
|---|---|---|
| 60201 | application_server | a middle-tier software product within a server architecture providing middleware services for security and state maintenance, along with data access and persistence. |
| 60202 | artificial_intelligence_and_expert_system | a computerized software application that performs specialized tasks that would normally require or exceed human intelligence. |
| 60203 | business_management_tool | a software application used to support operations, management, and decision-making functions within a business organization. Examples include maintenance and life cycle management, facilities management, financial tools, human resources applications, marketing and sales management, contract, order and procurement applications, project management and planning, accounting, and so forth. |
| 60204 | communication_and_network_system | a software application that is responsible for the management of external and internal communication channels. Examples include communication servers, telephony servers, email servers, network servers, and so forth. |
| 60205 | compiler_and_development_software | a software application used to create other software applications. Examples include language compilers, application development tools, web authoring and development applications, and so forth. |
| 60206 | computer_aided_design_software | a computerized software application used to produce detailed engineering drawings and instructions through the creation of geometric models to communicate design or manufacturing information, or both. Examples include engineering, design, and drafting applications. |
| 60207 | control_software_system | a software application that orders, limits, instructs or rules a process. |
| 60208 | database_management_system | a group of interrelated data items along with a set of software applications used to store, disseminate, and manage the data, also called database system, or database. |
| 60209 | educational_and_training_software | a software application used for the process of learning skills. |
| 60210 | entertainment_tool | a software application designed for amusement and enjoyment. |
| 60211 | geographical_visualization_and_information_tool | a software application used to capture, store, retrieve, analyze, and display spatial data, localization, and geographical information. Examples include navigation, tide and current applications. |
| 6021101 | harbour_monitoring_software | a software application that provides a visual representation of port facilities and traffic. |
| 6021102 | navigation_software | a software application used to manage all or certain aspects of vessel navigation. |
| 602110201 | digital_charting | a software application used to display or plot charts, or both. |
| 602110202 | gps_software | a software application used to receive, display, transmit, or process data, or any combination thereof from the Global Positioning System (GPS). |
| 602110203 | passage_planning_software | a software application used to plan the route of a vessel including position, course, distance and timing calculations. |
| 602110204 | route_plotter | a software application used to visualize the route of a vessel. |
| 602110205 | tide_and_current_software | a software application used to visualize or predict, or both tides and tidal currents. |
| 6021103 | radar_software | a software application whose primary function is to process radar data. |
| 6021104 | weather_software | a software application used to visualize or forecast, or both weather conditions. |
| 60212 | hardware_driver | a software application used as an interface for communication with a piece of hardware. |
| 60213 | industry_specific_software_application | a software application that is specifically used by a particular branch of the industry. |
| 60214 | infrastructure_application | a software application used for the interconnection of users, computers, and other hardware tools including telephone lines, cable television lines, satellites, antennas, routers, aggregators, repeaters, and other devices that control data transmission. Infrastructure software are concerned with sending, receiving, and managing the signals that are transmitted. |
| 60215 | manufacturing_software_application | a software application used as part of a process resulting in the production of goods. |
| 60216 | middleware | a software application used to mediate between two separate programs. |
| 60217 | modeling_and_simulation_software | a software application used for numerical representation or schematization. |
| 60218 | office_tool | a generic, usually non specialized, software application used for regular office tasks. Examples include spreadsheet applications, word processing, imaging, internet browsers, presentation tools, email and newsgroup processing tools, conferencing and live communication tools, and so forth. |
| 60219 | operating_system | a software application that is responsible for the management and coordination of activities and the sharing of the resources of a computer. |
| 6021901 | primary_operating_system | an operating system that is not installed on top of another operating system. |
| 6021902 | secondary_operating_system | an operating system that is installed on top of another operating system. |
| 60220 | scientific_calculation_software | a software application whose primary function is to perform computerized mathematical calculations. |
| 60221 | security_and_protection_tool | a software application that protects access to data, software, middleware and hardware. Examples include scripting tools, anti virus applications, firewall software, and so forth. |

**TABLE A1.3 List of Properties for Identification and RAM Data Exchange**

| Property Code | Property Name | Property Description | Data Type | Required |
|---|---|---|---|---|
| p_00001 | acquisition_code | the item acquisition code | String | No |
| p_00002 | availability | the probability that an item is in a state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided | Numeric | No |
| p_00003 | availability_definition | the description of the method used to calculate availability | String | No |
| p_00004 | call_sign | the unique lifecycle identifier assigned to the ship by the flag state for radio communication | String | No |
| p_00005 | date_ship_placed_in_service | the date when the ship first went into service | Date | No |
| p_00006 | dependability | the collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance and maintenance support performance | Numeric | No |
| p_00007 | dependability_definition | the description of the method used to calculate dependability | String | No |
| p_00008 | failure_rate | the limit if the ratio of the conditional probability that the instant of time of a failure of an item falls within a given time interval and the length of this interval given that the item is in an up state at the beginning of the time interval | Numeric | No |
| p_00009 | failure_rate_definition | the description of the method used to calculate failure_rate | String | No |
| p_00010 | flag_state | the national authority with whom the ship is registered | String | No |
| p_00011 | generic_identifier | the item generic identifier | String | Yes |
| p_00012 | generic_pump_type | the kind of generic pump | String | No |
| p_00013 | maintainability | the probability that a given active maintenance action, for an item under given conditions of use can be carried out within a stated time interval, when the maintenance is performed under stated conditions and using stated procedures and resources | Numeric | No |
| p_00014 | maintainability_definition | the description of the method used to calculate maintainability | String | No |
| p_00015 | manufacturer_country_code | the international country code of the manufacturer | String | Yes |
| p_00016 | manufacturer_name | the name of the manufacturer | String | No |
| p_00017 | manufacturer_national_identifier | the national business ID of the manufacturer | String | Yes |
| p_00018 | mean_logistic_delay | the expectation of the logistic delay | Numeric | No |
| p_00019 | mean_logistic_delay_definition | the description of the method used to calculate mean_logistic_delay | String | No |
| p_00020 | mean_maintenance_man_hour | the expectation of the maintenance man-hours | Numeric | No |
| p_00021 | mean_maintenance_man_hour_definition | the description of the method used to calculate mean_maintenance_man_hour | String | No |
| p_00022 | mean_time_between_failures | the expectation of the time between failures | Numeric | No |
| p_00023 | mean_time_between_failures_definition | the description of the method used to calculate mean_time_between_failures | String | No |
| p_00024 | mean_time_between_predictive_maintenance | the expectation of the time between predictive maintenance actions | Numeric | No |
| p_00025 | mean_time_between_predictive_maintenance_definition | the description of the method used to calculate mean_time_between_predictive_maintenance | String | No |
| p_00026 | mean_time_to_repair | the expectation of the time to restoration | Numeric | No |
| p_00027 | mean_time_to_repair_definition | the description of the method used to calculate mean_time_to_repair | String | No |
| p_00028 | model_number | the manufacturer model number | String | Yes |
| p_00029 | model_type | the manufacturer model type | String | Yes |
| p_00030 | parent_identifers | the complete sequence of the generic identifiers of the item's parents | String Array | Yes |
| p_00031 | parent_unique_identifier | the unique identifier of the parent item (equipment or system) | String | Yes |
| p_00032 | port_of_registration | the national home port of the ship | String | No |
| p_00033 | reliability | the probability that an item can perform a required function under given conditions for a given time interval (t1, t2). It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval. | Numeric | No |
| p_00034 | reliability_definition | the description of the method used to calculate reliability | String | No |
| p_00035 | serial_number | the manufacturer serial number | String | No |
| p_00036 | ship_classifier | the details of the classification society under which the ship is currently placed | String | No |
| p_00037 | ship_IMO_number | the ship IMO number or unique identifier | Numeric | Yes |
| p_00038 | ship_location | the type of ship spaces/locations, within which the product is positioned | String | No |
| p_00039 | ship_name | the owner assigned identifier of the ship | String | No |
| p_00040 | ship_operator | the details of the current operator of the ship | String | No |
| p_00041 | ship_owner | the details of the current owner of the ship | String | No |
| p_00042 | ship_type | the kind of ship | String | Yes |
| p_00043 | unique_identifier | the item unique identifier | String | Yes |
| p_00044 | version_number | the primary identification number in the life cycle of a software product | String | Yes |
| p_00045 | release_number | the identification number of a software product used to distinguish a minor variant of a version with specific features and functionality | String | No |
| p_00046 | build_number | the number that identifies a specific executable version of a software product | String | No |
| p_00047 | associated_system | the list of unique identifiers of all systems that use the software product | String Array | No |
| p_00048 | associated_equipment | the list of unique identifiers of all pieces of equipment that use the software product | String Array | No |
| p_00049 | product_registration_id | the identification number of a software product used for its registration | String | No |

**TABLE A1.3** *Continued*

| Property Code | Property Name | Property Description | Data Type | Required |
|---|---|---|---|---|
| p_00050 | original_equipment_manufacturer | An OEM part is a part that is designed specified (chemical and physical properties) and manufactured by the OEM. It also includes a repair kit or overhaul kit (which is all the parts needed to perform a repair or overhaul of a machine or piece of equipment) which includes OEM parts and purchased finished parts. All of the parts in the kit are specified by the OEM, but not all the parts are manufactured by the OEM. Examples of purchased finished parts in a kit include ball bearings, seals, o-rings. The part could be designed and specified by the OEM, and be manufactured by a sub contractor to the OEM, and still be an OEM part. | Y/N String | No |

**TABLE A1.4 Identification Requirements for RAM Data Exchange**

| Product Type | Required Properties |
|---|---|
| Ship | ship_IMO_number |
| | ship_type |
| System | generic_identifier |
| | parent_identifers |
| | parent_unique_identifier |
| | unique_identifier |
| Equipment | generic_identifier |
| | manufacturer_country_code |
| | manufacturer_national_identifier |
| | model_number |
| | model_type |
| | parent_identifers |
| | parent_unique_identifier |
| | unique_identifier |
| Elementary Item | generic_identifier |
| | manufacturer_country_code |
| | manufacturer_national_identifier |
| | model_number |
| | model_type |
| | parent_identifers |
| | parent_unique_identifier |
| | unique_identifier |
| Software | generic_identifier |
| | manufacturer_country_code |
| | manufacturer_national_identifier |
| | parent_identifers |
| | parent_unique_identifier |
| | unique_identifier |
| | version_number |

**TABLE A1.5 List of Properties by Product Type**

| Product Type | Applicable Properties |
|---|---|
| Ship | call_sign |
| | date_ship_placed_in_service |
| | flag_state |
| | port_of_registration |
| | ship_classifier |
| | ship_IMO_number |
| | ship_name |
| | ship_operator |
| | ship_owner |
| | ship_type |
| Systems | acquisition_code |
| | availability |
| | availability_definition |
| | dependability |
| | dependability_definition |
| | failure_rate |
| | failure_rate_definition |
| | generic_identifier |
| | maintainability |
| | maintainability_definition |
| | mean_logistic_delay |
| | mean_logistic_delay_definition |
| | mean_maintenance_man_hour |
| | mean_maintenance_man_hour_definition |
| | mean_time_between_failures |
| | mean_time_between_failures_definition |
| | mean_time_between_predictive_maintenance |
| | mean_time_between_predictive_maintenance_definition |
| | mean_time_to_repair |
| | mean_time_to_repair_definition |
| | parent_identifers |
| | parent_unique_identifier |
| | reliability |
| | reliability_definition |
| | serial_number |
| | ship_location |
| | unique_identifier |
| Equipment | acquisition_code |
| | availability |
| | availability_definition |
| | dependability |
| | dependability_definition |
| | failure_rate |
| | failure_rate_definition |
| | generic_identifier |
| | maintainability |
| | maintainability_definition |
| | manufacturer_country_code |
| | manufacturer_name |
| | manufacturer_national_identifier |
| | mean_logistic_delay |
| | mean_logistic_delay_definition |
| | mean_maintenance_man_hour |
| | mean_maintenance_man_hour_definition |
| | mean_time_between_failures |
| | mean_time_between_failures_definition |
| | mean_time_between_predictive_maintenance |
| | mean_time_between_predictive_maintenance_definition |
| | mean_time_to_repair |
| | mean_time_to_repair_definition |
| | model_number |
| | model_type |
| | parent_identifers |
| | parent_unique_identifier |
| | reliability |
| | reliability_definition |
| | serial_number |
| | ship_location |
| | unique_identifier |

**TABLE A1.5** *Continued*

| Product Type | Applicable Properties |
|---|---|
| Elementary Items | acquisition_code |
| | availability |
| | availability_definition |
| | dependability |
| | dependability_definition |
| | failure_rate |
| | failure_rate_definition |
| | generic_identifier |
| | maintainability |
| | maintainability_definition |
| | manufacturer_country_code |
| | manufacturer_name |
| | manufacturer_national_identifier |
| | mean_logistic_delay |
| | mean_logistic_delay_definition |
| | mean_maintenance_man_hour |
| | mean_maintenance_man_hour_definition |
| | mean_time_between_failures |
| | mean_time_between_failures_definition |
| | mean_time_between_predictive_maintenance |
| | mean_time_between_predictive_maintenance_definition |
| | mean_time_to_repair |
| | mean_time_to_repair_definition |
| | model_number |
| | model_type |
| | original_equipment_manufacturer |
| | parent_identifers |
| | parent_unique_identifier |
| | reliability |
| | reliability_definition |
| | serial_number |
| | ship_location |
| | unique_identifier |
| Software | acquisition_code |
| | associated_equipment |
| | associated_system |
| | availability |
| | availability_definition |
| | build_number |
| | dependability |
| | dependability_definition |
| | failure_rate |
| | failure_rate_definition |
| | generic_identifier |
| | maintainability |
| | maintainability_definition |
| | manufacturer_country_code |
| | manufacturer_name |
| | manufacturer_national_identifier |
| | mean_logistic_delay |
| | mean_logistic_delay_definition |
| | mean_maintenance_man_hour |
| | mean_maintenance_man_hour_definition |
| | mean_time_between_failures |
| | mean_time_between_failures_definition |
| | mean_time_between_predictive_maintenance |
| | mean_time_between_predictive_maintenance_definition |
| | mean_time_to_repair |
| | mean_time_to_repair_definition |
| | parent_identifers |
| | parent_unique_identifier |
| | product_registration_id |
| | release_number |
| | reliability |
| | reliability_definition |
| | serial_number |
| | ship_location |
| | unique_identifier |
| | version_number |

# APPENDIX

**(Nonmandatory Information)**

## X1. MECHANISM FOR PRIVATE DATA EXCHANGE

### X1.1 Definitions

X1.1.1 Private data exchange will be based on the definition of custom classes to be used by organizations willing to extend the standard class library for the exchange of data within a group of standard implementers. This process will be based on the definition of extended properties as shown in Table X1.1.

X1.1.2 The data to be exchanged will include the above information in addition to the standard list of properties. The extended class definitions will only be required for new custom classes. It will not be necessary to include the complete set of extended class definitions in each data exchange, although standard implementers will be free to choose this option. New members joining a private data exchange group will need to be sent all extended class definitions.

X1.1.3 The following rules are to be used for the definition of custom codes:

X1.1.3.1 All custom class codes must start with 5.

X1.1.3.2 The next digits must correspond to the custom class code of the parent in the class hierarchy.

X1.1.3.3 The last digits must uniquely identify the custom class within the entire extended hierarchy. If there are less than 100 items on a specific level, two digits are used to uniquely identify each item, starting with 01. If there are more than 100 items on a specific level, four digits are used to uniquely identify each item, starting with 0001. When the unique identifiers below a particular custom class include at least one item whose first two digits are 00, it means that the level below this particular custom class uses 4 digits for unique identification. Another two digits can be added for the unique identifiers of a particular level if this level includes more than 10 000 items and so on.

### X1.2 Sample Case

X1.2.1 It is assumed that a private group wishes to exchange RAM data for the following items:

X1.2.1.1 Helicopter landing lights,

X1.2.1.2 Helicopter signal lights, and

X1.2.1.3 Steam propulsion plant.

X1.2.2 Helicopter landing lights and helicopter signal lights are assumed to be pieces of equipment of the type “signal lights” that belong to a system named “helicopter landing system.” The steam propulsion plant is to be added under an existing item of the standard class library, the propulsion_ system whose class code is 225.

X1.2.3 Tables X1.2-X1.6 provide examples of the properties required for the definition of extended classes. It is provided for illustration purpose only and is not an attempt at defining an actual class extension.

### X1.3 Summary

X1.3.1 The data shown in Table X1.7 must be exchanged to define all custom classes.

**TABLE X1.1 Extended Properties for the Definition of Custom Classes**

| Property Code | Property Value | Property Description | Required |
|---|---|---|---|
| p_custom_code | Unique code of the extended class item | All custom class codes must start with 5. The next digits must correspond to the custom class code of the parent in the class hierarchy. The last digits uniquely identify the custom class within the class hierarchy. | Yes |
| p_custom_name | Unique name of the extended class item | All custom class names must start with “custom_.” The remaining portion of the name must be unique. | Yes |
| p_custom_definition | Definition of the extended class item | A narrative description of the custom class. | Yes |
| p_custom_level | The product type of the extended class item | This property can only take the following 4 values:<br>2 (for systems)<br>3 (for equipment)<br>4 (for elementary items)<br>6 (for software) | |
| | | The extended class level will be used to define the standard properties to be exchanged, which depend on the product type. | Yes |
| p_custom_parent | The class code or class name of the parent in the class hierarchy | The parent in the class hierarchy in some instances is another custom class or an existing standard class. It can be identified with either its code or its name, since both of them are unique. | Yes |

**TABLE X1.2 Definition of Helicopter Landing System**

| Property Code | Property Value | Comment |
|---|---|---|
| p_custom_code | 5235 | the custom class codes must start with 5. The first digits must correspond to the custom class code of the parent in the class hierarchy. In this example, helicopter landing system is added directly under system, whose code is 2. The last two digits uniquely identify the custom class within the class hierarchy. The standard hierarchy under 2 ends with 234, so the last two digits can be any number between 35 and 99 (35 was chosen in this example) |
| p_custom_name | custom_helicopter_landing_system | all custom class names must start with "custom_." |
| p_custom_ definition | a system that includes all equipment used in landing helicopters aboard ship | |
| p_custom_level | 2 | custom level must be 2 because a system is being defined. This indicates that the properties to be exchanged are the standard properties defined for systems. |
| p_custom_parent | system OR 2 | the parent in the class hierarchy is the standard system class whose code is 2. |

**TABLE X1.3 Definition of Signal Lights**

| Property Code | Property Value | Comment |
|---|---|---|
| p_custom_code | 5311 | the custom class codes must start with 5. The first digits must correspond to the custom class code of the parent in the class hierarchy. In this example, signal lights are added directly under equipment, whose code is 3. The last two digits uniquely identify the custom class within the class hierarchy. The standard hierarchy under 3 ends with 310, so the last two digits can be any number between 11 and 99 (11 was chosen in this example) |
| p_custom_name | custom_signal_lights | all custom class names must start with "custom_." |
| p_custom_ definition | equipment used to provide visual information to other personnel on the condition of a piece of equipment or process/procedure | |
| p_custom_level | 3 | custom level must be 3 because a piece of equipment is being defined. This indicates that the properties to be exchanged are the standard properties defined for pieces of equipment. |
| p_custom_parent | equipment OR 3 | the parent in the class hierarchy is the standard equipment class whose code is 3. |

**TABLE X1.4 Definition of Helicopter Landing Lights**

| Property Code | Property Value | Comment |
|---|---|---|
| p_custom_code | 531101 | the custom class codes must start with 5. The first digits must correspond to the custom class code of the parent in the class hierarchy. In this example, helicopter landing lights are added under signal lights, whose code is 5311. The last two digits uniquely identify the custom class within the class hierarchy, it can be any number between 01 and 99 (01 was chosen in this example) |
| p_custom_name | custom_helicopter_landing_lights | all custom class names must start with "custom_." |
| p_custom_ definition | lighting that marks the specific outline of the landing surface | |
| p_custom_level | 3 | custom level must be 3 because a piece of equipment is being defined. This indicates that the properties to be exchanged are the standard properties defined for pieces of equipment. |
| p_custom_parent | signal lights OR 5311 | the parent in the class hierarchy is the extended signal lights class whose code is 5311. |

**TABLE X1.5 Definition of Helicopter Signal Lights**

| Property Code | Property Value | Comment |
|---|---|---|
| p_custom_code | 531102 | the custom class codes must start with 5. The first digits must correspond to the custom class code of the parent in the class hierarchy. In this example, helicopter signal lights are added under signal lights, whose code is 5311. The last two digits uniquely identify the custom class within the class hierarchy. 01 is reserved for torpedoes. It can be any number between 02 and 99 (02 was chosen in this example) |
| p_custom_name | custom_helicopter_signal_lights | all custom class names must start with "custom_." |
| p_custom_ definition | lighting that is used to signal the helicopter pilot on the condition of approach to the landing surface | |
| p_custom_level | 3 | custom level must be 3 because a piece of equipment is being defined. This indicates that the properties to be exchanged are the standard properties defined for pieces of equipment. |
| p_custom_parent | signal lights OR 5311 | the parent in the class hierarchy is the extended signal lights class whose code is 5311. |

**TABLE X1.6 Definition of Steam Propulsion Plant**

| Property Code | Property Value | Comment |
|---|---|---|
| p_custom_code | 522503 | the custom class codes must start with 5. The first digits must correspond to the custom class code of the parent in the class hierarchy. In this example, weapon system is added under propulsion_system, whose code is 225. The last two digits uniquely identify the custom class within the class hierarchy. The standard hierarchy under 225 ends with 22502, so the last two digits can be any number between 03 and 99 (03 was chosen in this example) |
| p_custom_name | custom_steam_propulsion_plant | all custom class names must start with "custom_." |
| p_custom_ definition | a propulsion plant driven by steam generated by a combustion boiler | |
| p_custom_level | 2 | custom level must be 2 because a system is being defined. This indicates that the properties to be exchanged are the standard properties defined for systems. |
| p_custom_parent | propulsion_system OR 225 | the parent in the class hierarchy is the standard propulsion _system class whose code is 225. |

**TABLE X1.7 Custom Classes Data**

| p_custom_code | p_custom_name | p_custom_definition | p_custom_level | p_custom_parent |
|---|---|---|---|---|
| 5235 | custom_helicopter_landing _system | a system that includes all equipment used in landing helicopters aboard ship | 2 | 2 |
| 5311 | custom_signal_lights | equipment used to provide visual information to other personnel on the condition of a piece of equipment or process/procedure | 3 | 3 |
| 531101 | custom_helicopter_landing _lights | lighting that marks the specific outline of the landing surface | 3 | 5311 |
| 531102 | custom_helicopter_signal_ lights | lighting that is used to signal the helicopter pilot on the condition of approach to the landing surface | 3 | 5311 |
| 522503 | custom_steam_propulsion_ plant | a propulsion plant driven by steam generated by a combustion boiler | 2 | 225 |