SupplHi Standard Categorization

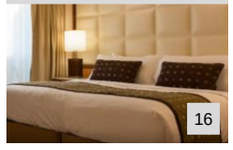
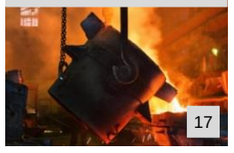
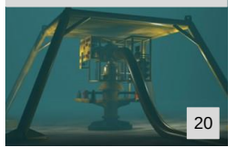
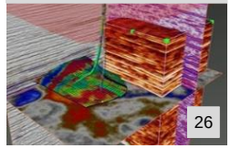
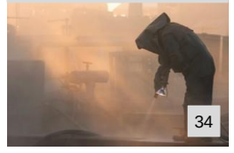
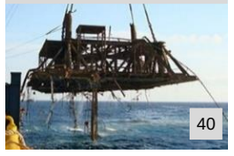
46 Groups - **290** Families - **2.800** Categories

Visit **www.supplhi.com** to explore the vendors in each Category

The category tree features three levels: Groups, Families, Categories. This helps guide the user through the main logical nodes.

Rev20 - September 2022

SupplHi Standard Groups of categories

HEAT TRANSFER EQUIPMENT AND VESSELS	HEATING EQUIPMENT AND SYSTEMS	PACKAGES	HANDLING SYSTEMS	VALVES	AUTOMATION CONTROL SYSTEMS AND INSTRUMENTATION	TELECOMMUNICATIONS	PUMPS	COMPRESSORS	TURBINES
 01	 02	 03	 04	 05	 06	 07	 08	 09	 10
PIPING, FITTINGS AND FLANGES	STRUCTURAL AND CONSTRUCTION MATERIALS	ELECTRICAL COMPONENTS AND SYSTEMS	ENGINES, MOTORS, GENERATORS AND DRIVES	SAFETY SYSTEMS, EQUIPMENT AND CLOTHING	INTERIORS	RAW MATERIALS	MANUFACTURING WORKS	SHIPBUILDING	SUBSEA EQUIPMENT
 11	 12	 13	 14	 15	 16	 17	 18	 19	 20
COMPONENTS AND SYSTEMS FOR VESSELS	COMPONENTS AND SYSTEMS FOR OFF-SHORE ACTIVITIES	MARINE AND DIVING EQUIPMENT AND SERVICES	MARINE CONTRACTING AND INSTALLATION	EXPLORATION	RESERVOIR MANAGEMENT	DRILLING SERVICES	DRILLING EQUIPMENT AND MATERIALS	WELL COMPLETION	ENGINEERING SERVICES
 21	 22	 23	 24	 25	 26	 27	 28	 29	 30
ENGINEERING, PROCUREMENT AND CONSTRUCTION	CONSTRUCTION AND CIVIL WORKS	FABRICATION	PAINTING, COATING, INSULATION AND SOUND PROOFING	SITE SERVICES	TESTING AND ANALYSIS	OPERATIONS AND MAINTENANCE	CHEMICALS, CATALYSTS, REAGENTS AND FUELS	WORKSHOPS AND LABORATORY TOOLS	DECOMMISSIONING AND ENVIRONMENTAL REMEDIATION
 31	 32	 33	 34	 35	 36	 37	 38	 39	 40
IT AND DIGITAL	LOGISTICS	PROFESSIONAL SERVICES	FACILITY MANAGEMENT	GENERAL SERVICES	ELECTRONICS				
41	42	43	44	45	46				

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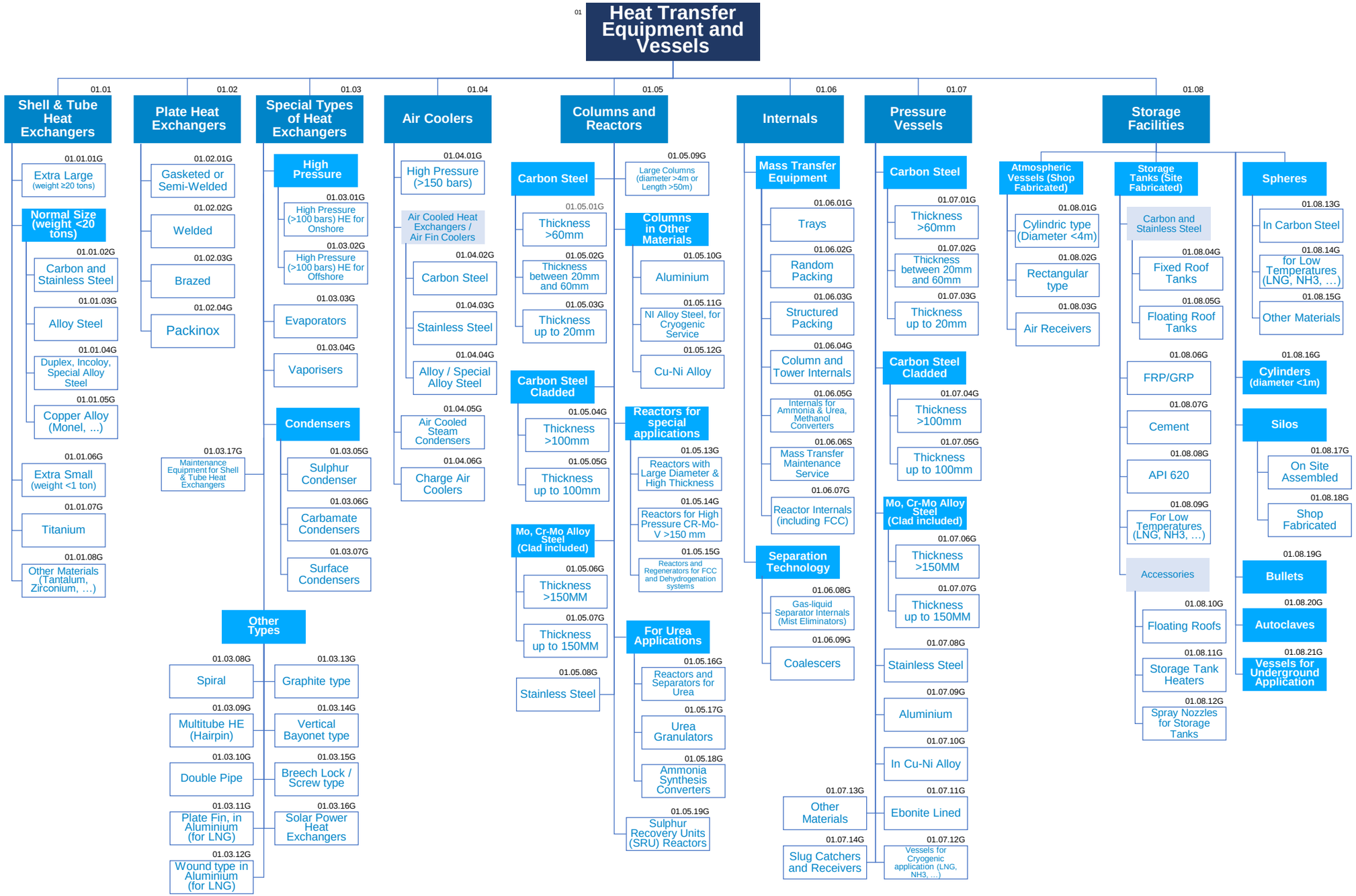


Heat Transfer Equipment and Vessels

This category is centred on all equipment with specific focus on high-pressure and high-temperature services.

The main purpose of half of the equipment in this category is heat transfer to and from process fluids, which is an essential part of most chemical processes. The most commonly used type of heat-transfer equipment is the shell and tube heat exchanger. Reactors, Columns and Internals are necessary for the chemical processes that occur during the refining process. The remaining equipment (Vessels, and Storage Tanks) focuses instead on storage of the products and/or raw materials of the plant processes.

Main rationales behind the Standard Categorization

On a family level the priority has been given to the different type of equipment, whilst on a category level to the specifications of the products (material and sizes mainly).

Shell & Tube Heat Exchangers

- Heat exchangers are the most commonly used means of heat transfer, the Shell & Tube type in particular.
- The word 'exchanger' really applies to all types of equipment in which heat is exchanged but is often used specifically to denote equipment in which heat is exchanged between two process streams.
- The categorization is based on materials and sizes of heat exchangers. However, in the industry the following terms are often associated to the Heat Exchanger (HE) family: Pre-Heaters, Vaporizers (if the process stream is vaporized), Condensers, Coolers, Heaters, Evaporators (if used to concentrate a solution) and Reboilers (if associated with a distillation column). In fact, in this categorization these objects are all considered to be heat exchangers, but they fall in the categories based on their materials and sizes.
- The rationale behind the separation is to try and include all used types of exchangers giving more space and detail to the most diffused ones, such as large Shell & Tube exchangers
- U-tube, fixed head and floating head are considered as part of the Shell & Tube categories.
- The Vaporisers category only deals with LNG vaporisers (for regasification).

Plate Heat Exchangers

- In this case it is important to differentiate between Manufacturers – who actually print the plates with a proprietary press (8,10,12,20 and recently 40 tons) and sell complete apparatus with their own brand – and Licensees – who assemble plates printed elsewhere onto locally built frames under their own brand, different from that of the plates producer (citing, in some cases, the name of the plate within the apparatus).
- 01.02.02G Welded Plate Heat Exchangers includes the various types of welded HEs – plate & frame, shell & plate, cross flow.

Special Types of Heat Exchangers

- Special HE for onshore usually have a large size (diameter > 500mm) and for H2 service, whilst Special HE for offshore usually have a small size (diameter < 500mm)
- 01.03.03G Evaporators include all types of evaporators (thin film, natural/forced circulation etc.).
- Condensers as intended for HVAC use or commercial cooling are not like the pressure equipment dealt with in this category, therefore, they are in the 03G Packages group.

Air Coolers

- This category is separate from Heat Exchangers because they are generally used when there is a lack of water and they do not require any coolant other than air. Therefore applications vary and are in many cases different from those of other Heat Exchangers.
- Air Coolers include both induced and forced draft types and all header types (plug, welded, screw bolted etc.).
- 01.04.04G Includes all other alloys and metals that compose the Air Cooler.

Columns and Reactors

- What differentiates the vessels from one another is their size, material and application. Therefore, our categorization is based on these three criteria.
- The rationale behind the separation of reactors such as ones for High Pressure and FCC use (01.05.14G) and Columns greater than 50m (01.05.09G) in length is that they require specific expertise and competences to be built.
- Ammonia and Urea reactors have their own categories due to the importance of these chemicals for fertilizing purposes.
- Towers are to be listed under the respective column category. This is acceptable due to their similarity in use and in competences necessary for construction.

Internals

- The main purpose of internals for columns and reactors is to separate different parts of a solution. This can be done through distillation, absorption, stripping, crystallization, evaporation, phase separation, and membrane separation.
- Column and Tower internals includes all conventional internals that are not otherwise listed.
- Reactor internals include all of the internal components, from support grids to filters and baskets.

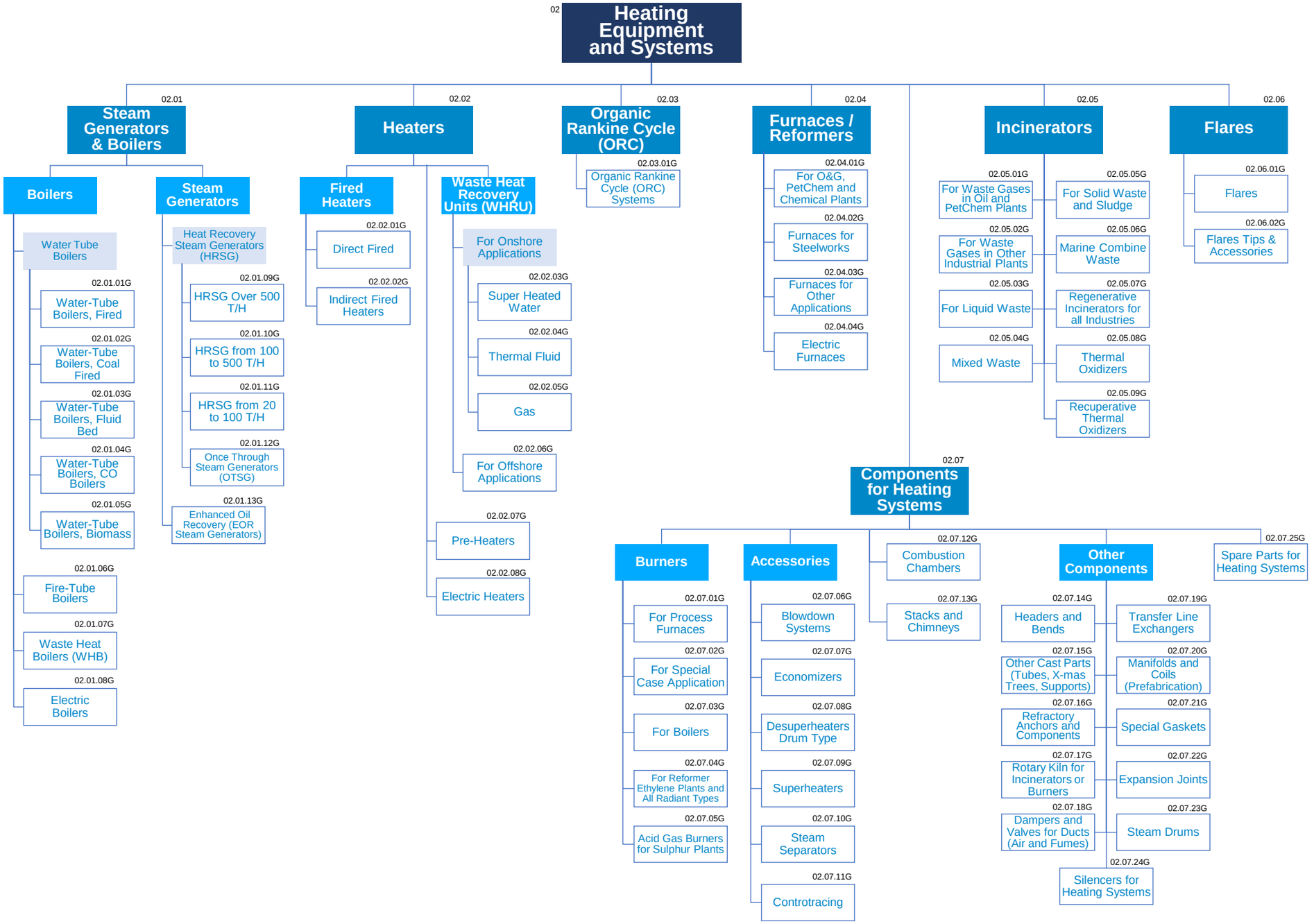
Pressure Vessels

- The same separation used for Columns is used here too as Columns and Reactors are quite similar to pressure vessels and the aim is the same: to differentiate amongst manufacturers – who has which competences.
- All vessels are included in this family, whether they are drums, separators, scrubbers etc.
- We have included a specific category 01.07.14G for Slug catchers (and launchers) as they have a very specific use and market competition shows a split is required.
- Other Materials 01.07.13G includes all non-listed materials (titanium, zirconium, …)

Storage Facilities

The differentiation here is based on shape and use according to the following specifications:

- Storage tanks: large containers used to store liquids or compressed gases.
- Silos: more commonly used for bulk storage (coal, grains etc.). These categories can include Silos of all materials, welded or seamless and with or without rubber lining.
- Cylinders: Generally smaller and used for gas storage
- Spheres: preferred for LPG or high pressure fluids. The shape allows even distribution of stress on the sphere's surface, giving it a solid structure.
- Bullets: also mostly used for LPG storage and are horizontal.
- Storage Autoclaves: vessels used to process parts and materials which require exposure to elevated temperature or pressure. (they are here and not under pressure vessels as they are mainly used for storage purposes rather than processes).
- Underground vessels are a self standing category due to their nature.
- Atmospheric vessels also have a separate branch because they are used for storage of various types of liquids since they maintain atmospheric pressure.



Heating Equipment and Systems

This category focuses on equipment used for industrial heating purposes. The main industries served by this equipment are the Oil&Gas and Power Generation ones.

The most widespread heating systems are boilers, steam generators (the market is expected to reach an estimated $36.8 B by 2018) and heaters. Their respective heat recovery units (WHB, HRSG and WHRU) are becoming more common too due to the increased efficiency they provide.

Whilst Flares and Incinerators are more for treatment (of flue gas or VOCs) the other categories are all focused on providing heat to (Boilers, Heaters, Furnaces) or recovering heat from (ORC plants) a process.

Main rationales behind the Standard Categorization

On a family level the priority has been given to the different type of equipment, whilst on a category level to the characteristics of the single systems (use, heating/recovery medium and type).

Steam Generators & Boilers

- The most important division to define is that of Steam Generators & Boilers VS Heaters. Steam Generators and Boilers both produce water vapor, whilst Heaters increase the temperature of a thermal fluid (or super-heated water, which due to the high pressure does not vaporize) without actually creating any vapor.
- Fire Tube Boilers: have hot gases inside the tubes and water outside the tubes. It is usually internally fired, and operates under lower pressure. It is not suitable for large power plants.
- Water Tube Boilers: have water inside the tube and hot gases outside the tubes. It is externally fired, and operates under high pressure. It is suitable for large power plants.

Notes:

- While Boilers can be seen as operating at sub-critical pressures, as water actually does reach boiling point, Steam Generators more often operate at super-critical pressures, thus vaporizing water instantly (water changes state without boiling). This will be the distinction followed to differentiate the two systems from each other.
  a. Steam generators = no boiling, water changes straight to vapor
  b. Boilers = boiling is allowed to occur due to sub-critical pressures
- Fire and water tube boilers include all kinds of fuels, whether they are gaseous, liquid or solid. The only separate fuel is biomass as it is quite different from the usual coal, oil or gas fueled types.
- The division among heaters and boilers is based on what has been heated (a direct fired heater will heat either water, thermal fluid or air). In the case of WHBs, HRSGs and WHRUs categorization is based on the source from which we are recovering heat (a WHRU might be recovering heat from super-heated water coming from a turbine process).

Heaters

- The distinction between direct and indirect fired heaters is currently the main differentiating characteristic in the market.
- In the case of Fired Heaters we usually refer to ones built following the API standards.

Notes:

- Direct fired heaters include a various range of products used for different processes including: Hydrotreating, Thermal Cracking, Naphtha Reforming, Dehydrogenation, etc.)
- The Direct and Indirect Fired Heaters categories include the split depending on medium heated: (superheated)water, thermal fluid, air/gas.
- WHR Heaters are considered as a subset of WHR Units.
- 02.02.07G Pre-Heaters includes pre-heaters for (feed)water, thermal fluid and air/gas.

Organic Rankine Cycle Plants

- The Organic Rankine Cycle is a thermodynamic process where heat is transferred to a fluid at a constant pressure. The fluid allows Rankine cycle heat recovery from lower temperature sources such as biomass combustion, industrial waste heat, geothermal heat, solar ponds etc. It is in it's own separate category as it is a specific technology.

Furnaces

- An industrial furnace is a piece of equipment used either to provide heat for a process or to serve a reactor by providing heats of reaction. Design varies as to its function, heating duty, type of fuel and method of introducing combustion air.
- Separating by application of the furnace, is more effective than separating by fuel type. This is because there are larger differences to be noted between furnaces in this categorization.

Notes:

- Furnaces are not to be confused with fired heaters. Furnaces include apparatuses such as Electric arc furnaces, which are used to melt steel. Direct fired heaters are generally not made to reach the heats furnaces can reach and are used for different purposes.

Components for Heating Systems

- This category lists the most used and demanded components for all the previously listed heating systems.

Notes:

- The main add-ons for boilers and steam generators are listed under the 'accessories' family.
- Burners play a major role in furnaces, heaters, boilers and incinerators, which is why they have their own column in the categorization. The use-based distinction was once again chosen to be buyer friendly.
- Combustion Chambers were included due to their use in gas turbines, a major piece of equipment in the Oil&Gas and power generation industries. It is common for them to need replacement, but they are more complex than a simple spare part, therefore they have their own category. They include the various types of build such as can, cannular and annular.
- The 'other components' listed are some of the common forged replacement parts used for heaters, furnaces, incinerators and flares
- 02.07.15G is not limited to the parts listed in brackets; it includes all cast parts that are not mentioned in the neighbouring categories.
- 02.07.21G Special Gaskets and 02.07.22G Expansion Joints refer mainly (but not exclusively) to Desox and Denox plants.
- 02.07.25G Spare parts include anything from a replacement part (flange, gasket, door seal, controller, gauge etc.) to insulation coatings.
- 02.07.23G Includes, among others: Exhaust, Vent and Stack Silencers.

Incinerators

- The division by type of waste is based on the fact that the categorization aims to be both vendor and buyer friendly. In this case the choice of categories is buyer oriented. Knowing what kind of waste they need to incinerate, they can find the right incinerators directly.

Notes:

- The difference between regenerative and recuperative in this case refers to the presence of a catalyst. In brief, Regenerative incinerators (02.05.07G) refer to what is commonly known as RTOs and Recuperative thermal oxidizers (02.05.09G) refer to RCOs (catalytic oxidizers).
- This categorization was chosen also because regardless of the type of classification of incinerators the vendor has chosen, it can always be translated to the proposed one. For instance, organic and animal waste (carcasses) would most likely fall under the solid waste.

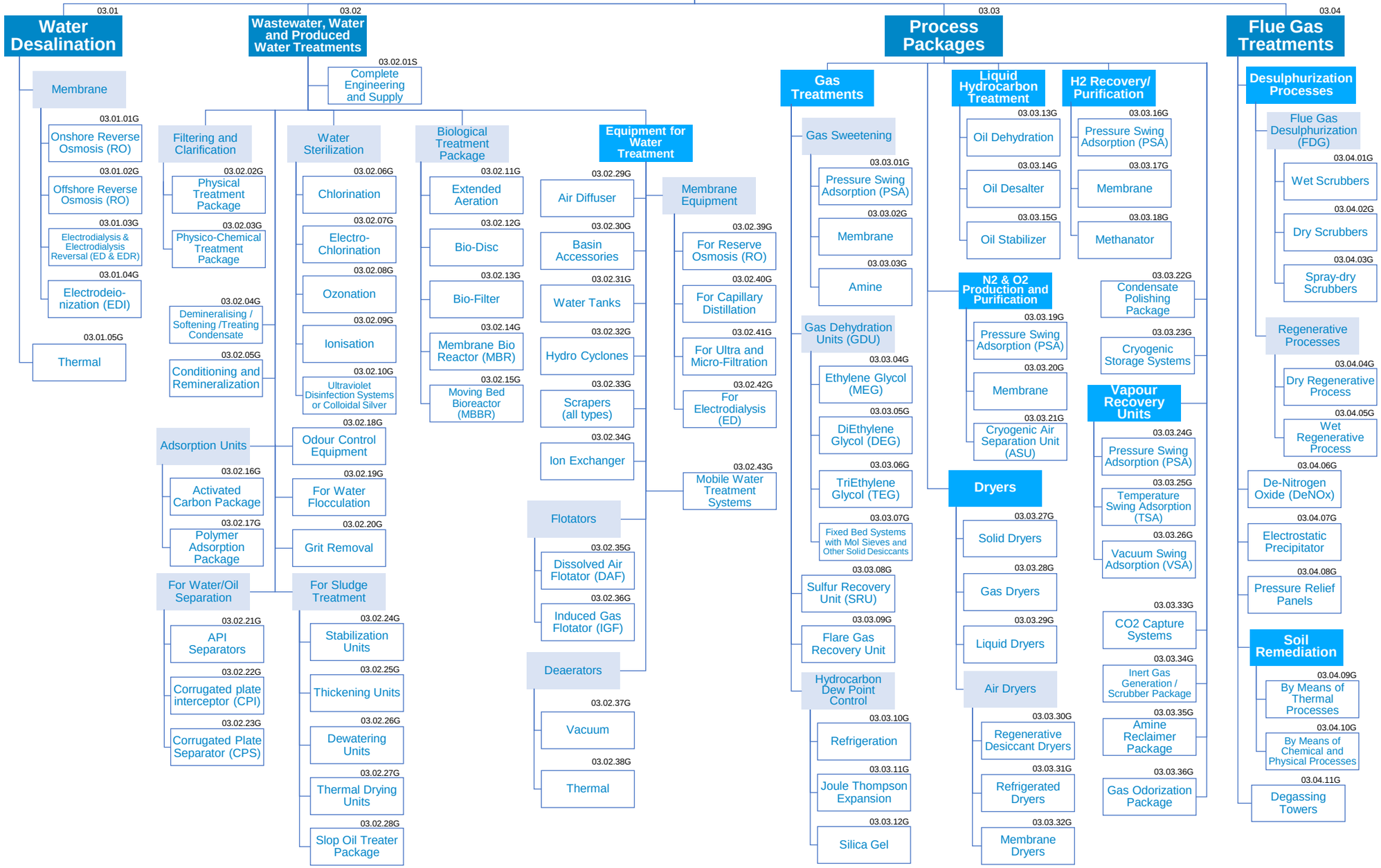
Flares

- We have chosen not to identify the various types of flares by category as it has emerged that market competition is quite homogeneous, in that each vendor can offer most if not all types of flares (Self-supported, Derrick, Guyed, Ground and Sonic flares).

Notes:

- Also sub-types of the abovementioned flares are included in the single category (e.g. Ground flares includes all types of such flares open, enclosed, smokeless, steam assisted, controlled combustion, invisible flaring system, etc.).
- 02.06.02G Flare tips and accessories includes, but is not limited to: Sonic tips, Pilots, Seals, Ignition control systems, Knock-out drums.

03 Packages (1/2)



03 Packages (2/2)

03.05 Cooling Towers
- 03.05.01G Natural Draft (Wet and Dry)
- 03.05.02G Mechanical Draft (Induced and Forced)
- 03.05.03G Small Dimensions (Roof Top Structures)

03.06 Refrigeration
- 03.06.01G With Rotary or Reciprocating Compressors
- 03.06.02G With Centrifugal Compressors
- 03.06.03G Absorption type
- 03.06.04G Ultra Low Temperature freezer (ULT)

03.07 Heating, Venting & Air Conditioning (HVAC)
- 03.07.01S Complete EPC
- 03.07.02S Engineering and Supply
- 03.07.03G Air Conditioning Chillers
- 03.07.04G Heat Pumps
- 03.07.05G Air Handling Units
- 03.07.06G Condensing Unit
- 03.07.07G Self Contained Units

Various Components
- 03.07.08G Ventilation Fans
- 03.07.09G Humidifiers
- 03.07.10G Heat Recovery Ventilation (HRV)
- 03.07.11G Refrigeration Unit for Air Conditioning
- 03.07.12G Chemical Filter Units
- 03.07.13G Unit Control Panels (UCP)
- 03.07.14G HVAC Control Systems
- 03.07.15G Others
- 03.07.16G Cold Rooms
- 03.07.17G Ducts for HVAC

03.08 Filtration
Solid-Liquid Filters
Vacuum Filters
- 03.08.01G Rotary Drum Filters
- 03.08.02G Disc Filters
- 03.08.03G Top Feed Vacuum Filters (Belt, Table, Tilting Pan,…)

Pressure Filters
- 03.08.04G Filterpress
- 03.08.05G Plate and Leaf Pressure Filters
- 03.08.06G Nutsche Pressure Filter
- 03.08.07G Candle Filter
- 03.08.08G Continuous Pressure Filters (Automatic & Pneumatic)

Other Filters
- 03.08.09G CCR Fine Filtration Package
- 03.08.10G Air Filters
- 03.08.11G Electrostatic Coalescers
- 03.08.12G Electrostatic Filters (Dust, ...)
- 03.08.13G Dedusting Filters (with Fan)
- 03.08.14G Smoke Extraction Equipment
- 03.08.15G Ash Removal Systems
- 03.08.16G Filter Housings

Centrifuges
- 03.08.17G Pusher Type Centrifuges
- 03.08.18G Decanter Centrifuges
- 03.08.19G Peeler Centrifuges
- 03.08.20G Other Types of Centrifuges

Filter Media
- 03.08.21G Cartridge Filters
- 03.08.22G Bag Filters
- 03.08.23G Basket Filters
- 03.08.24G Strainers

Pressure Filters & Sand Filters
- 03.08.25G Sand Filters
- 03.08.26G Multi Media Filters
- 03.08.27G Ultra Filtration (UF) Package
- 03.08.28G Automatic Self Cleaning Filters
- 03.08.29G Lube Oil Filters (API 614)

03.09 Separation
Separators
- 03.09.01G Solid From Solid
- 03.09.02G Liquid From Gas
- 03.09.03G Centrifugal – Dust From Gas
- 03.09.04G Liquid From Liquid
- 03.09.05G Solid from Liquid
- 03.09.06G Air from Liquid

Other Separators
- 03.09.07G Metal Detectors
- 03.09.08G Elutriators
- 03.09.09G Decanters
- 03.09.10G Film Evaporators
- 03.09.11G Multi-Cyclones
- 03.09.12G Infield Desanding Separation Package

Screens
- 03.09.13G Rotary Screens
- 03.09.14G Bar screens
- 03.09.15G Vibrating Screens

03.10 Main Skid-Mounted Packages
- 03.10.01G Dosing Systems / Chemical Injection Package
- 03.10.02G Accumulator Skids
- 03.10.03G Gas Pressure Regulating Systems
- 03.10.04G Fuel Gas Treatment Skids
- 03.10.05G Instrument Air Package
- 03.10.06G Manufacturing of Skid-Mounted Pumping System
- 03.10.07G Manufacturing of Skid-Mounted Compressors System
- 03.10.08G Well Testing Skids
- 03.10.09G Production Manifold Skid-mounted
- 03.10.10G Pig Launchers and Receivers
- 03.10.11G Compressors and Turbines Cleaning Systems

Metering skid Units
- 03.10.12G For Crude Oil
- 03.10.13G For Gas

03.11 Sub – Packages
- 03.11.01G Wellhead Control Panels
- 03.11.02G Power Packs
- 03.11.03G Lube Oil Systems
- 03.11.04G Compressed Air Systems
- 03.11.05G Bundles of Cylinders
- 03.11.06G Hydraulic Cylinders
- 03.11.07G Auxiliary Skid Unit
- 03.11.08G Gas Coolers
- 03.11.09G Ejectors

03.12 Electrolysers
- 03.12.01G Alkaline Electrolyser (AEL)
- 03.11202G PEM electrolyser > 80 m3/h
- 03.12.03G PEM electrolyser > 10 m³/h and < 80 m³/h
- 03.12.04G PEM electrolyser < 10 Nm³/h
- 03.12.05G AEM electrolyser
- 03.12.06G Solid Oxide Electrolyser Cell (SOEC)

Packages

Packages are multidisciplinary and process-oriented items that are defined by their functionality. Packages have critical interfaces with the rest of the plant, thus are often highly co-engineered along the value chain and may have long lead times.

What really defines a Package is its composition. No single component - pump, compressor, valve or anything else - prevails over the others, they are all equally important for the functioning of the Package as a whole.

Main rationales behind the Standard Categorization

On a family level the priority has been given to the different fields of application of each system, whilst on a category level to the characteristics of the single systems (type of treatment, process, type of filtration, …).

Water Treatment

- In this family four main sub-families were identified: desalination, water and wastewater treatment, water filtration and equipment.
- This split exist due to the different market competition across them.

Notes:

- Water filtration is this family rather than in Filtration & Separation as priority was given to the scope of filtration in this case.
- Thermal Desalination includes Multi-Stage Flash Distillation (MSF), Multiple-Effect Distillation (MED) and Vapour Compression Desalination (VC).
- Advanced wastewater treatment technologies to purify and recycle virtually all of the wastewater produced, with no discharge of any kind of pollutants into the environment (Zero Discharge regulation).
- 03.02.33G Scrapers (All types) also includes Flight scrapers and Chain scrapers.
- 03.02.43G Mobile Water Treatment Systems refers to the different processes including treatment solutions such as: resin, membrane, filtration, and other water treatment.

Process Packages

- The two-layer division of direct and indirect fired and then by medium heated is made to give more depth to the categorization.
- The division by fluid or gas heated is based on the fact that they require very different temperatures and pressures and thus different construction competences.

Notes:

- 03.03.22G Polishing Units includes Adsorbent and Catalyst polishing units.

Flue Gas Treatments

- Waste incineration and many other industrial processes generate flue gases. These often contain pollutants such as sulfur oxides (SO_2 + SO_3), hydrochloric acid (HCl), hydrofluoric acid (HF) as well as heavy metals and dioxins. These flue gases need to be treated as they are highly damaging for the environment.
- The most common way of removing pollutants is by using Scrubbers, DeNOx systems and Electrostatic Precipitators, hence the ordering of the categories.

Cooling Towers

- There are many ways to classify cooling towers, the most common is based on the type of air induction into the tower: natural draft (normal or fan assisted) and mechanical (induced or forced) draft cooling towers.
- Other types of existing classification are: by use (HVAC vs industrial), by build (Package type vs Field erected type), by heat transfer method (Wet vs Dry) and by air-to-water flow (Counterflow vs Crossflow).
- One of the reasons for so many differentiating factors is that Cooling towers vary in size, ranging from small roof-top units to very large hyperboloid structures that can reach heights of over 100m.

Notes:

- The choice to differentiate Natural vs Mechanical draft was made according to market competition.
- Small Dimensions cooling towers were included in this family rather than HVAC as priority to the Cooling Tower grouping was given.
- Wood, FRP and Concrete structure Cooling Towers can be classified as mechanical induced draft and are therefore included in 03.05.02G.

Refrigeration

- These were included due to their use in gas turbines, a major piece of equipment in the Oil&Gas and power generation industries. It is common for them to need replacement, but they are more complex than a simple spare part, therefore they have their own category.
- Ultra Low Temperature freezer (ULT) is included in the refrigeration family due to the complexity of this product and its use for less than 40 degrees Celsius

Heating, Venting & Air Conditioning (HVAC)

- HVAC is an important part of residential structures, small as well as large industrial and office buildings, onboard vessels, and in marine environments, where safe and healthy building conditions are regulated with respect to temperature and humidity, using fresh air from outdoors.

Notes:

- Other Various Components refers to any component of an HVAC system that hasn't been listed in the above categories. This category exists because there are multiple components in HVAC systems, but including every single one would unnecessarily expand the categorization. Therefore we have only included the main ones and added this category to guarantee that none are left out.

Filtration

- Pressure Filters, with the exception of the Rotary Drum Pressure Filter, are semi-continuous type machines that enter a wash and cake discharge mode at the end of the filtration cycle.
- Vacuum filters are more commonly used in the chemical, food and pharma industries, but also find wide application in the energy one.

Notes:

- 03.08.05G "Solid-Liquid Plate and Leaf Pressure Filters" include both vertical and Horizontal Types

Separation

- Since the separation techniques are very diverse several sub-families have been highlighted.

Notes:

- Decanter Centrifuges include horizontal and vertical types.
- 03.09.12G also includes Inlet Sand Catcher Packages, they have been grouped together due to their similar function and similar market competition.

Skid-Mounted Packages

- Packages can be permanently mounted in a frame or on a pallet/rails in order to be easily and securely transported and used as a unit. In some cases such units (e.g. fire-fighting Skid units) may also be temporarily placed onto a vehicle to equip it for a specific task.

Notes:

- Sub-Packages are included in this family as the suppliers of small packages (with specific functionalities) and that are part of larger packages.

04 Handling Systems

04.01 Weighing and Production Control

- 04.01.01G Scales
- 04.01.02G Weighing Bridges
- 04.01.03G Dosing and Weighing Hoppers
- **Batching, Feeding and Extracting Systems**
  - 04.01.04G Electro-mechanical Feeders
  - 04.01.05G Electromagnetic Feeders
  - 04.01.06G Apron Weighing Extractors
  - 04.01.07G Weigh Belt Feeders
  - 04.01.08G Loss/Gain in Weight Feeders
  - 04.01.09G Weigh Batchers
- **Mixing Equipment**
  - 04.01.10G Continuous Mixing
  - 04.01.11G Batch Mixing
  - 04.01.12G Vacuum Mixers
  - 04.01.13G Static Mixers
  - 04.01.14G Agitators
- 04.01.15G Handling / Dosing for Additives and Others (PE, PP, ...)
- 04.01.16G Package Unit of Sampling

04.02 Conveyors

- 04.02.01G Belt and Pipe Conveyors
- 04.02.02G Roller Conveyors
- 04.02.03G Screw Conveyors
- 04.02.04G Vibrating, Oscillating and Air Cushion Conveyors
- 04.02.05G Steel-band, Push-bar, Pan and Apron Conveyors
- 04.02.06G Chain and Reddler Conveyors
- 04.02.07G Flexible Conveyors
- 04.02.08G Spiral Conveyors
- 04.02.09G Overhead Conveyors
- 04.02.10G Components for Conveyors (Belts, Rollers, Pulleys,…)

04.03 Solids Handling

- 04.03.01G Catalyst Handling Systems
- 04.03.02G Bucket Elevators
- **Pneumatic and Gravity Handling**
  - 04.03.03G Pneumatic Conveying Systems
  - 04.03.04G Bin Activators (Extractor Under Silos)
  - 04.03.05G Rotary Valves, Vane Feeders and Diverter Valves
- **Elevators / Manlift**
  - 04.03.06G Rack and Pinion
  - 04.03.07G Traction
- 04.03.08G Gangways
- **Stockpile equipment and dispatching**
  - 04.03.09G Truck and Wagon Loaders
  - 04.03.10G Ship Loaders and Unloaders
  - 04.03.11G Reclaimers
  - 04.03.12G Telescopic Chutes
  - 04.03.13G Material Handlers
  - 04.03.14G Stackers
- **Hoists and Cranes**
  - 04.03.15G Hoists
  - 04.03.16G Bridge Cranes
  - 04.03.17G Portal / Gantry Cranes
  - 04.03.18G Mobile Cranes
  - 04.03.19G Monorail Cranes
  - 04.03.20G Other Cranes
- **Heavy Lifting**
  - 04.03.21G Strand Jacks
  - 04.03.22G Flat Jacks
  - 04.03.23G Hydraulic Jacks
  - 04.03.24G Skidding Systems
  - 04.03.25G Other Machinery
- 04.03.26G Mobile Concrete Batching Plant

04.04 Liquids Handling and Refueling Systems

- **Onshore**
  - 04.04.01G Onshore Refueling Systems
  - 04.04.02G Fuel Filling Systems-Land
  - 04.04.03G Vehicle Cleaning Station
  - 04.04.04G Onshore Loading Booms
  - 04.04.05G Loading Arms-Land (Mechanical)
- **Offshore**
  - 04.04.06G Refueling System for Helicopters used on Platforms
  - 04.04.07G Marine Loading Arms
  - 04.04.08G Multipurpose Towers for Platforms and Gangways

04.05 Transformation and Finishing Packages

- 04.05.01G Thermal Heating Process Packages (Calcination, Sintering,)
- 04.05.02G Briquetting Package Unit
- 04.05.03G Extruding and Pelletizing Equipment
- 04.05.04G Package System for Crystallization and Concentration
- 04.05.05G Coke Slurry Package System
- 04.05.06G Polymer Finishing Package System (Dewatering, Drying and Packing)
- 04.05.07G Plastic Film Extruding and Forming Package Unit
- 04.05.08G Screening and Regeneration Packages (Catalysts And Others)
- **Solidification**
  - 04.05.09G Package System of Granulation
  - 04.05.10G Package System of Pastilles & Flakes Forming
- **Powder Processing Equipment**
  - 04.05.11G Powder Drying (PVC and Others)
  - 04.05.12G For Milling Powders (PVC and Similar)
  - 04.05.13G Package Unit of Micronization and Powder Handling

04.06 Packing

- 04.06.01G Bagging Machines
- 04.06.02G Bag Breakers
- 04.06.03G Bulk Bag Unloaders
- 04.06.04G Packing Machines
- 04.06.05G Palletizing Machines
- 04.06.06G Wrapping Machines
- 04.06.07G Strapping Machines
- 04.06.08G Container Making Systems
- 04.06.09G Filling Lines
- 04.06.10G Oil Canning and Packing Units
- 04.06.11G Bitumen and Other Canning and Packing Units
- 04.06.12G Bagging, Palletizing and Packing Fertilizers

04.07 Crushing and Grinding

- **Crushers**
  - 04.07.01G Impact Crushers
  - 04.07.02G Roller Crushers
  - 04.07.03G Hammer Crushers
  - 04.07.04G Other Crushers and Grinders
  - 04.07.09G **Jet Mills**
- **Mills**
  - 04.07.05G Grinding Mills (SAG, rod, ball)
  - 04.07.06G Vertical Roller Mills
  - 04.07.07G Horizontal Roller Mills
  - 04.07.08G Vertical Roller Pre-Grinders (CKP, …)
  - 04.07.10G **Roller Presses**

04.08 Airport Equipment

- 04.08.01G Baggage Handling Systems
- 04.08.02G Airport Handling Equipment

Handling Systems

Handling Systems are packages that have the specific function of moving solids and liquids for short distances and more generally “handling” (weighing, crushing, packing, …) them.

Handling Systems are utilized in production lines, warehousing, and other logistics operations.

The Oil&Gas industry in particular requires a wide range of Handling Systems that go from Onshore and Offshore liquids handling to Packing Systems (e.g. Package Unit for Steel Drum Manufacturing).

Main rationales behind the Standard Categorization

Weighing and Production Control

- The family consists of equipment for weighing, extracting and mixing for industrial production lines and logistics centers
- Belt weighing systems and weighing bridges were differentiated from other industrial scales as they are manufactured by different vendors (requiring different competences)
  - Their applications are different as well, for example weighing bridges are commonly used to weigh trucks and other vehicles, while belt weighing systems are utilized in production lines
- Extraction packages are often also coupled with a weighing functionality, and are differentiated by type of technology (belt, paddle, …)
- At a high level, mixing can be divided into continuous and by batch. Vacuum Mixing was added as a third category as it is delivered by specific players and is applied to specific industrial processes (e.g. for sensitive chemical materials)

Conveyors

- Conveyors are separated from solids handling Equipment due to the specificity of their applications.
- Conveyors technology varies based on the type of material handled, for example Pipe Conveyors handle powder and/or materials that behave similarly to liquids.
- “04.02.10G Components for Conveyors (Belts, Rollers, Pulleys,…)” includes all components used for conveyors.

Solids Handling

- At a conceptual level, solids can be handled through a continuous process (conveyors, belts, …) or through a discrete process (hoists, cranes, elevators, …). However, there is a wide range of products and players within these two broad types
- Conveyors technology varies based on the type of material handled, for example Pipe Conveyors handle powder and/or materials that behave similarly to liquids
- There are two main types of elevators, which are based on different technologies and supplied by different vendors: Rack and Pinion and Traction. Vendor that can deliver both are rather uncommon
- Stockpile equipment is typical of logistics operations. Some examples are forklifts, stackers, etc.
- Hoists and Cranes include both material for plant and port operations, as well as other cranes (e.g. for construction)
  - Vendors tend to specialize in a specific type of cranes e.g. Bridge Cranes.
- Heavy Lifting equipment is used to lift very heavy loads for construction and engineering purposes. It can be delivered through different types of Jacks, Skidding Systems or special Cranes
- Logistics Equipment can be found in Group 42, the family includes Forklifts, Pallet Movers and Scissor Lifts and other specific logistics equipment
- Earthmoving Equipment such as front / pay loaders can be found in Group 35.

Liquids Handling and Refueling Systems

- Liquids Handling and Refueling can be needed for either Onshore or Offshore activities, with some very specific applications / technologies that are very relevant to the Oil&Gas industry, such as Refueling System for Helicopters used on Platforms.

Transformation and Finishing Packages

- Transformation and Finishing Packages include miscellaneous packages that either close a production process, or transform a product.
- Calcination and Sintering Process Packages are under Thermal Heat Process Packages.

Packing

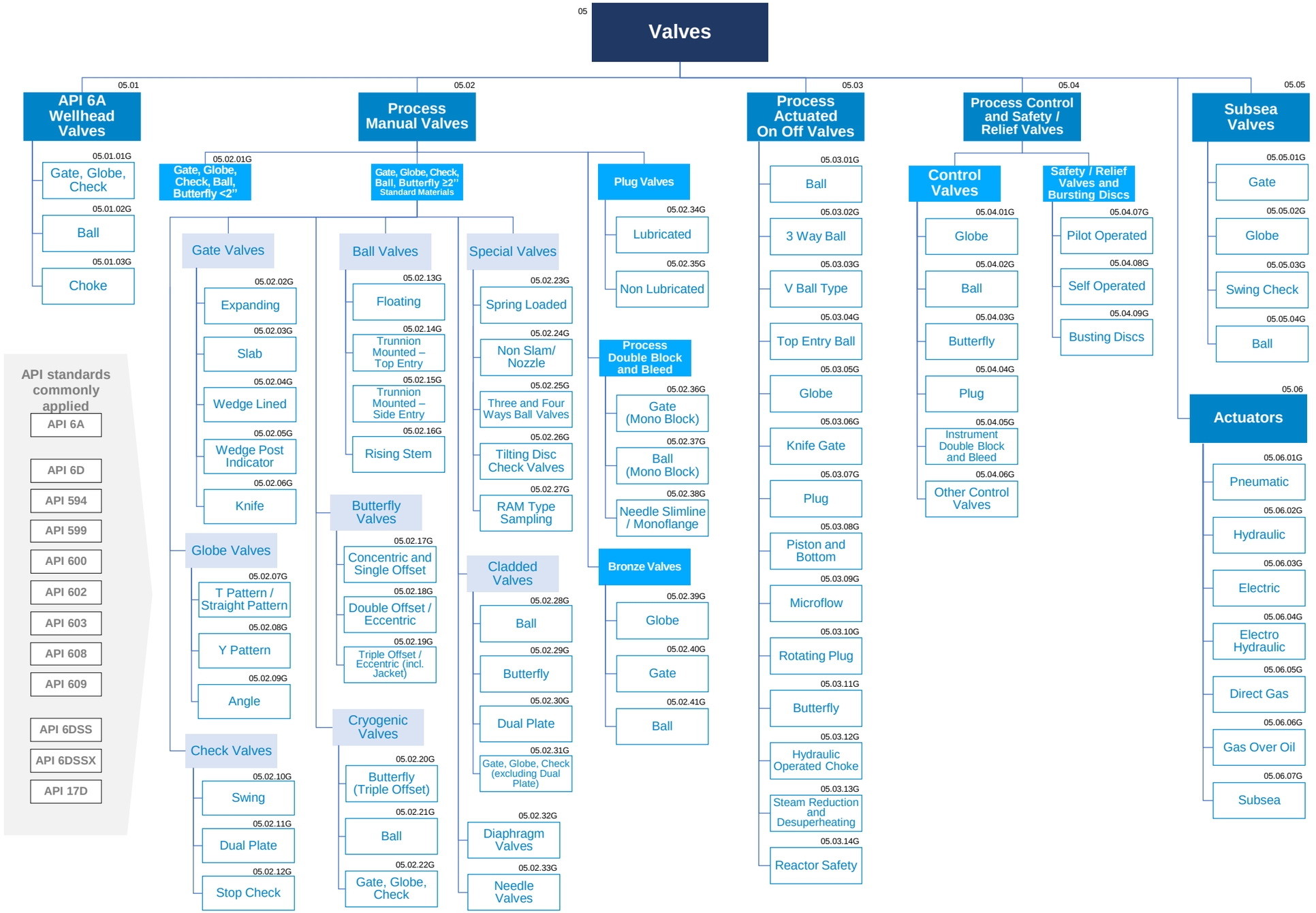
- Packing machines include both those used to produce / store packing materials (e.g. Package Unit for Plastic Drums Manufacturing), as well as those used to operate the packing process (Oil Canning and Packing Units, Bagging Machines, Wrapping Machines, Bag Breakers, etc.)
  - The technologies and producers behind these type of machines are highly differentiated

Crushing and Grinding

- Crushing and Grinding Systems are typical of the energy-intensive operations of cement plants
  - They are two steps of the cement production process: crushing is a first step, which is used to break limestones, clays and other materials used for cement production into smaller particles. The grinding process is then used to further reduce them to a proper size that meets the hydration and hardening requirements
  - Once again, for crushing and grinding systems the technology drives the competition and was used as a base for this categorization

Airport Equipment

- The Airport Equipment node refers to equipment used for airport logistics operations, such as baggage handling equipment.



Valves

A valve is a mechanical device that regulates, directs or controls the pressure or flow of a fluid within a system or process by opening, closing, or partially obstructing various passageways. Fluids go from gases, liquids, fluidized solids, to slurries, etc.

Valves are fundamental components of piping systems and can have a great variety of designs, models, materials, etc. to cover a wide range of industrial applications. The most common designs of valves include Gate, Globe, Check, Ball, Butterfly and Plug types.

Valves play a large role in most industries and are used in many parts of industrial plants and mechanical devices, going from pipelines to HVAC systems to the gasoline mechanism of an automobile.

Main rationales behind the Standard Categorization

API 6A Wellhead Valves

- The Categories in this Group are organized in Families according to the typical structure of the procurement organization of a Buyer: wellhead; process; instrumentation
- API 6A is the most relevant standard for wellhead valves, applied to Gate, Globe, Check, Ball and Choke Valves

Process Manual and Actuated On-Of Valves

- Process Valves is the family that has the highest number of sub-categories in most Buyers' category trees, and where there is the highest difference in nomenclatures and definitions also on the Vendors side
  - Valves can be differentiated by material (Carbon Steel, Stainless Steel, …), manufacturing method, size, certification standard, pressure range / rating class, specific applications (for pipelines, for critical service, cryogenic, …), valve design (top vs. side entry for ball valves, wafer vs. lug type for butterfly, etc.)
  - The choice was to differentiate by valve design, which is the strongest differentiating factor in the competitive market (the same producer often covers more sizes, pressure ranges, …)
  - The choice of material, sizing and API standard can be specified on SupplHi.com by the Vendor when uploading the references
    - Some players specialize in valves made of a specific material (e.g. Bronze Valves, Titanium Valves, Plastic Valves, …)
  - This family includes both Manual and Actuated On Off Valves (large valves e.g. 48'' that are actioned by an actuator due to their size)
- Common standards applied to process valves are API 6D, API 6A, API 594 (check), API 599 (Plug) and the API 600 series
- The 2-inches size is a common breakdown used in Buyers' vendor lists to mark the limit for "bulk" valves. This distinction can be found also when looking at the Vendors side. While most manufacturers of large valves can also produce small sizes, the opposite is not true
  - The distinction was applied to the most common types of valves: Gate, Globe, Check, Ball, Butterfly, Plug
- Ball Valves: entry types (side, top or fully welded), and body types (e.g. split body) have not been differentiated, as they have a lower relevance to differentiate the competition of ball valves producers
- Plug Valves: the differential is marked among lubricated and non-lubricated valves, the latter being an older fabrication style
- Butterfly Valves: biggest differential in the competition is marked for players who can deliver double or triple offset valves. Most players do not see concentric vs. single offset as a relevant differentiating factor (both on the Vendor and Buyer side)
  - Wafer vs. Lug style have not been differentiated
- Cryogenic Valves have been listed under the Process Valves Family
  - Main application for Cryogenic Valves in Oil&Gas is LNG capital projects
  - The most commonly accepted definition of Cryogenic Valves in the Oil&Gas industry applies to valves that can operate at temperatures below -150° C (-238° F)
  - The most common Cryogenic Valves in Oil&Gas are Triple Offset Butterfly (above 8'') and Ball (below 8''), however, the most critical are Rising Stem Valves, which allow switching from one process to another
  - Producers of Gate, Globe and Check Cryogenic Valves are often able to supply all these three kinds of valves, the three designs were therefore consolidated in one category
- Double Block and Bleed Valves categories in this family need to be distinguished from the instrumentation Double Block and Bleed (which are also typically smaller, <4'')

Process Control and Safety / Relief Valves

- This family includes valves that are actuated and typically connected to the plant's SCADA. For these types of valves, the actuator tends to be "the core" while the valve body is almost an accessory
- Control valves could have been classified under the "Control Systems and Instrumentation" Group of categories, as it is often the case in Buyers' category trees and vendor lists. However, looking at the competitive market, it is clear that producers of control valves are often producers of other types of valves and more rarely supply instrumentation equipment
- Producers of Desuperheaters are usually also producers of control valves (Desuperheaters are often classified under "control valves" according to the vendors) – they were therefore listed under this family
- Safety valves have the function of releasing a gas or a liquid from a system (e.g. a boiler), when it exceeds a pre-defined pressure or temperature limit
  - The main differentiation in the competition is between producers of self-operated valves (which are usually actioned by a spring) and pilot-operated valves (remotely commanded by a pilot)
- Bursting Discs are sometimes called rupture discs, the predominant nomenclature in the market has been adopted. While their technology is different from Safety / Relief Valves, they were classified under the same family because they serve similar purposes and are sometimes seen by vendors as business adjacencies

Subsea Valves

- Subsea valves, especially for ultradeep water applications, require specific knowledge and therefore need to be detailed separately from the other valves categories
  - Key players for these categories include both large conglomerates (which often deliver other subsea equipment as well), as well as very focused players that specialize for example in Subsea Ball Valves
- Ball valves are most commonly used for subsea applications, followed by GGC
- Check Valves for subsea applications tend to be Swing Check
- The Actuator for these valves is generally a choice of the valves manufacturer

Actuators

- Actuators are usually applied to control valves that need a high level of precision or in conditions where manned operation is extremely difficult (e.g. subsea)
- Subsea actuators, even if not mutually exclusive with the other categories, were detailed because they require special designs to operate in environments with very high pressure and low temperature and therefore require specific competences
  - The product itself is sometimes different (e.g. pneumatic actuators are generally not used subsea due to the high pressure)

06 Automation Control Systems and Instrumentation

06.01 Control and Safety Systems

- 06.01.01G Integrated Control & Safety Systems (ICSS)

Control Systems

- 06.01.02G Process Control Systems (PCS)
- 06.01.03G Programmable Logic Controller (PLC)
- 06.01.04G Supervisory Control and Data Acquisition (SCADA) System
- 06.01.05G Management Systems (MIS, PIMS, LMS, MES,)
- 06.01.06G Terminal Automation System (TAS)

Safety Instrumented Systems (SIS)

- 06.01.07G Fire & Gas (F&G) Systems
- Safety Shutdown Systems (SSS)
  - 06.01.08G Emergency Shutdown (ESD) Systems
  - 06.01.09G Emergency Depressurization (EDP) Systems

For Critical Equipment

- 06.01.10G Burner Management Systems (BMS)
- 06.01.11G Subsea Monitoring/ Control System
- 06.01.12G Compressors Control System
- 06.01.13G High-Integrity Pressure Protection Systems (HIPPS)

Monitoring Systems

- 06.01.14G Conditioning Monitoring Systems (CMS), including VMS, TMS, CVMS
- 06.01.15G Integrated System for Vibration Monitoring of Rotating Equipment
- 06.01.16G Fiber Optic Pipeline Integrity Monitoring System
- 06.01.17G Tank Gauging Systems
- 06.01.18G Building Monitoring Systems
- 06.01.19G Valve Remote Control Systems (VRCS)
- 06.01.20G Remote Terminal Units (RTU)

06.02 Analyzers

- 06.02.01G Analyzer Houses and Shelters

Liquid

- 06.02.02G Photometric Process Analyzer
- 06.02.03G pH and Conductivity Analyzer
- 06.02.04G Total Organic Carbon (TOC) Analyzer
- 06.02.05G Oil-in-Water Analyzer
- 06.02.06G Water Cut and BS&W Meters

Gas

- 06.02.07G Photometric Process Analyzer
- 06.02.08G Oxygen Analyzer
- 06.02.09G Process Gas Chromatograph
- 06.02.10G Flue Gas Analyzer
- 06.02.11G Moisture Analyzer
- 06.02.12G Mass Spectrometer Analyzer
- 06.02.13G Tunable Diode Analyzer
- 06.02.14G Dust Analyzer
- 06.02.15G Continuous Emissions Monitoring System (CEMS)
- 06.02.16G Air Quality Systems
- 06.02.17G Hydrogen Sulfide (H2S) Analyzers

06.03 Detectors

- 06.03.01G Fire & Gas Detectors
- 06.03.02G Gas Detectors
- 06.03.03G Fire / Flame Detectors
- 06.03.04G Heat and Smoke Detectors

Leak Detection Systems

- 06.03.05G Vessel
- 06.03.06G Pipeline (PLDS)
- 06.03.07G Valves
- 06.03.08G Corrosion Probe
- 06.03.09G Very Early Smoke Detection Apparatus (VESDA)

06.04 Flow measuring devices

- 06.04.01G Ultrasonic Flowmeters
- 06.04.02G Multiphase Flowmeters
- 06.04.03G Mass Flow Flowmeters
- 06.04.04G Vortex Flowmeters
- 06.04.05G Magnetic Flowmeters
- 06.04.06G Variable Area Flowmeters
- 06.04.07G Turbine Flowmeters
- 06.04.08G Target Flowmeters
- 06.04.09G Positive Displacement Flowmeters
- 06.04.10G Mass Flow Controllers (MFC)
- 06.04.11G Primary Elements of Flow Measuring
- 06.04.12G Cone Meters
- 06.04.13G Data Loggers
- 06.04.14G Flow Computers
- 06.04.15G Industrial Smart Meters
- 06.04.16G Flow Transmitters

06.05 Level measuring devices

- 06.05.01G Level Gauges
- 06.05.02G Ultrasonic Transmitter
- 06.05.03G Radar Transmitter
- 06.05.04G Nuclear Transmitter
- 06.05.05G Displacer Transmitter
- 06.05.06G Radiofrequency type Transmitter
- 06.05.07G Capacitance type Transmitter
- 06.05.08G Magneto Resistor
- 06.05.09G Level Profiler / Interface
- 06.05.10G Microwaves Absorption

06.06 Density and Viscosity measuring devices

- 06.06.01G Inertial Density Measuring Devices (Coriolis)
- 06.06.02G Oscillating Piston
- 06.06.03G Resonance Vibration
- 06.06.04G Other Density Measuring Devices

06.07 Pressure measuring devices

- 06.07.01G Pressure / Differential Pressure Transmitters
- 06.07.02G Pressure / Differential Pressure Gauges
- 06.07.03G Pressure Regulators

06.08 Temperature measuring devices

- 06.08.01G Temperature Gauges
- 06.08.02G Bimetallic Thermometers
- 06.08.03G Thermo-Resistances Detectors (TRD)
- 06.08.04G Thermocouples
- 06.08.05G Infrared for Temperature
- 06.08.06G Other Temperature Measuring Devices
- 06.08.07G Temperature Transmitters

06.09 Switches

- 06.09.01G Pressure & Temperature Switches
- 06.09.02G Limit Switches
- 06.09.03G Proximity Switches
- 06.09.04G Flow Switches
- 06.09.05G Float Operated Level Switches

06.10 Instrumentation Bulk Materials

- 06.10.01G Instrumentation Cables (Armored and Unarmored)

Miscellaneous Instrumentation

- 06.10.02G Pig Signaling Devices and Pig Detectors
- 06.10.03G Mooring Buoy Hawser Load Monitoring System
- 06.10.04G Annunciators
- 06.10.05G Instrument Protection Boxes
- 06.10.06G Electrical & Electronic Components for Systems
- 06.10.07G Instrumentation Tubes and Fittings
- 06.10.08G Wiring Harness

Automation Control Systems and Instrumentation

This Group defines the variety of systems and devices used in order to monitor and control a given process.

As a general rule of thumb, “families” of categories define the product and system type (e.g. Flow Measuring Devices, Pressure Measuring Devices, …), “sub-families” define the function, while the “categories” are described by the operating technology that is used in order to achieve the measurement (e.g. Magnetic Flow Meters, Ultrasonic Flow Meters, …).

Local Controllers have not been considered since not that frequent anymore in the plant. That applies also, in general, to pneumatic-driven applications.

Main rationales behind the Standard Categorization

Control Systems

- This Family describe a set of devices that manages, commands, directs or regulates the behaviour of other devices, systems, machines and processes.
- ICSS (Integrated Control and Safety System) identify systems that have control and security functions (SIS, F&G, ..) and are delivered through separated «machines», but integrated at physical as well as programming level.
- Generally speaking, the work Integrated defined a set of systems – or functions – separated but based on the same technology or on technologies with high level of interfaces among themselves, and frequently manufactured by the same vendor.
  - There is a general tendency toward proposing and procuring integrated solution, especially on greenfield projects;
  - On brownfield / revamping projects, higher possibility of systems separately procured.
- Distributed Control Systems (DCS) can be associated to PCS (Process Control System), sometimes referred also as Basic PCS (Process Control System). Industrial Control System (ICS) is also associated with PCS Process Control System.
- SIS (Safety Integrated System) can be associated to ESD System (that identifies the action of Emergency Shutdown).
- Fire & Gas (F&G), Emergency Shutdown (ESD) and Emergency Depressurization (EDP) are mainly referred as Systems, but – in case of Integrated Control and Safety Systems – they represent “functions”.
- Process Shutdown (PSD) Systems / “Function” is s shutdown of the entire process system and represent a level hierarchy within the Category of “Emergency Shutdown (ESD) Systems”.
- Structural Monitoring Systems included the monitoring of stress conditions, environmental conditions and others.
- For the purpose of this Standard Categorization, a series of Control Systems and Instrumentation have been considered in Packages (Group 03), for example:
  - Flow Meters Skids;
  - Metering Systems.

Analyzers

- All the measuring devices listed in this section are used to define the chemical properties of the samples and can be split as per Liquid Analyzer and Gas Analyzer
  - Gas Analyzer are an instrumentation used to measure the concentration of a known gas in given mixture of gases from a process / stream. This includes: Ambient Gas Monitoring, Emissions Monitoring and Process Monitoring
  - Liquid Analyzer are used in order to measure the concentration of a known element in a given liquid
- Multiwave Photometers Analyzers is a broad category that include: “Near Infrared”, “Ultraviolet”, “Fiber Optic” photometers. These photometers operate in the infrared (IR), near infrared (NIR), ultraviolet (UV) and visible (VIS) regions
- Chlorine Analyzer are included in Total Organic Carbon (TOC) Analyzers
- Continuous Emissions Monitoring Systems (CEMS) typically monitor the following emissions: sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, hydrogen chloride, airborne particulate matter, mercury, volatile organic compounds, and oxygen. CEMS can also measure air flow, flue gas opacity and moisture.

Detectors

- This family must not be confused with the analyzer one. Detectors detect situations that are outside of the normal operating conditions and set up an alarm. On the other hand, analyzers determine, in real time, the quantity/concentration of a said gas/liquid/particle in a given process.

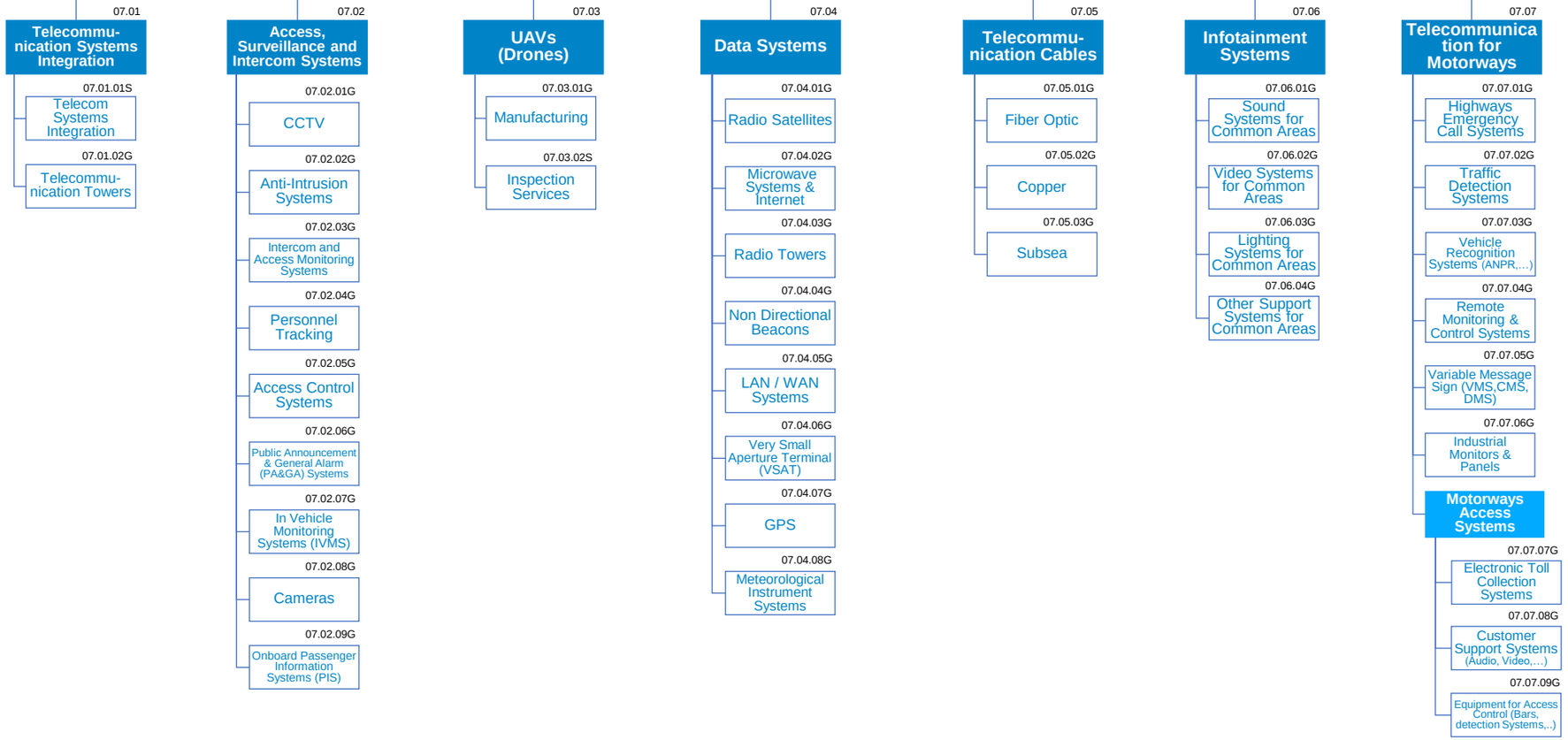
Flow measuring devices

- Mass Flowmeters include:
  - Coriolis Flowmeters
  - Thermal Mass Flowmeters
  - Multi-parametric Flowmeters
- Primary Elements of Flow Measuring include:
  - Flange
  - Fitting
  - Pitot tubes
  - Venturi tubes
  - Nozzles
  - Plates
  - Orifices
  - Meter Runs
  - …
- Ultrasonic Flow Meters include Doppler and Transit Time
- Rotameter is a different name for Variable Area Flowmeter
- Mass Flow Controllers (MFC) combine a mass flow meter, electronics and a valve.
- Data loggers are included in this family whether the data transmitted was a flow or another type of data.
- Flow computers are included in this family due to their association with flowmeters.

Instrumentation Bulk Materials

- In this Family can be found all the elements that usually don’t have a name in a P&I (Cables, Pipes, …).
- No distinction for armoured or unarmoured cable has been made
- “Electrical and Electronic Components for Systems” include Timers, Relays, …

07 Telecom-munications



Telecommunications

Telecommunication is the transmission of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems over significant distances. TLC is an increasingly important field in today's business environment, enabling companies to communicate effectively both inside and outside the enterprise and allowing employees to collaborate among each other and being monitor easily from wherever they are located.

Main rationales behind the Standard Categorization

Telecom Systems Integrations

- This self-standing category refers to companies able to provide complete, multi-system solutions for industrial communication and safety as a turnkey package.
- Integration means bringing together component subsystems into a whole and ensuring that those subsystems function together (including, for example: Telephone, IT, Surveillance and security).

Surveillance, Television and Intercom Systems

- This family includes any systems or devices designed for the monitoring of the behavior, activities or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them.
- The category "Intercom and Access monitoring" also includes announcement Public address systems.

Radio Communication Systems

- Here it is worth distinguishing two different technologies. Microwave communications are used for short-range communications, while satellite communications can be established over long distances. Indeed, Satellite communication by transferring signal via satellite can potentially reach all areas of Earth. They do not require installed fixed assets, ground infrastructure or specifically located ground stations.
- Microwave refers, but not limited to, HF,VHF, UHF, Trunking, Tetra.

Telephone Systems

- Here it is worth noting that this family refers only to business telephone systems, ranging from small key telephone systems to large-scale private branch exchanges.
- The rational behind the division is the opposition of traditional lines vs VoIP. Although both systems substantially do the same thing they are based on complete different technologies. In particular, VOIP converts audio signals from your speech into digital data that travels via broadband Internet (fiber optic, DSL or cable) to its destination. Instead of plugging into a traditional phone jack.
- Desktop telephone equipment refers, but not limited to, Telephones, Cordless Phones & Headsets.

UAV (Drones)

- The UAV (Unmanned Aerial Vehicle), commonly known as a drone, is an aircraft with no pilot on board. UAVs can be remote controlled aircraft (e.g. flown by a pilot at a ground control station) or can fly autonomously based on pre-programmed flight plans or more complex dynamic automation systems.
- Using a drone for an inspection is not just safer than sending a person; it can also be much quicker than setting-up safety equipment.

Cable Transmission Systems

- The rational behind the division is the differentiation between Fiber Optic and Copper wire transmission systems.
- Fiber-optic communication systems have primarily been installed in long-distance applications, where they can be used to their full transmission capacity. Nowadays optical fibers have largely replaced copper wire communications in core networks.

Infotainment Systems

- Infotainment Systems are systems installed normally to provide a combination of information and entertainment.
- This Family includes Visual, sound, lighting and other relevant systems used in large gathering areas

Main standards
- API 610
- API 674
- API 675
- API 676
- API 685
- ASME

08 Pumps

08.01 Dynamic

Centrifugal

API 610

08.01.01G Over Hung Pumps (OH) — OH

Impeller Between Bearings (BB) — BB
- 08.01.02G BB1
- 08.01.03G BB2 (Low-Temperature and Low-Viscosity)
- 08.01.04G BB2 (High-Temperature or High-Viscosity)
- 08.01.05G BB3
- 08.01.06G BB4
- 08.01.07G BB5

Vertical Suspended Pumps (VS) — VS
- 08.01.08G VS1, VS2, VS3
- 08.01.09G VS4, VS5
- 08.01.10G VS6, VS7

For Special Applications

For Chemical Applications
- 08.01.11G Metallic
- 08.01.12G Non Metallic

For Cryogenic Applications
- 08.01.13G In Tank with Submersed Motor
- 08.01.14G Other Cryogenic Pumps

Fire-Fighting
- 08.01.18G For Offshore and FPSO Applications
- 08.01.19G National Fire Protection Association's (NFPA 20)
- 08.01.20G Underwriters Laboratories (UL) and Factory Mutual Insurance Company (FM) Listed

- 08.01.21G For Desalting Plant, Sea Water Intakes and Cooling Water Applications
- 08.01.22G For Hot Oil Applications
- 08.01.23G For Molten Sulphur and Sulfuric Acid Applications
- 08.01.24G Barge Pumps

Seal-less Pumps
- 08.01.15G API 685
- 08.01.16G Magnetic Drive Pumps
- 08.01.17G Canned Motor

Multiphase Pumps
- 08.01.25G Gas-Liquid Mixture Pumps
- 08.01.26G Subsea

High Pressure Pumps
- 08.01.27G Boiler Feed Water Pumps
- 08.01.28G Reactor Feed Pumps
- 08.01.29G For Water Injection
- 08.01.30G Charge Pumps
- 08.01.31G For Other Applications

- 08.01.32G High Speed Pumps
- 08.01.33G Self-Priming Pumps (excluding for Fire-Fighting)
- 08.01.34G Air Driven Centrifugal Pumps
- 08.01.35G Slurry / Mud Pumps
- 08.01.36G Medium Consistency Pumps

Vertical Pumps
- 08.01.37G Submersible Dewatering
- 08.01.38G Submersible Slurry
- 08.01.39G Submersible Recirculation
- 08.01.40G Others

- 08.01.41G Axial Flow Pumps (AFP)
- 08.01.42G Sump Pumps

- 08.01.43G **Special Effect Jet Pumps**
- 08.01.44G **Regenerative Turbine Pumps**

08.02 Volumetric

Reciprocating

Reciprocating Piston type
- 08.02.01G API 674 Units
- 08.02.02G Manufacturer Standard
- 08.02.03G High Pressure Pumps for Carbamate and Ammonia Applications

Controlled Volume Diaphragm type
- 08.02.04G API 675 Units
- 08.02.05G Manufacturer Standard
- 08.02.06G High Pressure Metering (P> 200 Bar)

Controlled Volume Plunger Pumps
- 08.02.07G API 675 Units
- 08.02.08G Manufacturer Standard
- 08.02.09G High Pressure Metering (P> 200 Bar)

- 08.02.10G Air Driven Reciprocating Pumps

Rotary

Screw type
- 08.02.11G Twin and Multiple Screw
- 08.02.12G Progressive Cavity Pumps

- 08.02.13G Vane Type
- 08.02.14G Gear and Lobe
- 08.02.15G Rotary Pumps - Low-Noise and No-Noise
- 08.02.16G Circumferential Piston
- 08.02.17G Rotary Piston
- 08.02.18G Seal-less Rotary

Others
- 08.02.19G Peristaltic

Vacuum
- 08.02.20G Liquid Ring Vacuum Pumps (API 681)
- 08.02.21G Lobe Vacuum Pumps
- 08.02.22G Sliding Vane Piston Vacuum Pumps
- 08.02.23G Dry Vacuum Pumps
- 08.02.24G Miscellanea Vacuum Pumps

08.03 Other Types of Pumps
- 08.03.01G Retracted Impeller
- 08.03.02G Dissolved Air Flotation (DAF)
- 08.03.03G Liquid Expander

08.04 Pumps Parts & Spare Parts
- 08.04.01G For Centrifugal Pumps
- 08.04.02G For Reciprocating Pumps
- 08.04.03G For Rotary Pumps

08.05 Pumps Seals
- 08.05.01G Mechanical Seals (API 682)
- 08.05.02G Sealing Systems (API 682)
- 08.05.06G Packing seals
- 08.05.03G Non-API Mechanical Seals
- 08.05.04G Non-API Sealing Systems
- 08.05.05G For Slurry Applications

VISIT WWW.SUPPLHI.COM TO EXPLORE THE VENDORS IN EACH CATEGORY

Pumps

Pumps are devices used to move fluids through some form of mechanical action.

Pumps have many industrial applications, including power (mainly for water applications e.g. boiler feed), water and sewage, chemicals (including abrasive and corrosive fluids) and metals and mining (dewatering and slurry applications).

In Oil&Gas in particular, most pumps are engineered (meaning built on specifications), and their application varies from critical process applications to auxiliary activities as fire-fighting systems.

The main distinction among pumps is defined by the type of mechanical action they apply to the fluid; the most relevant families being Dynamic (Centrifugal) and Volumetric (Reciprocating and Rotary) Pumps.

Main rationales behind the Standard Categorization

Dynamic Pumps

- The choice of the “Dynamic” family name was made to be “parallel” between pumps and compressors, to reflect the parallelism that occurs between these two product Groups - as a matter of fact they are often under the responsibility of the same Rotating Equipment Procurement or Engineering departments in the Buyers’ organizations
- API 610 is the most relevant standard for centrifugal pumps in Oil&Gas, thus deserving a dedicated categorization. Among them:
  - Players differentiate not only based on the types of pumps they produce, but also on their coverage of the capacity / prevalence spectrum. Anyway, categorization was based on pumps models that are the most relevant differentiating factor
  - Over Hung Pumps (OH) represent the biggest volume in the market, but have a lower differentiation in producers, they were therefore not divided into sub-categories
  - Between Bearing Pumps (BB) have the highest unit value and most diverse competitive arena, they were therefore split among sub-categories:
    - BBs were categorized according to “atomic” level of the API categorization, with BB2 also split according to temperature and viscosity. This split is recurrent also in Oil&Gas vendor lists, as not many players can cover the entire range
  - VS were grouped according to the similarities among products, which drive the competition
    - VS1, VS2 and VS3; VS4 and VS5; VS6 and VS7
- Other centrifugal pumps are differentiated by the type of application, when that determines the underlying competition, under the Special Applications node (e.g. very specific players deliver Cryogenic Pumps or High Pressure Pumps), even if there might be some overlap with other categories (e.g. Reactor Feed Pumps are usually BB5)
  - Fire-Fighting pumps for onshore applications were considered as all included in either the category 08.01.19G National Fire Protection Association’s (NFPA 20) or 08.01.20G Underwriters Laboratories (UL) and Factory Mutual Insurance Company (FM) Listed
    - Most pumps used for these applications are regulated under one of these standards, also for compliance reasons on the End User’s side
  - The main differentiation of pumps for Chemical Applications was defined by the material, as these pumps are usually less “engineered” (by that meaning built on specification) than Oil&Gas Pumps
- Vertical submersible pumps are usually utilized in water applications
  - For example, dewatering and slurry applications are typical of the mining industry
- High Pressure Centrifugal Pumps specify the most critical applications: Boiler Feed Water Pumps, Reactor Feed Pumps, For Water Injection and Charge Pumps
- Special Effect are a kind of pumps that still uses kinetic force to move a fluid, but they apply it through “special” means that are different from the typical centrifugal pump
- Regenerative Turbine pumps differentiate from centrifugal because in the latter the fluid only travels through a centrifugal impeller once, while in a turbine it takes many trips through the vanes

Volumetric Pumps

- The choice of the “Volumetric” family name was made to be “parallel” between pumps and compressors
- Volumetric Pumps have been divided into three “nodes” Reciprocating Pumps, Rotary Pumps and Others (mainly represented by Vacuum Pumps)
- Reciprocating pumps are delivered by both large conglomerates that make also centrifugal pumps and some very focused players
- High pressure metering pumps are used in process applications where the liquids to be metered might be corrosive, toxic or flammable and temperatures extremely high
- The most relevant standards for Oil&Gas have been differentiated in the categorization, which are API 674 for Piston Pumps, API 675 for Diaphragm and Plunger and API 676 for Screw Types
- Under Screw Pumps, Progressive Cavity is a neutral name to define a set of pumps that are sometimes called Mono Screw, Single Screw, Eccentric Screw, etc.
- Among Vacuum Pumps a relevant distinction is that among wet and dry pumps:
  - A wet pump uses low vapor pressure oil in the pumping mechanism (for example oil is used to lubricate and seal the sliding joints between vanes and casing in a vane pump)
  - A dry pump on the contrary have no gas sealing fluid (but some may have lubricated gears/bearings)

Other Types of Pumps

- Other types of pumps are particular pumps usually linked to a very specific application (e.g. Liquid Expanders for cryogenic applications)

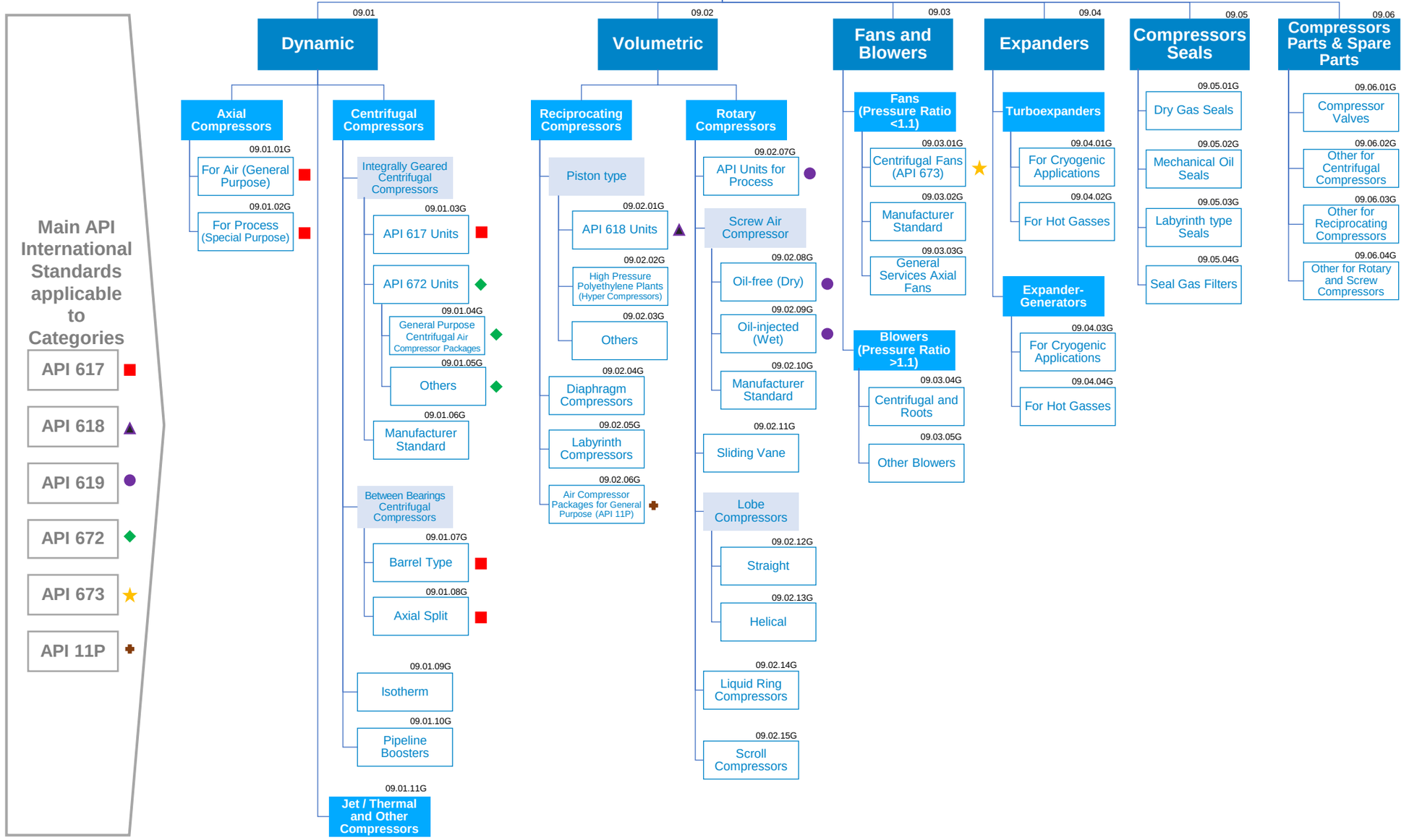
Parts and Spare Parts

- Parts and spare parts for new pumps are often supplied by the original vendor, but they may in some cases be supplied by specialized actors that focus on spare parts and maintenance. They were therefore detailed in specific categories

Pumps Seals

- Mechanical Seals are a component of pumps (machine elements made to seal the passage point of the rotating shaft), with a very specific market dynamic dominated by four large players, (John Crane, Eagle Burgmann, Flowserve and AES) which make up the large majority of this market. Of the four largest players, three are focused on seals
- The purchase decision of the seal is oftentimes linked to the pump (may be seen as a “package”)
- While the large players can deliver most seals categories, a many of the smaller players focus on one or two categories

09 Compressors



Compressors

Compressors are machines that increase the pressure (“compress”) of a gas, reducing its volume. They have for gases the same function that pumps have for liquids.

Compressors have four main applications: general service, refrigeration, oil and gas production and transportation, gas processing.

The compressors market is very mature, and its competition is very concentrated, in particular as far as centrifugal compressors are concerned.

Main rationales behind the Standard Categorization

Dynamic Compressors

- The choice of the “Dynamic” family name was made to be “parallel” between pumps and compressors, to reflect the parallelism that occurs between these two product Groups - as a matter of fact they are often under the responsibility of the same Rotating Equipment Procurement or Engineering departments in the Buyers’ organizations.
- In Axial Compressors the air flows parallel to the rotating axis. Typically the main compressor producers (MAN, Dresser Rand, …) can also deliver both this type of compressors and centrifugal compressors, while smaller players are more focused.
- Inside Integrally Geared Compressors, both API 617 and API 672 are standards for compressors for the petroleum, chemical, and gas industries, however, API 672 focuses on packaged compressors.
- Between Bearings Compressors are divided into Axial Split (sometimes called axially split or horizontally split) and Barrel Type (sometimes called radially split), which are differentiated based on the type of casing.
- Isotherm (or isothermal) Centrifugal Compressors are often used for air or oxygen applications, but can also be used in petrochemical plants. They are specific machines able to compress a gas without changing its temperature, and are delivered by a few players.
- Pipeline Boosters are used to ensure that the gas that travels in a pipeline remains pressurized. Compressor stations have specific requirements of efficiency and reliability, therefore the producers make dedicated product lines for these compressor types, which are not delivered by all players.
- Subsea compressors require a very specific technology: the first one was installed in September 2015 in a Statoil Field (Åsgard) – in this Standard Categorization they are comprised under Group 20 (“Subsea Equipment”)
- Despite being a type of ejector, Jet Compressors have been classified under this family due to their function of using a high-pressure gas to increase the pressure of another lower pressure gas (by mixing the two and discharging at an in-between pressure).

Volumetric Compressors

- The choice of the “Volumetric” family name was made to be “parallel” between pumps and compressors.
- Reciprocating Compressors were divided intro three main categories / nodes:
  - Piston Compressors:
    - API 618 is the most relevant standard for Piston Compressors;
    - Hyper Compressors are high pressure piston compressors for low density polyethylene (LDPE) plants.
  - Diaphragm Compressors: similar to piston, but the gas is compressed by a flexible membrane and they are produced by different players;
  - Labyrinth Type (or labyrinth piston) Compressors: piston compressors with a labyrinth sealing system.
- Rotary Compressors divided intro five main categories / nodes, which define the competition:
  - Screw Air Compressors, Sliding Vane Compressors, Lobe Compressors, Liquid Ring Compressors, and Scroll Compressors.

Fans and Blowers

- The differentiation between Fans and Blowers lies in the pressure ratio, which is up to 1.1 for Fans and greater than 1.1 for blowers. This definition is commonly accepted in the market (for example, they are defined in this way by the American Society of Mechanical Engineers – ASME).
- Within Fans, the most relevant API standard (API 673) was differentiated, as well as Axial Fans (their manufacturers tend to be different from those of centrifugal fans).

Expanders

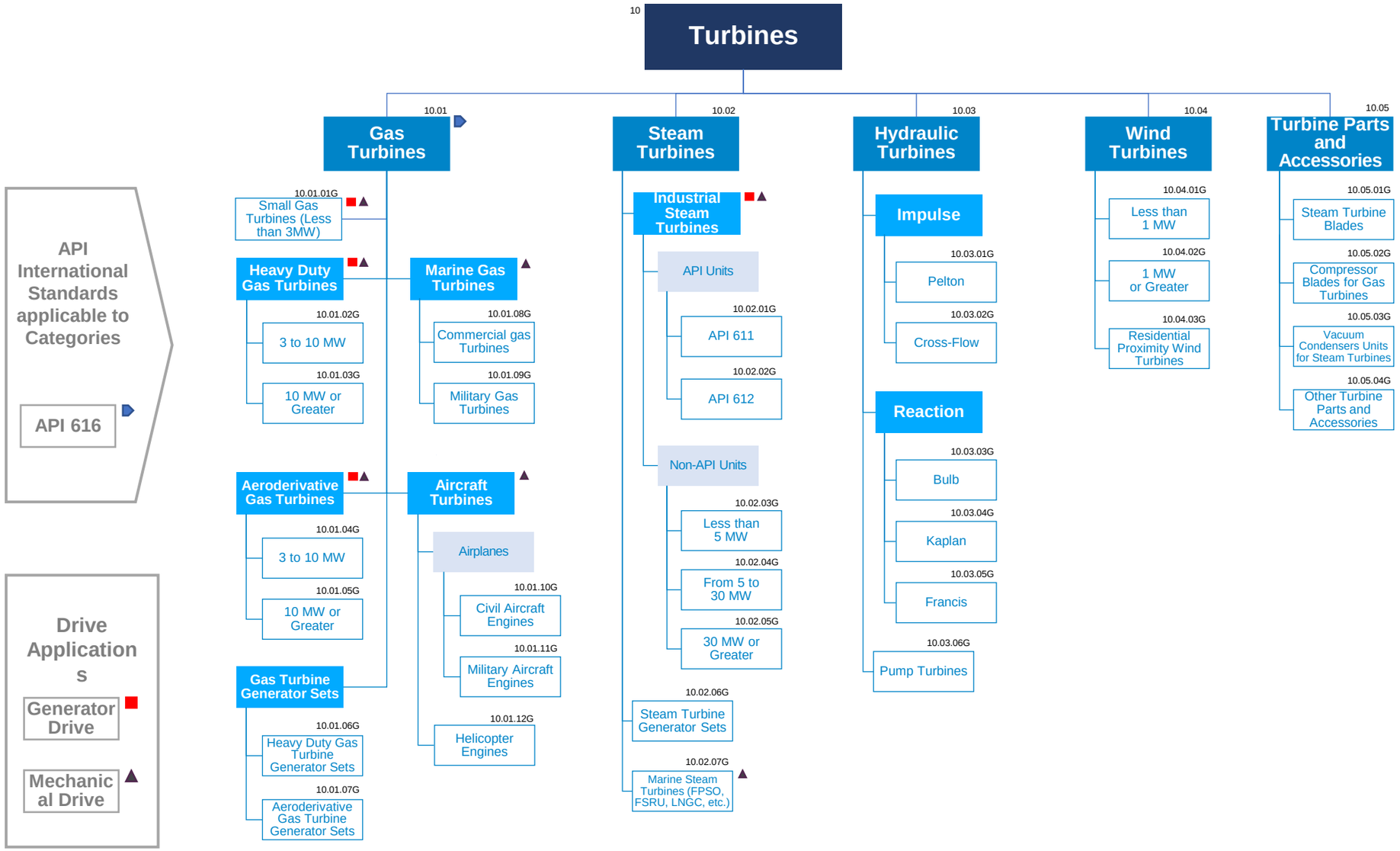
- Expanders are used to expand a pressure gas and may use the energy produced to drive a generator or a compressor (which may in other cases be absorbed through a “braking liquid”).
  - Not all players can deliver both expander-generators and the other types of expanders and, within each of these nodes, not all expanders work at any temperature.

Compressor Seals

- The rotating shaft of centrifugal compressors needs seals to prevent gas leakages where the shaft exits the compressor casing. Compressor Seals are divided into three sub-categories:
  - Mechanical Oil Seals: also called “Wet Seals”, they work through the principle of a barrier fluid (oil forced into the seal at a higher pressure than the process gas);
  - Dry Gas Seals: non-contacting seals, typically used in harsher environments;
  - Labyrinth type Seals: prevent leakage through a tortuous path.
- The technologies used to produce these seals are different from each other, and this defines the competition.

Parts and Spare Parts

- As for Pumps, parts and spare parts for new Compressors are often supplied by the original vendor, but they may in some cases be supplied by specialized actors that focus on spare parts and maintenance. They were therefore detailed in specific categories.
- Specialized Vendors supply Valves for Compressors, which have been separated in a specific Category.



Turbines

Turbines are mechanical devices that are used to extract energy from a fluid flow, converting it in work.

Turbines can be categorized as “mechanical drive”, when they use the rotation energy to run a compressor or a pump, or as “generator drive”, when they use such energy to run a power generator.

There are four main Families of turbines, classified based on the fluid that moves them, that are gas, steam, hydraulic and wind turbines.

Turbines have their most notable applications in the Power and Renewables industries (most of the electrical power in the world is generated by a turbine), and have relevant application also in Oil&Gas, Chemical and other industries.

Main rationales behind the Standard Categorization

Gas Turbines

- The difference between Heavy Duty and Aeroderivative gas turbines lies in the fact that Aeroderivative are lighter weight gas turbines, which derive from aviation turbines.
  - The 3 MW and 10 MW limits were inferred by looking at the product listings of relevant players.
- API 616 is the American Petroleum Institute standard for “Gas Turbines for the Petroleum, Chemical, and Gas Industry Services”.
- The “Generator Sets” node includes suppliers that sell the whole generator set as a package.
- Marine Gas Turbines and Aircraft Turbines nodes include turbines used for propulsion (and not, for example, generator sets on a ship, which should be listed under gas turbine generator sets).
- Marine gas turbines operate in a more corrosive atmosphere due to presence of sea salt in air and fuel and use of cheaper fuels, they are therefore differentiated from other turbines.
- Turbine maintenance could have been included in this group, as it is often offered by the manufacturer, but it has instead been listed under the “Maintenance, Modification and Operations Services” Group, as a form of coherence with other equipment (e.g. Pumps, Compressors, …). This is valid for Gas as well as other types of turbines.
- Turbines for aircraft need to be particularly light, they are therefore not delivered by all players.
  - Military and civil turbines were further differentiated, for both aircrafts and ships, as they present different requirements in terms of speed, dimensions, reliability, …
- Turboexpanders could have been included in this family (or with a dedicated family in this group), as they are essentially turbines through which a pressure gas is expanded. However, their producers are usually closer to Compressors producers, they were therefore included in that Group.

Steam Turbines

- Steam Turbines for process (petroleum, chemical, and gas industry services) typically follow API standards, while non-API turbines are usually applied to the Power and Renewables industries.
- API 611 and 612 are standards by the American Petroleum Institute, both of them are applied to “Steam Turbines for Petroleum, Chemical, and Gas Industry Services”; 611 being for general-purpose (non critical service, with pressure, temperature and speed limits) and 612 for special-purpose.
- The MW limits for non-API turbines were derived from the classification of main players (Siemens, GE-Alstom Energy, …).
- The “Generator Sets” category includes suppliers that sell the whole generator set as a package.
- In the last few years marine steam turbine engines have mostly been replaced by diesel engines, which tend to be more efficient.
  - However, there are still a few players delivering this product.
  - Marine Gas Turbines includes turbines used for propulsion (not, for example, generator sets on a ship, which are included under gas turbine generator sets).

Hydraulic Turbines

- Hydraulic Turbines transfer the energy from a flowing fluid to a rotating shaft.
- Hydraulic turbines were differentiated by their design, which defines the competition. There are two broad families of hydraulic turbines, impulse turbines and reaction turbines.
  - The impulse turbine generally uses the velocity of the water to move the runner and discharges to atmospheric pressure. The most relevant categories among reaction turbines are:
    - Pelton and Cross-Flow.
  - A reaction turbine develops power from the combined action of pressure and moving water. The runner is placed directly in the water stream flowing over the blades rather than striking each individually (e.g. propeller turbines are similar to the propeller of a ship). The most relevant categories among reaction turbines are:
    - Bulb, Kaplan and Kelvin.
  - Other types of hydraulic turbines exist, but they have not been included in specific categories due to a lesser relevance in the market.
  - Pump-Turbines are a particular type of turbines which are able to revert the flow and work as a pump when needed. They are manufactured by specific players.

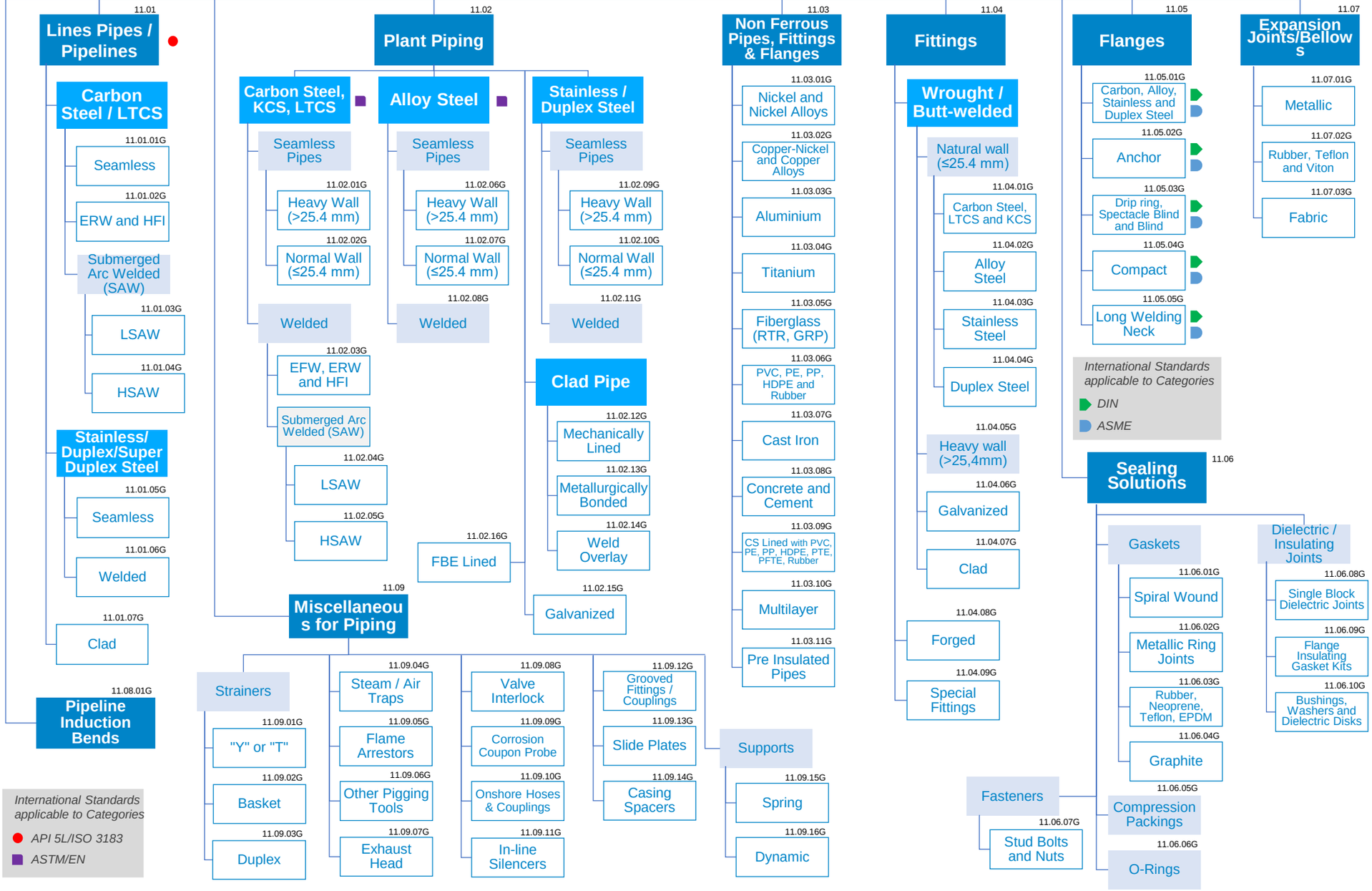
Wind Turbines

- Wind turbines are considered to be all used for power generation purposes (generator drive). The power cut was taken by looking at the classification the main players use and products they are able to deliver.
  - 1 MW seems to be an appropriate cut to differentiate the competition. The largest wind turbines currently installed go up to ~8 MW.

Turbine Parts and Accessories

- Turbine parts include both parts and spare parts, while accessories include all minor accessories for turbines that are not covered by other categories (e.g. consoles, specific air filters for gas turbines, etc.).

11 # Piping, Fitting and Flanges



Piping, Fitting and Flanges

This category focuses on one of the most important infrastructural components in the industrialized world, that is: the vast network of pipelines and plant piping.

Currently, the market for piping is very large, due to the need for such components in many industrial sectors, Oil&Gas, Construction and Power Generation to name a few. But also Water and Renewables (geothermal, …).

Main rationales behind the Standard Categorization

Line Pipes / Pipelines

- A line Pipe is manufactured from high-strength Steels; It is used to convey gas, oil, or water from sources (e.g., reservoirs, steam plants, oil and gas wells, refineries) to local distribution centers.
- This family includes Pipes made of Carbon Steel, Stainless Steel, Duplex and Super Duplex Steels.
- There are 2 main different processes for metallic pipe manufacture:
  - Seamless: formed from a cylindrical bar of steel that is heated to a very high temperature and then is pierced with a probe to create the hole through the cylinder. This process requires high-level of competences.
  - Welded: formed by forming a steel plate or coil into a cylindrical shape, and closing the seam using a welding process. This operation can be done with different technologies:
    - ERW/HFI, using an electrical resistance
    - SAW, involving the formation of an arc between a continuously-fed bare wire electrode and the workpiece. This welding process can be carried out Longitudinally (LSAW) or Spirally (HSAW).
- Different welded types are expressed only for Carbon Steel because is more used in the normal operations thanks to its Yield and Tensile Strengths.

Plant Piping

- The term “Plant piping” refers to the system of pipes that transport process fluids (e.g., air, steam, water, industrial gases, fuels, chemicals) around an industrial facility involved in the manufacture of products or in the generation of power.
- As for the Line Pipes, here, the main categorization principles are Material and productive process (Seamless or Welded).
- There is a third critical principle: Wall thickness of the Seamless pipes, since only few players in the market are able to make Seamless pipes wall above 25,4mm
- From a regulation point of view, it is appropriate to keep Stainless/duplex Steel and Clad Pipes separate from the other Plant pipes because they are used for particular applications, based on different requirements. They include 6MO.
- According to international standards, Pipes made with ERW and HSAW technologies are no longer allowed for complex “plant” applications (can be still used – for example – for water intake).

Non Ferrous Pipes, Fittings & Flanges

- This family was included due to the specific competences needed by manufacturers to construct in materials such as titanium, PVC or concrete.
- Copper alloys includes all metal alloys where copper is the main component such brass, bronze and etc…
- Polyethylene (PE), Polypropylene (PP) and High-density polyethylene (HDPE).
- Non Ferrous pipes and fittings, Multilayer are mainly composed (PE-X), Aluminium Layer (AL), (PE) Layer and adhesives.

Fittings

- The rational behind the division is the opposition of Forged vs Wrought fittings. Although Forged fittings are a subset of Wrought fittings, one of the main processes in forging is pressing, which requires special machinery and skills.
- Natural and Heavy wall (25,4mm) were separated since an inch thickness is a critical point that can separate manufacturers from one another.
- Special fittings include any fitting out of the ordinary, for example: parts required for Urea plants (that need to adhere to precise requirements), special t-joints etc.

Flanges

- 11.05.01G includes all common types of flanges made with the standard materials.
- The most demanded flanges (anchor, compact, etc.) were instead separated to allow more detail.

Sealing Solutions

- The attention is focused on the most diffused and demanded gaskets.
- 11.06.05G includes Compression Packings of any material.

Expansion Joints/Bellows

- Expansion Joints (also known as Bellows) are divided because depending on material they are used for different purposes.
- Dielectric Joints are divided by purpose because that is what differentiates manufacturers from another.

Pipeline Induction Bends

- Here it is worth noting the difference between Elbows and Bends. Bend is a generic term for any offset or change of direction in the piping. In short we can say that all Bends are Elbows but not all Elbows are Bends.
  - Pipeline Bends are generally manufactured as per the clients’ need, on a project-by-project basis. Bends have generally a radius of more than twice the diameter;
  - Elbows have industrial standards and have limitations to size. Elbows generally have radius of curvature between one to two times the diameter of the pipe.

Miscellaneous for Piping

- Strainers, are simple filters that are placed within pipes, not to confuse with the more complex Strainers in the Packages group.
- 11.09.15G Springs (also known as flexible supporters) accommodate movement according to thermal expansion, whilst Dynamics (11.09.16G) are used to protect the structure in more extreme cases stress such as during earthquakes or fluid disturbances.
- 11.09.13G Slide Plates are devices used to reduce friction. The usual material for this category is Teflon.

12 Structural and Construction Materials

12.01 Structural Steel

- 12.01.01G Structural Steel
- 12.01.02G Light Structural Frames
- 12.01.03G Steel Sections
- 12.01.04G Sheet Piles
- For Offshore Jackets
  - 12.01.05G Offshore Piles
  - 12.01.06G Seamless Offshore Tubulars
  - 12.01.07G Welded Offshore Tubulars
- 12.01.08G Anchor Bolts, Connection Bolts and Nuts
- 12.01.09G Primary support (U-Bolts and Clamps)

12.05 Structural Steel for Reinforced Concrete

- 12.05.01G Shaped
- 12.05.02G Electrowelded Meshes
- 12.05.03G PC Strands and PC Wires
- 12.05.04G PC Steel Bars
- 12.05.05G Trusses
- 12.05.06G Fibers for Reinforcement
- 12.05.07G Joint Sleeves
- 12.05.08G Dywidag Anchor Bars
- 12.05.09G Steel Rods
- 12.05.10G Concrete Piles

12.02 Metallic Materials

- 12.02.01G Steel Rebars
- 12.02.02G Gratings and Mesh
- Sheets and Plates
  - 12.02.03G Carbon Steel
  - 12.02.04G Stainless Steel
  - 12.02.05G Alloy Steel
  - 12.02.06G Aluminium
  - 12.02.07G Cryogenic and Low Temperature Steel
  - 12.02.08G Galvanized
  - 12.02.09G Copper Alloy
  - 12.02.10G Clad
- 12.02.11G Stair Treads and Checker Plates
- 12.02.12G Handrails and Ladders
- 12.02.13G Shelves / Racks
- 12.02.14G Loading Bays / Docks
- 12.02.15G Roof Sheets and Wall Cladding
- 12.02.16G Pipes for Scaffolding
- 12.02.17G Fences and Gates
- 12.02.18G Other Scaffolding Materials

12.06 Cement / Concrete

- 12.06.01G Concrete
- 12.06.02G Ready-Mix Concrete
- 12.06.03G Lime
- 12.06.04G Bentonite
- 12.06.05G Ashes and Fillers

12.07 Wood / Timber

- 12.07.01G Wood
- 12.07.02G Laminated Wood
- 12.07.03G Wood Beams
- 12.07.04G Wood Poles
- 12.07.05G Finished Lumber (Standard Length)
- 12.07.06G Wooden Boards for Lining

12.03 Other Non-Metallic Materials

- 12.03.01G Grouting Material
- 12.03.02G Gratings, Profiles and Structures in FRP
- 12.03.03G Block / Brick Wall

12.04 Construction Components

- 12.04.01G Gutters, Downspouts and Roof Flashing
- 12.04.02G Insulated Metallic Panels
- 12.04.03G Mechanical Equipment Acoustic Enclosures
- 12.04.04G Passive Fire Proofing
- Manholes, including Covers
  - 12.04.05G Steel
  - 12.04.06G Other materials (FRP/GRP, HPDE, …)
- 12.04.07G Access and Equipment Support Mats
- 12.04.08G Architectural Facades
- 12.04.09G Glass Walls & Structures

Structural and Construction Materials

Dealing with large industrial buildings, bridges, pipelines and similar structures require specific knowledge of materials and their properties, in order to understand how different materials support and resist loads (both static and dynamic loading).

Main rationales behind the Standard Categorization

Structural Steel

- The category Steel frame structures refers to the “skeleton” of the building, made by of vertical steel columns and horizontal I-beams connected with flanges, bolts and threaded fasteners.
- This technique is often used for High rise buildings, Industrial buildings and Temporary Structures.
- For Light Structural Frames refers to light steel components, that can potentially be carried by hand, without heavy tools or equipment
- Steel sections includes any steel shapes for Frames structures. This category mainly refers, but not limited to, beams, columns, channels and angles, and for hollow sections.

Metallic Materials

- A Rebar, also known as reinforcement steel, is a steel bar or mesh of steel wires used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and hold the concrete in tension.
- Plate and sheet are words used to describe the classification of metal depending upon its thickness. While sheet metal is less than 3 mm thick, plate metal is obviously thicker than 3 mm
- Steel for Cryogenic applications, such as special 9 % nickel steel, is excellently suited dealing with extremely low temperatures (e.g. Cryogenic steel sheets are used for the transport of LNG and LPG).
- Materials used in Warehousing and logistics services such as Shelves and Racks and Loading bays are included in this family due their metallic composition.

Non-Metallic Materials

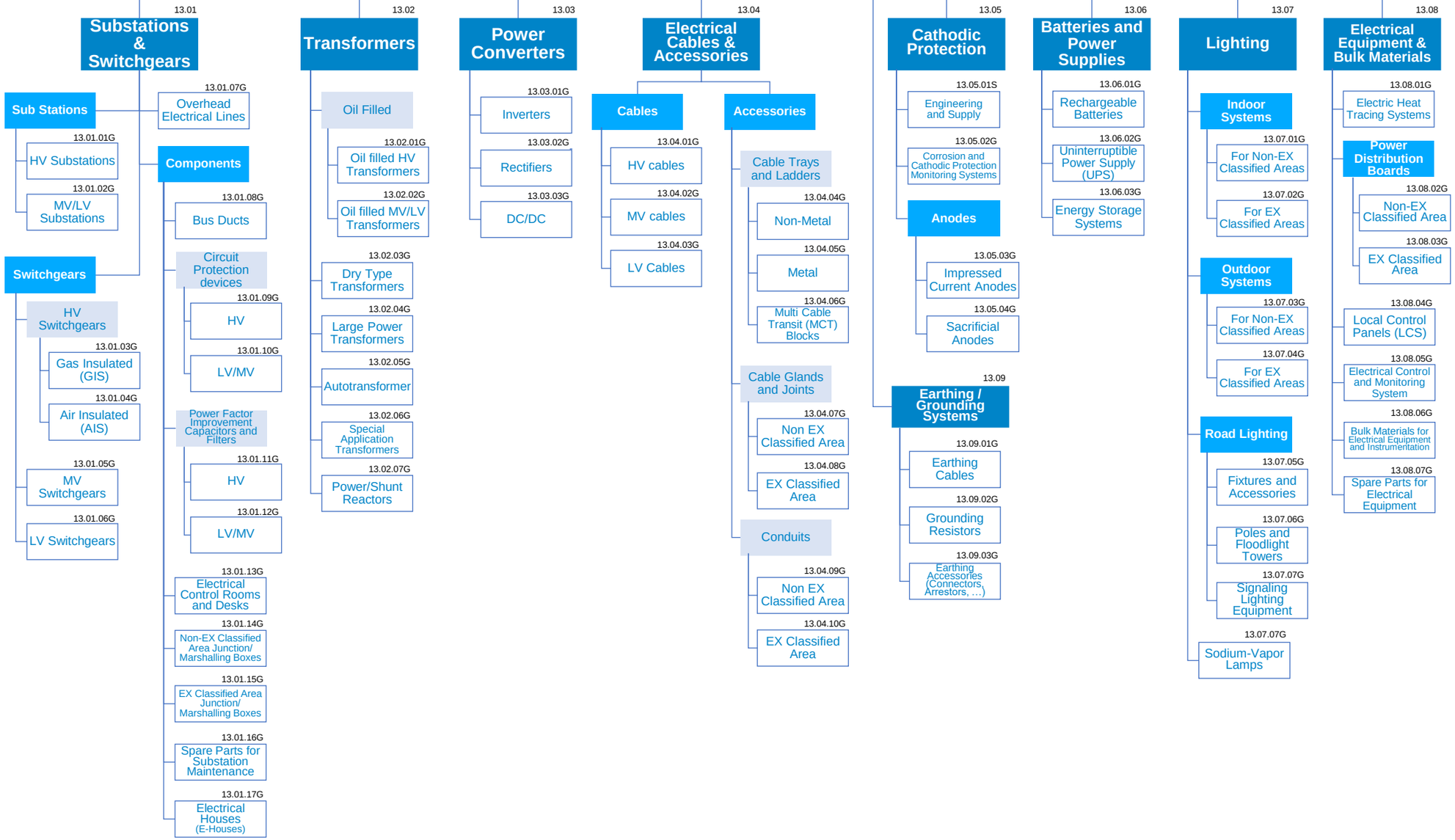
- Precast concrete is a construction product produced by casting concrete in a reusable mold which is then cured in a controlled environment, transported to the construction site and lifted into place. In contrast, standard concrete is poured into site-specific forms and cured on site.

Construction Components

- Mechanical Equipment Acoustic Enclosures are included in this family, since it is some sort of an assembled insulated panels.
- Doors and Windows for EX Classified Areas refer to Blast resistant and fire resistant systems, specifically required for buildings such as petrochemical plants, where is essential to protect life, infrastructure and assets.
- Industrial Sectional Doors refer to doors mainly used in warehousing and storing applications.
- “Access and Equipment Support Mats” includes mats used to provide access for trucks and earthmoving equipment in rough terrains, and to support cranes, or drilling rigs during operation.
- Architectural facade are pre-fabricated exterior faces or walls of a building.

Electrical Components and Systems

BACK TO GROUPS



Electrical Components and Systems

The set of electrical and mechanical equipment needed for the transmission and use of electrical energy. This can be as simple as a light bulb connected to a battery or as complex as distribution systems that carry power from generating centers to intermediary stations who then feed the power out to plants and housing.

Main rationales behind the Standard Categorization

Substations & Switchgears

- A Substation is an indoor or outdoor location containing switchgears, transformers, bus ducts and protection equipment.
- Switchgears are the combination of electrical disconnect switches and fuse/circuit breaker used to manage and isolate a power supply system.
- Circuit Protection devices include all the methods of equipment protection and human safety. This category refers to fuses, circuit breakers and disconnectors – earthing systems are in family 13.09.
- Whenever HV is separated from MV or LV it is because of the different requirements specific power stations may have (High Voltage is intended as greater than 33KV)
- Switchboards are not included as a category since they can be considered a subset of Switchgears. Thus they would be listed under LV Switchgears.

Transformers

- The rationale was to separate transformers based on type of insulation: Oil Filled (HV destined to primary distribution, LV destined to low voltage distribution) and Dry Type (air or resin).
- Large Transformers are mainly intended for HV power stations and interconnecting systems.
- Grounding resistors protect power transformers and generators from damaging fault currents.
- Power Reactors are not to be confused with transformers. While a Power Transformer is designed for efficient power transfer from one voltage system to another, a shunt reactor is intended only to consume reactive VARs.
- Special Application: includes furnace transformers, traction transformers and mobile transformers.

Power Converters

- The rationale was to separate converters based on type of application:
- DC/AC Converters (Also Called Inverters)
- AC/DC Converters (Also called Rectifiers)
- DC/DC Converters (Also called DC transformers)

Electrical Cables & Accessories

- Communication Cables can be found in the Instrumentation group as this group only concerns electrical components only.
- Subsea solutions have been separated due to their nature and specific skills required to install such systems.
- HV is intended as above 33KV, MV between 1KV and 33KV and LV up to 1KV
- Cable Glands are also known as fittings since they are a device designed to attach and secure the cable to the equipment.
- EX classified areas refers to places with specific requirements due to potential hazards. Therefore, this equipment must be thoroughly tested to ensure it does not trigger any dangerous events (e.g. explosions).
- Industrial type refers to generic use for any industry.

Cathodic Protection

- Cathodic protection refers to the technique used to reduce the corrosion of a metal surface.
- 13.05.01G is intended as a full supply. Basically a, complete ready to use protection system (including anodes, rectifier etc.)

Batteries and Power Supplies

- These are used in industrial applications where readily available energy is needed but might not always be available.
- UPS differ from Emergency generators in that they can provide almost instantaneous protection from power interruptions since they supply energy stored in batteries. This category includes both general purpose and specific application systems (e.g. Marine UPS, which need to be resilient to elevated levels of vibration).
- Energy storage systems are a full integrated turnkey solution, typically contained in a metal jacket.

Lighting

- The rationale is to divide systems based on the type of usage: industrial (indoor and outdoor) and road.
- The further distinction between EX classified areas and generic industrial use was made due to the specific needs of the former areas.

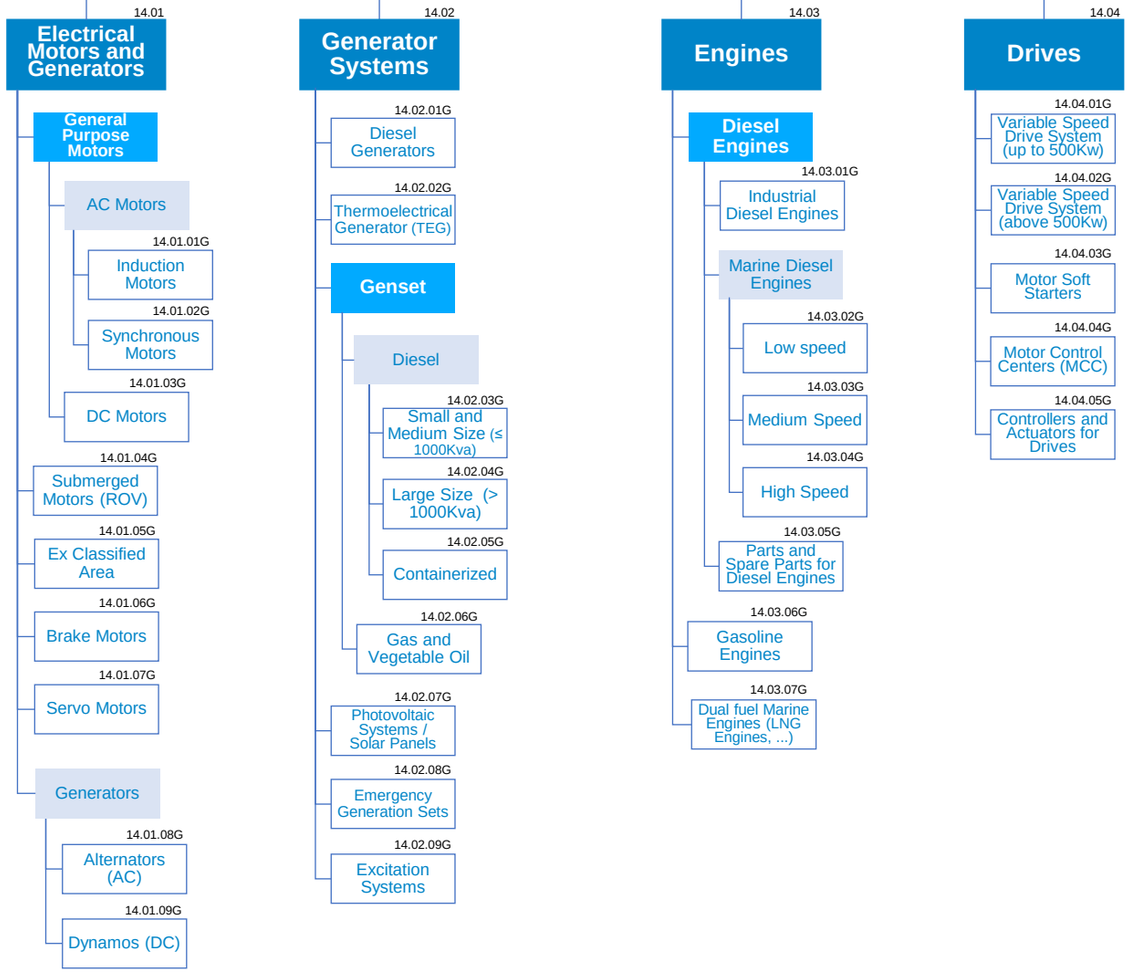
Electrical Equipment & Bulk Materials

- Electrical heat tracing systems are used to maintain or raise the temperature of an object (usually a pipe or a vessel). Turnkey kits have to be distinguished from simple cables that wrap around the object to heat.
- Spare parts include everything might be needed as a replacement in an electrical system (e.g. switches, plugs, etc.)
- 13.08.06G includes all bulk materials used for construction and assembly of electrical equipment and instrumentation.

Earthing / Grounding Systems

- This Family is similar to Circuit Protection devices. The distinction to be made is that here the categories include full systems and are specifically for earthing and grounding purposes and therefore include all surge and lightning arrestors and bonding systems as well.

14 Engines, Motors, Generators and Drives



Engines, Motors, Generators and Drives

The engine is the industry's heart. Whether you are a manufacture or a transport company to achieve the purpose of your business you will need a source of energy and an engine to convert that source into useful power. Equally, each manufacturer will have the need to install an engine as the first move to produce motion and to power the process equipment which is part of the production line, the same way a transport company must have an engine to carry out any delivery.

Main rationales behind the Standard Categorization

Electrical Motors and Generators

- Electrical motors and generators are machines which either convert electrical energy inputs into forces or convert applied kinetic energy inputs into electrical energy. In principle, any electrical generator can also be operated as a motor and vice-versa. In practice they will often be optimized for one application or the other.
- General purpose Motors have certain operating characteristics that allow them to be used for many different applications. In contrast, the other categories refer to engines built to meet specific needs such as ROVs or Brake motors.
- An alternator is an electrical generator (asynchronous or Synchronous) that converts mechanical energy to electrical energy in the form of alternating current while a dynamo produces direct current with the use of a commutator.

Generator Systems

- Here it is worth noting the difference between a Engine generator and a Generating set. On the one hand the former is a combination of an electrical generator (often an alternator) and an engine (prime mover), typically Diesel, mounted together to form a single piece of equipment that generates electrical energy. On the other hand, a “Genset” is The turnkey packaged combination of an engine, an electric generator and various ancillary devices such as base, canopy, sound attenuation, control systems, circuit breakers, jacket water heaters and starting system.
- A photovoltaic system consists of an arrangement of several components: solar panels, which absorb and convert sunlight into electricity, a solar inverter which changes the electric current from DC to AC, as well as mounting, cabling and other electrical accessories to set up a working system.
- The primary application of an emergency or Standby Genset is to supply power for a limited duration during a power outage. These units do not require some of the more elaborate and robust features expected in continuous power diesel generators.

Notes:

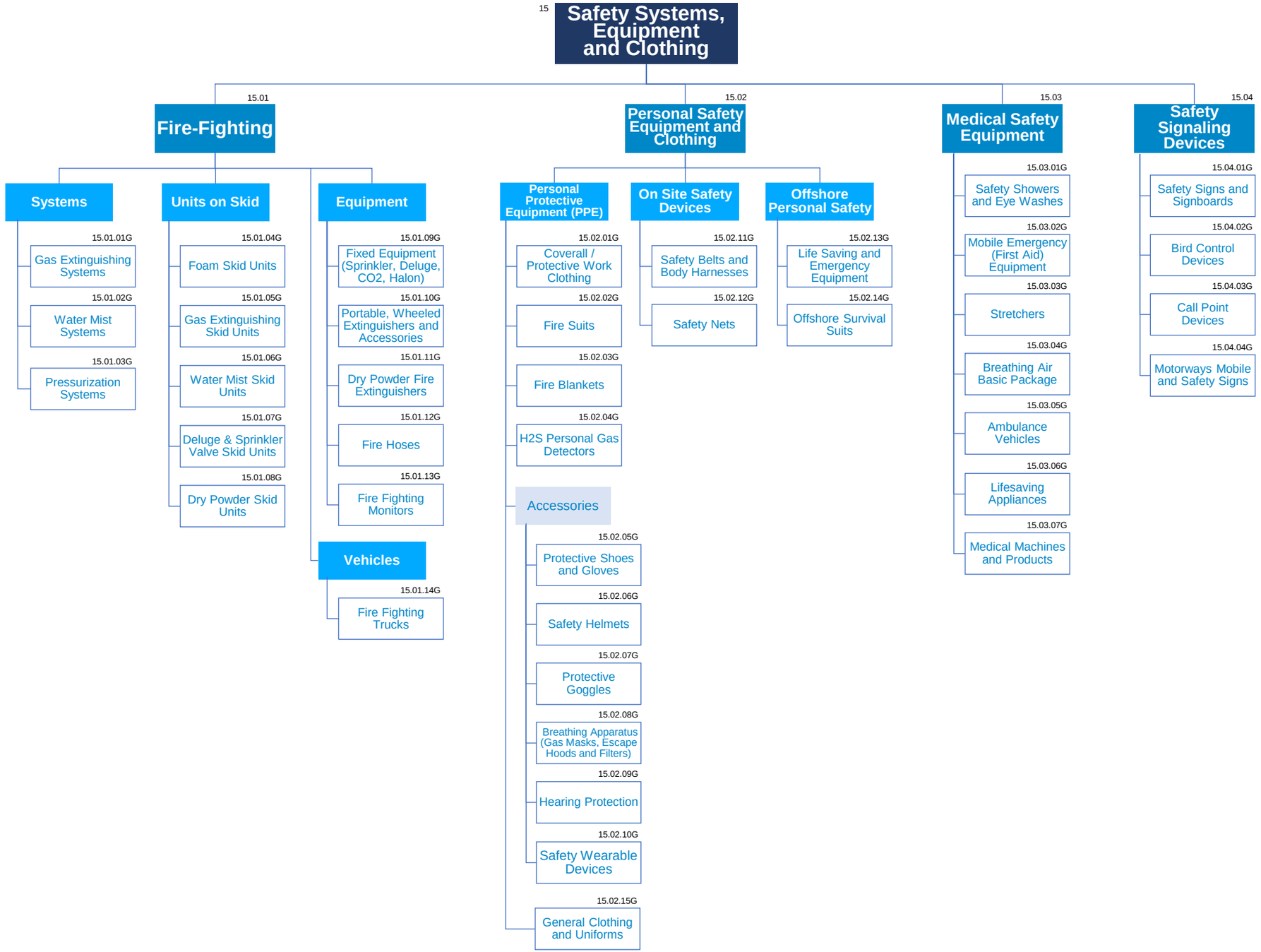
- A large size Genset is considered a device for industrial purpose with a power above 1000 Kva.

Engines

- This family refers to the main internal combustion engine (ICE) in which combustion is intermittent, typically fed with fossil fuels like natural gas or petroleum products such as gasoline and diesel fuel.
- Therefore all ICEs with a continuous combustion (e.g. gas turbines) and systems with an external combustion, such as steam or Stirling engines will be excluded from this group.
- The diesel engine definitely occupies a leading position in this family, being the most widely used solution in the industrial sector, given its strength and reliability. In this node distinction is made between industrial engines and marine engines as the latter has to be adapted for use inside boats and ships.
- According to the rotational speed, Marine diesel engines can be divided into (all diesel engines can be divided according to this criteria, but in the case of Marine diesel engines, since the applications vary greatly, it is worth making the distinction clear):
  - Low-Speed (<300 rpm)
  - Medium-Speed (300–1,000 rpm)
  - High-Speed (>1,000 rpm)
- High- and medium-speed engines are predominantly four-stroke engines, while Slow-speed engines are predominantly large two-stroke crosshead engines, hence very different from high- and medium-speed engines.
- Dual fuel Marine engines enable owners and operators to be fully flexible in the choice of fuels.

Drives

- Wherever motors are used, they must be controlled. This family refers to any device that serves to govern the performance of an electric motor in a predetermined manner.
- An adjustable-speed drive (ASD) or variable-speed drive (VSD) is an interconnected combination of equipment that provides a means of driving and adjusting the operating speed of a process machinery, leading it to efficiency both in cost and in time.
- A motor soft starter is a device used with AC electrical motors to temporarily reduce the load and torque in the power train and electric current surge of the motor during start-up. This reduces the mechanical stress on the motor and shaft, as well as the electrodynamic stresses on the attached power cables and electrical distribution network, extending the lifespan of the system.
- It is often desirable to control some or all of the motors from a central location. The apparatus designed for this function is the motor control center (MCC). It is a packaged combination of motor starters, fuses or circuit breaker, indicator lights and variable speed drives.



Safety Systems, Equipment and Clothing

The Safety Systems, Equipment and Clothing group refers to all the tools and systems used to improve the levels of safety for workers in their working environments whether these may be offshore platforms, chemical plants, or offices. Personal safety and fire-fighting are two major areas of concern when it comes to the general level of safety in the working environment.

Main rationales behind the Standard Categorization

Fire-Fighting

- This family includes any systems and equipment meant for the purpose of extinguishing or preventing the spread of a fire.
- The first seven categories can be considered 'Packaged' solutions. They have been divided based on whether they are skid mounted or not and on the medium used in fighting the flames.

Notes:

- 15.01.09G refers to all fixed (building/premises installed) equipment, whether it uses inert gases (ex. Halon) or water as a medium to extinguish the fire.
- 15.01.01G Gas Extinguishing Systems also includes cabinets and all other sub-components of the system.

Personal Safety Equipment and Clothing

- This is the family that covers all PPE (Personal Protective Equipment), which is equipment that will protect the user against health or safety risks at work, and emergency equipment.

Notes:

- Fire Suits and Blankets have been placed here rather than under the Fire-Fighting family as 15.01 is more system and package oriented, whilst this family is specifically meant for personnel related gear.
- 15.02.13G Life Saving and Emergency Equipment includes life jackets, buoys and flotation devices. It does not however include Life Boats (which are in the Offshore Group 22) or Offshore Survival Suits (also known as helicopter survival suits in some cases) which have their own category - 15.02.14G.

Medical Safety Equipment

- This family includes the main medical equipment that is present in most industrial related working environments.
- Mobile Emergency Equipment includes all types of first aid kits and boxes, whether they are meant for offshore platforms, offices, helicopters or others.

Safety Signaling Devices

- This refers to all signaling devices that have to do with personnel or plant safety.

Notes:

- 15.04.01G Safety Signs and Signposting includes all signs and signals that indicate a change in the safety of the surrounding environment or issue a warning message (this includes, but is not limited to: safety notices, road signs, danger signs and illuminated signs).
- 15.04.02G Bird Control Devices refers to all the equipment used to keeping birds at a safe distance whether it may be for onshore or offshore applications
- 15.04.03G Call Point Devices includes emergency call point poles and SOS call stations.

16

Interiors

16.01 Turnkey Works

- Prefabricated Areas
  - 16.01.01S Prefabricated Accommodation Cabins
  - 16.01.02S Prefabricated Accommodation Cabins for Ships
  - 16.01.03S Prefabricated Wet Units (bathroom modules) for Ships
  - 16.01.04S Prefabricated Wet Units (bathroom modules) for Houses
- Integrated Works
  - 16.01.05S Common Areas
  - 16.01.06S Medical Areas
  - 16.01.07S Laundry
  - 16.01.08S Catering
  - 16.01.09S Magazines and Shops

16.02 Furniture for Interiors

- 16.02.01G Furniture and Interior Products
- 16.02.02G Office Furniture
- 16.02.03G Outdoor Areas Furniture
- Tailor Made Furniture
  - 16.02.04G In Wood
  - 16.02.05G In Steel
  - 16.02.06G In Other Materials
- Catering Areas for Food & Beverage
  - 16.02.07G Furniture for Canteens and Catering Areas
  - 16.02.08G Counters and Furniture for Bars and Taverns
  - 16.02.09G Furniture for Kitchens

16.03 Apparatus & Furniture Components

- 16.03.01G Home Appliances
- 16.03.02G Mattresses
- 16.03.03G Beds Structure & Accessories
- 16.03.04G Pullman Bed
- 16.03.05G Accessories for Furniture
- 16.03.06G Profiles (Floors, Skirting, Walls, …)
- 16.03.07G Aluminium Profiles and frames
- Lighting
  - 16.03.16G Customized Lighting Structures
  - 16.03.17G Decorative Lighting
  - 16.03.18G Electrical Outlets and Switches
- 16.03.08G Ceiling Tiles
- 16.03.09G Bulkheads
- 16.03.10G Movable Walls and partitions
- 16.03.11G Ceiling Tailor Made Gypsum Decorations
- 16.03.12G Safes
- 16.03.13G Sanitary fixtures
- 16.03.14G Plumbing & Hydraulic Accessories
- 16.03.15G Ventilation Grills and Diffusers

16.04 Decorative Elements

- 16.04.01G Mirrors
- 16.04.02G Artwork
- 16.04.03G Wallpapers & Wallcoverings
- 16.04.04G Decorative Signage
- 16.04.04G Curtains and Textiles for Interiors
- 16.04.05G Decorative stairs
- 16.04.06G Woodworking Carpentry
- Panels
  - 16.04.07G Wooden Panels & Decorations
  - 16.04.08G Laminated Panels & Decorations
  - 16.04.09G Coated Panels & Decorations
  - 16.04.10G Glass Panels & Decorations
  - 16.04.11G Steel Panels & Decorations
  - 16.04.12G Plastic Panels & Decorations

16.05 Doors and Windows

- 16.05.01G For EX Classified Area
- 16.05.02G For non-EX Classified Area
- 16.05.03G Industrial Sectional Doors
- 16.05.04G Naval Openings and Windows
- 16.05.05G Sliding Doors
- 16.05.06G Doors Accessories
- Shutters
  - 16.05.07G Decorative Shutters
  - 16.05.08G Non-Decorative Shutters

16.06 Flooring and Surfaces

- 16.06.01G Carpets
- 16.06.02G Moquette
- 16.06.03G Wooden Flooring and Surfaces
- 16.06.04G Flooring and Surfaces in Teak
- 16.06.05G Deckheads
- 16.06.06G Flooring and Surfaces in Marble
- 16.06.07G Flooring and Surfaces in PVC and Vinyl
- 16.06.08G Flooring and Surfaces in Mosaic
- 16.06.09G Flooring and Surfaces in Porcelain & Ceramic
- 16.06.10G Flooring and Surfaces in Stone
- 16.06.11G Modular and Self-locking Flooring
- 16.06.12G Raised Floor Material

16.07 Installation Works

- 16.07.01S Furniture and Cabins Installation
- 16.07.02S Stairs Installation
- 16.07.03S Installation of Mirrors & Glass for interiors
- 16.07.04S Installation of Lighting
- 16.07.05S Installation of Panels
- 16.07.06S Special Finishing Works
- 16.07.07S Glazing

Interiors

Interiors covers all goods and products purchased for use or installation in an accommodation or a living space.

The group covers all interior items present in our daily homes, offices, hotels, yachts and other main accommodation types.

Main rationales behind the Standard Categorization

Turnkey Works

- Turnkey Works are split into two segments Prefabricated Items or areas and Works for a Specific setting.
- Turnkey Works for “Prefabricated Areas” includes Prefabricated Accommodation Cabins which can be installed in sites, or Caravans, Prefabricated Accommodation Cabins for Ships and Prefabricated Wet Units (bathroom modules) for Ships and for houses.
- “Dry” and Wet units were separated due to the differentiation needed in competences needed to produce each type of cabins
- Integrated Works for Canteens, Medical Areas, Laundry and Catering are created and differentiated also due to the specific competences needed

Furniture for Interiors

- This Family contains all furniture products for Interiors split by type of Area. For each Category of supply, it is included all products found in that specific area.
- “Common Areas Furniture” includes all furniture products and objects installed in common gathering areas such as hotel lobbies, cinemas, churches, Gyms, …
- “Outdoor Areas Furniture” includes all furniture products and objects for outdoor use such as gardens, Playgrounds and outdoor pools.
- “Tailor Made Furniture” includes all furniture products and objects designed as per customer specific requirements irrelevant of the material type and area.

Apparatus & Furniture Components

- Apparatus & Furniture Components family includes all functional components in the interiors
- “Home Appliances” or Electric appliances, or White goods are goods used in private accommodation structures. These products include basic refrigeration systems (fridges, Freezers,..) and basic kitchen appliances such as stove, and oven, housekeeping products such as Vacuum cleaning machines, washing machines, etc…
- Special Kitchen Equipment such as grills, Large volume ovens and other relevant equipment are found under “Furniture for Canteens and Catering Areas
- “Beds Structure & Accessories” include the frames, slats and other components that enter in the structure of beds, irrelevant of the material type
- “Sanitary fixtures” includes all the apparatus in toilets and bathrooms such as WCs, bidets, shower enclosures, bathtubs, etc. Whereas Plumbing & Hydraulic Accessories include the material used for the installation and functioning of the fixtures, such as P-Traps, flexibles, valves, etc…

Decorative Elements

- Decorative Elements covers all items used in interiors for decorations, such as panels mirrors, artwork, and curtains.
- “Artwork” includes works of sculpture, drawings, paintings, and all relevant items to the products such as frames hangers
- “Decorative stairs” include all type of decorative stairs irrelevant of the material type
- “Woodworking Carpentry” refers to special works and Tailor-made decorations performed in wood.

Doors and Windows

- This Family includes all related items and accessories of Doors and windows.
- Decorative Windows and Doors Shutters includes all types of shutters used for decorative purposes such as louvered, raised panel, flat panel, board and batten, and bahama and bermuda panels irrelevant of their material type.

Flooring and Surfaces

- “Flooring and Surfaces” is not limited to the application on Floors, it also includes surfaces such as walls or ceilings. The Family includes all type of Flooring and surfaces material used in interior areas such as Marble, Ceramic, Mosaic, Wood, Teak, etc…
- “Deckheads” is limited to ships application. It is the underside of a deck in a ship.
- “Raised Floor Material” includes all profiles, and relevant products needed to perform the raised Floor. In some Telecommunications Rooms, Raised floor is installed allowing the laying of cables underneath it.

Installation Works

- This Family covers the installation works of interior specific items that requires a special competence and experience.
- It covers glazing works, and the installation of stairs, mirrors, glass and other type of panels, and lighting
- Special Finishing works refers to additional special finish works required on site of the interior such as lamination or tailor made finishing

17 Raw Materials

17.01 Raw (Monolithic) Materials

- 17.01.01G Ferro-Alloys
- 17.01.02G Minerals
- 17.01.03G Ores

17.02 Shaped (Plates, Sheets, Bars, Billets, Rods, ...)

- 17.02.01G Semi-Finished Components in Stainless Steel & Aluminium
- 17.02.02G Semi-Finished Components in Copper Alloys, Brass & Bronze
- 17.02.03G Semi-Finished Components in Duplex and Super Duplex Steel
- 17.02.04G Semi-Finished Components in Nickel and Nickel Alloys
- 17.02.05G Semi-Finished Components in Carbon Steel
- 17.02.06G Semi-Finished Components in Titanium
- 17.02.07G Semi-Finished Components in Non Metallic Materials
- 17.02.08G Semi-Finished Components in Other Ferrous Metals
- 17.02.09G Semi-Finished Components in Other non Ferrous Metals
- 17.02.10G Semi-Finished Wear Resistant Components

17.03 Refractory Materials

- 17.03.01G Monolithic Refractory Materials
- 17.03.02G Shaped Refractory Materials

17.04 Semi-Finished Components for Pressure Equipment

- 17.04.01G Heads & Cones for Pressure Equipment
- 17.04.02G Shells for Pressure Equipment
- 17.04.03G Tubes For Boilers
- **Tubes for Shell&Tube Heat Exchangers**
  - 17.04.04G CS, Alloy Steel, SS, Copper
  - 17.04.05G Aluminium
  - 17.04.06G Titanium
- 17.04.07G Finned Tubes for Air Coolers

17.05 Semi-Finished Components for Steel Plants

- 17.05.01G Torpedo Transfer Cars
- 17.05.02G Tundish
- 17.05.03G Tundish Pre-Heaters
- 17.05.04G Tundish Transfer Cars
- 17.05.05G Ladles
- 17.05.06G Ladle Transfer Cars
- 17.05.07G Components for Ladles (Covers, Bail Arms, Hooks,...)
- 17.04.03G Trunnion Rings

Raw Materials

A raw material is a basic material that is used to produce goods, finished products, energy, or intermediate materials which are feedstock for future finished products. As feedstock, the term connotes these materials are bottleneck assets and are highly important with regard to producing other products.

Raw materials are converted into useful products in two steps: the material is formed into the requested shape, then the properties of the material is improved or altered in accord to the desired product.

Main rationales behind the Standard Categorization

Raw (Monolithic) Materials

- Alloys of iron that include elements such as: chromium, manganese, molybdenum, silicon, titanium, tungsten, vanadium and so on. Excluding carbon.
- A mineral is a naturally occurring substance – some examples of which are: aluminium, iron and copper.
- An Ore is a type of rock containing a mineral from which metals can be extracted - a typical example is Chrome ore.

Shaped (Plates, Sheets, Bars, Billets, Rods, ...)

- 17.02.08 Metals or alloys which contain Iron such as cast iron, cobalt, ... (in most cases "Shipbuilding Plates" are ferrous metal pates).
- 17.02.09 Metals or alloys which don't contain Iron such as Lead, and Zirconium alloys.
- 17.02.10 Plates for abrasion and impact resistant applications (approx. BHN hardness > 350).
- Sheets for ducting fabrication are included in this family. The selection of the appropriate category shall be done based on the type of material.

Refractory Materials

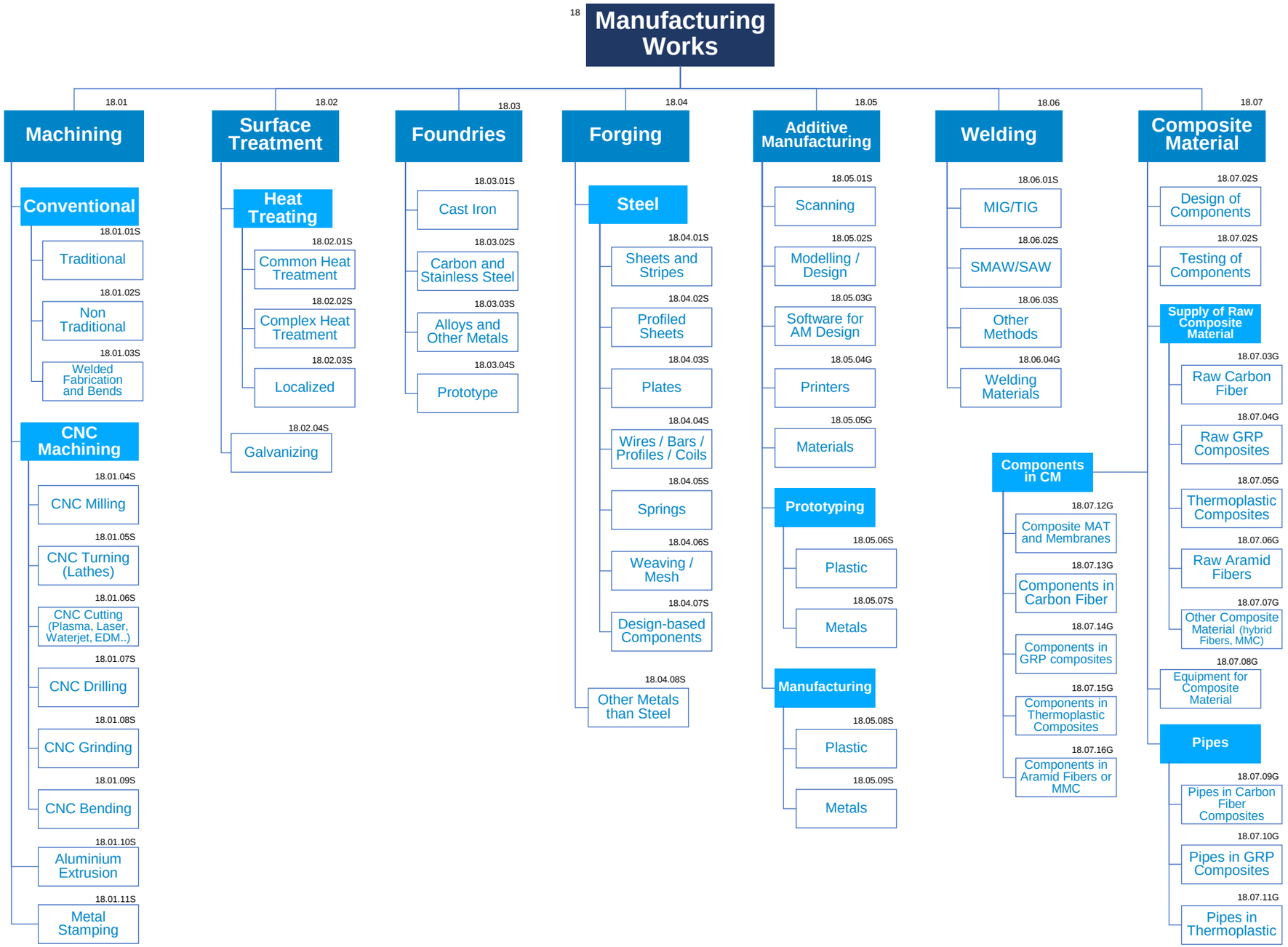
- Monolithic refractories are mechanical mixtures of refractory materials that serve as aggregates, binders, mineralizers or other properties that are desired in the product. These are refractory materials which have no definite shape. Castables are included in this category.
- 17.03.02G refers to refractory materials with a definite shape, such as bricks.

Semi-Finished Components for Pressure Equipment

- This family includes the most common premanufactured items that can be procured separately before the final assembly of the pressure equipment
- Tubes for pressure equipment are split into different categories depending on the application and the material of the equipment
- 17.04.03G Tubes designed for high temperatures and high pressures applications (also used for furnaces).
- 17.04.04G Tubes for Shell & Tube heat exchangers are used for cooling, heating or re-heating of fluids. Characterized by high corrosion resistance (also used for seawater coolers, condensers, evaporators, heaters and reheaters).

Semi-Finished Components for Steel Plants

- This family includes the premanufactured items that are used in steel plant.
- Ladles Transfer Cars, Torpedo Cars and Tundish Transfer Cars are split into different categories depending on the application.
- 17.05.07G Components for Ladles (Covers, Bail Arms, Hooks,...) covers all components and spare parts that are connected to ladles.



Manufacturing Works

Are those works performed to build base parts or sub-assemblies for major components, also these works and services are used to repair pieces or reproduce spare parts that are difficult to find.

These are also processes performed to material to give them the necessary properties to be able to resist certain given conditions.

In research and development there are also prototypes that can be produced through these processes.

Main rationales behind the Standard Categorization

Machining

- Machining family includes the works that give an specific shape to a piece through a controlled mechanical removal of material using machine tools
- The capabilities in the machining market are basically given by the process used to shape a piece
- Traditional machining category is defines as the traditional machining processes such as Turning, Drilling, Boring, Reaming and milling, in general all the activities that can be performed with a machine tool such as grinding
- Non Traditional machining is defined as the processes used to give shape to a piece to different methods than the included in the traditional category such as Water, Laser, Laser and Chemical cutting, as well as processes like stamping
- Weld fabrication and bends are the processes used to manufacture complex parts by welding two or more pieces giving as a result a part that itself is not a module or a finished equipment, in this category are included bends, because the suppliers who fabricate complex parts are commonly available to perform this activity

Surface Treatment

- Surface treatment is a chemical process that treats a surface and changes its physicochemical properties to make a particular part more suitable to resist hard conditions keeping the properties of the base material
- Common Heat treatment includes common treatments such as Annealing, Quenching, Tempering, Hardening and Aging
- Complex Heat treatments comprehend more complex activities and equipment than the ones used for the treatments described before such as Case Hardening (Carburizing and Nitriding) or Ion Implantation.
- Localized Heat Treatment refer to the stress relief treatment done to a surface after a welding process, this requires specific equipment and can be done at site.
- Related categories included in other Groups
  - Spraying or metallization, is not including among “Surface Treatment” family as the process to perform it is physical and protects a surface but do not change the properties of the base material, so this category can be found in the family “Coating” of the group 34 “Painting, Coating, Insulation and Sound Proofing”

Foundries

- Foundries are referred to the base materials from which is started a process of forging, these are usually the result of melting the ores coming from mines and are sold to industries to transform them in other raw materials
- The categories of this family are basically the differentiation between the major groups of metals used in industry; Cast Iron, Carbon and stainless steel and other Steel Alloys and materials, commonly the foundries are able to perform finishing process to deliver manufactured pieces
- A category of prototyping is included as some foundries provide the service of prototyping pieces by lost wax method.

Forging

- Forging is the set of processes that give shape to a material deforming it by applying pressure on it; typically forging is performed after foundry to elaborate raw materials
- The market in Forges is given by the final shape of the raw material that result from a process, which basically can be Sheets, Plates, Springs, Wires and Profiles or mesh, they are typically provided in steel, but some of the suppliers also provide other metals as copper or zinc.

Additive Manufacturing

- According to the ISO/ASTM52921-1 “Standard Terminology for Additive Manufacturing – Coordinate Systems and Test Methodologies”, Additive Manufacturing (AM) is the process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies.
- The word Additive Manufacturing is frequently associated – in non-technical context - to “3D printing”, as the fabrication of objects through the deposition of a material using a print head, nozzle, or another printer technology; until present times this term has in particular been associated with machines that are low end in price and / or overall capacity.
- 3D Prototyping refers mainly to the construction of prototypes and manufacture of a small amount of units.
- 3D Modelling refers to the engineering/design activities performed through a computer prior to any physical printing
- Different Additive Manufacturing processes apply: extrusion, jetting, binder jetting, sheet lamination, photopolymerization, power bed fusion / sintering, direct energy deposition
- Competition in the market changes based on the type of materials: Metals (Stainless Steel, Steel, Titanium, Gold, Silver) vs Plastics (Acrylonitrile butadiene styrene (ABS), Polylactic acid (PLA), Polyvinyl alcohol (PVA), Polycarbonate, …) vs Other (e.g. Bio-ink, Glass, …)

Welding

- Welding is the process that joins materials by melting the base material and typically adding new material that once cooled makes forms the joint
- Welding in usually used when building plants to connect all the pipelines and to build the equipment that must be finished in field such as tanks and big columns, also is common in the joint of civil structures
- Welding capabilities are given not by the material to be welded but by the method used to perform the activity and that is the differentiating point in the market.
- SMAW/SAW are methods of welding in which the electrode is covered by a flux which brings protection to the weld from environmental protection
- MIG/TIG or GMAW and GTAW are methods of welding that weld by using an electrode covered by a flow of inert gas to protect the weld from environmental contamination and use similar equipment
- Other methods include less common methods such as electroslag and electric resistance welding
- There is no incidence in the energy source to perform the welding, although many sources are possible, what differentiates competition is the welding method
- Related categories included in other Groups
  - Cladding category, even though the physical process may seem close to welding, it’s final goal is not joining pieces but coating, so it’s been considered within the Group’s 34 Family
  - Weld Overlay is considered as part of Group’s 34 Category Cladding as it is used as a coating and most of the competitors that are able to perform Cladding, can do Weld Overlay

Composite Material

- The Composite Material family includes the main Raw composites used for the production of products (components, sub-components and piping products), the services relevant to Composite such as design and testing, and the manufactured goods by type of composite

19

Shipbuilding

19.01 Vessels Construction

Military Vessels Construction

- 19.01.01S Naval Ship
- 19.01.02S Auxiliary Ship
- 19.01.03S Submarine

Mercantile Vessels Construction

Offshore Operations

- 19.01.04S Heavy-Lift Vessel
- 19.01.05S Multi-Purpose Supply Vessel
- 19.01.06S Pipe Laying Support Vessel (PLSV)
- 19.01.07S Cable Layer Vessel
- 19.01.12S Seismic Research Vessel
- 19.01.08S AHT and AHTS
- 19.01.13S Well Stimulation Vessel (WSV)
- 19.01.09S PSV (Platform Supply Vessel)
- 19.01.14S Accommodation Vessel
- 19.01.10S Diving Support Vessel (DSV)
- 19.01.15S Pusher Boats/Tugboats
- 19.01.11S Dredger

Barges

- 19.01.16S Crane Barge
- 19.01.17S Launching Barge
- 19.01.18S Self-Elevating Barge

Transportation

- 19.01.19S Containerships
- 19.01.20S Oil Tankers
- 19.01.21S LNG Carriers
- 19.01.22S LPG Vessels
- 19.01.23S Bulk Carriers

Offshore Production

- 19.01.24S FPSO / FPU / FSO / TLP / FLNG
- 19.01.25S FSRU
- 19.01.26S Semi-Sub
- 19.01.27S SPAR

Drilling Rigs / Vessels

- 19.01.28S Ultra-Deepwater
- 19.01.29S Deepwater
- 19.01.30S Jack-Ups

Support Vessels

- 19.01.31S Fishing Vessels
- 19.01.33S Fire Boats
- 19.01.32S Crew Boats
- 19.01.34S Coast Guard Patrol Boats

Leisure Vessels Construction

Yachts

- 19.01.35S Yacht (<60 meters)
- 19.01.36S Mega Yacht (60-80 meters)
- 19.01.37S Mega Yacht (80-100 meters)
- 19.01.38S Mega Yacht (100+ meters)

Cruise

- 19.01.39S Cruise Contemporary
- 19.01.40S Cruise Premium
- 19.01.41S Cruise Upper Premium
- 19.01.42S Cruise Niche and Luxury

- 19.01.43S Ferry
- 19.01.44S Roll-On / Roll-Off

19.02 Works at Shipyard

- 19.02.01S Fabrication of Hulls
- 19.02.02S Outfitting Works
- 19.02.03S Electrical & Automation Works
- 19.02.04S Piping Systems Works
- 19.02.05S Hydraulic Systems Works
- 19.02.06S HVAC Works
- 19.02.07S Surface Preparation & Coating

19.03 Maintenance and Repair of Shipping Units

- 19.03.01S Dry-dock Maintenance and Repair
- 19.03.02S Alongside Maintenance and Repair
- 19.03.03S Hull and Relevant Accessories
- 19.03.04S Engine Room and Auxiliary Systems
- 19.03.05S Electrical and Automation Equipment
- 19.03.06S Safety Equipment / Systems
- 19.03.07S Hydraulic Systems
- 19.03.08S Underwater Maintenance and Repair Inland/Inshore
- 19.03.09S ROVs

19.04 Conversion of Shipping Units

- 19.04.01S Dry-Dock Conversion
- 19.04.02S Alongside Conversion

19.05 Ship Breaking / Dismantling

- 19.05.01S Ship Breaking / Dismantling

Shipbuilding

Shipbuilding is the construction of ships and other floating vessels. It normally takes place in a specialized facility known as a shipyard. Shipbuilding and ship repairs, both commercial and military, are referred to as "naval engineering". Despite having many similarities with shipbuilding, boatbuilding is not considered in this category group.

This category group aims to encompass all activities related to shipbuilding. Construction services are classified in three different groups according to the ship's scope (Mercantile, Military, and Leisure) following a study of the market competition. Works at Shipyard, Maintenance & Repairs, Conversion, and Ship Breaking are instead considered as cross-purpose activities.

Main rationales behind the Standard Categorization

Vessels Construction

- This Family includes services related to the construction and installation of specialized equipment of vessels for military, mercantile and leisure use as well as general shipyard works. These services are usually carried out at a shipyard or other specialized facilities.
- "Naval Ship" includes all combatant surface classes and are differentiated from other ships by construction and purpose. Generally, naval ships are damage resilient and armed with weapon systems.
- "Auxiliary Ship" includes supporting units such as hospital, replenishment, tankers, command and support, etc.
- "Submarine" include all submarine classes.
- "Multi-Purpose Supply Vessel" (MPSV) are typically designed with 'plug and play' equipment to accommodate a range of work scopes including: offshore rescue assistance, tanker assistance, towing, field assistance and unloading deck cargo and Liquid cargo to rigs and production platforms. The vessels may be equipped for field standby operations.
- "Accommodation Vessel" are used in the field to provide offshore accommodation and living facilities, deck space and workshops for fabrication, and cranes for supply and topside lifts. This category includes also accommodation barges.
- Yachts are classified according to their length as that is a discriminant for shipyards' physical capacity (i.e. having enough space to build the ship).
- "Cruise" ships market is segmented in:
  - Contemporary: Price/quality oriented customers (3000+ passengers; 130-220K Gross Tonnes).
  - Premium: Experienced and averagely demanding customers (500-2500 passengers; 90-140K Gross Tonnes).
  - Upper Premium: Upscale destination oriented cruises (<1300 passengers; 40-70K Gross Tonnes).
  - Luxury/Niche: Luxury and expedition cruises (<600 passengers; 10-40K Gross Tonnes.

Works at Shipyard

- This family includes all works and installation of materials carried out at the shipyard. The items listed here are common to most vessels notwithstanding their use destination.
- "Fabrication of Hulls" comprises all manufacturing and semi-manufacturing activities for hull fabrication, including the addition of anchor pockets, pipe fittings, etc.
- "Outfitting Works" includes the superstructure, installation of the ship's power plant, engines and other machinery, electrical, plumbing, HVAC, finishing of interiors and installation of furnishings.
- "Electrical & Automation Works" refers to related to electrical systems installation and automation systems and devices monitoring and controlling many aspects of the ship operation including:
  - Propulsion (Main Engine) and Power (Auxiliary Engines)
  - Auxiliary Machinery
  - Cargo & Ballast
  - Condition based monitoring

Notes:

- Works carried out in floating dry docks are also included in this family as they are akin in scope and procedures.

Maintenance and Repair of Shipping Units

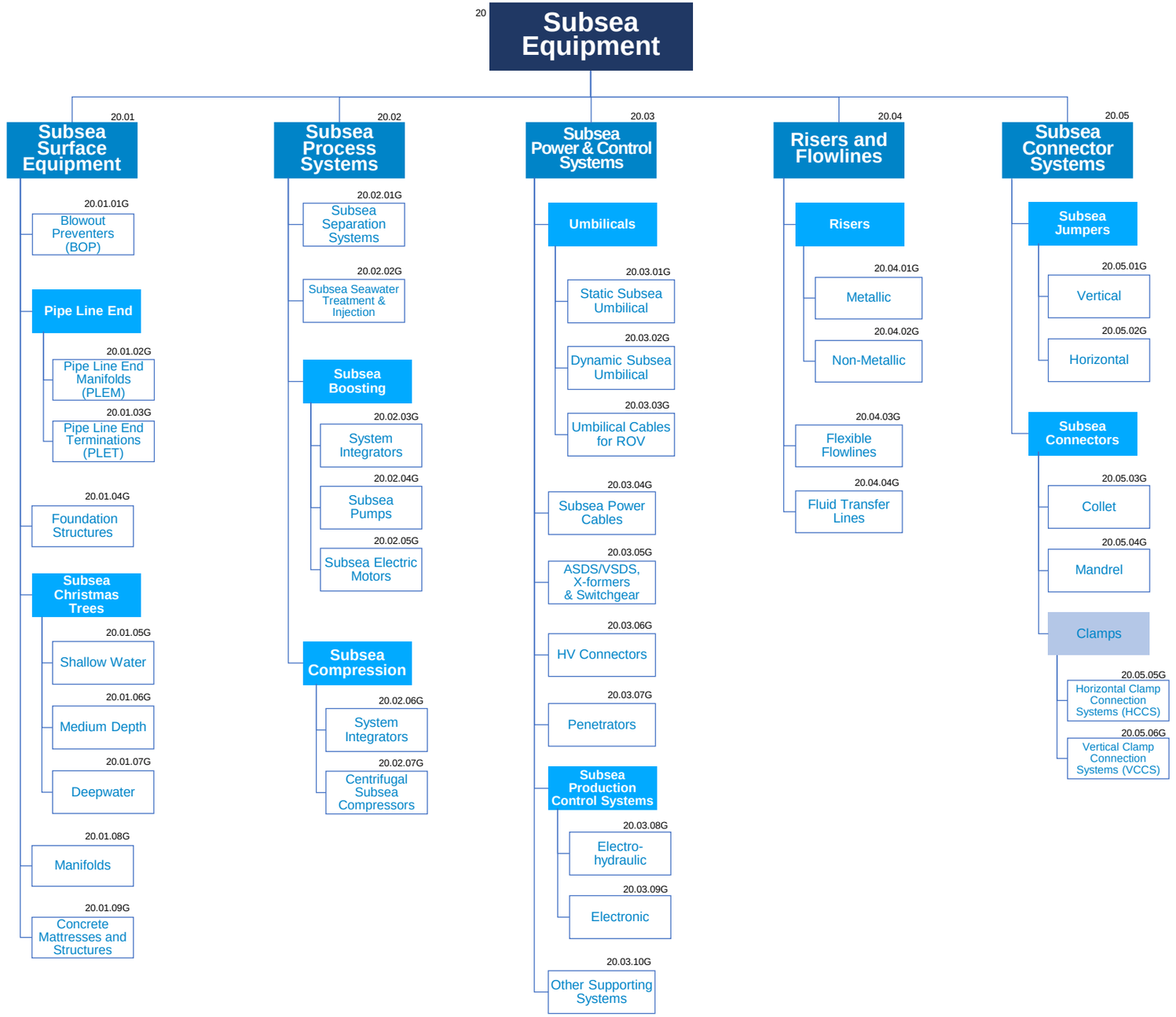
- This Family includes all services needed to ensure the proper functioning of vessels and vessel equipment.
- "Hull and Relevant Accessories" includes all maintenance, repair and conversion works of the hull and its relevant accessories such as anchor pockets and pipe fittings.
- "Engine Room and Auxiliary Fittings" refers to engine, tanks and fluid management items, deck gear and hydraulic systems, steering gear, gearing, shafting, propellers, marine DC/AC electrical systems, and refrigeration while it does not include fire safety systems, which are instead listed under "Safety/Equipment Systems" (19.02.07S).
- "Electrical and Automation Equipment" does not include the electric equipment related to the engine as it is classified under "Engine Room and Auxiliary Fittings" (19.02.04S).It does include works related to telecommunication equipment.
- "Underwater Maintenance and Repair Inland/Inshore" encompass services from inspection of external condition and any required maintenance work all the way through to highly technical major repairs or replacements of a ship's external underwater equipment and machinery.
- "Outfitting" can include the superstructure, installation of the ship's power plant, engines and other machinery, electrical, plumbing, HVAC, finishing of interiors and installation of furnishings.

Conversion of Shipping Units

- This Family includes all services related to the refitting and restructuring of vessels to adapt them to new uses.

Ship Breaking / Dismantling

- This Family includes all services related to the decommissioning and dismantling of ships carried on both onshore and offshore.



Subsea Equipment

This Group of Categories covers a wide range of subsea equipment and technologies that are required to develop offshore Oil&Gas fields. The range of applications vary across varying pressure, temperature and water depth requirements and are driven by the complexities of the subsea environment.

A constant effort is ongoing in developing technologies to increase oil recovery for mature projects and to develop new projects that may otherwise be considered economically unviable or inaccessible. A new generation of standardized subsea production equipment and systems is underway, especially for deepwater applications.

This Group is characterized by a small number of large international players. In fact, different segments require different and sophisticated technology, creating a ”winner-takes-all” market.

Main rationales behind the Standard Categorization

Subsea Surface Equipment

- The competition across these Family changes mainly on the basis of the water depth. For the purposes of this Standard Categorization, the following water depth apply:
  - Shallow water is up to 100 m
  - Medium depth is 100-750 m
  - Deepwater is above 750 m
- Blowout Preventers (BOP) – ram type of annular type - are used to seal, control and monitor wells to prevent blowout, the uncontrolled release of Oil&Gas from well. They are usually installed redundantly in stacks.
  - The terms Blowout Preventer, Blowout Preventer Stack and Blowout Preventer System are used interchangeably;
  - Main components are: electrical and hydraulic lines, control pods, hydraulic accumulators, test valve, kill and choke lines valves, riser joint, hydraulic connectors, support frame.
- Subsea Christmas Trees are the primary means of flow control for subsea wells. They are not "wellhead" as sometimes incorrectly referred to.
  - Different types of Subsea Christmas Trees are typically manufactured by all types of players:
    - Horizontal vs Traditional tree
    - Mono Bore, Dual Bore, Full Bore Tree
    - Diverless
  - Main components are: Valves, Controls equipment, Structural material, Fittings and flanges.
  - Mechanical and hydraulic Subsea Christmas Trees are increasingly replaced by electric.
- Subsea Manifolds and Templates allow produced fluid to be commingled or diverted and allow injection fluids to be distributed to desired flow paths.
  - Main components are: Valves, Piping, Controls equipment, Structural material, Fittings and flanges.
  - They cover both Internal or External Pigging Loops
- Foundation Structures refer to subsea structures only, and not – for example – to Offshore Wind Farm structures.

Subsea Process Systems

- Subsea Production System (SPS) are based on “packages” of complex components and require advanced technology.
  - Even higher reliability is required as oil exploration site goes deeper into sea, thus heightening the entry barrier. Therefore, the market is consolidated, with the top 4 players holding 80%+ market share.
- Subsea Processing and Compression systems have multiple functions:
  - Separate produced fluid into different phases debottlenecking flowline, risers and topsides;
  - Separate produced water at the wells and re-inject it underground for disposal, saving energy to transport unnecessary water to surface;
  - Boost the pressure for long distance facilities.
- Subsea seawater injection refers to only those projects utilizing a subsea pump to inject seawater and does not include typical water injection using a pump on a topside facility.

Subsea Power & Control Systems

- Dependable power supply and distribution is vital for production facilities on the seabed, together with efficient communication. Subsea HV & AC/DC Power and Control Systems:
  - ensure the power and control of the Subsea Production Systems for safe and efficient operations;
  - receive feedback from components ion indicating various process parameters
- The umbilical delivers power, chemical and control signals via subsea equipment.
- The technology development trend is for faster subsea communication through fiber optics.
- Most commonly used is the electro-hydraulic multiplexed system.

- Riser, flowlines, fluid transfer lines and jumpers are critical to offshore oil and gas production systems. They are subject to extreme temperatures, pressures, physical stresses and corrosive materials - yet must still ensure reliable connections and optimal product flow.
- Risers are dynamic lines suspended in the water column connecting production facilities to subsea infrastructure; Risers deliver Oil&Gas extracted from sea bed to above sea.
- Flowlines are static pipelines used to carry fluids on the seabed.
- Fluid transfer lines are typically large diameter pipelines connecting two structures which are often dynamic.
- Technology development focus is now on increasingly temperature and pressure resistant Risers.

Subsea Connector Systems

- Jumpers are short lengths of pipe connecting two fixed structures either above or below water:
  - Vertical and Horizontal Jumpers can be either Rigid Jumpers and Tie-In spools.
- Collet connectors are used for both integral and non-integral connection systems.

21 Components and Systems for Vessels

21.01 Propulsion and Positioning Systems

Propulsion Systems
- 21.01.01G Integrated Propulsion Systems
- 21.01.02G Inline Propellers
- 21.01.03G Kort Nozzles
- 21.01.04G Azimuth Propellers
- 21.01.05G Reduction Gears and Shaft Lines

Waterjets
- 21.01.11G Small and Medium Sized (<2600 kW)
- 21.01.12G Large Sized (>2600 kW)

Thrusters
- 21.01.06G Tunnel Thrusters
- Azimuth Thrusters
  - 21.01.07G Fixed Mounted
  - 21.01.08G Retractable
  - 21.01.09G Underwater-Mountable Thrusters
- 21.01.10G Cycloidal Drive

- 21.01.13G Accessories for Propellers and Positioning
- 21.01.14G Auxiliary Wind Propulsion

21.02 Stabilization

Fin Stabilisers
- 21.02.01G Retractable Stabilisers
- 21.02.02G Fixed-Fin Stabilisers

- 21.02.03G Steering Gear
- 21.02.04G Rudder Roll Stabilization Systems
- 21.02.05G Ballasting Systems

21.03 Bridge Systems

Dynamic Positioning Systems (DPS)
- 21.03.01G DPS-1
- 21.03.02G DPS-2
- 21.03.03G DPS-3

- 21.03.04G Thruster Control Systems
- 21.03.05G Joystick Control Systems
- 21.03.06G Helideck Monitoring Systems
- 21.03.07G Navigation Systems

21.04 Mooring/ Anchoring and Buoying

Buoys and Floats
- 21.04.01G General Surface Buoys
- 21.04.02G Mooring Buoys
- 21.04.03G Inflatable Bags
- 21.04.04G Navigation and Intelligent Data Buoys
- 21.04.05G Riser, Cable and Umbilical Floats
- 21.04.06G Cable and Flowline Protection Systems

Moorings Systems and Equipment
- 21.04.07G Turret Mooring Systems for FPSO
- 21.04.08G Mooring winches
- 21.04.09G Anchor Windlasses
- 21.04.10G Capstans
- 21.04.11G Mooring Hatches
- 21.04.12G Fenders

- Chains
  - 21.04.13G Anchors and Dead Weights
  - 21.04.14G Chains and Connectors
  - 21.04.15G Chain Stoppers

- Ropes
  - 21.04.16G Wire Ropes
  - 21.04.17G Fiber Ropes
  - 21.04.18G Rope and Chain Tensioners
  - 21.04.19G Other Mooring Equipment and Systems

21.05 Hull Protection
- 21.05.01G Fire Barrier Doors and Gates Systems
- 21.05.02G Watertight Doors Systems

Corrosion
- 21.05.03G Anti-Vegetation Systems
- 21.05.04G Marine Galvanic Anodes
- 21.05.05G Marine Impressed Current Cathodic Protection (ICCP) Systems
- 21.05.06G Marine Impressed Current Anti-Fouling Systems (ICAF)

21.06 Naval Special Equipment
- 21.06.01G Mast Systems and Related Components
- 21.06.02G Pilot and Operator Chairs and Desks
- 21.06.03G Hyperbaric Chambers
- 21.06.04G Maritime Security and Weapons Systems
- 21.06.05G Special Navigation & Signalling Lighting

- 21.06.06G Naval Threat & Countermeasures Simulator (NTCS)
- 21.06.07G Marine Exhaust Systems
- 21.06.08G Active Hull Cooling (AHC)
- 21.06.09G On Board Sewage Treatment System
- 21.06.10G Under Water Equipment Carriers

- 21.06.11G Lifting Magnets
- 21.06.12G Antivibration and Antishock Equipment
- 21.06.13G Special Containers for Naval Applications
- 21.06.14G Decks' Equipment
- 21.06.15G Demagnetization Systems

Components and Systems for Vessels

This Group covers the large set of Components and Systems used in the maritime industry to meet high requirements for safety and reliability of a vessel.

Focus is on the components and systems that enable the vessel to navigate in safety and that are common to all vessels, no matter of the operational need of the vessel itself. In fact, components and systems for offshore activities, e.g. lifting systems and deck handling equipment, deck machineries, … are included in Group 21.

Several products would require more complex categorization, reaching a “catalogue”-oriented view. However, the competition among players is homogeneous within each category of supply.

Main rationales behind the Standard Categorization

Propulsion and Positioning Systems

- The functional market segmentation helps to target the exact needs of the Buyers.
- For the purposes of this categorization, “position” is a synonymous of “manoeuvring”.
- Applications can be extremely broad: inland shipping, river and coastal shipping, ferries, yachts, harbour and sea-going tugs, ocean-going vessels, offshore systems, and military applications.
- Azimuth Propellers are not differentiated based on the type of transmission: Mechanical (L-drive and Z-drive) and Azipod (Electrical L-drive transmission).
- Tunnel Thrusters are Tunnel thrusters built into the bow, below the waterline. Most tunnel thrusters are driven by electric motors, but some are hydraulically powered.
- Azimuth Thrusters include Fixed Pitch Propellers (FPP) as well as Controllable Pitch Propellers (CPP). Moreover, there is no differentiation between Mechanical transmission (L-drive and Z-drive) and Azipod (Electrical L-drive transmission).
- The cycloidal drive propeller is also known as the Voith Schneider propeller (VSP).
- A waterjet generates propulsive thrust from the reaction created when water is forced in a rearward direction.
- Main market trends:
  - Offshore is moving toward integrated propulsion and positioning "package": some large players are able to offer integrated package of propulsion together with engines and electric motors;
  - Propulsion and positioning for Offshore vessels are converging, increasingly leveraging on thrusters;
  - Clear trend in propulsion toward the azimuth solution with reduction of in-line propulsion;
  - Positioning trend toward retractable thrusters especially for pipe and cable laying.

Stabilization

- Ship stabilizers are fins or rotors mounted beneath the waterline and emerging laterally from the hull to reduce a ship's roll due to wind or waves.
- Active fins are controlled by a gyroscopic control system.

Bridge Systems

- The categorization of Dynamic Positioning Systems (DPS) is based on IMO (International Maritime Organization) publication 645 and are described as Class 1, Class 2 and Class 3.
  - Equipment Class 1 has no redundancy. Loss of position may occur in the event of a single fault
  - Equipment Class 2 has redundancy so that no single fault in an active system will cause the system to fail. Loss of position should not occur from a single fault of an active component or system such as generators, thruster, switchboards, remote controlled valves etc. But may occur after failure of a static component such as cables, pipes, manual valves etc.
  - Equipment Class 3 which also has to withstand fire or flood in any one compartment without the system failing. Loss of position should not occur from any single failure including a completely burnt fire sub division or flooded watertight compartment
- Navigation System is a broad Category that includes: Radars, GPS, Navcom Eqm Installer, Auto Pilot, BNWAS, Gyro System, Speed Log, Loading Computer, Central Clock, Automatic Identification Systems, Voyage Data Recorder, Sound Reception System, Radio Plant, VHF Station, Telephone / Intercommunication, CCTV, Navigation Light Controller, Meteorological Systems,...
- Navigation Systems do not includes Subsea Acoustic Positioning systems such as Sonars echo sounders(mapped in Group 23)
- Vessel Central UPS is mapped in Group 13.

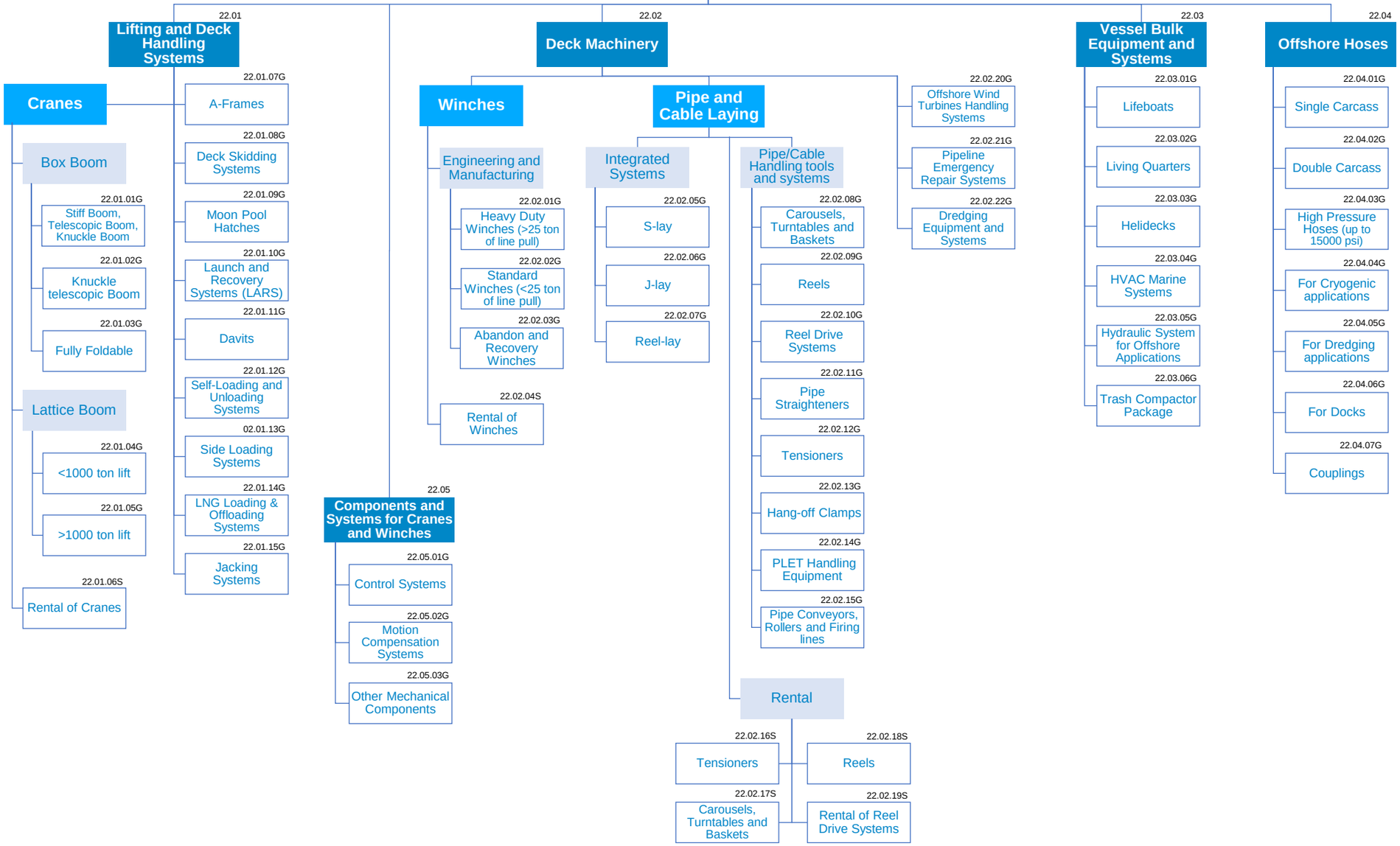
Mooring/ Anchoring and Buoying

- General Surface support Buoys are extensively used in single point mooring (SPM) system and this category covers the three main types: cylindrical, chain-through and pick-up.
- Mooring Buoys includes Catenary Anchor Leg Mooring (CALM) used in both shallow and deep waters, and Single Anchor Leg Mooring (SALM) use in shallow waters only.
- Navigational Buoys are the "traffic signals" that guide boat operators safely along some waterways. They also identify dangerous or controlled areas and give directions to a specific location. While Intelligent Data Buoys are devices that provide to the operator information such as wave direction, surface current or water temperature.
- Turret Mooring Systems for FPSO are becoming even more complex systems with a tendency for being internal and submerged.
- Mooring winches are devices used during mooring operations to hold a boat in place at a pier or similar fixture. It necessary to specify that the formers are just a part of Anchor mooring systems. They may operate in a number of ways (e.g. in a Wire Spooling systems) and are fixed in place on the deck of a ship in key positions.
- A windlass is a complex device meant for the same purpose as that of capstan, but comprised of different parts, which together make the anchorage process smoother and easier.
- A capstan differs from a windlass only in the matter of the axis on which the rope or cable is wound (for a capstan it’s vertical axis, whereas for a windlass it’s horizontal)
- Fenders’ category includes all main types of fenders: floating foam fenders and donut fenders, multi-purpose fenders – for dockside or vessel-side installation, vessel fendering systems, fixed fendering systems.
- In general, "wire rope" refers to diameter larger than 3/8 inch (9.52 mm). Sizes smaller than this are designated cable or cords. The wire, for rope, is made from several materials such as steel, iron, and/or stainless steel. High Carbon steel is the most widely used material.
- Other Mooring Equipment and Systems includes, but not limited to, Recovery equipment, deviation systems and Automatic Mooring systems.

Hull Protection

- Impressed Current Cathodic Protection (ICCP) Systems usually consist of anodes connected to a DC power source, often a transformer-rectifier connected to AC power. It includes tubular and solid rod shapes or continuous ribbons of various materials (e.g. high silicon cast iron, graphite, mixed metal oxide, platinum and niobium coated wire, …).
- The Marine Growth Prevention System (MGPS) is also known as Impressed Current Anti Fouling (ICAF).

22 Components and Systems for Offshore Activities



Components and Systems for Offshore Activities

This Group of Categories identifies the mission specific and ancillary components and systems required for offshore operations with vessels. In fact, the components and systems that enable the vessel to navigate in safety and that are common to all vessels, no matter of the operational need of the vessel itself, and are mapped in Group 21.

Mission specific equipment and systems are utilised by various aspects of the Subsea sector including Oil & Gas, Exploration & Production, Subsea Minerals, Submarine Fibre Optic Communication, Power Cable installation and Renewable Energy project.

The Systems are developed according to the competences of a System Integrator that design the solution and procured the required components.

Main rationales behind the Standard Categorization

Lifting Systems and Deck Handling equipment

- "Offshore Cranes" refer to all types of Cranes, excluding A-Frames
  - Offshore Cranes are typically tailor made designed according to the customer requirements, in order to prevent all the risks that an offshore handling equipment could meet;
  - Typical application of Offshore Cranes are: DSV vessels, Subsea construction and maintenance vessels, PSV, AHT and AHTS vessels, Drill ships, FPSO/FSO, Research vessels, Seismic vessels;
- This Family does not include Truck Mounted Specialized Material Handling Cranes.
- Rental of cranes refers to small / medium foldable cranes, easily installed on vessels' decks. Therefore, the rental of port / shipyard cranes for on-pier assembly operations of offshore constructions is excluded.
- All types of Side loading system are covered in the related category: conveyor system, side mover, side swinger.
- Jacking Systems include Single acting hydraulic jacking systems as well as Continuous hydraulic jacking systems.

Deck Machineries

- Winches can be used for different application: load lifting, Umbilical/Subsea/Heavy lift, abandonment and recovery and general purpose.
- Winches are not detailed by type of driver: hydraulic, electric, electro-hydraulic.
- Rental of winches refers to hydraulic, electric or pneumatic driven devices.
- Capstans are a Category of the Group 21.
- Integrated Systems for Pipe and Cable Laying are delivered by Systems Integrators that can leverage on the combination of engineering and Project Management competences.
- Trend of increase in integration of the pipe/cable laying systems with the vessel, also through automation of working processes and integration of automation systems.
- Tensioners refers to systems for pipe, umbilical, cable and optic fiber.
- In terms of pipe-laying methods:
  - The S-Lay derives name from "S" curvature of pipe under the water and are typically used in shallow waters (<6,500 feet);
  - The J-Lay derives name from "J" curvature of pipe under the water and is typically used in deeper waters than S-lay vessels;
  - The Reel-lay derives name from on-board ability to reel pipe (like a fishing line); Reels can unwind horizontally or vertically: Horizontal reels lay pipe in S-Lay configuration, Vertical reels lay pipe in J-lay configuration.
- Carousels are used for storage during transportation and installation of flexible pipe, umbilicals, risers and other products for offshore applications.

Vessel Bulk Equipment and Systems

- Lifeboats is a generic category for all types of lifeboats ranging from Free Fall Lifeboats, totally enclosed Lifeboats, Rescue Boats, Hyperbaric Lifeboats and Offshore Capsules.

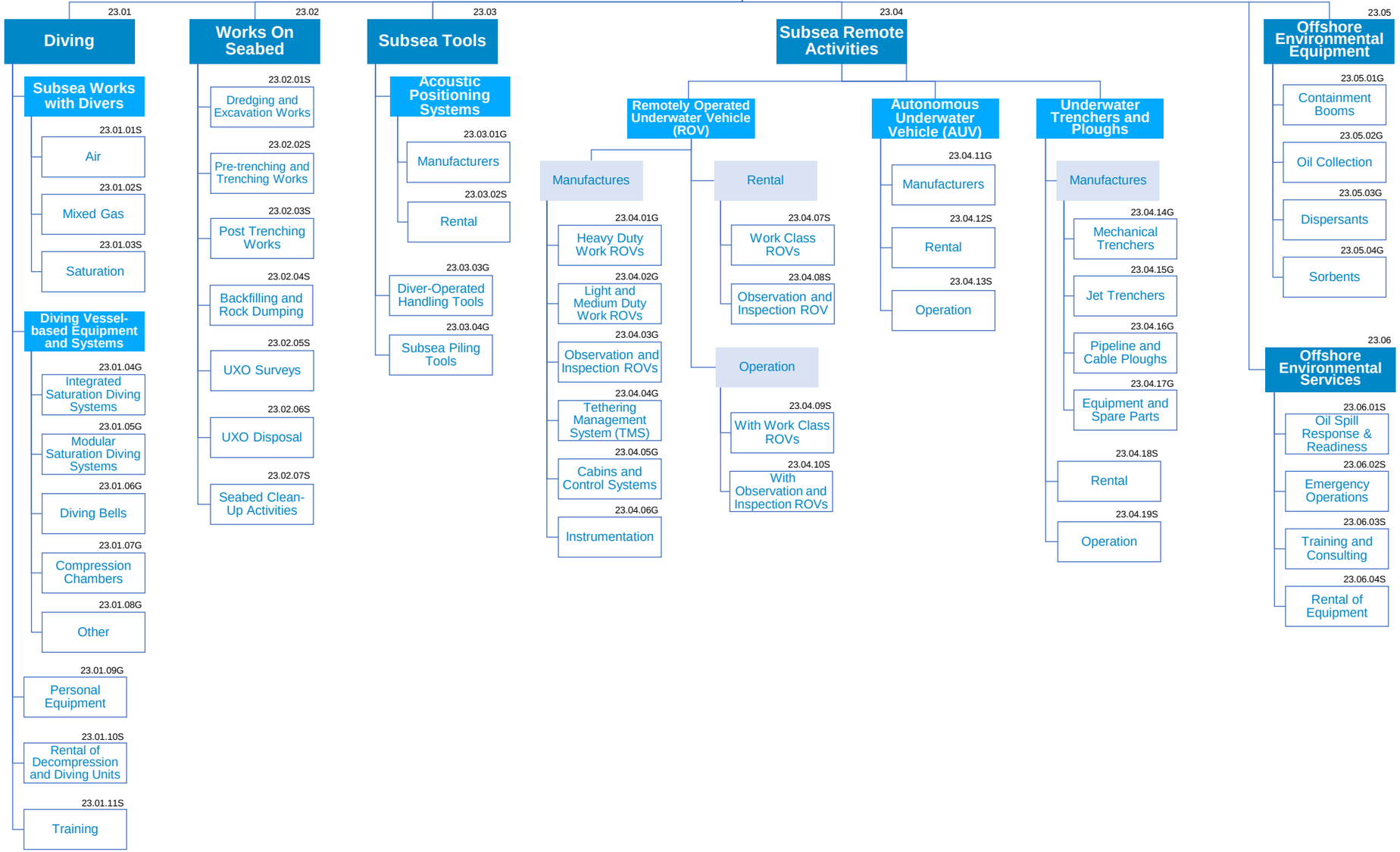
Offshore Hoses

- Double Carcass hoses have a primary carcass surrounded by a secondary carcass – in essence a hose within a hose.
- Cryogenic hoses refer to Hoses for offshore LNG transfer.

Components and systems for Cranes and Winches

- This family refers to the principal components and systems that can be delivered integrated in the main drive systems as well as an add-on to an existing systems.
- Mechanical components refer to the principal items used to design a crane, winch or A-Frame (e.g., Gearboxes, bearings, brakes).
- Heave compensation systems can vary from Active to Passive. AHC differs from PHC by having a control system that actively tries to compensate for any movement at a specific point, using power to gain accuracy. This category includes also constant tensions (CT).

23 Marine and Diving Equipment and Services



Marine and Diving Equipment and Services

Equipment and Services for Marine and Diving operations are critical goods and services that support activities performed offshore, at different water depths and environments.

Reliability and operability of the equipment and service in critical conditions is key for the ability to deliver goods and services in this Group of Categories.

The activity is generally moving toward deeper and harsher waters. However, shallow waters still playing a major part in the market. Unmanned and remotely operated vehicles are increasingly preferred - also for HSE reason - to diving activities and there is an increasing number of subsea sensors and robotics to improve efficiency and allow for preventive maintenance.

Main rationales behind the Standard Categorization

Diving

- The Subsea Works with Divers include Air, Mixed Gas, and Saturation diving services. Those professionals can be leveraged for several subsea activities, Offshore, Inshore (Inland / Onshore) and Hazmat with no differentiation for the purpose of this categorization:
  - Inspection, Repair & Maintenance (IRM) of existing field infrastructures, including extensive NDT campaigns, interventions for pipeline repairs (including hot-tapping and spool tie-ins), wellhead intervention, appurtenances replacement such as boat fenders, chains & hoses change out at SPMs/FPSOs;
  - Installation activities (tie-ins, risers, hoses and installation services on platform, pipelines, SPMs and loading terminals);
  - Pipeline and dropped object protection;
  - Pre-commissioning activities: pigging and pressure test operations;
  - In-water Survey of Ships and Mobile Offshore Units;
  - Offshore decommissioning such as platform removal, subsea well abandonment, pipeline and umbilical deburial and recovery, subsea structure recovery, subsea protection mattress recovery.
- In terms of water depth, Air Diving is typically performed in Shallow Waters (from 0 to 50 msw Meters Sea Waters or 160 fsw – Feet Sea Waters), while Mixed Gas and Saturation Diving in Deep waters (above 50 msw)
- Saturation diving is a diving technique that allows divers to reduce the risk of decompression sickness by operating in a pressurized environment.
- Integrated saturation diving systems are typically built according to the specifications of the Ship on which they will be placed.
- Modular Saturation Diving Systems, are designed to be deck-deployed on existing work vessels and can be quickly removed and re-installed on other vessels.
- Others Diving Vessel-based Equipment include: Cylinders and Gas Banks, Dive Panels, Launch and Recovery, Divers Heaters,
- Personal Equipment for Diving include: Helmets, Masks and Scuba, Diving Suits & Accessories, Communications, Lighting, Gauges, Camera & TV Systems, …

Works On Seabed

- The Works on Seabed incorporates all activities done on the seafloor, from pre-trenching, dredging to post trenching services including backfilling and rock dumping activities.
- UXO Surveys refers to the exploration and scanning services related to securing the seabed from any Unexploded Ordnance
- Seabed Clean-Up Activities refers to activities related to the disposal or management of any debris on the seabed

Subsea Tools

- Underwater Acoustic Positioning Systems (e.g. Sonar Transponders) are commonly used in a wide variety of underwater work, including oil and gas exploration, ocean sciences, salvage operations, marine archaeology, and military activities. These systems are used for the tracking and navigation of Vehicles (e.g. ROV) or divers by means of acoustic distance and/or directional measurements, and subsequent position triangulation.
- Diver-operated Handling tools are devices designed to facilitate and allow the operator to work underwater. This category includes devices suitable for tasks such as: cutting and welding, securing/anchoring , enlarging, cleaning, dragging.
- Subsea Piling Tools refers to the technologies used to (remotely) install conductors and drive piles. It refers to Stabframes (which keep Hammers in position while operating on the seabed), Internal Lifting Tools (used for the safe lifting and upending of tubular piles for insertion into the seabed) and Hydraulic Underwater Hammers.

Subsea Remote Activities

- ROVs are unoccupied, highly manoeuvrable, and operated by a crew aboard a vessel. They are used for offshore Oil&Gas, Defence and marine geoscience. ROV are segmented according to work capability at seabed:
  - Heavy Duty Work ROVs have the ability to carry at least two manipulators. They have a working depth up to 3500 m.
  - Light and Medium Duty Work ROVs are typically powered by an engine with less than 50 HP. Their chassis may be made from polymers such as polyethylene rather than the conventional stainless steel or aluminum alloys. They typically have a maximum working depth of less than 2000 m.
  - Observation Class is used primarily for deep ocean research,, search and salvage missions. This category includes, but is not limited to, Micro, Mini and Ultra deep ROVs
  - Tethering Management systems are used for stores and deploy the ROV tether cable so that the ROV is decoupled from motion of the surface vessel and is able to operate at a larger radius.
  - The category 23.04.06G (instrumentation) includes any kind of additional tool (for working and survey purposes) used to increase the capabilities of Subsea Robots.
- An autonomous underwater vehicle (AUV) is unmanned vehicle which travels underwater without requiring input from an operator.
- Operations with Trenchers and Ploughs include any Seabed preparation works, required before installation of subsea equipment and systems. This includes the levelling of the seabed prior to laying of cables and line pipes or for seabed clean-up campaigns.

Offshore Environmental Equipment

- This family refers to the most common equipment needed in order to prevent offshore incidents that release oil or hazardous substances into the environment and limit the amount released during those incidents, making the recovery easier.

Offshore Environmental Services

- Oil Spill Response & Readiness consists in keeping boats and crew available and ready for any environmental accidents, according to a schedule previously determined, in a preventive way.
- Emergency Services are unscheduled service, providing response to oil or any other residue spills in the open sea.
- Trainings refer to the performance of theoretical and practical trainings about how to prevent and how to react to an environmental accident on the coast or on the sea. While Consulting includes the environmental impact assessment and evaluation of the Equipment and skills.
- The rental refers to the rental and maintenance of environmental protection equipment for sea.

24 Marine Contracting and Installation

24.01 Chartering for Offshore activities

Transportation Barge / Vessel

Dry Towage Transportation
- 24.01.01S By Self-Propelled Semi-Submergible Vessel
- 24.01.02S By Towed Semi-Submergible Vessel

Wet Towage Transportation

By Convoy (Tug + Barge)
- 24.01.03S Above 350 ft
- 24.01.04S Up to 350 ft

By Barge
- 24.01.05S Above 350 ft
- 24.01.06S Up to 350 ft

Work Barge / Vessel
- 24.01.07S Self-Elevating Barge
- 24.01.08S Crane Barge
- 24.01.09S Launching Barge
- 24.01.10S Heavy-lift vessel
- 24.01.11S Pipe Laying Support Vessel (PLSV)
- 24.01.12S Cable layer vessel
- 24.01.13S Multi-Purpose Supply Vessel
- 24.01.14S Seismic Research Vessel
- 24.01.15S Diving Support Vessel (DSV)
- 24.01.16S Well Stimulation Vessel (WSV)
- 24.01.17S Accommodation Barge/Vessel

Offshore Support Vessels (OSV)

AHT and AHTS
- 24.01.18S Over 18001 BHP
- 24.01.19S With 15001 - 18000 BHP
- 24.01.20S With 12001 - 15000 BHP
- 24.01.21S With 10001 - 12000 BHP
- 24.01.22S With 7001 – 10000 BHP
- 24.01.23S Up to 7000 BHP

PSV (Platform Supply Vessel)
- 24.01.24S Over 4500 tons
- 24.01.25S 3001 to 4500 tons
- 24.01.26S 1501 to 3000 tons
- 24.01.27S Up to 1500 tons

- 24.01.28S ROV Support Vessel
- 24.01.29S Oil Spill Response Vessel (OSRV)
- 24.01.30S Ocean Going Tug
- 24.01.31S Fast Boat
- 24.01.32S Crew Boat

Helicopters for Offshore activities
- 24.01.33S Light Helicopters
- 24.01.34S Medium Helicopters
- 24.01.35S Heavy Helicopters

24.02 Offshore Installation

Fixed Offshore Structures
- 24.02.01S Platforms
- 24.02.02S Pipes and Cables
- 24.02.03S Subsea Umbilical, Risers, Flowlines (SURF)
- 24.02.04S HSE Systems & Antipollution Equipment
- 24.02.05S Offshore Wind Farms
- 24.02.06S Tidal/Wave installations

Floating Offshore Structures
- 24.02.07S Single Point Mooring Buoys (SPM)
- 24.02.08S FPSOs

- 24.02.09S Hook Up

24.03 Offshore Logistics
- 24.03.01S Storage
- 24.03.02S Heavy Lift Stevedoring
- 24.03.03S Ro-Ro shipping (Roll-on/Roll -off)
- 24.03.05S Towing
- 24.03.06S Bunkering
- 24.03.04S Offshore Hazardous Waste Management

24.04.01S Offshore Inspection, Repair and Maintenance (IRM) Services

24.05.01S Offshore Decommissioning and Removal

24.06 Offshore Support Structures
- 24.06.01G Floating Cylinders and Wharves
- 24.06.02G Steelwork to Protect Subsea Structures
- 24.06.03G Protective Mattresses for Sealines

24.07 Maritime Technical Services
- 24.07.01G Marine Warranty Survey (MWS) Services
- 24.07.02G Maritime Inspection Services
- 24.07.03G Maritime Classification and Certification Services
- 24.07.04G Maritime Consulting Services
- 24.07.05G Flag State and Coastal State Services
- 24.07.06S Admiralty / Maritime Attorney Services

Marine Contracting and Installation

Offshore Installation services and Marine Contracting are complex services delivered through ad-hoc assets (vessels, barges, helicopters, …), mainly for the Oil&Gas, Renewables and Telecommunication industry. They can be spot services, as well as multi-year contracts.

Some of the vessels deployed for this services require specific equipment to the offshore functionality (e.g. pipe-laying systems, diving systems, …): such equipment are mapped in other Group (e.g. 21 and 22)

Main rationales behind the Standard Categorization

Chartering for Offshore activities

- Anchor Handling Towing Supply Vessel (AHTS) are highly versatile large, powerful Anchor Handling Towing Supply vessels, capable of all types of towing and anchor handling activities. AHTS are able to position and moor drilling rigs under challenging conditions. They also provide general offshore support service, drilling rig support functions and cargo transport.
- Platform Supply Vessels (PSV) carry a wide variety of cargoes, namely: fuel, drilling fluids, cement or mud (stored in tanks beneath the deck). Decks transport materials such as casing, drill pipe & tubing.
- Some of the Work Barge / Vessel are frequently associated with the broad family of Construction Support Vessels (CSV).
- Regarding Helicopters for Offshore activities, they are generally divided according to their max gross weight. However, not official reference on classification exist. Another possible definition is according to the number of passenger seats:
  - Light, up to 6000 lbs, less than 9 passenger seats;
  - Medium, 3500 to 12500 lbs, 10-18 passenger seats;
  - Heavy, above 12500, 19 or more passenger seats.

Offshore Installation

- Offshore construction is the installation of structures and facilities in a marine environment, usually for the production and transmission of electricity, oil, gas and other resources.

Offshore Logistics

- Offshore support terminals are the intermediaries between platforms and suppliers for oil companies.
  - Beside the transportation of goods and people, provides storage services, anchorage, residues treatment, answer to emergencies, …
  - The main components of an offshore support terminal are the pier and cranes, silos, and storage space
- The Offshore Hook-Up is the activity of connecting the various modules together, including piping, electrical cables, structures, …

Offshore Inspection, Repair and Maintenance (IRM) Services

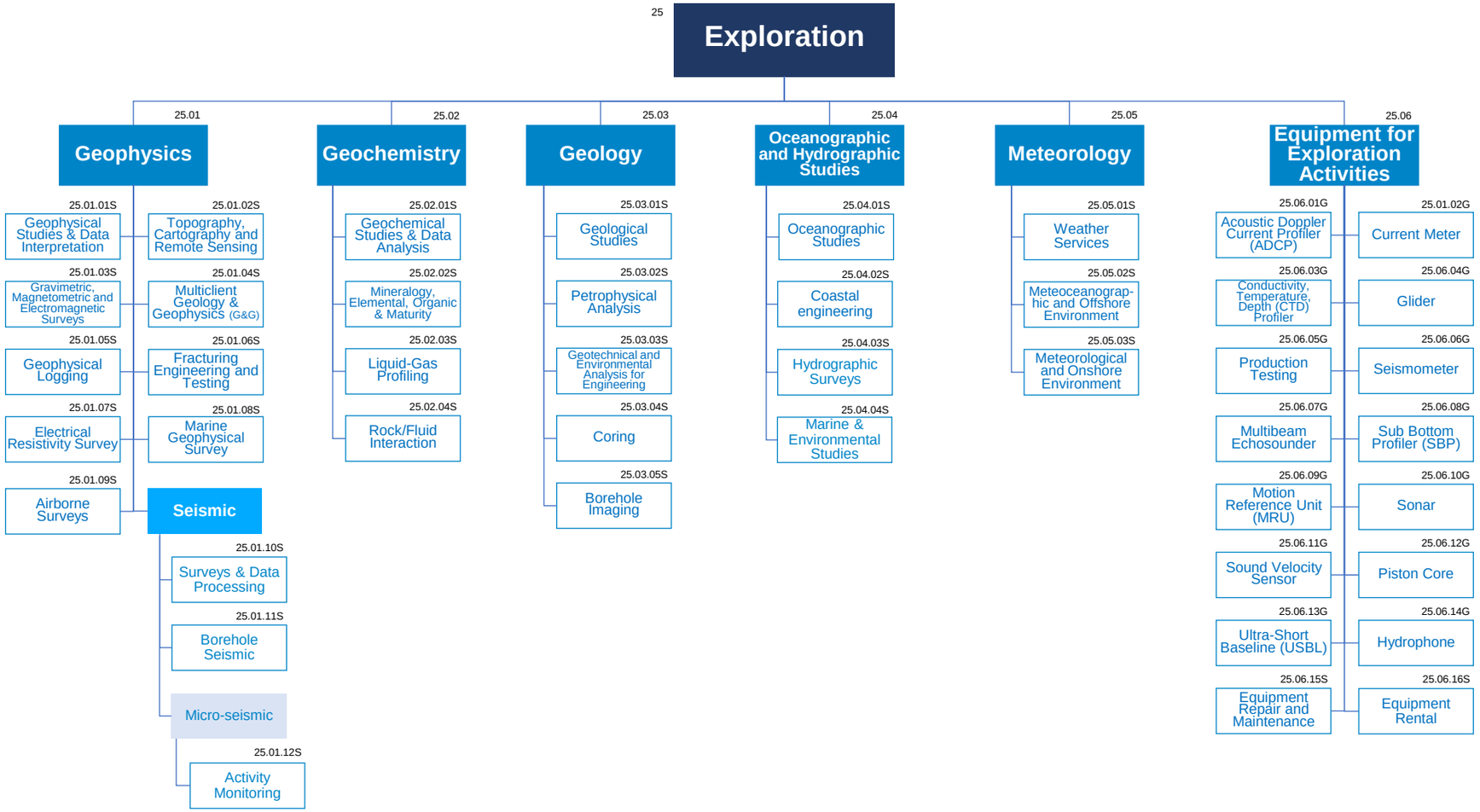
- Comprehensive subsea inspection services for pipelines, risers, platforms, hulls and moorings leverage on vessels and on ROVs together with experienced teams of surveyors, inspection engineers supported by specialised software tools.

Offshore Decommissioning and Removal

- It embraces a large set of activities: seek approval services, clean services, treat/ store hazardous waste, remove offshore (lift), dispose onshore, site clearance, monitor residual liabilities.
- To be detailed in the next revisions.

Offshore Support Structures

- Offshore Support Structures that require more complex EPCI works (e.g. tripods for offshore wind farms, …) are mapped in the Engineering, Procurement and Construction Group.



Exploration

This Group covers activities and materials used for Exploration and Reservoir Management to assess key characteristics of a field as well as to efficiently manage it.

The first families refer to the exploration and development phases, while Reservoir Management covers the most relevant activities during the production phase.

The “Equipment for Exploration” family is meant to capture the most critical and strategic equipment needed notwithstanding the exploration method.

Main rationales behind the Standard Categorization

Geophysics

- This family encompasses all activities related to field appraisal in the exploration and development phases. These activities are mostly carried out by contractors.
- “Geophysical Studies” principally refers to acquisition and processing of seismic data including marine and airborne surveys (e.g. Processing data to generate interpreted images of the subsurface).
- Supervision of Geophysical activity is included under “Geophysical Studies and Data Interpretation”.
- “Fracturing engineering” can be found under Group 26 “Reservoir management” .
- Seismic explorations are most often used and entail the collaboration of specialized professionals. They include all activities to collect information on composition, fluids, extension and geometry of the underground layers of rock. 2D, 3D, and the more complex 4D techniques are all considered under the seismic category.

Geochemistry

- This family encompasses all exploration studies that entail the use of tools and principles of chemistry to explain geological phenomena. In particular we refer here to exploration geochemistry that includes applications to environmental, hydrological and mineral exploration studies.
- Data gathering, processing and analysis are included in the “Geochemical studies and Data analysis” category.
- “Mineralogy, Elemental, Organic and Maturity studies” refers to the chemical, crystal, and elemental characteristics of a specific area.
- “Rock/Fluid Interaction” refers to the studies and surveys performed to gather a complete picture of the rocks and fluids interactions impact while drilling.

Geology

- This family represents all activities of systematic investigation of the geology beneath a given piece of ground for the purpose of creating a geological map or model for a reservoir or other site.
- “Geological Studies” include traditional walk-over survey, studying outcrops and landforms, and intrusive methods (such as hand augering and machine-driven boreholes).
- “Petrophysical Analysis” refers to the physical and chemical studies of underground soil or rocks.
- “Geotechnical and Environmental Analysis for Engineering” refers to studies concerned with the chemical and physical behavioral of materials.
- “Coring” Services refers to coring services performed for data studying and interpretation.
- “Borehole Imaging” refers to the logging and data processing services for exploration of soil characteristics.
- Diving Services for exploration are not included in this group and can be found under Group 23 “Marine and Diving Equipment and Services”.

Oceanographic and Hydrogeological Studies

- This family includes all studies related to the physical and biological aspects of the ocean and of the seabed during the exploration phase.
- This family also incorporates “Coastal engineering” services performed for data gathering and exploration of the ocean’s characteristics.

Meteorology

- This family includes all weather and ocean forecasts that are essential to making informed decisions about day to day operations, shipping and aircraft movements, and construction or maintenance work.
- The family includes categories for Meteoceanographic and Meteorological for onshore and offshore environmental impacts.

Equipment for Exploration Activities

- This family includes all critical equipment employed in exploration activities.
- AUVs are not included in this family and are instead listed under “Subsea Remote Activities” (23.03).
- Software systems are classified under IT Software (41.03).
- Some equipment such as anemograph and fluoroscope are not included due to their low level of criticality.
- It also includes services of “Repair and Maintenance and Rental of Exploration equipment”

26

Reservoir Management

26.01 Reservoir Consulting

- 26.01.01S Reservoir Engineering
- 26.01.02S Simulation and Modelling
- 26.01.03S Interpretation Services
- 26.01.04S Reservoir Laboratory Services
- 26.01.05S Oil Production Optimizations

Well Assurance

- 26.01.06S Cement Evaluation
- 26.01.07S Well Integrity
- 26.01.08S Well Production flow Analysis and Diagnosis

Well Control Engineering

- 26.01.09S Well Design
- 26.01.10S Well Management
- 26.01.11S Pressure Control while Maintenance
- 26.01.12S Emergency Response Services
- 26.01.13S Well Audits & Planning
- 26.01.14S Mature Field Management

26.02 Sand Control

- 26.02.01S Reservoir Conductivity and Connectivity
- 26.02.02S Reservoir Enhancement
- 26.02.03S Gravel Packs
- 26.02.04S Chemical/Fluid Systems
- 26.02.05S Screens
- 26.02.06S Multizone Sand Control Systems
- 26.02.07S Other Sand Control Techniques

26.03 Remote Operations Services

- 26.03.01S Remote Visualization and Advisory Services
- 26.03.02S Information Management Services
- 26.03.03S Managed Customer Solutions
- 26.03.04S Field Communication Services

26.04 Geoscience Services

- 26.04.01S Surface / Downhole Sampling
- 26.04.02S Wellsite Fluid Analysis
- 26.04.03S Fluid and Rock Laboratory Services
- 26.04.04S Reservoir Monitoring

26.05 Artificial Lift

- 26.05.01G Electrical Submersible Pumps (ESP)
- 26.05.02G Sucker Rod Pumps
- 26.05.03G Progressive Cavity Pumps (PCP)
- 26.05.04G Gas Lift
- 26.05.05G Plunger Lift
- 26.05.06G Hydraulic Pump

26.06 Stimulation

- 26.06.01S Vessels
- 26.06.02S Fracturing
- 26.06.03S Lateral Jetting
- 26.06.04S Acidizing / Near Wellbore Cleaning
- 26.06.05S Sand Control
- 26.06.06S Nitrogen and Nitrogen Foam

Reservoir Management

This category groups includes all services used during the operations of production, decay and abandonment of a reservoir, annexed activities as well as equipment rental or selling.

Products and services related to previous stages than production can be found in groups 25 (Exploration), 27(Drilling Equipment) 28(Drilling Services) and 29 (Well Completion).

Main rationales behind the Standard Categorization

Reservoir Consulting

- Refers to the group of services that monitor and analyse the reservoir during its life.
- “Reservoir Engineering” Includes activities such as completions and production engineering.
- Well Assurance details the support services during drilling such as “Cement Evaluation”, “Well Integrity” and “Well Production and flow Analysis”.
- “Well production analysis and Diagnosis” Includes well control assessment activity.
- Well Control Engineering includes related activities from design to the emergency response during drilling.

Geoscience Services

- Refers to the services that analyse the reservoir conditions during its productive life.
- “Surface / Downhole Sampling” refers to sampling services to capture reservoir fluid samples at reservoir conditions. This category includes all surface and downhole sampling techniques (SCAR, openhole MDT, Gas Sample Bottle…).
- Fluid and Rock Laboratory Services refers to the studies of the well’s rocks and fluids performed in a laboratory
- Reservoir Monitoring refers to the collection and data management of the reservoir during production.

Sand Control

- During the production phase and according to the characteristics of the reservoir, it is possible to find precipitates that can cause problems to the extraction pipes and equipment, these sands and waxes must be controlled though the categories in this family.
- “Chemical/Fluid Systems” includes Acid Systems, Chemical Fluid Loss Control, Filter Cake Breaker, and Formation / Proppant Stabilization.
- “Gravel Pack refers to the services of performing the control while monitoring the conditions at the well.
- “Other Sand Control Techniques” include Water Packs, Slurry Packs and Resin injection.

Artificial Lift

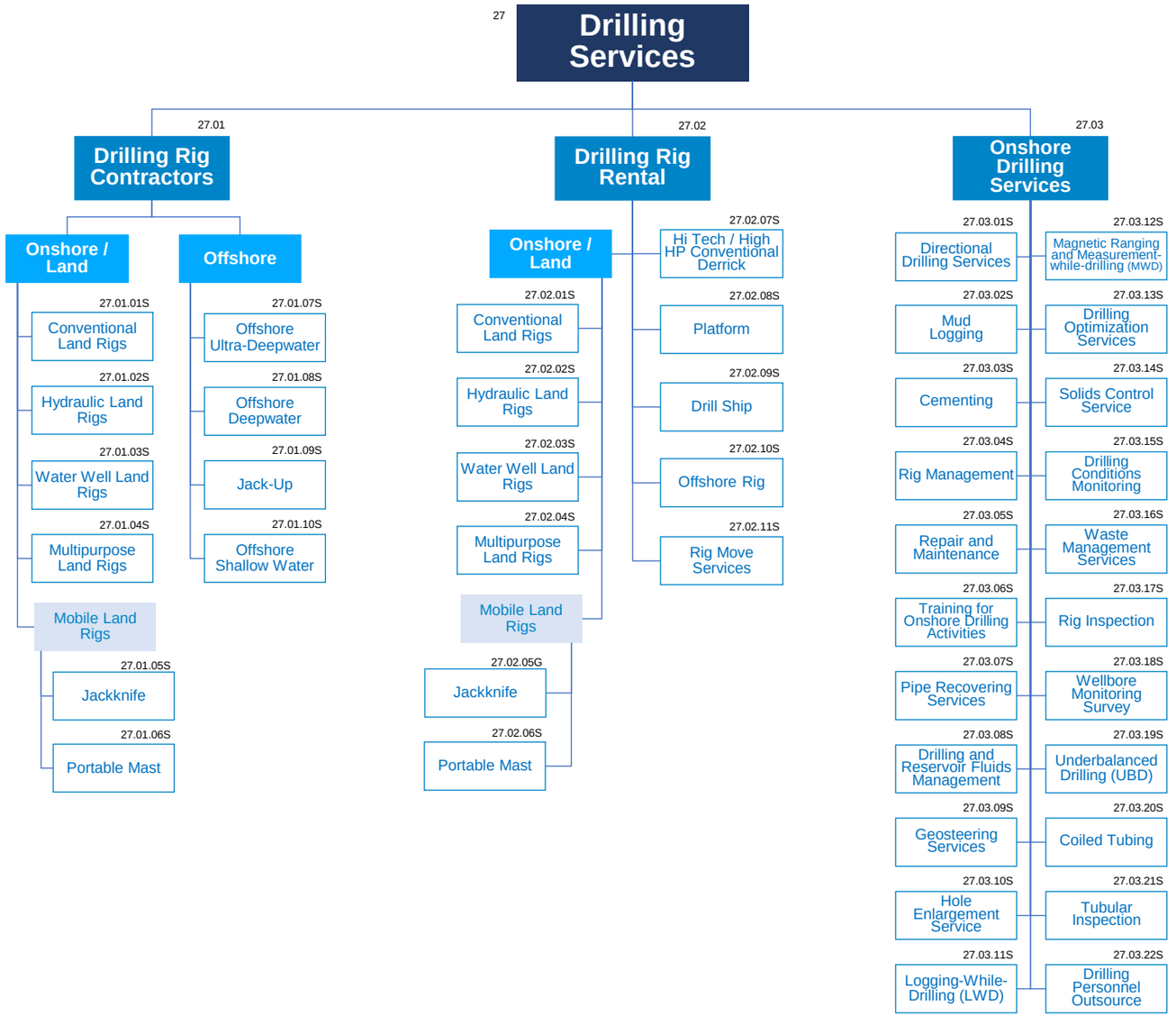
- Refers to the goods provided to when it is needed additional pressure to extract fluids from a reservoir.
- “Electrical Submersible Pumps”, “Sucker Rod Pumps” and “Progressive Cavity Pumps” and “Hydraulic Pumps” are separated form the Group 08 “Pumps” due to the specificity of this pumps for increasing flow of liquids from a production well
- “Gas Lift” and “Plunger Lift” are also added to this category in addition to the other pumping options

Remote Operations Services

- The services typically provided by the “Artificial lift” Suppliers to monitor and control online the features of the device in the bottom of the well.
- This family covers all related services needed to execute operations remotely to reduce the security concerns of the personnel and to gather a better understanding of the well activity including “Field Communication Services”

Stimulation

- Refers to the activities performed to improve the fluid production rate of a well / reservoir.
- The listed categories are the most common and performed activities for Stimulation.
- “Sand Control” is included and refers to the execution of the stimulation activity.
- Lateral Jetting refers to the stimulation using water control systems or techniques.
- “Fracturing” in this family refers to the Stimulation service and not to the engineering service for Exploration activities
- Acidizing or acidification refers to the injection of acid blends and techniques for well stimulation.



Drilling Services

This category group encompasses services related to drilling activities. These span from complete drilling contracting to more specific services and rental of rig systems.

Main rationales behind the Standard Categorization

Drilling Rig Contractors

- This family includes all complete drilling services provided by specialized contractors for both onshore and offshore locations.
- “Conventional Land Rigs” cannot be moved as a whole unit and are typically used in the petroleum industry.
- “Mobile Land Rigs” are drilling systems that are mounted on wheeled trucks and can be classified in “Jackknife” and “Portable Mast” according to the mast structure.
- “Hydraulic Land Rigs” refers to drilling systems with special hydraulic features such as self-erecting telescopic mast made from a single powerful hydraulic cylinder and the built-in integrated hydraulic top drive, This category includes also more advanced generations of fully automated drilling rigs (e.g. Advanced Hydraulic Electrical Automated Driller).

Drilling Rig Rental

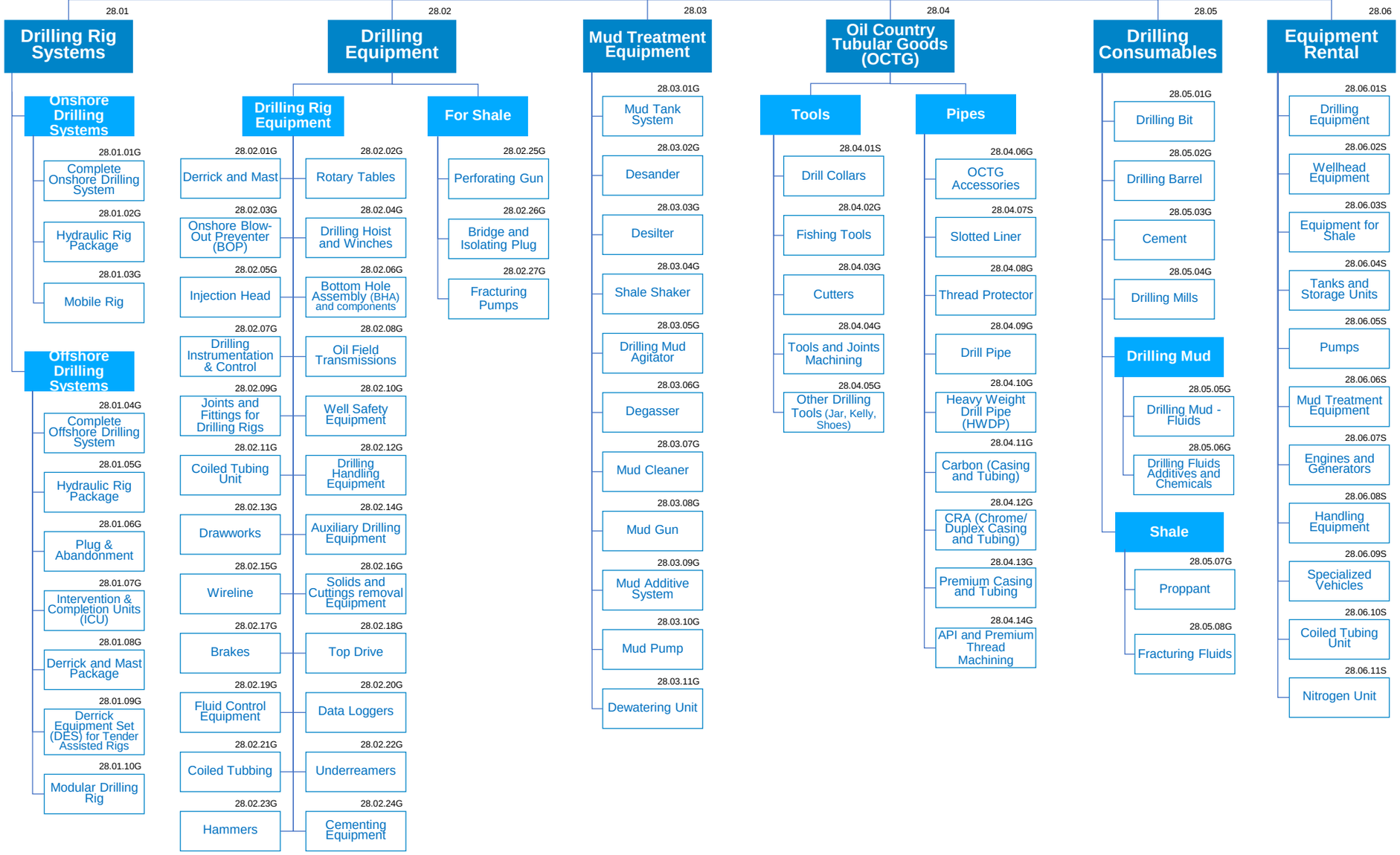
- This family includes rental expenses of complete rig systems. Such practice is reportedly more common for onshore as offshore usually require more specific skills and expertise to install and operate the equipment.
- “Multipurpose Land Rigs” can be used across a wide range of water well, mineral, geotechnical and GHP drilling projects. This category does not include rigs specifically designed only for Water Well drilling already listed as “Water Well Land Rigs” (27.01.03S).
- “Hi Tech / High HP Conventional Derrick” refers to the conventional Derrick operating under a high pressure or incorporates high technical systems.
- “DrillShip” is a vessel designed for use in exploratory offshore drilling of new oil and gas wells or for scientific drilling purposes.

Onshore Drilling Services

- This family includes all support services for drilling activities for onshore.
- “Directional Drilling Services” refers to professional manpower and technologies to provide the trajectory control needed to drill the well correctly, the high-quality hole required to successfully run and cement casing, and the precise well placement to optimize production and maximize recovery. This category includes also MDW/LDW-motor rentals.
- “Cementing” includes both primary (fluid movement restricting & casing bonding) and remedial cementing (squeeze & plug cementing)
- “Pipe Recovering Services” Includes recover by both “Fishing” or by “Cutting techniques” when a tool or pipe stick inside the hole.
- “Fracturing” Service can be found in Group 26 (Reservoir Management) in the “Stimulation” Family
- “Repair and Maintenance” includes the service of refurbishing of drills
- “Rig Management” Also takes into account the operation services of a rig
- “Mud Logging” Includes Drilling Mud Engineering and Services.
- “Drilling Personnel Outsource” refers to the rental of manpower to perform the drilling operations.

Drilling Equipment and Materials

BACK TO GROUPS



Drilling Equipment and Materials

This category groups includes all equipment and materials used in drilling operations and annexed activities as well as equipment rental.

Pumps, generators and engines employed for drilling activities are not listed under this category but are instead categorized respectively under “Pumps” (08) and “Engines, Motors, Generators and Drives” (14).

Main rationales behind the Standard Categorization

Drilling Rig Systems

- This family includes systems that support complete drilling activities or more specific operations separated into 2 sub families onshore and offshore (i.e. hydraulic systems).
- It includes the drilling systems used during the contracting or rental services.
- “Mobile Rig” refers to drilling equipment mounted on trucks, tracks or trailers.

Oil Country Tubular Goods (OCTG)

- This family includes seamless rolled products consisting of drill pipe, casing and tubing and its accessories.
- “Other Drilling Tools (Jar, Kelly, Shoes)” includes other drilling tools not categorized separately such as shoes, jars and kellies.
- “OCTG Accessories” Includes fittings and joints specific for drilling activities such as Wash Tools, Bar Stocks, X-Over, Swages, Pump Joints, Drifts, Scrapers, Valves and BOP Ram, Centralizers, Cementing Plug, Float Equipment, all the joints that provide connection to the OCTG components and are inside the hole
- Manifolds are taken into account in the group 29 (Well Completion) being a set more related to completion activities.
- Premium Casing and Tubing: Premium Casing and tubing refers to licensed Threads used by certain manufacturers
- API and Premium Thread Machining: Refers to machining factories which are licensed to machining OCTG Threads
- Drilling Mills: Refers to a smaller type of drilling bits

Equipment Rental

- This family classifies equipment items rented for drilling operations.
- “Handling Equipment” refers to handling systems employed in drilling operations, mainly used to move pipes and similar tubular goods. This category includes: pipe shuttles, cranes, hoists, rackers, etc.
- “Specialized Vehicles” includes support vehicles for drilling activities such as support trucks, service trucks, water supply equipment, etc.
- “Drilling Equipment” and “Wellhead Equipment” do not include specific equipment for shale, which is instead classified as “Equipment for Shale” (28.06.03S)
- “Pumps” Includes all kind of pumps that can be used for drilling purposes; Fracturing, Injection, among others…

Drilling Equipment

- This family includes all materials employed in drilling activities for both onshore and offshore sites.
- “Well Safety Equipment” encompasses all material employed to contrast the occurrence of disrupting events during drilling. This category does not include Blow Out Preventers (20.01.01G & 20.01.02G) nor items listed under “Process Control and Safety / Relief Valves” (05.03).
- “Auxiliary Drilling Equipment” includes electro magnetic brakes for drilling equipment, brakes (hydromatic, drum, and disc), air clutches, cathead, and pulsation dampeners.
- “Land Blow-Out Preventer (BOP)” refers only to the systems used onshore, while offshore BOPs are classified under “Subsea Equipment” (20.01.01G & 20.01.02G).
- “Derrick / Mast” refers only to the supporting structure for drilling and does not include its installed equipment such as hoists, winches, etc.
- “Instrumentation” encompasses several instruments and tools used during drilling activities (e.g. manometers for hydrocarbon pressures). Such items have to be kept separate from other specialized instruments for exploration and reservoir management listed under category group 25.
- “BHA and components” can comprehends, subs such as bit Sub, Z-Over Sub, Floating Sub and lifting Sub, stabilizers, reamers, shocks and hole-openers
- “Drilling Hoist and Winches” refers to winches, mobile hoists, hooks, swivels, sheaves, traveling blocks, Crownblocks, Deadline Anchors and the hoist supports usually installed in the derrick.
- “Drilling Handling Tools” includes tools such Elevators, Slips, Bushings, Tongs, Stabbing Guides, Clamps, Backsavers and Safety Stands
- “Joints and Fittings for Drilling Rigs” includes tools such as Swivel Joints and Hammer Valves, Fittings that do not connect tools inside the hole. “Hammers” are put in a separate category

Notes:

- Engines and generators employed for drilling activities are not included in this category group and are instead listed under “Engines, Motors, Generators and Drives” (14).
- Pumps used for drilling activities (especially for drilling mud and hydrocarbon fluids) are not included in this category group and are instead listed under the comprehensive “Pumps” category group (08).

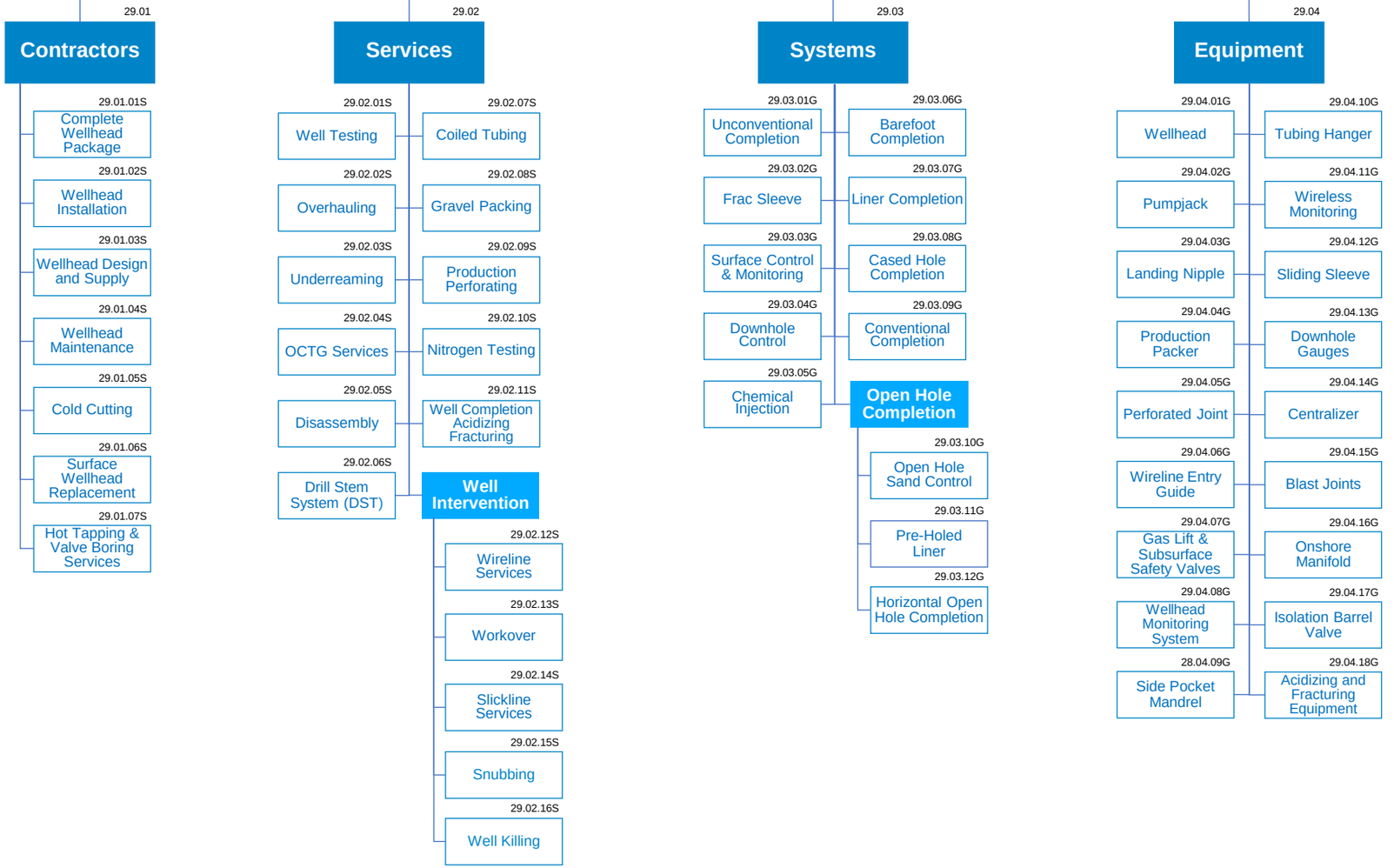
Mud Treatment Equipment

- This family refers to specific material for mud guns, storing, filtering, cleaning as well as joints, fittings, shakers and agitators. Mud pumps and mud injection columns are not considered under this family.
- “Cementing Units” refers to both modular, skid-based cementing units and portable bulk plants.

Drilling Consumables

- This family refers to all those goods that are quickly used and need to be replaced often (e.g. lubricants, drill bits).
- “Drilling Mud – Fluids” includes all drilling mud fluid based such as water base, oil base, and lubricants.
- “Drilling Fluids Additives and Chemicals” Includes chemicals for processes related to drilling activities such as Acids, Production Enhancement, Pipe Lines Fracturing Additives and Drilling Fluids.
- “Fracturing Fluids” includes viscous water-based fluids, non-viscous water-based fluids, gelled oil-based fluids, acid-based fluids, and foam fluids.

29 Well Completion



Well Completion

This family group encompasses all goods and services employed in well completion operations. The group is further divided in four families that range from full well completion contractor services to more specific services and equipment. Well completion services also include here disassembly activities.

Main rationales behind the Standard Categorization

Contractors

- This family includes whole well completion services provided by specialized contractors.
- “Cold Cutting” refers to cutting and bevelling services without the use of flames nor the production of sparks.
- “Hot Tapping & Valve Boring Services” refers to Hot tap performed into valves on wellheads, tubing, and trees. It can be carried out using either electrically, hydraulically, or pneumatically operated machines.

Services

- This family refers to all support services for well completion activities in both onshore and offshore sites. It also includes disassembly services performed for modifications or decommissioning.
- “Production Testing” refers to dynamic production monitoring and productivity sustaining activities. It includes diagnosis and solution of well problems, multiple wells data interpretation, and produced fluids profiling.
- “Remote visualization and advise” can be found in Group 26 (Reservoir Management)
- “Workover” is here intended in its specific acceptation as the process of pulling and replacing a completion involving invasive techniques.
- “Well Testing” Includes Swabbing Activities
- “Coiled Tubing” is part of “Drilling Services” group and is identified a the category code 27.03.21

Systems

- “Conventional Completion" include casing flow, casing and tubing flow:, pumping flow, tubing flow, gas lift well, single-well alternate completions, single-well concentric kill string, single-well 2-tubing completion.
- Goods as perforated Liner or Perforated casing are considered as OCTG as the suppliers with capabilities to supply them are the same as OCTG ones
- “Systems for Unconventional Completion” refers to systems where plays like shale, margins tend to be razor thin.
- “Chemical Injection” refers to the activities performed for well completion systems, not to be confused with “Dosing Systems / Chemical Injection Packages on Skids” “03.10.01G”
- “Systems for Barefoot Completion” refers to systems that has no casing or liner set across the reservoir formation.
- “Systems for Open Hole Completion” sub family includes the three categories of “Open Hole Sand Control”, “Pre-Holed Liner” and “Horizontal Open Hole Completion”

Equipment

- This family includes equipment and components used for well completion.
- “Wellbore Cleaning Tools” are included in the category “OCTG Tools” of the group 28 (Drilling Equipment and Materials)
- “Acidizing and Fracturing Equipment” does not include fracturing pumps that are already in Group 28 “Drilling Equipment and Materials”

30 Engineering Services

30.01 Plant Engineering

Feasibility study, Basic Design, FEED

- 30.01.01S Oil&Gas Upstream Onshore
- 30.01.02S Chemical and Petrochemical
- 30.01.03S Refining
- 30.01.04S Fertilizers (UREA and Ammonia)
- 30.01.05S Oil&Gas Fixed Offshore Structures
- 30.01.06S Oil&Gas Floating structure (FPSO, FPU, TLP, …)
- 30.01.07S Power plant
- 30.01.08S Nuclear plant
- 30.01.09S Desalination plant
- 30.01.10S Water Treatment plant
- 30.01.11S Steel Plant
- 30.01.12S Cement plant
- 30.01.13S Renewables
- 30.01.29S Carbon Capture, Utilization, and Storage (CCUS)

Detailed Plant Design

- 30.01.14S Process
- 30.01.15S Piping
- 30.01.16S Stress Analysis and Piping Support Design
- 30.01.17S Electrical
- 30.01.18S Equipment and Machinery
- 30.01.19S Automation
- 30.01.20S Utilities
- 30.01.21S Multidisciplinary
- 30.01.22S HSE
- 30.01.23S Safety Systems and Fire Fighting
- 30.01.24S Civil
- 30.01.25S Structural (for Offshore)
- 30.01.26S Heating, Ventilating and Air Conditioning (HVAC)
- 30.01.27S Instrumentation
- 30.01.28S Telecommunication

30.02 Onshore Pipeline Engineering

- 30.02.01S Conceptual Design and Feasibility Studies
- 30.02.02S Basic Design and Front End Engineering Design (FEED)
- 30.02.03S Detailed Design
- 30.02.04S Route Design

30.03 Civil Engineering for Infrastructure

- 30.03.01S Engineering of Marine Works (Harbours, Piers, Jetties,)
- 30.03.02S Engineering of Railways and Rail Mass Transport

Engineering of Motorways

- 30.03.03S Design of Roads and Highways
- 30.03.04S Engineering of Tunnels
- 30.03.05S Design of Bridges in Steel, reinforced or precast concrete
- 30.03.06S Engineering of Road Safety
- 30.03.07S Studies and design of Road Safety Systems
- 30.03.08S Hydraulic Design and Soil Protection Studies
- 30.03.09S Engineering of Motorway Noise protection

- 30.03.10S Engineering of Underground Works
- 30.03.11S Design of Residential Camps
- 30.03.12S Design of Urbanization works (roads, technological networks, primary services)
- 30.03.13S Feasibility Studies of Large Onshore Civil Infrastructure

Detailed Design for Large Onshore Civil Infrastructures

- 30.03.14S Architecture Design
- 30.03.15S Concrete Structures Design
- 30.03.16S Steel Structures Design
- 30.03.17S Hydraulic Works

30.04 Offshore-specific Engineering

Subsea Field Development

- 30.04.01S Conceptual Design and Feasibility Studies
- 30.04.02S Basic Design and FEED of Subsea Systems and Plants
- 30.04.03S Basic Design and FEED of Umbilicals, Risers and Flowlines
- 30.04.04S Detailed Engineering of Subsea Systems and Plants
- 30.04.05S Detailed Engineering of Umbilicals, Risers and Flowlines
- 30.04.06S Installation Analysis

Sealines

- 30.04.07 S Conceptual Design and Feasibility Studies
- 30.04.08S Basic Design and Front End Engineering Design (FEED)
- 30.04.09S Detailed Design
- 30.04.10S Welding, Non Destructive Test

30.05 Naval Engineering

- 30.05.01S Naval Basic Design and FEED

Detailed Naval Engineering

- 30.05.02S Naval Electrical
- 30.05.03S Naval Automation and Control
- 30.05.04S Detailed Engineering for Naval Hydraulic systems
- 30.05.05S Naval Architectural
- 30.05.06S Design of Mooring systems
- 30.05.07S Studies and design of Accommodation modules
- 30.05.08S Vessel Conversion Engineering
- 30.05.09S Naval Space Planning and Interior Design

30.06 Environmental Engineering

- 30.06.01S Environmental Impact Studies
- 30.06.02S Risk Analysis and Environmental Impact Assessment (EIA)
- 30.06.03S Environmental Remediation Planning
- 30.06.04S Agronomical, Forestry, Marine Biologic and Ecosystem Studies
- 30.06.05S Topographic Surveys
- 30.06.06S Geotechnical Investigation and Engineering
- 30.06.07S Water Systems Studies and Design

30.07 Support Services for Engineering

- 30.07.01S Project Management
- 30.07.02S Project Management Consultancy (PMC)
- 30.07.03S Construction, Erection and Heavy Lifting Engineering
- 30.07.04S Engineering Consultancy for Local Permitting
- 30.07.05S Sworn Surveys Experts
- 30.07.06S Certifications of Engineering Activities
- 30.07.07S Engineering Document Control
- 30.07.08S Vibration Analysis Services
- 30.07.09S Building Information Modelling BIM Services
- 30.07.10S Modelling and Prototypes

30.08 Technology Licensing

- 30.08.01S Technology Licensing for Oil&Gas Downstream
- 30.08.02S Technology Licensing for Fertilizers
- 30.08.03S Technology Licensing for LNG

Engineering Services

Engineering Services are sets of activities (interdisciplinary and specialized) that guarantee the definition of the technical solutions to be adopted up to the delivery of a plant - according to the agreed objectives of security, environmental, efficiency quality control, flexibility and reliability.

Engineering is conceptually a pyramid of subsequent details of definitions, that refine the design from different phases of the project, from conceptual to detailed engineering.

Services in this Group of categories can be performed on a lump sum, deliverable, or reimbursable basis and this categorization does not discriminate on the ability of a vendor to deliver according to different contractual models.

Main rationales behind the Standard Categorization

On a family level priority has been generally given to the products designed (a plant, a pipeline etc.) and on a category level to the discipline/competence required to design and deliver the project.

Plant Engineering

- This is where the majority of players belong
- The market for detailed design is typically composed by small companies, (even small engineering boutiques)
- This family includes the engineering activities required to design the following types of plants: Oil&Gas, Refining, Chemical and Petrochemical, Fertilizers (Urea and Ammonia), Fixed Offshore Structures, Floating Structures (FPSO, FPU …), Power Plants, Nuclear Plants, Desalination plant, Water Treatment plant, Steel Plant, Cement plant and Renewables
- Plant Engineering embraces onshore and offshore plant engineering with the exclusion of specific activities which can be found in the following families (30.02, 30.03 …)
- The categories in Detailed Design are exhaustive of all the engineering disciplines (civil, chemical, electrical, mechanical etc.)
- Single activities are not detailed because the categories represent a homogenous set of vendors (E.g. Electrical can comprise the following activities: engineering for substation, engineering activity for cathodic protection systems, Calculation and studies); however, in a few cases the specialized activities performed by a smaller set of suppliers have been isolated (30.01.15S Hazop)
- Basic and feed could have been split according to the product/engineering asset they are able to design; but are kept together because generally vendors that are able to deliver feeds can also perform basic designs
- 30.01.13S Renewables includes: Solar, Offshore Wind Farm, Onshore Wind Farm, Geothermal, Biomass, Hydropower, Mini hydro (up to 20 MW), Tidal
- 30.01.21S Multidisciplinary Design includes multiple plant engineering disciplines with an integrated approach: calculations, stress analysis, sizing, budget details
- 30.01.25S Structural Engineering (for offshore) only focuses on offshore specific activities (e.g. platforms) for this reason it differs from Civil Detailed Design (30.01.24S)which is the construction of the civil structures within an onshore site

Onshore Pipeline Engineering

- All the activities linked to the design of an onshore pipeline - except for the geotechnical and topography surveys which are under Environmental Engineering (30.06) fall under this category
- Onshore and offshore pipelines are separate because they involve very diverse skills and are performed by different companies (for sealines see Offshore-specific Engineering 30.04).

Civil Engineering for Infrastructure

- This family differentiates from civil Detailed Design (30.01.17S) which focuses only on civil activities which are part of a larger scope of work (e.g. within a petrochemical plant); while Civil Engineering for Infrastructure (30.04) refers to the engineering of a civil infrastructure where the civil works are predominant in the scope of work (tunnels, jetty).

Offshore-specific Engineering

- This family refers to works that take place during the designing and construction phases of the project, therefore it is different from Operations and Maintenance Engineering, which comprises the activities for the post-construction maintenance of a plant
- 30.04.10S Welding, Non Destructive Tests is not to be confused with Non-destructive Welds (30.07.09S), as it refers to the offshore activity, which encompasses a set of skills and machinery different from the onshore inspection.

Environmental Engineering

- Companies that fall under this family offer a very specific service, generally focusing either on topographic, geotechnical or Water Systems
- Companies that perform Topographic Surveys (30.06.05S) and Geotechnical Investigation and Engineering (30.06.06S) offer their services to all the industries described in Plant Engineering
- 30.06.07S Water Systems Studies and Design refers to the study of the hydrological structure of a certain area. Not to be confused with Hydraulic Works 30.03.12S, which are related to the design of bridges, dams, canals etc.

Support Services for Engineering

- This family refers to works happening during the designing and construction phases of the project, therefore it is different from Operations and Maintenance Engineering (Group 37), which comprises the activities for the post-construction operations and maintenance of a plant
- “Construction Erection and Heavy lifting Engineering” activities are the engineering for the erection and lifting of particularly large and complex structures, equipment and machinery; not to be confused with the transport of large size objects, which falls under Group 42 “Logistics”
- Engineering Consultancy for Local Permitting is required in several geographies to satisfy local regulation, e.g. through the consultancy of a locally registered and chartered professional
- Sworn Surveys Experts and Advisors are worn expert are impartial and independent professionals with a proper qualification, e.g. for evaluating damages to buildings; they can be publicly appointed
- Certifications for Technical Materials cover – for example, ASME stamps – the compliance with international and regional directives and regulations across the world
- Engineering Document Control is a specialist job that – in some cases – may required outsourcing to dedicated professional

31 Engineering, Procurement and Construction

31.01 Oil&Gas

Upstream
- 31.01.01S Onshore Conventional Upstream
- 31.01.02S Oil Sands
- 31.01.03S Offshore Fixed Facilities (Platforms)
- 31.01.04S FPSO / FPU / TLP / SPAR
- 31.01.05S Subsea Field Development

Midstream
- 31.01.06S Onshore LNG Liquefaction
- 31.01.07S Floating LNG (FLNG)
- 31.01.08S LNG Onshore Regasification
- 31.01.09S FSRU
- 31.01.10S Small Scale LNG
- 31.01.11S Onshore Pipelines
- 31.01.12S Offshore Pipelines
- 31.01.13S Storage and Terminals

Downstream
- 31.01.14S Gas-to-Liquids (GTL)
- 31.01.15S Petrochemicals
- 31.01.16S Refining
- 31.01.17S Fertilizers

31.02 Traditional Power
- 31.02.01S CCPP
- 31.02.02S Gas Fired
- 31.02.03S Oil Fired
- 31.02.04S Coal and Lignite
- 31.02.05S CHP and Cogeneration
- 31.02.06S Waste-to-Energy (WTE)
- 31.02.07S Nuclear

31.03 Renewables
- 31.03.01S Biomass
- 31.03.02S Geothermal

Hydroelectric
- 31.03.03S Large Hydroelectric
- 31.03.04S Small Hydroelectric

- 31.03.05S Solar CSP
- 31.03.06S Solar Photovoltaic (PV) Plants
- 31.03.07S Floating Offshore Solar System

Wind
- 31.03.08S Onshore Wind
- 31.03.09S Offshore Wind

- 31.03.10S Tidal and Wave
- 31.03.11S Carbon Capture, Utilization, and Storage (CCUS)

31.04 Water

Desalination
- 31.04.01S Reverse Osmosis Desalination
- 31.04.02S Thermal Desalination
- 31.04.03S Desalination, Other Technologies

- 31.04.04S Water and Wastewater Treatment

31.05 Other types of Plants
- 31.05.01S Chemical
- 31.05.02S Steel and Metals
- 31.05.03S Mining
- 31.05.04S Upstream Fertilizers
- 31.05.05S Pharmaceutical
- 31.05.06S T&D Infrastructure
- 31.05.07S Various Industrial

31.06 Civil Complexes
- 31.06.01S Ports
- 31.06.02S Jetties
- 31.06.03S Dams
- 31.06.04S Bridges and Viaducts
- 31.06.05S Yard, Warehouse and Workshops
- 31.06.06S Villages
- 31.06.07S Hospitals
- 31.06.08S Garbage Disposal and Recovery Plants

31.07 Railways
- 31.07.01S EPC of Railways
- 31.07.02S Tunnelling (Dug with TBM)

Main Components and Systems
- 31.07.03G Supply of Rails
- 31.07.04G Railways Signals
- 31.07.05G Railways Noise Barriers
- 31.07.06G Railways Equipment and Cabins
- 31.07.07G Railways Traction System
- 31.07.08G Railways Automation System
- 31.07.09G Other Systems and Components for Railways

31.08 Highways
- 31.08.01S EPC of Highways
- 31.08.02S Rockfall and Landfall Barriers Works
- 31.08.03S Noise Barriers Works
- 31.08.04S Safety Barriers Works
- 31.08.05S Road Signage Works
- 31.08.06S Horizontal Signage Works
- 31.08.07S Vertical Signage Works

Main Components and Systems
- 31.08.08G Noise Barriers
- 31.08.09G Steel Road Safety Barriers
- 31.08.10G Concrete Jersey barrier
- 31.08.11G Rockfall and Snow barriers
- 31.08.12G Road Signage
- 31.08.13G Traffic Lights

Engineering, Procurement and Construction

Engineering, Procurement, and Construction (EPC) is a particular form of contracting arrangement used in some industries where the EPC Contractor is made responsible for all the activities from design, procurement, construction, to commissioning and handover of the project to the End-User or Owner.

Main rationales behind the Standard Categorization

EPC / EPCI of Oil&Gas Plants

- This Family includes also EPCI Contractors (Engineering, Procurement, Construction and Installation), e.g. related to the Offshore Shallow Water Platform, FPSO / FPU / TLP / SPAR, Onshore Wind and Offshore Wind

In terms of description of each segment in the Oil&Gas industry:

- Upstream Onshore Conventional: Oil and Gas treatment facilities for conventional onshore developments. Oil gathering and separation systems and gas treatment and fractionation plants constitute the bulk of this segment; but EOR systems (such as gas injection) are also present, alongside similar brownfield projects aiming at extending the life of ageing fields.
- Oil Sands: There are mainly two kinds of projects in this segment. Very large mining projects, and smaller SAGD recovery projects. While the former is self-explanatory, the latter relies on the injection of steam in the tar reservoir in order to facilitate extraction.
- Offshore Shallow Water: Traditional offshore developments composed of topsides mounted on jackets anchored to the seabed. Alongside larger manned platforms, there are smaller unmanned wellhead platforms. Decommissioning projects are increasingly important in regions such as the North Sea.
- FPSO/FPO/TLP/SPAR: Surface facilities for deep-water development projects. FPSO's tend to be transformed from oil tankers, but purpose built vessels are all but infrequent. TLPs and SPARs differ in their mooring systems, and are closer in concept to traditional offshore developments, even though relying on subsea field developments.
- Subsea Field Development: Subsea facilities for deep-water developments. Subsea production systems (SPS) tied back to a platform of FPSO through flowlines, risers and umbilical. Tiebacks to existing platforms are increasingly popular for cost reasons.
- LNG Onshore Liquefaction Plant: Liquefied Natural Gas (LNG) production facility. Built in coastal locations to allow mooring of LNG carriers, these plants require, alongside liquefaction trains, jetties and other marine structures. Barge based plants are also an option, for cost reasons.
- Floating LNG (FLNG): Deployed directly on offshore fields, these plants are comparable to FPSOs in their concept. Due to costs and conceptual development reasons, they are not widespread yet.
- LNG Onshore Regasification: Liquefied Natural Gas (LNG) receiving facility. Built in coastal locations to allow mooring of LNG carriers, these plants require, alongside regasification trains, jetties and other marine structures. It is not infrequent to see storage facilities integrated with the plant.
- FSRU: Floating version of a regasification plant. Often leased, for cost reasons, and moored for connection to the national gas grid. Sometimes built as a complement to a gas fired power project.
- Onshore Pipeline: Pipeline transporting gas, crude or products: onshore sections. Frequent scope of works include substitution or revamping of compression stations for gas pipelines, but greenfield projects are far more common.
- Offshore Pipeline: Pipeline transporting gas, crude or products: offshore sections. Highly specialised scope of work. Brownfield projects (i.e. pipe replacement) are still rare.
- Storage and Terminals Broad segment including all facilities aimed at storing and receiving crude and products. Alongside oil tank farms, we find LNG storage tanks and underground gas storage facilities.
- Gas-to-Liquid (GTL): Facilities aimed at the production of synfuel from natural gas. Heavily penalised by current energy prices.
- Petrochemical: Broad segment including all facilities for the production of chemicals derived from crude and gas. Two broad categories: aromatics and olefins. Olefins (such as ethylene, propylene and derivatives) constitute the largest group. Brownfield projects aimed at revamping existing plants constitute a substantial portion of the projects in this segment.
- Refining: Alongside greenfield refinery developments, it includes all the modernisation projects aimed at meeting increasingly stricter clean fuels regulations. Expansions of existing plants are also popular, combined with upgrade projects or on a standalone basis.
- Fertilizers: Ammonia, Urea or combined plants. Revamping projects of existing facilities are also frequent. The latest developments often include production capabilities for diesel exhaust fuel additives (DEF).

EPC of Traditional Power Plants

In terms of description of each segment in the Power industry:

- CCPP: Uses both a gas and a steam turbine together to produce up to 50% more electricity than a traditional simple-cycle plant.
- Coal/Lignite: Power plants that use coal to turn water into steam and drive a turbine.
- Gas Fired: Simple-cycle or open cycle gas turbine plants, have lower thermal efficiency.
- Oil Fired: Power plants or thermal power stations that use fuel oil as their primary energy source.
- CHP / Cogeneration: Simultaneous production of electricity with the recovery and utilisation of heat. Typically embedded close to the user to avoid excessive distribution losses.
- Waste-to-Energy (WTE): Process of generating energy in the form of electricity and/or heat from the primary treatment of waste.

EPC of Renewable Power Plants

- Biomass: Biogas is a mixture of biomethane and CO2 and small amounts of other gases. It is created by anaerobic digestion of organic wastes.
- Solar CSP: Conversion of sunlight into electricity through concentrated solar power (CSP).
- Geothermal: Conversion of thermal energy stored in the Earth into electricity.
- Hydroelectric: Production of electrical power through the use of the gravitational force of falling or flowing water.

EPC of Other Industrial Plants

Regarding the other industries:

- Fertilizers "Upstream": Potash, Phosphate, Nitric Acid, Sulfuric Acid and Ammonium Nitrate Plants.

EPC of Civil Complexes

- "Ports" includes Wharves and Defence Works

EPC of Railways

- "Engineering of Railways and Rail Mass Transport" is considered under the "Engineering Services" (Group 30)

32 Construction and Civil Works

32.01 General Subcontractor
- 32.01.01S General Subcontractor

32.02 Civil Works
- 32.02.01S Civil Works
- 32.02.02S Earth-moving (Site Preparation, Embankments, Soil Improv.)
- 32.02.03S Demolitions
- 32.02.04S Roads and Asphalted Areas
- 32.02.05S Landscaping and Gardening
- 32.02.06S Precast Concrete Elements
- 32.02.07S Concrete Stacks
- 32.02.08S Concrete Fire Proofing
- 32.02.09S Piling, Micro-piles, Diaphragms, Sheet-piling
- 32.02.10S Special Structural Works
- 32.02.11S Fluvial, Defense, Hydraulic and Reclamation Works
- 32.02.12S Environmentally Friendly Interventions
- 32.02.13S Archeological Excavations
- 32.02.14S Works for Museums and Cultural buildings

32.03 Civil Buildings
- 32.03.01S Civil Buildings
- 32.03.02S Firefighting Systems for Buildings
- 32.03.03S Water-proofing
- 32.03.04S False Ceilings
- 32.03.05S False Paving
- 32.03.06S Movable Walls/Partitions and Furniture
- 32.03.07S Masonry/Walls
- 32.03.08S Plastering and Special Walls Plastering
- 32.03.09S Flooring/Special Coats
- 32.03.10S Doors & Windows
- 32.03.11S Special Concrete Floors
- 32.03.12S Gutters/Down Spouts/Flashings
- 32.03.13S Technical/ Architectural Facades
- 32.03.14S Plumbing and Sanitary Facilities, Kitchens, Laundries
- 32.03.15S Floorings and Special Superstructures
- 32.03.16S Civil Building Renovation
- 32.03.17S Installation of Structural Glass

32.04 Mechanical Works
- 32.04.01S Mechanical Erection Works
- 32.04.02S Rtrp/Grp Piping
- 32.04.03S Chemical Cleaning
- Tanks Erection
  - 32.04.04S Cryogenic
  - 32.04.05S Not Cryogenic
- 32.04.06S Spheres Erection
- 32.04.07S Steel Structures Erection
- 32.04.08S Furnaces / Incinerators Erection
- 32.04.09S Flares Erection
- 32.04.10S Boilers Erection
- 32.04.11S Handling Systems Installation
- 32.04.12S Aqueducts and Irrigation Works
- 32.04.13S Execution of Drainage Works

32.05 Electrical, Instrumentation and Telecom. Works
- 32.05.01S Electrical, Instrumentation and Telecommunication Works
- 32.05.02S Electrical Works
- 32.05.03S HV Electrical Works
- 32.05.04S Over Head Lines (OHL) Works
- 32.05.05S Instrumentation Works
- 32.05.06S Telecommu-nication Works
- 32.05.07S Photovoltaic Systems

32.06 Pipelines
- 32.06.01S Onshore
- 32.06.02S Offshore
- 32.06.03S Dismantling and Removal of Pipelines

32.07 Other Construction Subcontracts
- 32.07.01S Geological/ Geotechnical Investigations
- 32.07.02S Survey, Demining & Uxo Clearance
- 32.07.03S Polluted Soils Decontamination
- 32.07.04S Pre-Engineered Building
- 32.07.05S Scaffoldings
- 32.07.06S HVAC
- 32.07.07S Painting
- 32.07.08S Expropriation Works

Construction and Civil Works

This Group covers the set of geotechnical, civil, structural, mechanical, electrical, instrumentation, telecommunication and geotechnical activities performed of a site for the erection and construction of a plant. It focuses from site preparation till building auxiliary infrastructure like roads, pipelines, water treatment systems.

It generally covers activities that are sub-contracted by the overall Contractor, either to a General Sub-Contractor or to a mix of focused service providers – specialized in the different areas of expertise - under the coordination of the Contractor's Construction team.

On a family level the priority has been given to the different types of construction, whilst on a category level to the specifications and purpose of the services offered.

Main rationales behind the Standard Categorization

General Subcontractor

- This Family refers to companies dedicated to take charge of the entire Construction phase. They can potentially subcontract activities and managing them, or engage in the direct hiring of construction resources
- Competition generally remains "flat", based on the type of plant that is managed under the General Subcontractor role, since suppliers that are experts in a specific field can add value by performing key activities that are part of the main project

Civil Works

- This Family refers to any type of activity related to civil works that prepares the site for the construction.
- Each activity can be assigned to a Construction company (with reference to the Category "Civil Works") or subcontracted to a set of specialized supplier (e.g. 32.02.02S Earth Moving, 32.02.03S Demolitions, 32.02.04S Roads and Asphalted Areas, and 32.02.05S Landscaping and Gardening)
- 32.02.08S "Concrete Fire Proofing" relates to certified structures made out of concrete that have an elevated fire-resistance rating
- 32.02.09S "Piling, Micro-Piles, Diaphragms, Sheet-Piling" has the purpose of grouping the most common types of piling used in the industry to set up the foundations of a structure
- 32.02.10S "Special Structural Works" groups suppliers dedicated to working with structures with particular specifications (e.g. building refurbishment after damage, structural consolidation, architectural restorations, plant upgrade for a given building, etc.)
- 32.02.11S "Fluvial, Defense, Hydraulic and Reclamation Works" refers to any type of civil work that involves water and avoiding potential floods of the grounds of the construction
- The categories do not take into account maintenance or lease of equipment that might be needed by subcontractors to perform their activities and that is part of Group 16 "Hire and Rental of Onshore Equipment and Vehicles"

Civil Buildings

- 32.03.01S "Civil Buildings" refers to any type of building capable of holding operations
- Categories 32.03.04S False Paving & 32.03.05S False Ceilings concern hard surfaces that can be applied to form roads or roofs depending of the case

Mechanical Works

- The list presents a wide range of different characteristics and specifications that can only be found when the supplier is specialized
- 32.04.02S "RTRP/GRP Piping" refers to Reinforced Thermosetting Resin Pipe (RTRP), whereas stands for Glass fiber Reinforced Plastic or Polyester (GRP)
- Different types of specific mechanical erections have been included: tanks, spheres, steel structures, furnace/incinerators, flares and boilers as they are typically performed by specialized suppliers
- Tanks erection has been divided in two categories: cryogenic, which is used to store frozen material and not cryogenic, which are other type of tank used to store materials

Electrical, Instrumentation, and Telecommunication Works

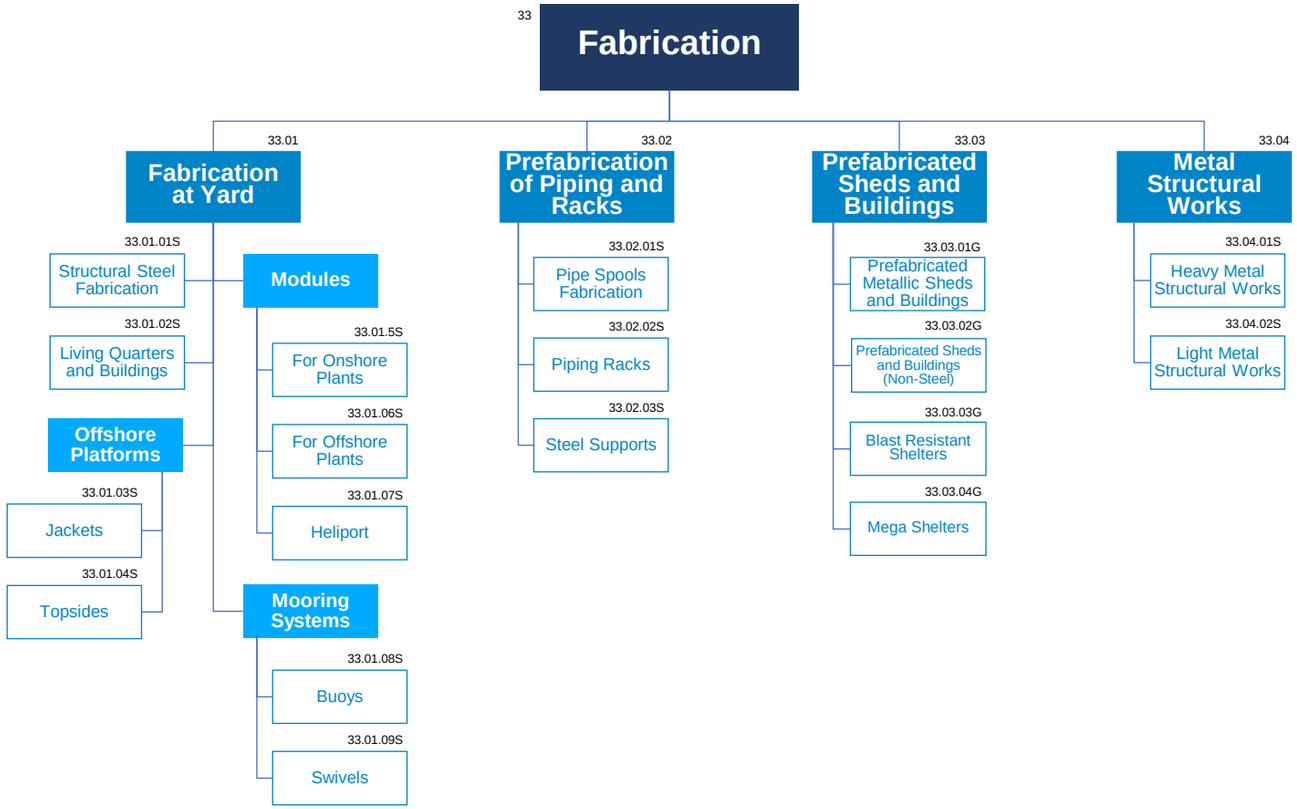
- The competition in this Family changes based on the competences required and not all the vendors are able to deliver the combined set of competences to fulfil the integrated scope of work
- 32.05.02S "Electrical Works", 32.05.03S "HV Electrical Works" (High Voltage), 32.05.04S "Overhead Line Works (OHL)" and 32.05.07S "Photovoltaic Works" are related to any type of fixed structure, appliances, equipment or service that control, generate or make use electricity
- 32.05.05S "Instrumentation Works" refers to services dedicated to the measurement and control of process variables such as temperature, level, humidity, flow, PH, speed, etc., within an specific area
- 32.05.06S "Telecommunication Works" is a category that focuses on installing devices that use wire, radio, optical or other electromagnetic systems in order to perform transmission signals, messages, writings, images and sounds or intelligence of any nature

Pipelines

- This Family refers to tubular sections used to transport a determined substance such as oil, gas, water, …
- The categories are divided in Onshore (in land) and Offshore (shallow water, deepwater) as vendors are usually specialized and need to leverage on different assets

Other Construction Subcontracts

- This Family refers to subcontracts that are important and significant in the industry but that do not fit in the already mentioned families. For example, geological investigations, any type of clearance or decontamination are services often needed during a construction or civil work
- 32.07.05S "Scaffoldings" Works are the set of activities required to provide and install metal or wooden temporary structures that support workers build, repair or clean a building structure
- 32.07.06S "HVAC" (Heat, Ventilation and Air Conditioning) Works are the set of activities required to install HVAC systems at site
- 32.07.07S Painting refers to any type of painting work performed at the site



Fabrication

Fabrication is the manufacturing and value added processes that involve the construction of structures and systems from various raw materials and components that is performed in a different location - properly equipped – at other than the final destination.

It covers fabrication activities at yard and also prefabricated items and structures such as piping, racks, sheds and buildings

Main rationales behind the Standard Categorization

Fabrication at Yard

- This family refers to goods and services fabricated and provided at yard.
- 33.01.01S ”Structural Steel Fabrication” relates to the construction of a structure made of steel that has a profile formed with a specific cross sections fabricated at yard
- 33.01.02S ”Living Quarters and Buildings” refers to buildings, usually built from steel, that include a section or area dedicated to house a crew of people
- 33.01.03S ”Jackets” refers to the steel frame supporting the deck and the topsides in a fixed offshore
- 33.01.04S “Topsides” refers to the upper half of the structure, above the sea level (offshore), outside the splash zone, on which equipment is installed
- Modules refers to the process of building and constructing equipment off-site in a fabrication facility. The completed product can then be delivered to the worksite and quickly installed and integrated into field operations. This differs from on-site construction in which the equipment or system is fully built at the worksite, the categories are 33.01.05S ”For Onshore Plants” and 33.01.06S ”For Subsea Plants”
- 33.01.07S ”Heliport” is a modular manufactured structure made out of steel or aluminium that can be either installed onshore or offshore used to land helicopters
- 33.01.08S ”Buoys” refers to a mooring system in the form of an anchored float that can serve as a navigation mark, show reefs or other type of hazard that might need to be highlighted
- 33.01.09S ”Swivels” refers to a mooring system that joins two chain cables of a moored ship near the bow in such a way as to keep them from becoming twisted or entangled

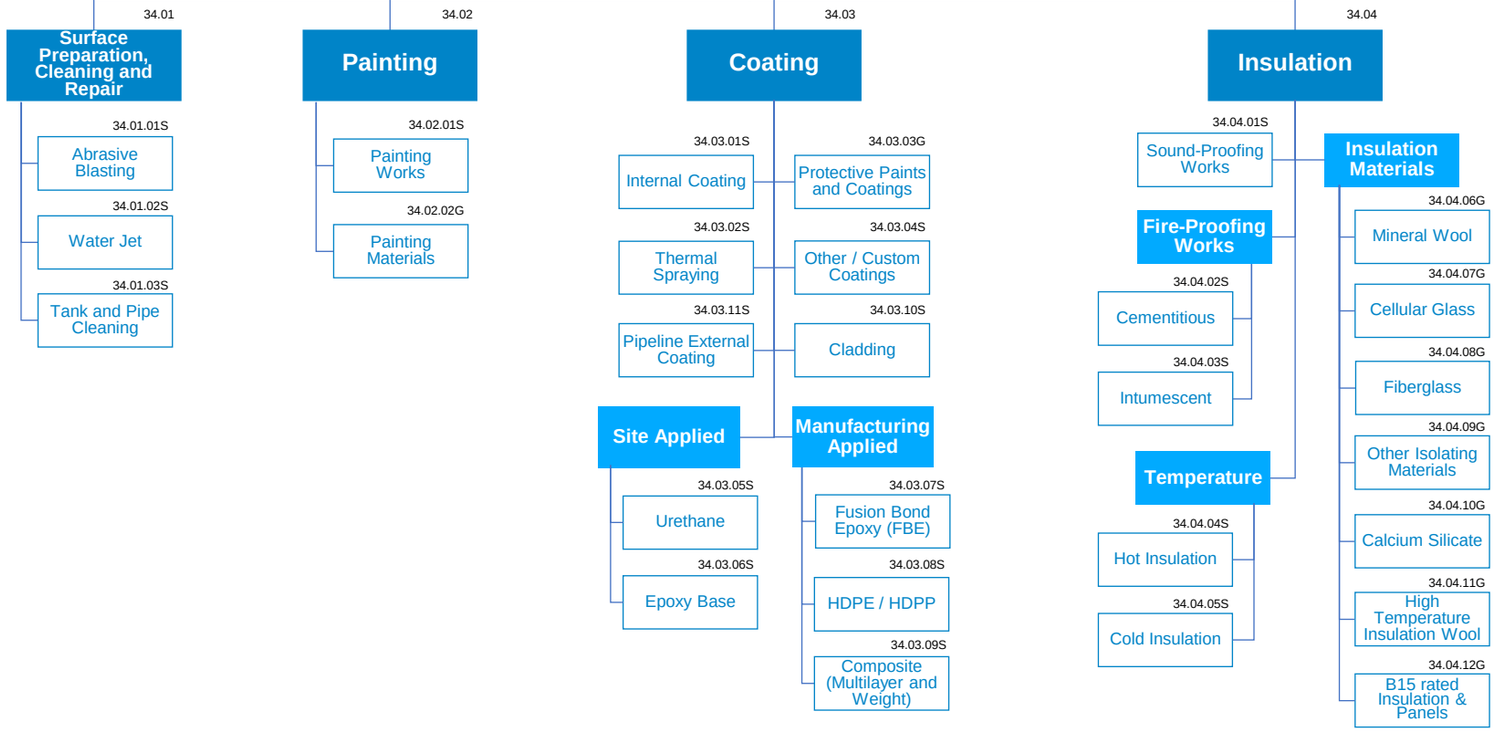
Prefabrication of Piping and Racks

- This family covers piping, which are considered as lengths of pipe made of metal, plastic, or other materials, as well as piping racks and steel supports
- 33.02.01S Pipe Spools fabrication refers to the production of prefabricated components using various types of raw pipes and pipe fittings, including flanges, elbows, tees, and other elements. This category may take into account roll fitting and welding
- 33.02.02S Piping Racks refers to structures that can support pipes, power cables, instrumental cable trays, mechanical equipment, vessels or valve access platforms at a given site
- 33.02.03S Steel Supports are elements made out of steel designed to rest the load of the pipe, which includes the weight of the pipe itself, the material carried by the pipe, fittings attached to pipe and pipe covering

Prefabricated Sheds and Buildings

- This family relates to sheds and buildings that are delivered to the site as prefabricated
- “Prefabricated Metallic Sheds“ include any size of building made out of metal and fabricated somewhere other than the site; the use intended for these buildings ranges from storing items or performing work inside
- “Prefabricated Buildings (Non Steel)“ refers to non-steel buildings that are manufactured and constructed by placing together factory-made components or units that are transported and assembled on-site to form the complete building
- “Supply Erection of Accommodation Camps“ and “Supply of Accommodation Camps“ refer to the design, supply and build of camp, featuring office space and accommodation for the workforce that can be transported wherever needed
- Blast Resistant Shelters are API 756 compliant
- Mega Shelters are designed to cover large site work areas: excavation and site prep; concrete foundation work; structural fabrication work; large enough for equipment to operate safely inside
- “Porta Cabins for Mobile“ refers to cabins that can be lifted and transported, designed to be placed where no civil foundation has been implemented
- “Technical Containers“ refers to flexible and modular system for the transport of equipment on vehicles
- “Equipment and Apparatus for Kitchens and Canteens“ refers to technical appliances to install in areas where workers will be cooking and dining. Examples of this are stoves, ranges, ovens, refrigerators, tables, chairs, etc.

34 Painting, Coating, Insulation and Sound Proofing



Painting, Coating, Insulation and Sound Proofing

Works performed to protect lines, equipment or areas from the damage caused by the environment around them an also for the safety of the operators when performing their activities.

They also include the works performed to protect equipment from an eventual fire or disaster that may occur during the operations.

Insulation and sound proofing works are performed to avoid the loss of energy in equipment and processes that need to keep its temperature, also in equipment that cause extreme vibration, plus make the operation on these equipment safer for the operators.

Main rationales behind the Standard Categorization

Surface Preparation, Cleaning and Repair

- This family comprehends the activities performed to clean and prepare a surface to a painting or a coating process, as well the activities to clean equipment, floors and repair surfaces with wear
- As a conceptual level, preparing a surface to perform painting or coating activities consists in cleaning it to assure the best adhesion of the coating or painting
- Abrasive Blasting category includes all the techniques that shots any abrasive element to a surface in order to “clean” it
- Pipe cleaning includes “pigging” services
- Chemical cleaning or washing includes all the methods of removing impurities using chemical substances or solvents such as pickling.
- Competition changes regarding the method used to prepare or clean the surface as the technology and safety issues vary from one to the other

Painting

- This family refers to the painting of material and equipment to mainly prevent corrosion
- This painting process can be performed at plant, site or fabrication yard
- This family is different from the Painting Works (part of the Group “Construction and Civil Works”) that refers to painting for civil buildings

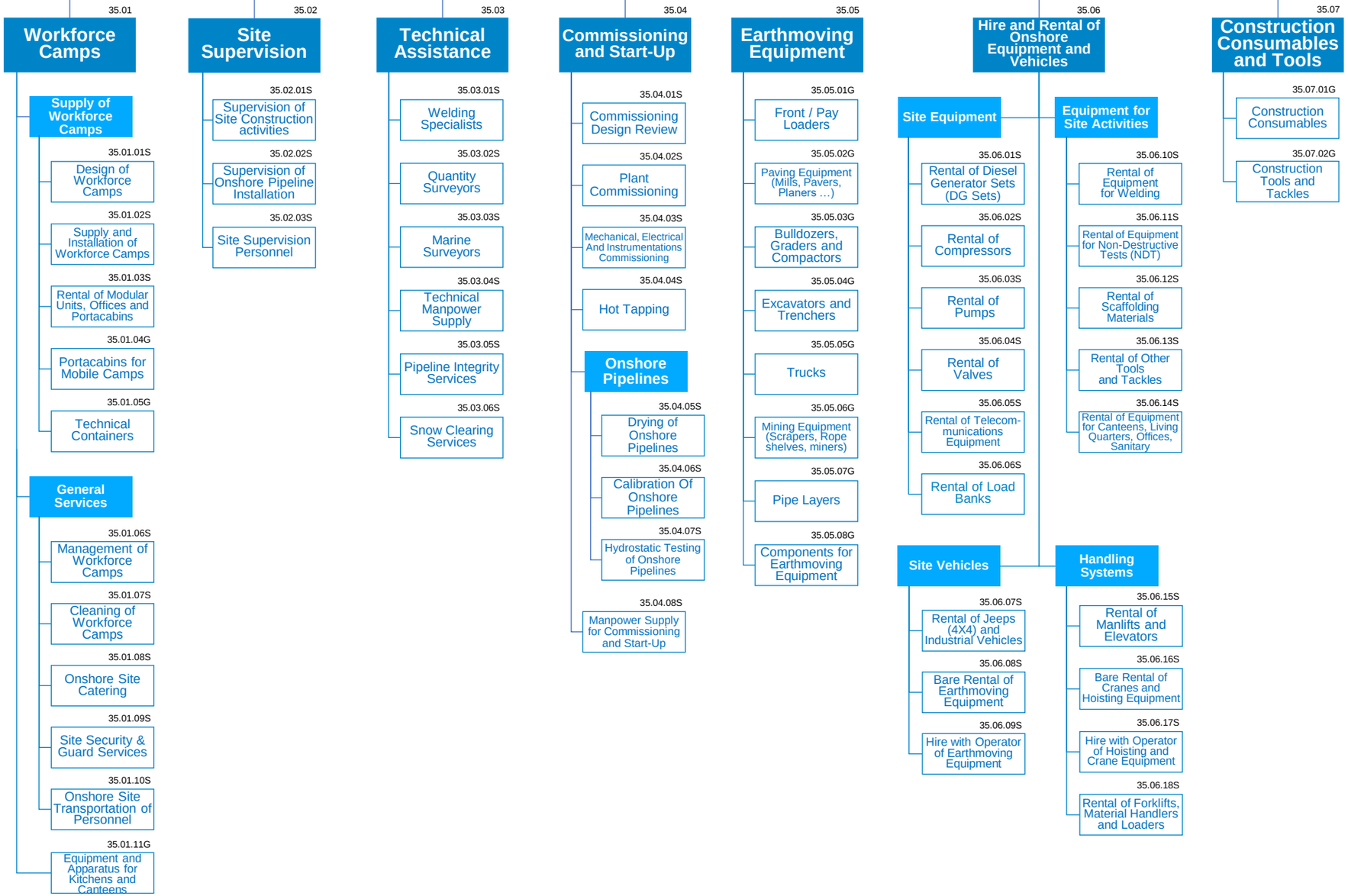
Coating

- This family takes into account the services performed to protect pipelines from environment by applying polymers
- Competition changes on mainly type of coating and application place, it is common that a supplier that offers one polymeric coating, be able to provide all the range of available polymers and the same for metallic, also the equipment required to coat varies and so do the skills of vendors
- Category “HDPE and HDPP” includes double and triple layer coatings in these materials and also PE and PP
- Category Other/Custom coatings includes vendors that can provide coatings not commonly used in the industry or are able to customize coating according to the buyers specs
- Multilayer Coatings of mixed materials are included in the “Composite” Category
- Thermal spraying refers to the coating of a surface with a flux of a molten material, whether ceramic or metallic, through processes such as Flame Spraying, Combustion Spraying, High Velocity Oxygen Fuel (HVOF) coating and Plasma Spraying, as well as Weld Overlay.
- Cladding is the process of joining two different materials, by creating a Physical/chemical bond, different to welding, with the purpose of coating and protect a base material
- Related categories included in other Groups
  - Galvanizing, is not including among “Coating” family as the process to perform it is chemical and changes the properties of the material, so this category can be found in the family “Surface treatment” of the group 14 “Manufacturing Works and Services”
  - HVAC Duct Vapor Barriers is included in Group 03 (“Packages”) as it is considered part of the HVAC system instead than a coating

Insulation

- Insulation is performed to:
  - keep equipment within the process temperature whether hot or cold
  - protect operators from these process temperatures
  - reduce the noise by equipment such generators
- Similar to these works, fire proofing is a safety requirement to reduce risk for certain processes in case of an accident in the plant
- Competition changes based on the type of Insulation activities (sound-proofing, fire-proofing, temperature insulation) and not based on the materials that are used in the works
- Metal Sheets for insulation can be found in group 32 “Construction, Civil Works and Installation” as it refers mostly to ceilings and walls.
- Mineral Wool category contains all the materials formed by spinning or drawing molten minerals as Rockwool or Glass Wool, typically suitable for less that 1000°C
- High Temperature Ceramic Wool Category includes fibers able to resist more than 1000°C such as Ceramic fiber, Zirconia and Alumina fiber
- Calcium Silicate is a category itself due to its fabrication process.
- Polystyrene and other polymers are not considered du to its low resistance to high temperatures; typically they degrade after 150°C which is not suitable for high temperature processes
- There is not a category for cryogenic applications as the materials used for high temperatures are also used for cryogenic applications.

35 Site Services



Site Services

Activities at Construction Sites, Fabrication Yards and Manufacturing Plant require an heterogeneous set of services that are delivered by specialized and focused vendors, at local and global level: they range from the support to Engineering on-site activities till the hire and rental of site equipment.

Activities of Testing and Analysis are covered under a dedicated Group

Main rationales behind the Standard Categorization

Site Supervision

- Site Supervision Personnel can be temporary as well permanent. It may also involve the site manager's role that is typically in charge of the supervision and management of all site-based staff employed by the company to ensure that the project is delivered within their contractual obligations.

Technical Assistance at Site

- A Quantity Surveyor (QS) is a construction industry professional with expert knowledge on construction costs and contracts. They are not to be confused with Land Surveyors or Land Survey Engineers. Services provided by a quantity surveyor may include: Cost consulting and Cost estimating.
- A Marine Surveyor (including "Yacht & Small Craft Surveyor", "Hull & Machinery Surveyor" and/or "Cargo Surveyor") is a person who conducts inspections, surveys or examinations of marine vessels to assess, monitor and report on their condition and the products on them, as well as inspects damage caused to both vessels and cargo.
- Technical Manpower Supply grants access to suitably trained, qualified and experienced professionals for onshore and offshore site activities; it doesn't cover Site Supervision Personnel
- Offshore Site Canteen and Catering is covered under the Group (Marine Contracting and Installation); Canteen and Security for offices (not site) are covered under Group 45 (General Services)

Commissioning and Start-Up

- Site Commissioning is the process of assuring that all systems and components of a building or industrial plant are designed, installed, tested, operated, and maintained according to the operational requirements of the owner or final client; a commissioning process may be applied not only to new projects but also to existing units and systems subject to expansion, renovation or revamping.
- "Commissioning Design Review" involves agents that inspect and test building systems early in the design process near the end of the construction phase and has become a valued addition to the building owner's repertoire to ensure that a project is delivered successfully.
- "Hot Tapping", or Pressure Tapping, is the method of making a connection to existing piping or pressure vessels without the interruption of emptying that section of pipe or vessel. This means that a pipe or tank can continue to be in operation whilst maintenance or modifications are being done to it.
- Hydrostatic Test for pressure vessels, plumbing, gas cylinders, boilers and fuel tanks is covered under Group 36 ("Testing and Analysis")
- Manpower Supply covers the need for the hiring of manpower for Commissioning phase

Earthmoving Equipment

- Earthmoving Equipment includes the main equipment used in the construction or industrial world.
- The categories of this family are mainly split based on their applications
- Components for Earthmoving Equipment includes replacement parts and attachments used on different types of construction and earthmoving equipment

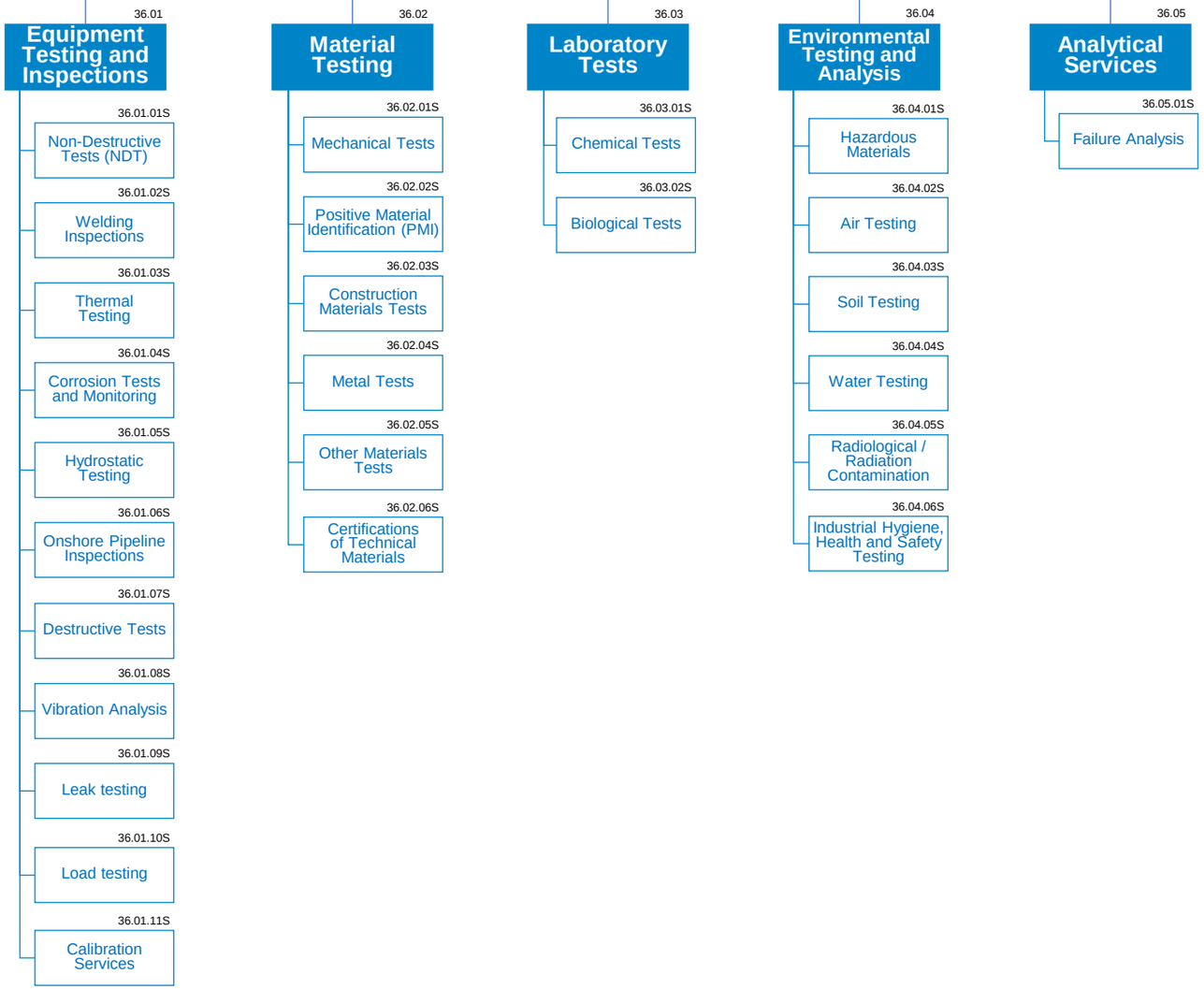
Hire and Rental of Site Equipment

- This Family of Categories includes all hire and rental services for equipment and vehicles for onshore utilization.
- The purchase of the original equipment are included under other Groups
  - Diesel Generator Sets under "Engines, Motors, Generators and Drives" (14) Group
  - Compressors in the "Compressors" (09) Group
  - Pumps purchases under the "Pumps" (08) Group
  - Valves purchases are listed under the "Valves" (05) Group
  - Telecommunication under the "Telecommunications" (07) Group
  - Elevators / Manlifts are classified under Family 04.02
  - "Hoists and Cranes" and "Forklift" are listed in the "Solids Handling" family (04.02)
- "Load banks" refers to devices designed to provide electrical loads for testing various power sources and/or to support diesel generators activity
- "Material Handler" includes those machines, typically equipped with hydraulic arms, suited to scrap sorting and handling, millyard applications, ...
- "Loaders" refers to heavy equipment machines used in construction to move aside or load materials such as asphalt, demolition debris, dirt, snow, feed, gravel, logs, raw minerals, recycled material, rock, sand, woodchips, etc. into or onto another type of machinery. This category includes: bucket loader, front loader, front-end loader, payloader, scoop, shovel, skip loader, wheel loader, or skid-steer
- "Rental of Scaffolding Materials" here refers to the rental of pipe, while "Scaffoldings" (32.07.05S) includes scaffolding works provided by subcontractors at site and "Pipes for Scaffolding" (Group 12) focuses on the purchase of the pipes
- Purchases for canteen and kitchen equipment are included in "Equipment and Apparatus for Kitchens, Bars and Canteens" (33.03.05G) for Prefabricated Buildings, Sheds and Caravans, and "Kitchen Equipment and Furniture" (45.04.06G)
- Welding Equipment purchases are listed under "Welding Machines and Systems" (39.02)
- Purchases concerning Non-Destructive-Tests (NDT) are classified under "Equipment and Consumables for Non-Destructive-Tests" (39.06)
- "Other Tools and Tackles" does not include "Facility Management Tools and Tackles" (44.01.02S)
- Rental expenses associated to general purpose vehicles are listed under "Means of Transport" (45.02) in the "General Services" Group.

Construction Consumables and Tools

- Construction Consumables and Tools and Tackles cover the materials used up during construction activities, e.g. small hand tools, flash lights, batteries and light bulbs, rope, slings and cables, fasteners, cleaning supplies (e.g. rags, brooms, mops, …), spray paint and material tagging devices, caulking, tape and patching compounds, shims and grout, plastic sheeting and tarps, lumber, …
- Welding consumables are under Group 36

36 Testing and Analysis



Testing and Analysis

Testing and Analysis activities are continuously required in the industrial world during the manufacturing process on materials as well as equipment and systems. Testing and Analysis activities can be performed at manufacturing plant / site as well as in laboratories. Those tests can also set the basis for products' acceptance.

Environmental Testing and Analysis is increasingly required with activities that cover air, soil, water with a special focus on hazardous materials and radiation / contamination.

Main rationales behind the Standard Categorization

Equipment Testing

- Non Destructive Testing (NDT) is a wide group of analysis techniques used in science and technology industry to evaluate the properties of a material, component or system without causing damage. Current NDT methods are: Acoustic Emission Testing (AE), Electromagnetic Testing (ET), Guided Wave Testing (GW), Ground Penetrating Radar (GPR), Laser Testing Methods (LM), Leak Testing (LT), Magnetic Flux Leakage (MFL), Microwave Testing, Liquid Penetrant Testing (PT), Magnetic Particle Testing (MPT), Neutron Radiographic Testing (NR), Radiographic Testing (RT), Thermal/Infrared Testing (IR), Ultrasonic Testing (UT), Vibration Analysis (VA), Eddy Current Testing (EC) and Visual Testing (VT).
- Welding Inspection requires a wide variety of knowledge on the part of the inspector, including an understanding of welding drawings, symbols, and procedures; weld joint design; code and standard requirements; and inspection and testing techniques. Different Welding inspection methods can apply:
  - Visual Inspection (if performed correctly, a visual inspection is often the easiest and least-expensive method for many applications. However, a good-looking weld doesn't always ensure internal quality, and discontinuities aren't always visible to the naked eye)
  - Surface crack detection (used to detect fine cracks, seams, porosity, and other surface-breaking discontinuities, surface crack detection is usually applied using one of two methods: liquid penetrant inspection or magnetic particle inspection)
  - Radiographic and ultrasonic weld inspection (two non-destructive testing methods that detect discontinuities within the internal structure of a weld)
  - Destructive weld testing (involves the physical destruction of the completed weld to detect various mechanical and physical characteristics)
- Thermal analysis techniques include differential scanning calorimetry, differential thermal analysis, thermo-mechanical analysis, dynamic mechanical analysis, thermogravimetric analysis, and pyrolysis combustion flow calorimetry. Infrared thermography (IRT), thermal imaging, and thermal video are also included.
- The target of a corrosion test of can be the verification of the quality/reliability of a base material and its manufacturing process as well as of welded joint. The weldability of a material as a general concept also implies the ability to maintain the corrosion resistance appropriate to the service required for the component.
- Hydrostatic Testing is a way in which pipelines, pressure vessels, plumbing, gas cylinders, boilers and fuel tanks can be tested for strength and leaks. Pressure testing is a similar testing method and is included in this category. Hydrostatic Testing specifically for pipelines is covered under Group 35 ("Site Services").
- Pipeline Inspection includes two types of service:
  - In-line service: quick scans, full assessments, pre-engineering, mechanical works, mechanical and chemical cleaning, gauging, caliper runs, inspection, reporting and consulting.
  - Out-line service: pipeline location & depth detection, soil corrosion detection, stray current detection, evaluation of cathodic protection, effectiveness, damage points detection & location.
- Pipeline Pigging Services are also included under Pipeline Inspection services and they are usually performed through intelligent pigs (or smart pigs) to assess the integrity of assets in a quick and non-intrusive manner. Smart pigs are intelligent pipeline inline inspection tools that examine the structural integrity of pipeline systems.
- Load testing is the process of putting demand on a system and measuring its response. This category specifically refers to Physical Load Testing only (not software load testing).
- Leak testing refers to all leak tests (gas leak, water leaks, valves leaks, …) that have not yet been covered (e.g. pipeline inspection or hydrostatic testing).

Material Testing

- A mechanical test shows whether a material or part is suitable for its intended application by measuring properties such as elasticity, tensile strength, elongation, hardness, fracture toughness, impact resistance, stress rupture and the fatigue limit.
- Positive Material Identification (PMI) is the analysis of a metallic alloy to establish composition by reading the quantities by percentage of its constituent elements. Typical methods for PMI include X-ray fluorescence (XRF) and optical emission spectrometry (OES).

Laboratory Tests

- "Pipeline Integrity Services" is the analysis of the data gathered during the phases of inspection (Non-Destructive welds, Non-Destructive tests)

Environmental Testing and Analysis

- Hazardous Material Analysis is based on a review of the Material Safety Data Sheets (MSDS's) for products to determine appropriate classification based on material properties (i.e. flammable and combustible liquids, toxic materials, corrosive materials, water-reactive materials, oxidizing materials, hazardous gases, non hazardous, etc.). Classifications are typically based on definitions provided in the applicable building and/or fire code.
- Radioactive contamination, also called radiological contamination, is the deposition of, or presence of radioactive substances on surfaces or within solids, liquids or gases, where their presence is unintended or undesirable

Analytical Services

- Failure Analysis is the process of collecting and analyzing data to determine the cause of a failure, often with the goal of determining corrective actions or liability. Materials can fail due to a number of reasons: fatigue, overload, creep, corrosion, erosion, poor welds, wear, improper materials, design, manufacturing, defects, modifications, poor maintenance, and misuse.

Operations and Maintenance (1/2)

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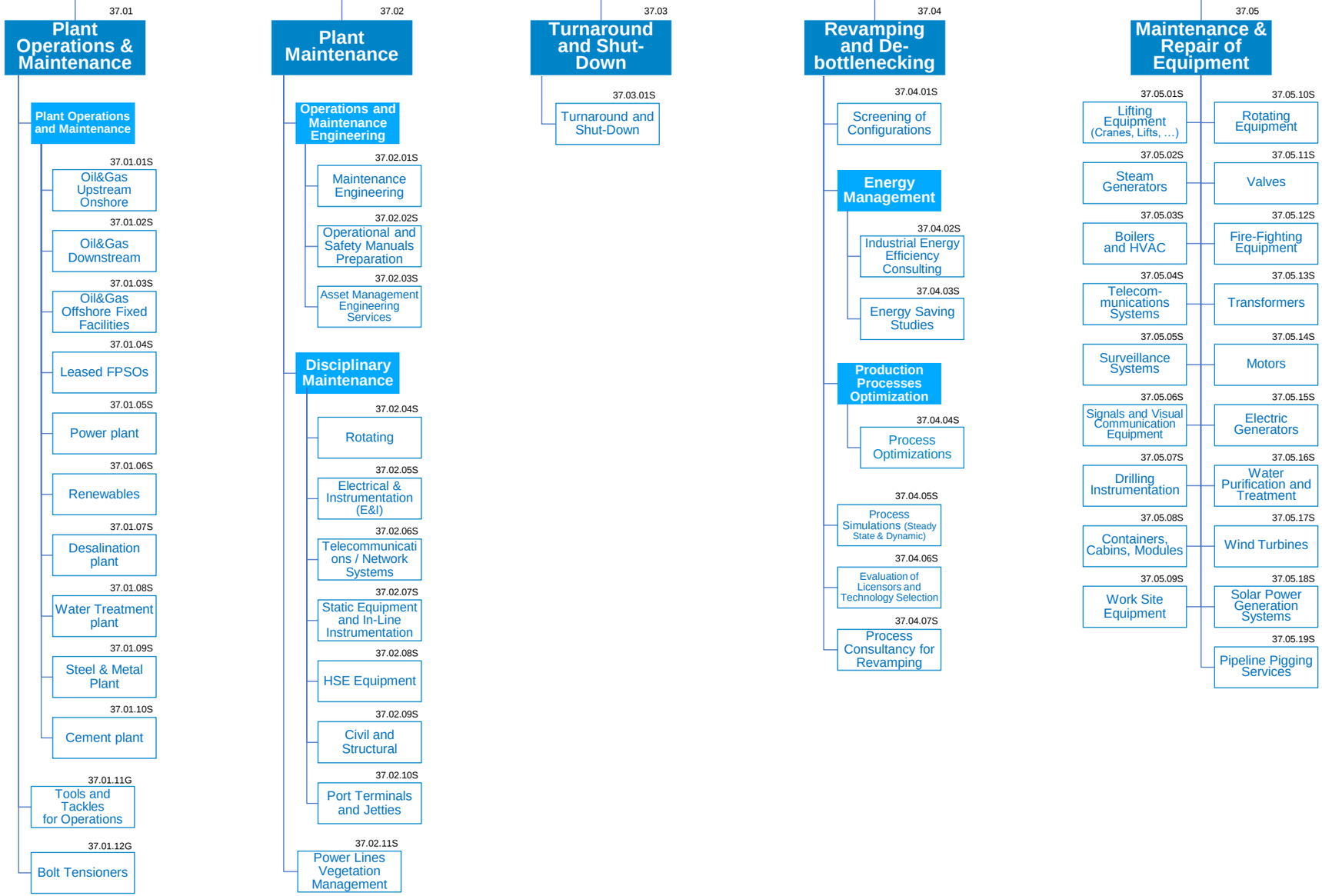
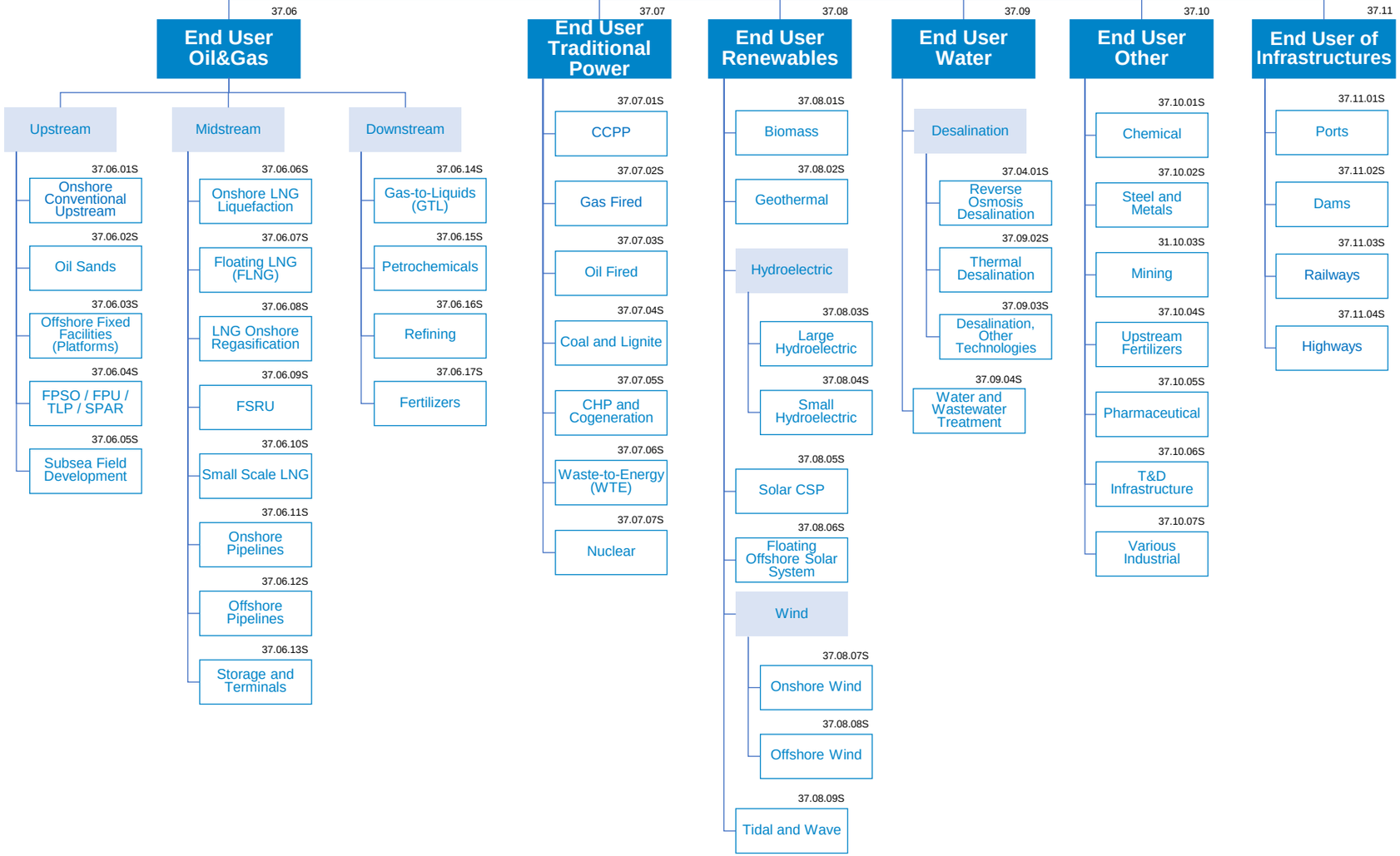


37 Operations and Maintenance (2/2)



Operations and Maintenance

This Group refers to the planning and management of the Operation and Maintenance of plants in order to ensure that safe operational performance is optimized, that availability is maximized and that cost is minimized. Operation and Maintenance activities are typically internalized, however end-users are increasingly outsourcing O&M activities to specialist companies and/or to contractors.

Main rationales behind the Standard Categorization

Plant Operations & Maintenance

- Integrated Operations & Maintenance services are delivered by consistently achieving the following objectives:
  - Operating plants in a safe, compliant and efficient manner;
  - Developing and implementing formal procedural, maintenance, environmental and safety management programs;
  - Maintaining overall care and control of the plant and site;
  - Advising and recommending tooling and inventory requirements;
  - Recommending procedural changes, when necessary, to improve operation;
  - Responding and adjusting to changing operating conditions.
- Expertise and competition changes based on the type of Plant and related operations

Operations and Maintenance Engineering

- This family is part of Engineering Services as it refers to the design of the Maintenance Engineering (the drawing of Safety Manuals, Asset Management and Trainings for Plant Operations). The actual operations of performing the maintenance of a plant post-construction do not fall under this category – for maintenance activities see Professional Services 43S
- Maintenance Engineering defines the standard cycles and the asset modelling philosophy in line with the defined strategy and model. Performs planning and management of activities and materials
- Routine planned maintenance based on preventive maintenance program, in accordance with the design,
- Routine corrective maintenance, based on needs registered by plant operations
- GSA: The contractor is responsible for all the long term maintenance (both periodic and turnaround maintenance) of the plant and for facility management activities
- The pricing model is a mix of fixed price (e.g. planned maintenance), cost-plus (e.g. shutdowns) and incentive schemes based on performance (e.g. plant availability)

Revamping and De-bottlenecking

- All the activities necessary for the Revamping and Debottlenecking of a plant fall under this category
- Though revamping and debottlenecking are two different activities the decision was made to put them together as they are performed by the same companies

Turnaround and Shut-Down

- Deeper interventions, that stop of the production of a part or of the full plant through "small projects" that are strongly schedule-driven (usually run H24) in order to maximize the work in the limited time frame available. It often include equipment substitution, small modifications and maintenance that is "under the shadow" of the critical equipment maintenance.

Maintenance & Repair of Equipment

- Maintenance, Repair and Operations (MRO) involves fixing any sort of mechanical, plumbing, or electrical device should it become out of order or broken (known as repair, unscheduled, casualty or corrective maintenance).

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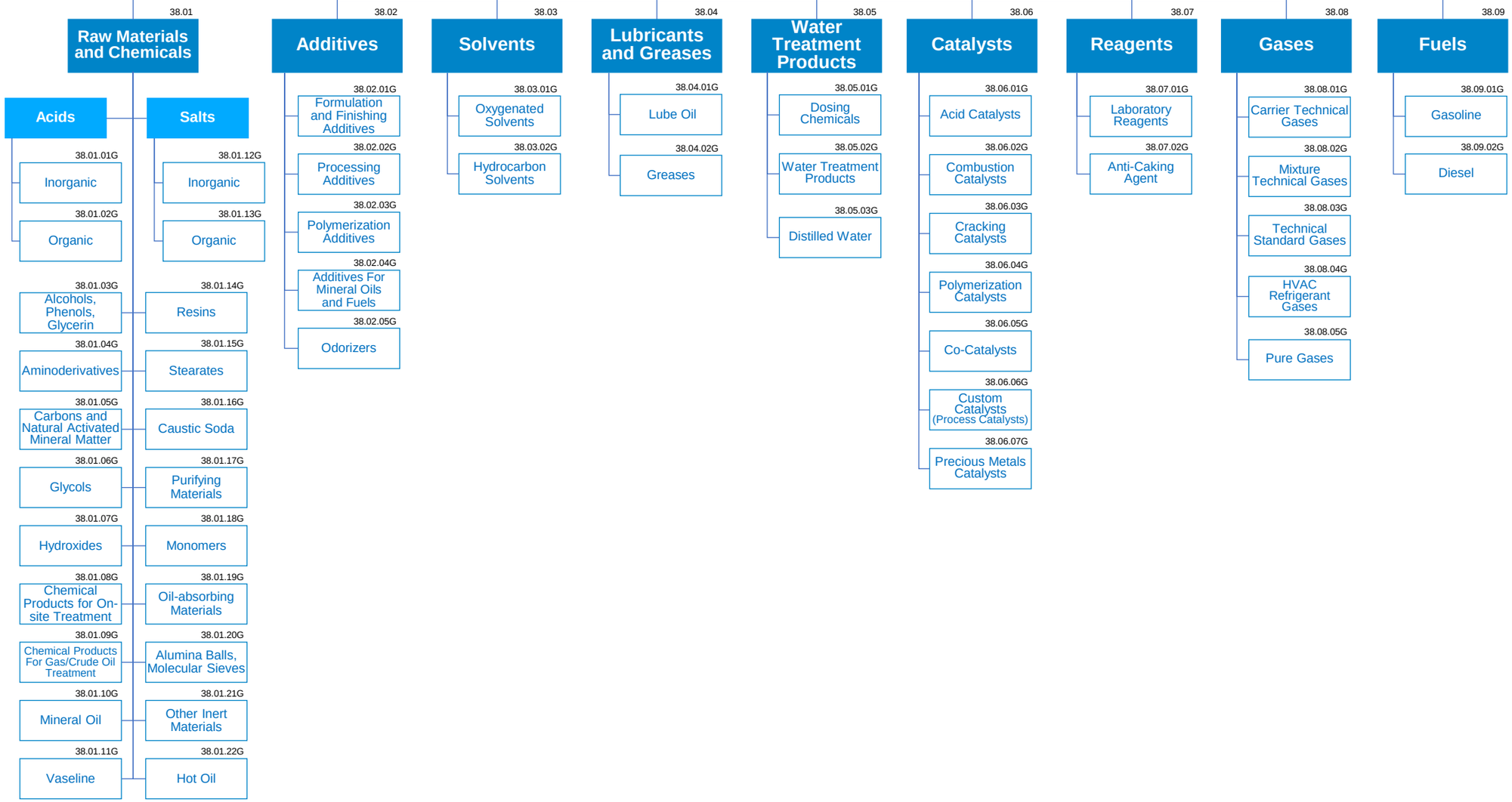
38 Chemicals, Catalysts, Reagents and Fuels



Chemicals, Catalysts, Reagents and Fuels

Chemicals, Catalysts, Reagents and Fuels are constantly used for the manufacturing, testing, commissioning, operations and maintenance of components, equipment, systems, and plants.

Main rationales behind the Standard Categorization

Raw Materials and Chemicals

- Inorganic acids, also called mineral acids, are acids derived from one or more inorganic compounds. These inorganic acids are either oxygen-less or oxoacids. With reference to the number of hydrogen atoms they are either mono-, di-, or tribasic.
- An organic acid is an organic compound with acidic properties. The most common organic acids are the carboxylic acids, whose acidity is associated with their carboxyl group –COOH. Sulfonic acids, containing the group –SO2OH, are relatively stronger acids.
- An inorganic salt is just any salt that doesn't contain carbon (making NaCl an inorganic salt).
- An organic salt is a salt (chemistry) containing an organic ion.

Additives

- Odorants used for natural gas vary from country to country, depending on gas distribution regulations. Some odorants contain sulfur, which is oxidized to sulfur dioxide when the gas is burned.

Solvents

- A solvent is a substance that dissolves a solute (a chemically distinct liquid, solid or gas), resulting in a solution. A solvent is usually a liquid but can also be a solid or a gas. The quantity of solute that can dissolve in a specific volume of solvent varies with temperature.

Lubricants and Greases

- A lubricant is a substance introduced to reduce friction between surfaces in mutual contact, which ultimately reduces the heat generated when the surfaces move.
- Grease is a semisolid lubricant: the characteristic feature of greases is that they possess a high initial viscosity, which upon the application of shear, drops to give the effect of an oil-lubricated bearing of approximately the same viscosity as the base oil used in the grease.

Water Treatment Products

- For the chemical treatment of water a great variety of chemicals can be applied.

Catalysts

- A catalyst is a substance which speeds up a reaction, but is chemically unchanged at the end of the reaction. When the reaction has finished, you would have exactly the same mass of catalyst as you had at the beginning

Gases

- Oxygen, Argon, Helium, Carbon Monoxide, Acetylene, Nitrogen, Carbon Dioxide, Hydrogen, Polysilicon and all gases that needs to be compressed in accordance with various industrial applications required by the market.
- Used in many different applications such as steelmaking, oil refining, medical applications, fertilizer, or semiconductors.
- Some examples of what 38.08.05G Pure Gases includes are: Air Gases, Rare Gases, Isotopes and Hydrocarbons.

Fuels

- Gasoline known as petrol outside North America, is a transparent, petroleum-derived liquid that is used primarily as a fuel in internal combustion engines. It consists mostly of organic compounds obtained by the fractional distillation of petroleum, enhanced with a variety of additives.

39 Workshop and Laboratory Tools

39.01 Tools for Workshops

- 39.01.01G Workshop Engineering and Supply
- 39.01.02G Precision Tools and Ironmongery
- 39.01.03G Pneumatic Tools
- 39.01.04G Measurement and Control Tools
- 39.01.05G Tools for Electrical Workshop
- 39.01.06G Vehicle Maintenance Equipment

39.02 Tools for Laboratories

- 39.02.01S Design of Laboratory Layout
- 39.02.02G Laboratory Engineering and Supply
- 39.02.03G Supply of Furniture for Laboratories
- 39.02.04G Laboratory Extruders, Press, Mixers and Homogenizers
- 39.02.05G Laboratory Sampling Equipment
- 39.02.06G Laboratory Spectro-Photometers
- 39.02.07G Laboratory Gas and Hydrocarbon Analyzers
- 39.02.08G Laboratory Water Analysis Apparatus
- 39.02.09G Laboratory Glassware & Other Minor Apparatus
- 39.02.10G Laboratory Technical Gases Distribution Network
- 39.02.11G Laboratory Physical Testing Apparatus
- 39.02.12G Laboratory Elemental Analysers
- 39.02.13G Laboratory Titration and Potentiometric Apparatus

Scales

- 39.02.14G Hydraulic
- 39.02.15G Mechanic
- 39.02.16G Electronic

Hydro-Cleaners

- 39.02.17G Diesel Engine Hydro-Cleaners
- 39.02.18G Electrical Hydro-Cleaners

39.03 Welding Machines and Systems

- 39.03.01G Arc Welding Equipment
- 39.03.02G Resistance Welding Equipment
- 39.03.03G Induction Heating Equipment
- 39.03.04G Oxyfuel Welding Equipment
- 39.03.05G Semi-automatic Welding Machines
- 39.03.06G Automatic Welding Machines
- 39.03.07G Electrode Drying and Welding Test Equipment
- 39.03.08G Electrodes and Welding Consumables
- 39.03.09G Abrasive and Other Welding Equipment
- 39.03.10S Maintenance of Welding Equipment

39.04 Equipment and Consumables for Non Destructive Tests (NDT)

- 39.04.01G X-Ray
- 39.04.02G Gamma-Ray
- 39.04.03G Magnetic Particles
- 39.04.04G Eddy Current (ECT)
- 39.04.05G UV Blacklight
- 39.04.06G Laser Methods
- 39.04.07G Ultrasonic
- 39.04.08G Resonant Acoustic
- 39.04.09G Liquid Penetrant
- 39.04.10G Visual Testing
- 39.04.11G Other Testing Equipment

39.05 Calibration and Testing

- 39.05.01G Mechanical Testing Equipment
- 39.05.02G Test Benches
- 39.05.03G Calibration Benches

Workshop and Laboratory Tools

Workshops and Laboratories are required in each manufacturing plant in the industrial world. They vary in magnitude based on the size of the plant and of the activities, frequently linked to the Operations and Maintenance needs.

Laboratory design and procurement guidance is required by organisations seeking to establish new or ancillary facilities to support and enhance their exploration and production assignments.

Main rationales behind the Standard Categorization

Tools for Workshops

- The market is characterized by the presence of service providers that act as global, single-source supplier of workshops for Oil&Gas and Power plants.
- Precision Tools and Ironmongery refers to the manufacture of iron and other precision measurement tools, such as steel rule, tape measure, protractor, micrometer, height gauge, various calipers and dial indicators.

Tools for Laboratories

- The basic design of a Laboratory typically includes layout, furniture planning, fume extraction, solvent and chemical storage, waste management, equipment selection, legislative and environmental requirements, specification for utilities and safety apparatus.
- The market is characterized by the presence of service providers that act as global, single-source supplier of laboratory packages, handling the purchasing of test equipment, laboratory furniture, work benches, storage cabinets, fume cupboards, start-up chemicals, consumables, pressure-control and heating, ventilation and air-conditioning systems.
- Frequent is also the sourcing two-year operating spares, devising operating and procedures manuals and planning for modular laboratories.
- The categories within this family should not be confused with the plant instrumentation comprised under Group 06 (“Control Systems and Instrumentation”)
- “Laboratory Sampling Equipment” refers to tools used to extract a small portion of a substance or material for testing and analysis.
- Laboratory scales are split into 3 different categories based on their function and application.

Welding Machines and Systems

- Welding Machines and systems includes the main types of welding equipment in addition to the various consumables and accessories used in the welding process.
- Arc Welding Equipment refers to the equipment using an electric arc between an electrode and a workpiece or between two electrodes.
- Resistance Welding Equipment is the process joining metals by the heat obtained from resistance of the work to the electric current, and by pressure.
- Induction Heating Equipment refers to the equipment that imply heating of an electrically conducting object by electromagnetic induction.
- Oxyfuel Welding Equipment are the equipment that use gases or Oxygen in the welding process.
- Semi-Automatic Welding Machines refers to the machines that need an operator to complete the work of pre-programmed automatic welding machine.
- Consumables and accessories used in the welding processes can be found in the categories 39.03.07G, 39.03.08G, 39.03.09G.

Equipment and Consumables for Non-Destructive-Tests

- Non-destructive testing (NDT) or Non-destructive evaluation (NDE) is a method of materials testing to assess the characteristics of a component without altering or destroying it. NDT is important in the materials testing industry where quick, dependable information on finished or raw material is needed. This may occur during the production stage, during the service life of a material or product, or as a diagnostic tool in the event of material failure.
- Resonant Acoustic (Acoustic Emissions Testing) refers to the equipment used while testing and analysing a deformation of a material.

Calibration and Testing

- Mechanical testing equipment covers devices used for adhesion, compression, drop (shock), tensile, vibration, and fatigue testing.
- Benches are built to cover core parameters most common to industrial sectors. These include electrical, pressure, temperature, loop and frequency. The modules integrated into the consoles are made to optimise calibration work and increase output.

40 Decommissioning & Environmental Remediation

40.01 Decommissioning Prep. Services

- 40.01.01S Removal Preparations & Planning
- 40.01.02S Permits & Compliance Services

40.02 Decommissioning Operations

Onshore Operations

- 40.02.01S Facilities Demolition & Site Clearance
- 40.02.02S Material Dismantling & Disposal
- 40.02.03S Well Plugging

Offshore Operations

- 40.02.04S Plug & Abandonment
- 40.02.05S Topside & Jacket Removal
- 40.02.06S Material Transfer Disposal
- 40.02.07S Subsea Infrastructure Removal
- 40.02.08S Pile Cutting

40.03 Soil Remediation Services

- 40.03.01S Soil Recycling & Washing
- 40.03.02S Environmental Dredging & Hydro Excavation
- 40.03.03S Soil Stabilization & Solidification
- 40.03.04S Soil Vapor Extraction
- 40.03.05S Soil Bioremediation Services
- 40.03.06S Soil Physical & Chemical Treatment
- 40.03.07S Soil Thermal Treatment
- 40.03.08S In-situ Soil Remediation
- 40.03.09S Ex-situ Soil Remediation
- 40.03.10S Reforestation Service
- 40.03.11S Tree Planting Service

40.04 Waste Remediation Services

- 40.04.01S Construction of Landfills
- 40.04.02S Integrated Waste Management
- 40.04.03S Waste Treatment & Disposal
- 40.04.04S Waste Recycling

40.05 Water Remediation Services

- 40.05.01S Assessment & Monitoring
- 40.05.02S Pond/Lagoon Closure
- 40.05.03S Contaminated Water Treatment

Decommissioning & Environmental Remediation

The Decommissioning and Environmental Remediation Group deals with the termination services at the end of the service of an onshore or offshore plants and facilities and with the environmental remediation services and sustainable treatment of contaminated soil, waste and water.

Main rationales behind the Standard Categorization

Decommissioning Engineering Services

- The Decommissioning Engineering Services includes the specific activities related to the Pre-Decommissioning phase.
- “40.01.01S Removal Preparation & Planning” includes the studies in the early phase prior to the start of removal activities. It also includes studies related to planning, cost estimation and control, and scheduling related to the decommissioning service.
- “40.01.02S Permits & Clearance Service” refers to process of issuing the permits and clearances required before the start of the operations.

Decommissioning Operations

- The Decommissioning Operations family covers operative services for both onshore and Offshore decommissioning activities.
- “40.02.02S Onshore Material Dismantling & Disposal” refers to the removal activities of onshore facilities components and structures
- “40.02.06S Offshore Material Transfer & Disposal” refers to the transfer of the offshore components and structure to shore and the disposal of the items
- “40.02.07S Subsea Infrastructure Removal” includes the removal of all components and structures below sea level including the removal or burial of pipelines and cables.
- The category for Subsea clearance and Seabed Cleaning activities can be found in Group 23 under “23.02.07S Seabed Clean-Up Activities”

Soil Environmental Remediation Services

- The Soil Environmental Remediation services refers to different techniques used to decontaminate soil.
- The “40.03.01S Soil Recycling & Washing” category refers to the decontamination of non-hazardous pollutants through recycling or the separation of contaminants through Soil Washing.
- “40.03.02S Soil Environmental Dredging & Hydro Excavation” refers strictly to the environmental practices used in dredging and excavation. For seabed dredging and excavation works “23.02.01S Dredging and Excavation Works” can be selected.
- “40.03.03S Soil Solidification & Stabilization” is a technique used to seal contaminants in the soil, most commonly using cement.
- “40.03.04S Soil Vapor Extraction” is another treatment technique for volatile contaminants that collects contaminants from the extracted gases from the soil
- Equipment and packages used for soil remediation can be found in “03.04.09G Packages for Soil Remediation by means of Thermal Processes” & “03.04.10G Packages for Soil Remediation by means of Chemical and Physical Processes”
- Environmental Engineering Studies and Planning can be found in Group 30 under “30.06 Environmental Engineering”
- Environmental Testing and analysis services can be found in Group 36 under “36.04 Environmental Testing and Analysis”
- Offshore Environmental Equipment and services can be found in “23.05 Offshore Environmental Equipment” & “23.06 Offshore Environmental Services”

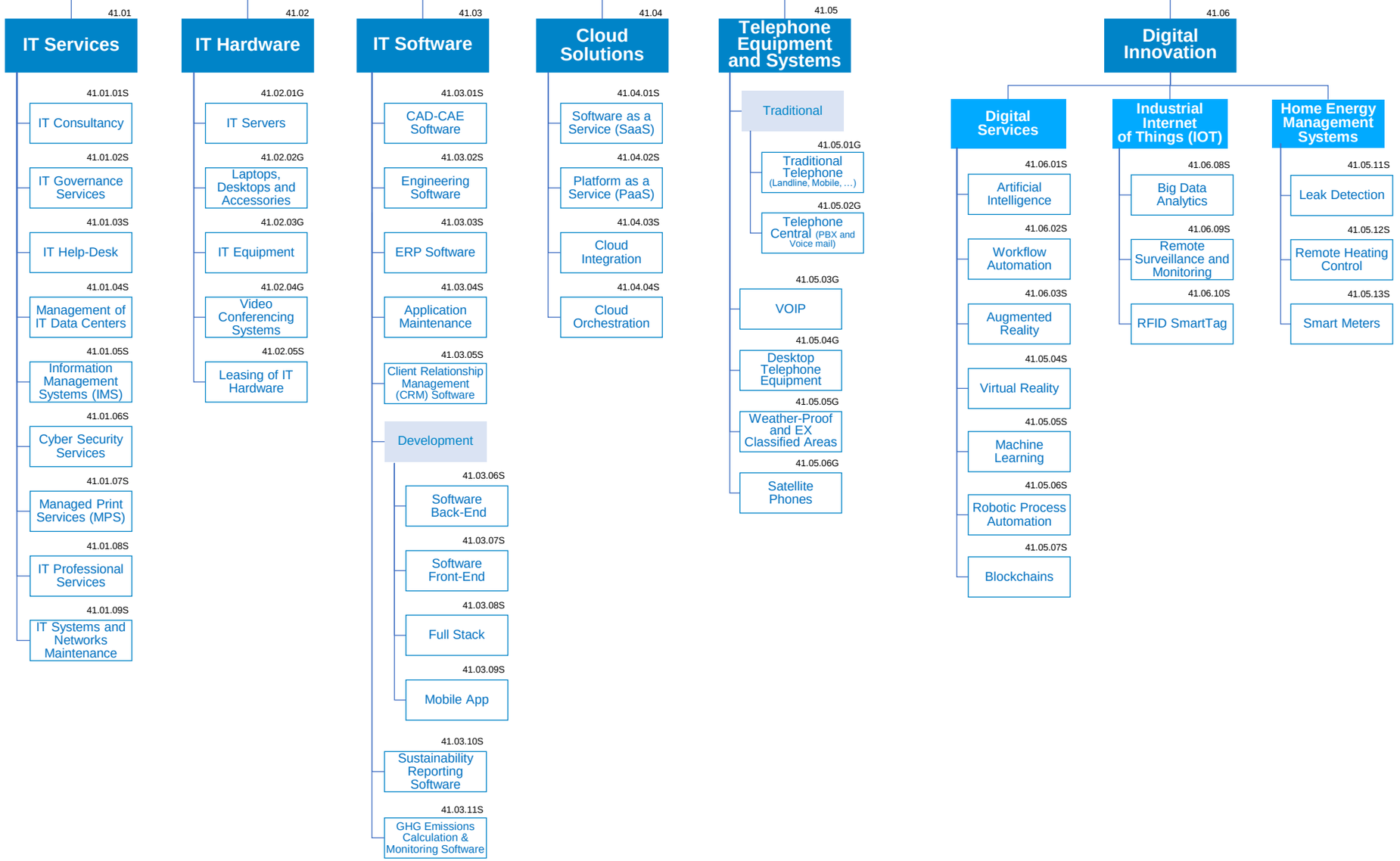
Waste Environmental Services

- “40.04.01S Construction of Landfills” also includes services related to Landfill leachate treatment.
- “40.04.02S Integrated Waste Management” refers to full combined service of collecting, transferring, treatment and recycling of waste.
- “31.02.06S EPC of Waste-to-Energy (WTE) power plants” refers to incineration of waste to energy. Waste incinerators can be found in “02.05 Incinerators”
- Conventional waste collection services can be found in “44.04.05S Waste Collection” and “44.04.06S Hazardous Waste Collection”

Water Environmental Services

- Water treatment equipment and packages can be found in Group 03 Packages
- 40.05.01S Ground Water Assessment & Monitoring refers to ground water monitoring and control services. Other related testing and study services can be found under “30.06.07S Water Systems Studies and Design” and “36.04.04S Water Testing and Environmental Analysis”

41 IT and Digital



VISIT WWW.SUPPLHI.COM TO EXPLORE THE VENDORS IN EACH CATEGORY

IT and Digital

This Group of Categories encompasses all the IT and Digital products and services that are deployed by businesses.

"IT Hardware" and "Telephone Systems" refer to physical assets owned by companies, while other categories include IT and Digital Services which can be offered in-house, outsourced or provided as a combination of the two. These categories include items that can be applied across other category groups (i.e. back-end development of a specific software for offshore activities).

Main rationales behind the Standard Categorization

IT Services

- This Family includes all services related to the management, optimization, and protection of IT systems and resources
- The "IT Governance Development" category includes the establishment of chains of responsibility, authority and communication regarding IT and the definition of policies, standards, and controlling mechanisms to guide and facilitate operations
- "IT Data Centre" refer to service of operations and management of facilities used to house computer systems and associated components, such as telecommunications and storage systems
- "Information Management System" is a software designed to facilitate the storage, organization and retrieval of information
- "Cyber Security" encompasses technologies, processes and practices designed to protect IT Systems from attack, damage or unauthorized access. It includes: application security, information security, network security, disaster recovery / business continuity planning, operational security, end-user education
- "Managed Print Services" (MPS) includes management and optimization a company's document output, hardware rental and maintenance, and the service and consumables needed to operate the existing system
- Specialized IT services cover all the other services that require focused knowledge and experience (e.g. Data Centre Design, …)

IT Hardware

- The term "IT Hardware" encompasses all physical components of computers, telecommunications, and other devices
- The first four categories include hardware directly owned by the company and not under a rental / leasing contract
- "IT Equipment" includes all items not necessarily associated to laptops and desktops. These include Projectors, Screens, etc. but exclude telephone hardware, which belongs to the "Telephone Systems" family
- Printers and Faxes and related consumables are considered under the Group 45 ("General Services")

IT Software

- "IT Software" is the virtual component of IT systems which consists of encoded information or computer instructions
- The first three categories include Software that is ready to be used
- The "Application Maintenance" category consists in the activities aimed at ensuring the functioning of applications such as de-bugging, adaptation to new cases or increasing the maximum capacity
- The last four categories include all activities related to software development (both in- and out-sourced):
  - "Back-end" (BE) refers to the part of the software system elaborating data generated by the Front-End (FE)
  - "Front-End" (FE) refers to the part of the software system, which is accessible to users or other external systems that produce input data
  - "Full Stack" refer to developers that can work cross-functionally on the full "stack" of technology, i.e. both the front end and back end. Full stack developers offer the full package
  - "Mobile App Development" encompasses all the development activities related to Mobile Apps (thus including also BE and FE)

Cloud Solutions

- This category contains all the categories related to the delivery of hosted services over the internet (i.e. use an application or virtual machine without having to build and maintain computing infrastructures in-house)

Notes:

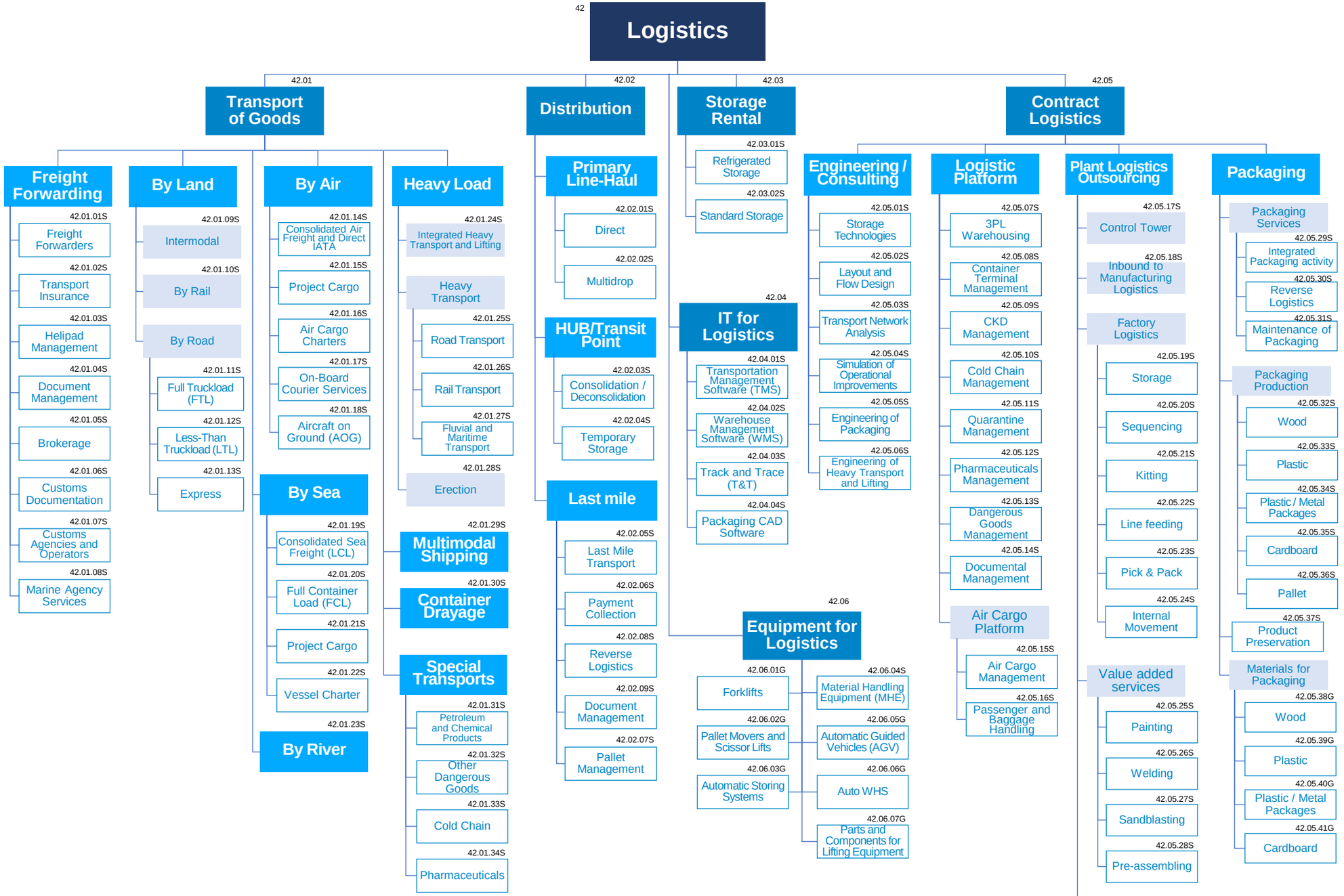
- Cloud computing has recently grown in importance as it provides advantages in terms of reliability and manageability. However it poses some control and security issues. For instance, it is crucial to know the physical location of the hosting servers as this influences the jurisdiction under which data is protected
- "Cloud Integration" allows multiple application programs to communicate and share data in the cloud
- "Cloud Orchestration" refers to the ability to build cloud infrastructures capable to handle entire processes as opposed to single tasks

Telephone Systems

- This family includes all physical Telephone Systems
- "VoIP" refers to physical Telephone Systems capable of transmitting voice and/or multimedia content over the internet
- "Weather-Proof and EX Classified Areas" Telephone Systems are specifically included under this category and not generically under the "Safety Systems, Equipment and Clothing" Group of Categories

Digital Innovation

- This family groups the main digital innovation trails that have an impact on businesses
  - "Digital Services"
    - "Artificial Intelligence": Software routines capable to simulate certain human reasoning paths
    - "Workflow automation": allows to have the right information in the right place at the right time
    - "Augmented Reality" (AR): Unlike virtual reality, which creates a totally artificial environment, AR uses the existing environment and overlays new information on top of it
    - "Virtual Reality" (VR): software-created artificial environment presented to the user in such a way that it appears as if it was real
    - "Machine Learning": Software routines capable to build rules out of experience and adapt to new situations
    - "Robotic Process Automation": the ability to interface Information systems simulating the human interaction instead of building APIs
  - "Industrial Internet of Things" (IOT)
    - "Big Data Analytics": extracting useful information from very large data sets. The complexity of such processes usually calls for specific tools and know-how
    - "Remote Surveillance and Monitoring": monitoring and security system operated from a location other than that controlled
    - "Radio Frequency Identification (RFID) SmartTag": electronic tag attached to an object to track and store data relating to its use
  - "Home Energy Management Systems" includes the system of tools allowing for a better monitoring and control of energy consumption



Logistics

Logistics is the management of the flow of physical items (food, materials, equipment, liquids, …) between the point of origin and the point of consumption in order to meet requirements of end-users. Any business sector (e.g. Automotive, Energy, Industrial, Aerospace & Defence, Consumer, Healthcare, e-commerce, …) typically requires customized solutions for its logistic need. It involves the integration of information flow, material handling, production, packaging, inventory, transport and warehousing.

Logistics management is the part of supply chain management that plans, implements, and controls the efficient, effective forward, and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customer's requirements.

The logistics of people and Offshore Naval Logistics have not been considered in this Group of Categories.

Main rationales behind the Standard Categorization

Transport of Goods

- Transport of Goods is characterized sub-divided based on the type of good transported and the modal of transport, which defines the competition:
  - "Normal" goods (in gauge), further characterized by modal, which differentiates the competition and at the same time may be relevant for Buyers, depending on the destination they want to reach
  - Transport by Sea, in particular is differentiated for the type of cargo transported (Containers vs. Project Cargo for large items)
  - Sea cargo can be classified in multiple ways depending on the number of senders and receivers, however, the competition typically differentiates just FCL and LCL among their services
  - FCL/FCL: One sender → One receiver; FCL/LCL: One sender → Multiple receivers; LCL/FCL: Multiple senders → One receiver; LCL/LCL: Multiple senders → Multiple receivers) Heavy Load, which usually involves large industrial components (e.g. pressure vessels, …)
  - Special Transport, which involves dangerous and hazardous materials
  - Freight Forwarding is composed by support / agency services
- Transport of hazardous goods does not include waste disposal services, which are included in another group of categories (General and Various Services)
- Commercial triangulations could have been included as a sub-category, but for the purpose of this Standard Categorization they have been considered linked to a fiscal choice of the client rather than a competence of the logistics operator.
- Consolidated Air Freight and Direct IATA are usually different services offered by the same provider, they were therefore included in the same category.
- Aircraft On Ground (AOG) shipments have been detailed in a dedicated category as they require specific competences (ability to transport oversized components in a timely manner).
- Logistics categories that are considered "consumer" (or at least outside the B2B world) were generally not detailed in a specific category (e.g. the transport of pets or of art pieces).
- Pharmaceuticals logistics is usually handled as an integrated solution by the provider, which needs to endure speed, temperature control and regulatory compliance. It has therefore been listed as a separate category under special transport

Distribution

- The main difference between Transport and Distribution is that the latter has also a relevant service component. Distributors usually deliver either Primary Distribution (from a production facility to a distribution center) or Last Mile Distribution (from the distribution center to the final consumer or retail shop)
- Within Distribution, "Consolidation and Deconsolidation" services are often offered by the same player and have therefore been included in the same category.

Storage Rental

- Differentiated from Warehousing because these suppliers simply offer the rental of a space, which can be refrigerated or not, but do not manage it. They operate therefore more like a real estate company

IT for Logistics

- Companies that provide IT services related to logistics are usually specialized and don't offer other logistics services; IT was therefore listed as a separate family

Contract Logistics

- Plant Logistics Outsourcing:
  - While "Transport of Goods" and "Distribution" include all the movements of products from the plant to the end-users, inbound and factory logistics have been classified under the "Plant Logistics Outsourcing" Family
  - Main types of Logistics services related to manufacturing, which include extremely differentiated services (provided by different actors), are:
    - Network Logistics: Inbound, Transit Point and Outbound logistics for a manufacturing facility
    - Plant / Factory Logistics: logistics services delivered inside the factory such as Sequencing and Line Feeding
    - Logistics Platform: activities related to the production platform, such as warehousing
    - Value Added Services: part of the production activities delivered directly by the logistics provider
- Packaging:
  - The "Packaging Service" Family identifies a specific service - the packaging of goods to be transported. It includes four different types of players:
    - Producers of packages, differentiated by the material they can deliver
    - Providers of materials for packages, sub-suppliers to the Producers
    - Providers of services such as Maintenance of Packaging
    - Integrated packagers
  - Reverse logistics is for all operations related to the reuse of products and materials. It is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. It could have been considered within the Family of "Distribution" services.

Equipment for Logistics

- Equipment for Logistics includes the main equipment used during the operations in warehouses or yards.
- It also includes some specific types of equipment such as AGV and Auto WHS
- Other warehousing material such as shelves and racks, Loading bays / docks and Industrial Doors can be Found in group 12

43 Professional Services

43.01 Company Management

- 43.01.01S Strategic Management Consulting
- 43.01.02S Administrative, Tax and Financial Consultancy
- 43.01.03S Financial Auditing
- 43.01.04S Legal Consultancy
- 43.01.05S Claim Management Services
- 43.01.06S Insurance Services
- 43.01.07S Marine Insurance Services
- 43.01.08S Government Relations Consulting
- 43.01.09S Welfare and Local Content Services
- 43.01.10S Project Planning, Scheduling and Cost Control
- 43.01.11S Compliance Due Diligence Services
- 43.01.12S Carbon Credit Trading / Carbon Offset Management
- 43.01.13S Carbon Neutral Certifications

43.02 Supply Chain

- 43.02.01S Vendor Management Platform
- 43.02.02S Financial Assessment of Suppliers
- 43.02.03S Technical Evaluation of Suppliers
- 43.02.04S Purchasing Services
- 43.02.05S Data Analysis
- 43.02.06S Expediting & Inspection

43.03 Risk Management

- 43.03.01S Risk Assessment Consulting
- 43.03.02S Quantitative Risk Assessment (QRA)
- 43.03.03S Technological Risk Assessment (TRA)

43.04 Quality Services

- 43.04.01S Control Application of Quality Plans and Quality Certifications (ISO,
- 43.04.02S Quality Site Supervision
- 43.04.03S Quality Assurance and Control

43.05 HSE Services

- 43.05.01S HSE Consulting
- 43.05.02S HSE Studies & Analyses
- 43.05.03S HAZID / HAZOP and SIL Studies
- 43.05.04S Life Cycle Assessment (LCA)
- 43.05.05S Environmental Monitoring
- 43.05.06S Noise Level Analysis
- 43.05.07S HSE Certifications

43.06 HR, Trainings and Personnel

Personnel Management

- 43.06.01S Top Management Recruitment
- 43.06.02S Recruitment Service Agencies
- 43.06.03S Skills Evaluation
- 43.06.04S Translation & Interpreting
- 43.06.05S Health Medical Services (Evacuation, Occupational, Physicians, …)

Trainings

- 43.06.06S Project Management Professional Certifications (PMP)
- 43.06.07S Project Management
- 43.06.08S Behavioral and Communication
- 43.06.09S Professional Qualification Courses
- 43.06.10S Technical Qualification Courses
- 43.06.11S Language
- 43.06.12S IT Courses
- 43.06.13S Site Operations & Maintenance
- 43.06.14S Compliance & Governance
- 43.06.15S HSE Trainings (Fire Fighting, First Aid, Offshore …)

43.07 Sales, Marketing and Communication

- 43.07.01S Market Studies and Analyses
- 43.07.02S Communication Services

Advertising Services

- 43.07.03S Graphic and Web Design
- 43.07.04S Photography and Video Making Services
- 43.07.05S Organization of Events, Fairs and Exhibitions
- 43.07.06S Commercial Agents
- 43.07.07S Associations (Trade, Sectorial, …)
- 43.07.08S Export Credit Agencies (ECA)

43.08 Research and Development R&D

- 43.08.01S R&D Consulting
- 43.08.02S Intellectual Property Management (Patenting and Trade Marking)

Professional Services

Broadly speaking, Professional Services are services that are typically outsourced and require a specific professional qualification. In this context, Professional Services refer particularly to those services that are commonly procured by industrial Buyers, excluding Engineering Services, IT Services, services that are more closely connected to the company's daily operations (e.g. Maintenance) and other "General Services" that are included in other Groups of Categories.

Therefore, the Families included in this Group go from the typical "corporate" services (Strategy Consulting, Communication Consulting, etc.) to services that are more specific for the businesses of industrial Buyers' (Project Quality Control, Safety Studies, …).

Main rationales behind the Standard Categorization

Company Management Services

- This Family includes all the consulting services related to the administration and management of a company.
- Some categories are typically issued by authorized / certified entities (e.g. legal consulting, tax consulting, …), while others are usually issued by companies that are accredited by their "brand equity" (e.g. Management, Strategy and Organizational Consulting).
- The "Strategic Management Consulting" category includes a broad range of consulting services, from organizational, to governance, to more typical "strategic" topics.
- Project Planning, Scheduling and Cost Control are sometimes delivered by the same players, but they require different competences and have therefore been separated in three categories.

Supply Chain Services

- This family covers the entire range of procurement service providers, from specialist consultancy companies, (e.g. Data Analysis, Procurement and Contracting Consulting, …), to the outsourcing of specific parts of the procurement process (Inspection, Purchasing, Project Planning, …) to information providing services (Commercial Information and Financial Assessment of Suppliers, …).
  - Inspections require a high level of trust and reliability of the inspector, which is usually guaranteed by the international brand of the vendor (this category is dominated by few large players).
  - Vendor Management Platforms and Data Analysis are usually delivered by focused organizations, sometimes specialized in a single industry (e.g. Oil&Gas). These companies may sometimes also deliver Consulting Services related to procurement.
  - "Financial Assessment of Suppliers" was listed under "Procurement Services" even if its suppliers are usually specialized and different from the ones that provide other categories in this family (e.g. Bureau van Dijk, Dun & Bradstreet, …). This was done in respect of its "business proximity".

Quality and HSE Services

- The HSE Studies node includes assessments, consulting, certifications and studies related to Health, Safety and the Environment
  - HAZID / HAZOP and SIL Studies: studies that aim at identifying potential safety risks to personnel and equipment (in particular, Hazard Identification, Hazard and Operability and Safety Integrity Level)
  - Reliability is defined as the probability for a system to perform its function without failures, while Availability is the probability for the system to "ready to use" (given that it is not failed or under maintenance)
  - Generic plant safety studies were differentiated from the risk assessments for personal protection
- Specific attention was dedicated to Maritime Technical Services, which are often delivered by focused actors (even though very large inspection players deliver both maritime and other types of inspections)
- The Quality related categories can refer either to the quality management system of a company as well as quality control on a specific project.

HR, Trainings and Personnel Services

- This Family includes Personnel Management Services and Trainings as two main "nodes".
  - Personnel Management Services are classified by the type of service offered, rather than the type of personnel it is offered to.
  - Trainings are classified by the type of skill they aim to develop:
    - Professional Qualification: typical skills for corporate / staff functions (Languages, IT, Marketing, …)
    - HSE: includes mostly safety trainings for site operations (Fire Fighting, First Aid, …)
- Professional Qualification Courses includes: Business and Marketing, Legal, Procurement & Logistics, IT and R&D.

Sales, Marketing and Communication Services

- Marketing, Sales and Communication include all services related to sales and marketing, but also more broadly those related to managing the spread of the company information towards the public (PR agencies, …).
  - The first categories of this family (43.07.01S and 43.07.02S) are related to the collection of information and the definition of a marketing strategy.
  - The following three (43.07.03S to 43.07.05S) to advertising services and to the definition of a corporate identity.

R&D Services

- R&D Consulting includes both companies that redesign the R&D process, as well as organizations to which a part of the R&D process can be outsourced.

44 Facility Management

44.01 Global Service

- 44.01.01S Building Maintenance Global Services
- 44.01.02G Facility Management Tools and Tackles

44.02 Building Management

- 44.02.01G Building Maintenance Materials
- 44.02.02S Building and Office Cleaning Services
- 44.02.03S Pest Control Services
- 44.02.04S Cleaning of Sewers and Cesspits
- 44.02.05S Repair and Maintenance of Elevators
- 44.02.06S Maintenance of Green Areas
- 44.02.07S Office Moving and Loading/ Unloading Services
- 44.02.08S Management of Vending Machines
- 44.02.09S Laundry Services
- 44.02.10S Plumbing Services
- 44.02.11S Cleaning Services for Boilers and Chimneys
- 44.02.12S Building Security Service
- 44.02.13S Building Security Service
- 44.02.14S Disinfection and Sanitization Services
- 44.02.15S Exterior Windows Cleaning Services
- 44.02.16G Security equipment for Security Personnel

44.03 Repair and Maintenance of Equipment

- 44.03.01S Air Conditioning System
- 44.03.02S Air Conditioning Terminals
- 44.03.03S VRV and Split
- 44.03.04S Special Fire Detection Systems
- 44.03.05S Fire Protection Systems and Equipment
- 44.03.06S Fire Extinguishers
- 44.03.07S Fire Extinction
- 44.03.08S Rental of Air Conditioning Equipment
- 44.03.09S Power Generation Systems
- 44.03.10S Extraordinary Maintenance of Electric Motors
- 44.03.11S Emergency Power
- 44.03.12S MT-LT Electrical Systems
- 44.03.13S Special Automation and Control Systems
- 44.03.14S Hot Water Systems
- 44.03.15S Chilled Water Systems
- 44.03.16S Doors and Windows
- 44.03.17S Exhaust Air Systems
- 44.03.18S Kitchen Furniture
- 44.03.19S Office Equipment
- 44.03.20S Portable Transfer Water Pumps
- 44.03.21S Potable and non Potable Water Systems

44.04 Utilities

- 44.04.01S Electricity
- 44.04.02S Gas
- 44.04.03S Water
- 44.04.04S Biomass for Combustion
- 44.04.05S Waste Collection
- 44.04.06S Hazardous Waste Collection

Facility Management

This Group of Categories covers all the goods and services concerned with the successful and profitable maintenance, operation, and monitoring of buildings or properties.

While “Global Service” and “Building Management” focus on the structural part of the buildings, “Repair and Maintenance of Equipment” refers to those items associated to the facilities. Finally, the “Utilities” category encompasses all the expenses sustained for Energy and Water supply as well as for Waste Collection.

Main rationales behind the Standard Categorization

Global Service

- This Family includes all services and tools employed to maintain and preserve facilities building from a structural standpoint
- “Building Maintenance and Global Services” does not include ordinary and extraordinary cleaning services, “Plumbing Services” (44.02.08S), and “Maintenance of Green Areas” (44.02.04S)
- Materials employed for Building Maintenance are classified under the “Building Management” family (44.02.12G)

Building Management

- This Family refers to the management of buildings in their structural parts
- “Building and Office Cleaning” only refers to buildings and does not include items such as “Chemical Cleaning” (22.04.02S) or “Cleaning of Living Camps” (35.04.05S)
- “Security” exclusively refers to building security and does not include cyber nor site security

Repair and Maintenance of Equipment

- This Family includes all the expenses related to repair and maintenance of equipment as opposed to buildings structural parts
- “Automation and Control Systems” include industrial automation, motion control systems, etc.
- All voices do not include the separate purchase of spare parts

Utilities

- This Family contains utilities expenses for all facilities and assets including vehicles and emergency diesel generator sets. Fuel Bunkering is covered under the Group 24 (“Marine Contracting and Installation Services”)
- Biomass for Combustion is the burning of organic material used to heat greenhouses

45 General Services

45.01 Travel Services

- 45.01.01S Travel Agency
- 45.01.02S Hotel and Other Accommodation Facilities
- 45.01.03S Transportation Fares (Air, Land, Sea)
- 45.01.04S Agency Services for VISA Passport

45.02 Means of Transport

- 45.02.01S Rental of Bus and Vehicles, without Driver
- 45.02.02S Rental of Bus and Vehicles, with Driver
- 45.02.03S Leasing of Bus and Vehicles
- 45.02.04S Parking Rent
- 45.02.05S Maintenance and Repair of Bus and Vehicles
- 45.02.06G Batteries for Vehicles
- 45.02.07G Tyres for Vehicles

45.03 Office and Other Rentals

- 45.03.01S Office Rent
- 45.03.02S Apartments Rent and related Expenses
- 45.03.03S Rent of Warehouses, Archives and Land
- 45.03.04S Management of Document Archives
- 45.03.05S Real Estate Agency Services

45.04 Canteen and Meals

- 45.04.01S Office Canteen
- 45.04.02S Onshore Catering
- 45.04.03S Restaurants
- 45.04.04S Meal Tickets / Vouchers
- 45.04.05G Kitchen Equipment and Furniture

45.05 Information Providers

- 45.05.01S General Magazines and Books
- 45.05.02S Data Providers
- 45.05.03S Weather Forecasting
- 45.05.04S Technical Information Services

45.06 Office Consumables and Services

- 45.06.01G Printers, Fax, Shredders
- 45.06.02G Consumables for Printers
- 45.06.03G Stationery Materials
- 45.06.04S Express Courier
- 45.06.05S Postal Services
- 45.06.06G Fiscal Stamps
- 45.06.07S Medicines
- 45.06.08S Presidium of Nursing Doctor at Office
- 45.06.09S Leasing and Rental of Furniture and Appliances
- 45.06.10S Printing Services

General Services

General Services are typically outsourced and are services that are applicable to the entire firm and are not confined to any department or function.

The main purpose of the items and services considered in this Group is to cater the the general needs of the company's employees when they are at the office premises or travelling to fulfil their functions.

Main rationales behind the Standard Categorization

Travel Services

- This Family contains all the expenditure types associated to travel and accommodation
- "Hotel and Other Accommodation Facilities" include expenses for guesthouses, hotels, short term, etc.
- "Transportation Fares" encompass all travelling and ticket expenses related to every mean of transport: air, land, sea but also rivers and lakes

Means of Transport

- "Maintenance and Repair of Bus and Vehicles" includes all ordinary and extraordinary maintenance and repair expenses excluding those already contemplated by the rental and leasing contractual agreements
- By 'driver' is here intended a dedicated person responsible for conducting the vehicle by contractual terms. 'Without Driver' refers to those vehicle rental agreements, which do not include dedicated driver services and whose conduction is thus left to the user
- The rental of Offshore vessels is included under the Group 24 ("Marine Contracting and Installation services")

Office and Other Rentals

- This Family includes all rental and associated expenditures with the exception of those related to vehicles and parking
- Beside rental expenses, the first three categories include also related costs such as those incurred for utilities (if not comprised in the rental contract), garbage disposal, etc.

Canteen and Meals

- This Family encompasses all expenditures types related to food and meals. However, "Equipment for Canteens, Living Quarters, Offices, Sanitary" (16.03.03S), Prefabricated "Equipment and Apparatus for Kitchens, Bars, Canteens" (33.03.05G), and Site Services "Onshore Site Canteen and Catering" (35.04.04S) are excluded
- "Office Canteen Service" is only related to canteens at the office premises and does not include On-Site Canteen services, which are contemplated by other Category Groups
- "Onshore Catering" refers to services provided in special areas or remote sites
- "Offshore Catering" refers to services provided on platforms, barges, etc. it can be found in Group 24 Marine Contracting and Installation
- "Ticket Restaurants" refer to meal tickets or vouchers, which are accepted as a payment method in a network of adhering restaurants, canteens, supermarkets, etc.

Information Providers

- This Family includes the main sources of information, from the more general such as "General Magazines and Books" to the more specific "Technical Information Services"
- "Data Providers" encompasses ready-made statistics, data archives, open data, secure data labs, question banks, etc.
- "Technical Information Services" refer to specific technical publications required for the constant update of the resources of the Engineering and of other technical departments

Office Consumables and Services

- This Family includes all services and consumables consumed at the office premises
- Paper used for printers is included in "Consumable for Printers" (45.06.02G) and not in "Stationery Materials" (45.06.03G)
- Shipping related expenses other than "Express Courier" (45.06.04S), "Postal Service" (45.06.05S) are listed under the "Logistics" (42) Category Group
- "Medicines" do not include first aid kits and similar safety items which are instead classified in the "Medical Safety" Family (15.03)

46 Electronics

46.01 Electronic Assemblies

- 46.01.01G Electronic Boards Assembled
- 46.01.02G Printed Circuit Boards (PCB)
- 46.01.03G Mechanical Assemblies for Electronics
- 46.01.04G Electromechanical Assemblies for Electronics
- 46.01.05G Control Levers for Electronics
- 46.01.06G Switches and Network Devices for Electronics

46.02 Electronic Components

Electrical

- 46.02.01G Electric COTS Boards
- 46.02.02G Electric Gearmotors for Electronics
- 46.02.03G Electric Power Supplies for Electronics
- 46.02.04G Electric Transformers for Electronics
- 46.02.05G Power Terminal Blocks for Electronics
- 46.02.06G Electric Components for Electronics
- 46.02.07G Electric Slip Rings
- 46.02.08G Electric Buttons and Indicators
- 46.02.09G Electric Process Sensors
- 46.02.10G Navigation Sensors, Gyro Compasses and Electric Accessories

Mechanical

- 46.02.11G Mechanical Fans for Electronics
- 46.02.12G Mechanical Filters and Filter Modules
- 45.02.13G Mechanical Joints/Brackets/Supports for Electronics
- 46.02.14G Mechanical Accessories for Electronics
- 46.02.15G Mechanical Elastomers for Electronics

Electronic

- 46.02.16G Electronics Audio/Video/Lights/ Control
- 46.02.17G Electronic Displays
- 46.02.18G Electronic Resistors
- 46.02.19G Electronic Capacitors
- 46.02.20G Electronic Diodes
- 46.02.21G Electronic Converters
- 46.02.22G Electronic Relays
- 46.02.23G Electronic Batteries
- 46.02.24G Electronic Tranzorb
- 46.02.25G Electronic Feeders
- 46.02.26G RF Electronic Components
- 46.02.27G Electronic Controllers, Processors, FPGAs, CPLDs
- 46.02.28G Electronic Logic Gates
- 46.02.29G Electronic Transistors
- 46.02.30G Electronic Drivers
- 46.02.31G Electronic Storage
- 46.02.32G Electronic Hybrids
- 46.02.33G Electronic Connectors & Accessories

46.03 Electronic Cables/Wires

- 46.03.01G Cables for Electronics
- 46.03.02G Cable Accessories for Electronics
- 46.03.03G Radio-Frequency (RF)
- 46.03.04G Data/Signal for Electronics
- 46.03.05G Power supply for Electronics
- 46.03.06G Wiring for Electronics

46.04 Mechanics Fusions for Electronics

- 46.04.01G Fusion / Selective Laser Melting (SLM) for Electronics
- 46.04.02G Mechanical Precision parts for Electronics
- 46.04.03G Semi-Finished Mechanical Products for Electronics
- 46.04.04G Racks
- 46.04.05G Console
- 46.04.06G Waveguides and Accessories

46.05 Optical for Electronics

- 46.05.01G Optical Windows for Electronics
- 46.05.02G Optical Lenses for Electronics
- 46.05.03G Optical Filters

46.06 Electronic Systems

- 46.06.01G Optronics System
- 46.06.02G Railways Electronic Systems
- 46.06.03G Automation System
- 46.06.04G Assembled Racks
- 46.06.05G On-board Control Subsystems
- 46.06.06G Process Controllers
- 46.06.07G HPA, BUC, LNA, LNB
- 46.06.08G Transceiver
- 46.06.09G Mobile Terminals System for Electronics
- 46.06.10G Time Frequency System

46.07 Consumables for Electronics

- 46.07.01G Conductive Paste
- 46.07.02G Silicone
- 46.07.03G Tin

46.08 Services for Electronics

- 46.08.01G Wiring Harness for Electronics
- 46.08.02G Electronic Board Assembly
- 46.08.03G Staking Adhesive
- 46.08.04G Electromechanical Assembly for Electronics
- 46.08.05G Mechanical Precision Re-machining
- 46.08.06G TX Licenses and Use of Frequences

Standard Categorization Manifesto

We believe that the sharing of a common language in a highly diversified industrial value chain of goods and services is of fundamental importance for all the involved parties. To date it is common to encounter efficiency losses deriving from the co-existence of different nomenclatures which were born from the widespread practice of calling the same goods or services with different names.

Thus the Standard Categorization was designed by SupplHi, to guide Buyers in search of Vendors in the various detailed procured categories. This Standard Categorization has been designed with the kind support of key Buyers, key Vendors and Trade Associations, at international level.

What defines such a categorization is the ability to create a new category each time competition amongst suppliers differs (e.g. ‘not everyone can supply everything’). This also implies a simplification and reduction of the category tree if a given set of goods or services is provided by the same variety of suppliers (e.g. ‘everyone supplies everything’). Therefore, in contrast to other categorizations, the discriminating factor does not lie within the product or the technology itself, but in the competition of the supply side of the market.

SUPPLHI

The **Vendor Management** platform for industrial equipment and services

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