

Standard cost coding system (SCCS)

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are, as far as possible, intended to replace oil company specifications and serve as references in the authorities' regulations.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standard will be withdrawn.

The NORSOK standards are developed according to the consensus principle generally applicable for most standards work and according to established procedures defined in NORSOK A-001.

The NORSOK standards are prepared and published with support by The Norwegian Oil Industry Association (OLF), The Federation of Norwegian Industry, Norwegian Shipowners' Association and The Petroleum Safety Authority Norway.

NORSOK standards are administered and published by Standards Norway.

Introduction

This NORSOK standard describes a system for coding of cost and weight estimates and as-built/experience data which has been recognised for some time as standard cost coding system (SCCS).

The SCCS was originally developed in 1989 by the three Norwegian oil companies Norsk Hydro, Saga Petroleum and Statoil with purpose of standardisation and specification of a cost coding system. The Norwegian Petroleum Directorate (NPD) joined the work to ensure consistency between the new standard and NPD's requirements for reporting to their INVERS database.

The SCCS is designed to provide a uniform coding basis for the estimate preparation and to serve as a standard for collecting/collating historical data.

This NORSOK standard has been developed on basis of the SCCS to update, improve and simplify previous edition no. 2 of the system from 1992 and to open for ownership, input and support from the entire Norwegian petroleum industry. NPD's 'Veiledning til PUD/PAD', states that cost reporting should be coded according to SCCS.

Major changes in this edition compared to rev. 2002-10-01 are:

- PBS – physical breakdown structure:
 - For AAC the fifth letter code has been deleted. The text is in principle unchanged;
 - Codes and descriptions for offshore wind park have been included, PBS AW;
 - Code ABR has changed the content, from the abandoned concept conical buoy to circular barge type substructure;
 - Subsea production systems (AD) has been adjusted:
 - Workover system and intervention system are removed from tools system and coded separately within production station (ADA);
 - Riser base (ADC) is moved to infield pipelines (ADK);
 - Subsea distribution unit (ADO) is segregated and moved to respectively; umbilical (ADE), infield pipeline (ADK) and power cable (ADL).
- Standard activity breakdown – SAB
No major changes;
- Code of resource – COR:
 - Structural bulk COR BNB has been deleted and been included in COR BNA. Text is in principle unchanged;
 - Telecommunication bulk has been implemented as a separate code in COR B. This is implemented in order to correspond with discipline codes in engineering disciplines and COR E;

- The second code letter in equipment (COR E) is implemented. This code letter is implemented in order to aggregate COR E code into disciplines, and this code letter corresponds with the second letter code under engineering disciplines. The third code letter in equipment (COR E) is used to split discipline into groups of equipment as required.
- For marine operations and logistics COR X, the third letter code has been deleted and some additional second letter codes are added.

The SCCS is not intended to replace project's work breakdown structure (WBS), TAG/system code or area/module breakdown structure, which are and will remain unique for each separate project. However, this NORSOK standard is prepared to provide a basis for the establishment of such standardised coding systems.

This standard is divided into two main sections, one, which presents the coding structures, and one, which describes the codes in text form.

1 Scope

This NORSOK standard describes a system for coding of cost and weight estimates and as-built/experience data. The system comprises 3 sets of complementary sub-coding systems named:

- PBS (physical breakdown structure)
- SAB (standard activity breakdown)
- COR (code of resources)

2 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet the requirements of the referenced standards.

2.1 Normative references

None

2.2 Informative references

None

3 Terms, definitions and abbreviations

For the purposes of this NORSOK standard, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

shall

verbal form used to indicate requirements strictly to be followed in order to conform to this NORSOK standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.2

should

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.1.3

may

verbal form used to indicate a course of action permissible within the limits of this NORSOK standard

3.1.4

can

verbal form used for statements of possibility and capability, whether material, physical or casual

3.2 Abbreviations

The SCCS consists of three individual hierarchical coding structures each having separate and different purposes.

- **PBS** – physical breakdown structure. This hierarchical structure defines the physical/functional components of «Projects» during any phase of development. The PBS provides a coding structure, which enables any known oil and gas production and processing facility configuration scheme to be coded. The structure presented in this manual is independent of project specific area/module/sub-project classification systems.
- **SAB** – standard activity breakdown. This hierarchical structure provides a timescale attribute to express when during the project lifetime, expenditures and activities occur. The structure presented in this manual is independent of project specific work breakdown structure (WBS) or activity breakdown structures (ABS). The alphabetical prefix introduces a code for use of SCCS throughout all phases of a project, from exploration through removal of facilities.
- **COR** – code of resource. This hierarchical structure classifies all project resources and categorises resources according to primary, secondary and tertiary levels of resources. This hierarchical structure also termed code of account (COA) classifies the complete scale of resources involved in developing offshore and landbased installations.

4 PBS – physical breakdown structure

4.1 Introduction to PBS code

The physical breakdown structure is a hierarchical structure which defines the physical/functional components of oil and gas facilities/projects during any development phase. The PBS structure defined herein is sought independent of project specific-area/module/preassembly/unit/structure/subproject (as applicable) classification systems.

This section of the SCCS manual provides PBS codes and code names.

Due to the requirement to provide a unique structure, the PBS defines functional areas as physical areas. Actual functional areas and systems within areas may vary from project to project, e.g. actual modules/units may contain functions which combine functional areas and sub areas differently from those defined in the PBS; in such cases it is advised when required to prepare reports conforming to SCCS codes to re-aggregate sub areas functions into PBS codes.

The physical breakdown structure is divided into

- **A** – offshore field installations,
- **B** – landbased installations.

4.2 Offshore field installations

A – Offshore field installations

Offshore field installations include all types of facilities for petroleum exploitation, support and transportation, hereunder:

- topsides which may comprise any of a number or combination of functions/facilities like
 - drilling,
 - wellhead and manifolds,
 - processing (incl. compression, injection, etc.),
 - utilities,
 - quarter/accommodation and helideck,
 - flare,
 - deck and deck appurtenances.
- substructures required for support of topsides which may comprise any of a number or combination of structures like
 - steel jackets,
 - gravity base structures,

- jack-up rigs,
- compliant towers,
- semi submersible structures,
- tension leg platform substructures (TLP),
- ship type structure,
- barge type structure,
- single and multicolumn deep floaters (spar buoys, etc.),
- circular barge type structure,
- artificial seabed.
- drilling and completion of production and injection wells, deploying
 - platform installed rig(s),
 - tender rig(s),
 - mobile rig(s).
- subsea production systems which comprise
 - template,
 - satellites,
 - manifolds,
 - control system,
 - workover system,
 - intervention system,
 - subsea separation/booster/injection stations
 - control and monitoring systems
 - tools systems,
 - infield pipelines,
 - riser and riser bases,
 - umbilical system,
 - power cables,
 - hybrid risers and riser towers,
- offshore transport systems which comprise
 - pipelines and expansion loops,
 - pipeline protection and crossings,
 - flexible risers and riser bases,
 - control systems (umbilical, etc.),
 - valve stations/connection points,
 - shore approaches (landfall),
 - booster stations,
 - tie-in to 3rd party facilities,
 - local off take systems for offloading and/or storage and local off take to shuttle tankers,
 - storage systems,
 - cables,
 - bridges.

Battery limits are confined to include all offshore facilities required for exploitation, support and transport from an offshore field to

- landfall for pipeline and cable systems, this includes shore approach via tunnels or at a beach site (onshore pipelines and cables are covered under PBS B),
- tie-in and modifications to existing 3rd party facilities for receiving, processing and further transport of products,
- tie-in to existing pipeline systems for transport of products.

PBS A is outlined and coded as follows:

AA Topsides

Topsides are a grouped term for facilities placed above sea level supported by fixed, compliant or buoyant substructures. Topsides may also be termed topside/topside facilities/production facilities/deck or other dependant on country/operator terminology.

Topside facilities may have any of a number or combinations of functions/facilities, dependant on development scheme configurations, such as

- drilling,
- wellhead and manifold,
- processing (incl. compression, injection, etc.),
- utilities,
- quarter/accommodation and helideck,
- flare,
- deck and deck appurtenances,

all of which enable the exploitation of hydrocarbons.

NOTE Descriptions hereunder describe in a hierarchical way:

- main functional areas, e.g. AAA – drilling area,
- sub functional areas, e.g. AAAA – derrick, and for purposes of completeness and clarity functional systems/facilities within sub areas are further outlined.

System/facilities descriptions hereunder are only intended to provide guidelines for cost coding, as the systems/facilities normally are designed and laid out differently and uniquely for each development project according to technical and functional requirements, construction philosophy and project realisation strategies.

Due to this it remains no exact correlation between a system/facility and PBS, as a system/facility may transgress individual physical areas as defined in this manual. For coding purposes it is suggested that the primary location of tagged equipment for «systems» takes precedence over installed bulk and steel, i.e. transgressing bulk/steel is coded according to the PBS area through which such bulk material pass.

Battery limits between topsides and substructures defined in the physical breakdown structure (PBS) are

- jackets (steel piled jackets) – between leg stab-ins forming part of, and extending from, deck/deck frame and connection points with upper legs of jacket substructure,
- gravity base structures (GBS) – for concrete GBS – between shaft(s) transition ring (steel, concrete or compliant elastomeric connections) and deck structure. For steel GBS – between leg stab-ins forming part of and extending from deck/deck frame and connection points with upper legs of internal jacket,
- semi submersibles – between upper columns of semi submersible substructure and deck structure,
- tension leg platforms (TLP) – between upper columns of TLP hull/substructure and deck structure,
- ship and barge type substructures
 - all facilities placed at/above or upon main deck level; process units, modules, decks, process piping, utilities and flare system (topside),
 - systems – typically utility and support systems placed within hull, which are required to support production of hydrocarbons and not considered to form part of vessel storage/distribution system, main propulsion system or marine systems (substructure),
 - living quarters for ship and barge type substructures are deemed to be part of the substructure.
- jack-up platforms
 - all facilities placed at/above or upon main deck level of the hull; process units, modules, decks, process piping, utilities and flare system (topside),
 - systems – typically utility and support systems placed within hull, which are required to support production of hydrocarbons and not considered to form part of the hull, main propulsion system or marine systems. Normally there is nil or few such systems (substructure).
- compliant towers – between leg stab-ins forming part of, and extending from, deck/deck frame and connection points with upper leg(s) of tower structure. Between transition ring and deck for concrete structures,
- single column deep floaters – between deck structure and transition ring/crushing tubes placed on top of mono column,
- multicolumn deep floater – between the upper columns of the deep floater hull/substructure and the deck structure,
- for artificial seabed, see PBS ABS.

Topside facilities are subdivided and coded as outlined below:

AAA Drilling area

The drilling area is divided into the following subareas:

- derrick – which includes the derrick structure, derrick substructure, drill floor, skid beams and jacks and drillers offices. The "derrick area" contains structures, equipment and machinery for carrying out the drilling operation;
- mud handling and drilling utilities – mud handling is a group of systems, which store, mix, transfer, circulate, recover and treat drilling mud. The systems are used to transport cuttings, cool drill bits and provide a dense medium to prevent blowouts. Drilling utilities is essential utilities required in support of drilling operations – e.g. power, compressed air, water, lighting and storage;
- pipehandling – an arrangement to store, handle, move and feed conductor pipes, casing and tubing to the derrick.

For medium or large topsides normally the derrick tower and a few modules constitute the drilling area. The area is further outlined and coded in the following:

AAAA Derrick

This code covers the drilling derrick, derrick substructure, drill floor, skid beams and jacks which are used for drilling and completion of production and injection wells and workover of completed wells.

The derrick is a tower/mast lattice framework structure rising from the derrick substructure positioned above wellslots in the wellbay area or directly above the wellslots.

The derrick supports the hoisting mechanism – crown and travelling blocks used for raising and lowering drillstrings. The travelling block is connected to the swivel/kelly, the kelly is attached to the drillstring and turned by the rotary table. Topdrive systems have also been used in recent years. Drawworks is the hoisting winch for handling drill pipe, casing and tubing.

Machinery and equipment installed within the derrick area may include

- derrick base/substructure,
- BOP control,
- cathead,
- cat line,
- crown block,
- doghouse/drillers office,
- drawworks,
- drillers console,
- drilling line,
- dynamatic/hydraulic packs,
- elevators,
- fast line,
- gin pole,
- hoisting line,
- hook,
- kelly,
- kelly bushing,
- kelly hose,
- ladders/access,
- line guides,
- derrick mast structure,
- mast lifting line,
- monkey board,
- mousehole,
- piperack (derrick),
- rathole,
- reserve drilling line,

- rotary drive,
- rotary table,
- safety line,
- standpipe,
- swivel,
- swivel springs,
- tongs and travelling block.

AAAB Mud handling and drilling utilities

This code covers mud handling and drilling utilities systems/facilities:

Mud handling

The mud systems comprise mud pumps, mud tanks, mud lines and circulating hoses. The systems, operating through continuous circulation of mud, have several functions:

- removal of drill cuttings from the drill bit;
- cool and lubricate the drill bit and plastering borehole walls;
- provide a dense medium to prevent flow of water, oil and gas into the wellbore thus preventing blowouts.

Mud is a suspension of clays in water or oils; a mixture where bentonite is dosed with barite to increase density. The mud systems are divided into

- mud preparation, which includes bulk storage, distribution and mixing,
- mud pumps,
- mud recovery and treatment system,
- reserve-storage pits and hoppers.

Machinery and equipment installed in the mud handling systems may include

- burner boom,
- centrifuges,
- chemical dosers,
- compounds storage,
- cyclones,
- drill cuttings disposal,
- desanders/desilters,
- degassers,
- discharge lines,
- mud mixing bins/hoppers,
- mud-bulk storage,
- mud-gas separators,
- mud guns,
- mud hoppers,
- mud-lines,
- mud logging unit,
- mud mixers,
- mud mixing plant,
- mud pressure control,
- pump drivers,
- pumps – mud mixing,
- pumps – mud circulation,
- reserve pit/bins,
- sand settling bin/pit,
- shale bin/pits,
- shale shaker,
- storage-bulk barite,
- storage-liquid mud,
- storage mud additives,
- suction lines,

- suction bin/pit,
- water storage and supporting structures.

Drilling utilities

Drilling area utilities are required to support the drilling operation and comprise of such as

- accumulators,
- air compressors,
- drill tool storage,
- engine drivers,
- fuel lines,
- fuel tanks,
- power generators,
- oil and grease storage,
- tool house,
- trip tanks,
- water storage and reticulation,
- plant lighting.

AAAC Pipe handling

Pipe handling is a system adjacent to the drilling derrick used for storage, retrieving and handling of casing and conductor pipe and tubing.

The pipe handling system comprises

- piperacks for storage,
- piperack floor (normally part of weatherdeck),
- catwalk,
- ramp and associated structural components.

The system is confined to the interface with the derrick structure and handles pipes from piperacks through catwalk and up pipe ramps whereupon pipes are stacked/stored in the derrick piperack (see PBS AAAA). Fully automated pipe handling systems have in later years been used for offshore projects.

AAB Wellhead and riser area

The function of the wellhead and riser area is to receive wellstream from the production riser systems for further distribution to separation systems, receive and distribute treated water from water injection system for injection into reservoir(s) and receive separated gas for reinjection into reservoir(s) or gas for gas lift.

This code is subdivided and coded as outlined in the following:

AABA Wellhead area

Wellhead area or wellbay area is located below the derrick/derrick substructure. The lower decking of the area is fabricated with wellslots/covers for later drilling and completion of wells.

Functional systems within the wellhead area/wellbay include

- drilling and well control systems,
- production systems,
- production stimulation systems,
- chemical injection systems,
- systems within the wellbay area related to subsea production.

Manufactured equipment/facilities installed in the wellhead area or related to wellhead area are such as

- surface wellheads,
- X-mas trees,
- emergency shut down system,

- production manifold,
- test manifold,
- water injection manifold,
- mechanical handling equipment,
- fire and safety systems,
- controls,
- blow-out preventer.

See: X-mas trees installed topside will normally be part of drilling and completion's budget, see PBS AC.

AABB Riser area

In the riser area the risers are connected to the topsides facilities. Included are facilities/systems in support of the risers (risers not included) in the riser area – riser balcony for floaters – with riser tensioner/heave compensators for floating structures, connectors, etc.

Some of the components mentioned under the previous code (PBS AABA) may be installed in the riser area.

For rigid and preinstalled risers, see codes under PBS AB. For flexible risers, see codes under PBS AD and AE for flowline and transport pipeline risers respectively.

AAC Process and utilities

Functional systems/facilities within the process and utilities area consist of

- process,
- process support,
- electrical power,
- platform utility.

As outlined and subcoded below.

For medium and large topsides process and utilities will consist of different modules. If a module covers major parts of more than one PBS code below, the PBS level above should be applied.

AACA Process

This code is dedicated to the treatment of produced gases, fluids and sand.

The purpose of the process function as defined hereunder, is to

- separate the well stream into oil, gas, water and sand,
- stabilize oil to required temperature and pressure,
- process gas to specified quality: for sales gas and – where required – for injection and/or gas lift,
- treat produced water and – where required – water for injection.

The main gas oil separation plant process consists of separation train(s) for separation of oil, gas, water and sand from the wellstream and is further divided into systems for gas treatment, oil treatment and water treatment as outlined and coded in the following.

Separation

Test separation and separation and stabilisation:

Test separation

The function of the test separation system is to receive wellstream from individual wells via the test manifold and test each well for production performance: i.e. throughput, gas/oil ratio, water produced and sand content. Products after test separation are fed into the production separation and stabilisation train(s):

Separation and stabilisation

The production separation train(s) separate wellstream into gas, liquid hydrocarbons and free water. The gas passes to gas treatment systems for NGL recovery and free water is passed to the oily water treatment system. Produced oil, after stabilisation to required temperature vapour pressures, is transferred to crude treatment systems for dehydration, de-emulsification and paraffin removal.

Production separation train(s) comprise of dual or multi-phase horizontal separators connected in series (stages) to successively separate water and free associated gas from the crude oil stream. Individual separator operating pressures are reduced during each stage prior to dehydration.

Gas treatment

Under normal operation all produced gas in excess of that required to meet platform fuel demand and for flare line purging is compressed and either exported to the gas pipeline system, used for gas lift or reinjected into the reservoir for secondary recovery, gas drive, etc. The gas treatment function contains systems, which in part comprise the main processing system:

- gas recompression, cooling and scrubbing;
- dehydration and regeneration;
- gas conditioning;
- gas sweetening;
- gas pipeline compression, metering and transfer;
- gas injection;
- gas lift.

As outlined in the following:

Gas recompression, cooling and scrubbing

The function of this system is to successively compress and cool produced gas from separators and remove liquids (NGL and water) from the gas stream. Recovered natural gas liquids are normally spiked into the oil stream, and water is removed in the dehydration system. Dry gas meeting the hydrocarbon and dewpoint control specification is passed to either compression for reinjection into the reservoir system or to the gas pipeline compression, metering and transfer system. Gas not meeting specification is passed to the gas conditioning and sweetening system prior to pipeline compression, metering and transfer.

Dehydration and regeneration

The function of this system is to remove water/contaminants from the gas stream (moisture/water is removed to prevent hydrate formation within pipelines), retard corrosion and to prevent condensation. Dehydration is achieved by

- absorption, where liquid absorbents are used, e.g. glycol (TEG, DEG, MEG),
- adsorption, using packed/trayed towers with active adsorbents, e.g. alumina, silica,
- condensation by cooling/refrigeration. Absorption and adsorption methods require regeneration of absorbents and adsorbents.

Gas conditioning

Systems used for/to treat and condition gas to meet hydrocarbon specification of the gas product, may include stripping of gas stream or dosing to achieve specification.

Gas sweetening

Processes used for the removal of acid gases: hydrogen sulphide, carbon dioxide (CO₂) and other from gas streams. Raw gas is scrubbed in packed/trayed absorber columns, and the removed acid gas solution is stripped by regeneration.

Gas pipeline compression, metering and transfer

Gas meeting specification from foregoing systems is compressed to pipeline export pressure, metered, and transferred into the pipeline system. The system includes also normally pig launchers/receivers for transfer.

For transport pipelines, see PBS AE with subcodes.

Gas injection

Gas injection includes separate topside systems and facilities for secondary recovery of product or storage; gas recycling, gas drive, miscible flooding and for reinjection into reservoir(s) for storage and/or later production:

- gas recycling/cycling – gas recycling/cycling is a technique used to increase production of natural gas liquids (NGL) from gas/condensate reservoirs. NGL is recovered from the produced wet gas stream in the gas treatment plant, dry gas is recycled, compressed and reinjected into reservoir(s) via gas injection wells where further NGL is absorbed;
- gas drive – produced gas is injected into the reservoir gas cap and used as a drive mechanism for oil production;
- miscible flooding – miscible flooding is used in conjunction with oil production. Wet gas (propane) and in some cases carbon dioxide and nitrogen are injected together with dry gas into the reservoir. The gases act as solvents reducing oil viscosity and swell within the reservoir improving mobility of the oil in place;
- gas injection for storage – gas injection for storage is used where pipeline offtake is not available, where phased production is adopted or where gas production is not considered economically feasible. Also relevant for CO₂ injection for underground storage.

Gas lift

Gas lift is the introduction of produced gases at high pressure into individual wellbores to assist oil flow to the surface.

The system includes the gas supply header, piping from header to each well and all associated bulk items (topside located components). The system excludes gas lift completion equipment (part of drilling and completion costs, see PBS ACC) and gas compression facilities.

Gas injection and gas lift do not include costs related to wells, non-dedicated gas injection compressors and installations in the wellhead area.

Oil treatment

The oil treatment function as defined hereunder, contains systems which in part or wholly comprise the main processing system after separation:

- crude cooling;
- crude treatment – dehydration, de-emulsification and paraffin removal;
- crude handling, pumping, metering and transfer.

As further outlined in the following:

Crude cooling

To suit requirements for offshore storage it may be necessary to cool the crude oil stream to specified maximum temperatures. Cooling to required temperatures may be achieved by the use of crude cooling heat exchangers within the separation train between the last separation stages.

Crude treatment

Crude treatment includes crude dehydration, de-emulsification and paraffin removal. The stabilised crude delivered from the last stage of separation will normally contain minor amounts of free water, oil/water emulsion and paraffin. Removal of such may be by use of mechanical, chemical, electrical or thermal means or combinations thereof to remove emulsified water and/or paraffin.

Crude handling, pumping, metering and transfer

Crude oil meeting specification is transferred from the dehydrator/coalescer to

- offshore storage system for later local offtake, pumping, metering and transfer to shuttle tankers,
- export pipeline pumps, pig launcher/receiver, oil metering skid and pipeline transfer piping to pipeline system.

Water treatment

The water treatment function as defined hereunder, consists of

- oily water treatment,
- water injection.

As outlined below.

For systems for seawater, ballast water, fresh water, hot water, fire water and sewage, see under PBS AACD.

Oily water treatment

Oily water treatment includes treatment of: produced water, reclaimed water, sludge and bilge/ballast water. The system collects produced water from separators, test separator(s) and coalescer/dehydrator, recovers oily water from ballast/bilge systems and open/closed drain systems for separation of oil from water.

Recovered oil is pumped into the oil separation train(s), gas is normally vented through the flare/vent system and water is either used for injection water or discharged into the sea.

Water injection

Water injection (water flooding) is a production technique, which injects under high pressure filtered and treated seawater, water from aquifer wells and/or produced water into reservoir(s) for the purposes of pressure maintenance. Water injection can be used early in the production phase to supplement natural water drive or employed in a secondary recovery phase.

Seawater/produced water/aquifer water is taken from the platform service water system/well system and stripped of dissolved oxygen. Deaerated water is pumped via filtration units to water injection pumps, and injection water is transferred to water injection wells.

The water injection system comprises of such as

- deaeration unit:
 - deaerators, i.e. vertical cylindrical vessel(s) which operate at full vacuum;
 - inert gas/catalyst stripping systems (Minox-deoxygenation).
- deaerator pumps:
 - booster pumps which discharge to water injection filters;
 - deaerator vacuum pumps.
- filter plant – a number of vessels containing filter elements for particle removal,
- water injection pumps – a number of multistage centrifugal pumps,
- chemical dosing associated with injection water; e.g. antifoam, oxygen scavenger, biocide, filteraid and antiscale.

Excluded are costs related to wells and installations in the wellhead area.

AACB Process support

Process support as defined hereunder covers systems required in a more direct support of the main processes (see PBS AACA), and includes such as

- cooling and refrigeration.
- heating systems,
- chemical injection systems,
- flare, vent and blow-down system,
- fuel gas system.

For support systems of a more general platform utility character, i.e. utilities serving the total platform facilities generally, see PBS AACD.

Cooling and refrigeration

- cooling medium system – provides a medium to remove excess heat from process plant equipment and machinery and for cooling produced crude and/or gas,
- refrigeration systems – the systems are used in combination with gas dehydration for water removal, and/or for stripping of natural gas liquids.

Heating systems

Heating systems include heating medium system/hot oil system. Heating medium system provides heat recovered from turbine waste heat recovery exchangers, recovered from cooling medium system or heat generated by other means e.g. electrically to support production; i.e. for crude oil and gas heating, glycol regeneration, storage purposes and HVAC systems. The heating medium is normally circulated hot oil.

Chemical injection systems

Includes chemical treatment necessary to supplement the performance of the various mechanical processes involved in production processes. The chemicals are used for different purposes such as

- de-emulsification,
- antifoam,
- reverse emulsion,
- anti-hydrate,
- pour point depressant,
- biocide,
- formation anti-scale,
- oxygen scavenger,
- filter aid,
- deaerator anti-foam,
- CO₂ corrosion inhibitor,
- methanol and chlorinators.

Flare, vent and blow-down system

Includes

- liquid blow-down,
- vapour blow-down,
- gas blow-down and blow-down drums.

Under operation all produced gas will be compressed and either exported to the gas pipeline or reinjected into the reservoir. Under emergency conditions the whole of the gas produced on the platform plus blow-down from the gas compression plant must be diverted and flared by the flare system flare stack/boom. The system hereunder does not include relief valves, flare structure, tip or piping within structure (see PBS AAF).

Fuel gas system

The fuel gas system treats and distributes produced gas for use as fuel gas for such as

- gas turbine driven electrical power generators,
- gas turbine driven compressors, -water injection pumps and -export pumps,
- gas driven reciprocating power generators,
- heaters,
- flare pilots/ignition panels,
- starting gas,

- mud burning,
- purge gas for vents and headers.

For diesel and aviation fuel systems, see PBS AACD.

AACC Electrical power

Electrical power comprise

- power generation,
- power distribution and control.

As outlined under the following subcodes:

Power generation

Power generation provides electricity, hereunder main power and emergency power, to the platform facilities.

Power generation includes the major generating sets like

- main gas turbine driver units (e.g. 13.8 kVA/6.0 kVA units) with couplings, alternators, control units, lube oil units, coolers, fuel supply headers, filters, scrubbers and inlet/exhaust ducting,
- emergency generator units (normally diesel driven) complete with couplings, alternators, controls, coolers and fuel supply system.

Power distribution and control

The power distribution and control system centrally controls power generation to ensure correct voltage and frequency for distribution to local power consumers and lighting consumers.

The power distribution and control system includes such as

- central generator controls for load shedding and sharing,
- transformers,
- buses,
- switchboards, to consumers, etc.,
- converters and similar for DC power e.g. from land,
- cabling between switchboards,
- lighting/domestic power,
- industrial power,
- earthing/grounding systems emergency lighting,
- signal lighting for aircraft,
- DC-UPS uninterruptible power supply,
- cathodic protection wiring and panels,
- switchgear rooms/motor control centers,
- fire and safety systems required in area, and
- mechanical handling equipment.

AACD Platform utilities

This code includes utilities of a more general character; i.e. utilities serving the total platform facilities (and not primarily the production processes).

Included are platform utility systems/facilities as defined hereunder:

- heating, ventilation and air conditioning (HVAC),
- water treatment (ballast water, fire water, etc.),
- steam and condensate system,
- main control room facilities,
- open and closed drains,
- dry bulk loading,

- fluid bulk loading,
- fuel treatment (diesel and aviation fuel),
- compressed air systems,
- inert gas,
- hydraulic power,
- workshops and storage,
- fire and safety systems,
- other utilities.

For utility-like systems primarily for process support, see PBS AACB.

The systems/facilities are outlined in the following:

Heating, ventilation and air conditioning (HVAC)

HVAC systems provide

- forced ventilation of enclosed platform areas/modules; removes hydrocarbon laden air, replenishes fresh air,
- heating for enclosed platform areas,
- air conditioning for local control rooms, offices and amenities rooms.

HVAC system is normally centralised with HVAC system equipment and units installed in utility modules/preassemblies for platform distribution.

HVAC systems comprise such as

- air conditioning units,
- fans,
- air heater coils,
- filter/coalescer,
- separators,
- duct attenuators,
- shut-off dampers,
- control dampers,
- fire and gas dampers,
- backflow dampers,
- grilles and bulk ductwork,
- piping,
- instrumentation and electrical supply.

Water treatment (ballast water, fire water, etc.)

Water treatment hereunder includes:

- water supply,
- treatment,
- collection,
- transfer and reticulation.

Systems included hereunder are:

- seawater systems – low/medium/high pressure seawater including seawater lift, supply to water injection header and jet water/service washdown,
- ballast water systems – including permanent and temporary ballast water systems,
- fresh water system – this system provides fresh water for human consumption. It may also provide water for sanitary systems and for fire main pressure maintenance,
- hot water system – this system provides hot water for e.g. sanitary purposes,
- fire water system – this system supplies and distributes seawater for fire control. The fire water system is independent of all other systems except for pressurization of the fire water header by the sea water supply system during non-emergency conditions,

- sewage treatment system – this system handles, treats and disposes waste from e.g. toilets, urinals, showers, wash basins and kitchen sinks.

For oily water treatment, see PBS AACA.

Steam and steam condensate systems

- Steam system – steam can be generated as a by-product through heat exchange, waste heat recovery or directly by steam generation. Steam systems are divided into high pressure, medium pressure and low pressure systems.

High pressure (HP) steam is normally generated by waste heat recovery units and/or separate boilers and is used primarily as the driving medium for steam turbines and generators. The system is normally considered for combined cycle application.

Medium pressure (MP) steams forms part of combined cycle applications and may be used as source for process heating.

Low pressure (LP) steam is generated by waste heat recovery and is normally used for plant heating purposes both for e.g. space heating and as feed for steam tracing systems.

- Steam condensate system – the function of this system is steam condensate collection and recycling by means of a steam regeneration unit/package prior to feedback into the steam supply and distribution system.

Main control room facilities

Included hereunder are systems/facilities in connection with the main control room, which normally is located in the utility area (in a safe zone).

The control room houses the computer for process and facilities monitoring and control (CPC) and the central instrument and communication hardware.

The CPC facilities gather and store e.g. production data, write reports, produce graphs, and perform process and production calculations. They supervise, but do not control the operations. Control is exercised by the operators who indicate the instrumentation set points.

The main CPC facilities can be located offshore or onshore. If offshore, the platform will have computer and input/output stations. If the CPC facilities are onshore, a remote terminal unit (RTU) and an input/output station will be on the platform. The RTU automatically assembles data and relays the data to the onshore facilities. The onshore CPC facilities are accessed through the platform's input/output station.

Included are the control room facilities and if required input/output stations, RTU (onshore CPC system), or CPC computer (offshore CPC system), as well as components for control, communications and navigational aids; intra platform communication and communication with shore, vessels, helicopters, etc. This may include components like

- alarms – emergency horns, bells, etc.,
- microwave radio receiver/transmitter,
- radio – UHF/VHF aviation/marine radio and radio telephone,
- telephone exchange – handsets/telephones, switchboard, etc.,
- public address – speakers and transmitter,
- paging – UHF personal beepers,
- hand transceivers,
- MF beacon – radio beacon for aircraft,
- portable loud speakers,
- portable signal lamps,
- radar meteorological measurement,
- television monitors,
- aircraft visual aids,
- entertainment public address – speakers, transmitter, tape recorder, etc.,
- navigational aids,

- centralized clock.

Open and closed drains

The systems included are

- open deck water drains which collect and handle rain water and wash down fluids,
- atmospheric hydrocarbon closed drains which collect fluids from leakage or spillage,
- pressurized closed drainage systems for collection of oily water emulsion for further treatment in the produced water system (see PBS AACA).

Dry bulk loading

Systems required for offloading from supply vessels, etc., of dry bulk material required during the production and operation period. The systems may be containerised for lifting/storage of chemicals, mud, provision and other, or may be transferred by other means.

Fluid bulk loading

Systems for offloading from supply vessels, etc. of liquid bulk material required during the production and operation period. The systems may be by hose transfer or containerised for lifting by platform cranes. The fluids to be loaded may be diesel fuel, liquid chemicals, water, drilling fluids, liquid gases, etc.

Fuel treatment

Included are systems for treatment of liquid fuels:

- aviation fuel – this system provides storage and pumping of helicopter fuel;
- diesel fuel – this system provides storage, pumping and distribution of diesel fuel. The fuel may be used for drivers in connection with e.g. the crude pumping, chemical storage and injection, cranes, electric power generation, instrument air, fire water pumping and the drilling facilities.

For fuel gas system, see PBS AACB.

Compressed air systems

Compressed air systems include plant utility air and instrument air systems:

Instrument air systems are air supply systems used for pneumatically controlled and actuated instruments/components e.g. flow, level, pressure and temperature instruments, control valves and control panels.

Plant utility air systems provide compressed air for air operated tools, air driven motors/drivers for starting e.g. turbine units.

Compressed air systems include electrical/diesel driven air compressors, receiving surge vessels, air dryers and distribution header. Compressed air may also be generated from turbine bleeding.

Inert gas

Includes facilities for chemically un-/non-reactive gases used for e.g.

- active fire protection – e.g. nitrogen, carbon dioxide, stored in bottle banks and used as blanket gas for extinguishing fires,
- diving gases – helium and argon stored in bottles and mixed with air to provide diver-breathing gases for hyperbaric diving operations.

Hydraulic power

A system for generating, transmission and control of hydraulically operated equipment such as

- emergency shutdown valves (ESD),
- sub surface safety valves (SSSV),
- wing valves,
- oil and gas process train valves,
- remotely operated valves via umbilicals,
- automatic shutdown system,
- shear rams,

- hydraulic motors and linear motion rams.

Power is generated both hydraulic power units (HPU), which may be combined within a general hydraulic supply system or having separate integrity with emergency power back-up (UPS).

Workshops and storage

Fabricated and equipped compartments for storage of materials and for maintenance of facilities during production and operations phase. Included are structures, units, containers, workshop equipment, handling equipment and storage areas/systems.

Fire and safety systems

Fire and safety systems required and located within the process and utilities areas for personnel safety, active fire protection, escape and personnel safety.

Other utilities

Includes other platform utility systems/facilities not covered previously.

AAD Living quarter

Permanent living quarter (LQ) provides space for bedrooms, kitchen, cafeteria, laundry, recreation rooms, offices, etc. Living quarters are self-contained when towed out and include facilities for distribution of fire water, potable water, sewage, power, and facilities for fire detection, communication, HVAC, etc.

For ship and barge type production platforms, the living quarter is deemed to be part of the substructure and is to be PBS coded under ABM and ABN respectively.

AAE Helideck

The helideck provides an open surface away from obstructions for landing of helicopters. The helideck is usually supported above the living quarter by a steel structure, and it is equipped with light and other outfitting.

AAF Flare

The flare boom is generally a truss-type structure cantilevered horizontally or at a slight upward angle of the well end of a platform. Flare towers are also truss-type structures installed on the top deck of a platform, or may be freestanding adjacent from the platform. The purpose of a flare tower or flare boom system is to burn gases at a safe distance from the platform.

The code includes such as

- flare structure,
- flame front generator,
- snuffing equipment,
- piping in structure,
- flare tip.

The flare tip typically consists of a burner, pilot, fluid seal and inlet flange. The flame may be ignited by shooting, and devices for this are also to be included hereunder.

The system excludes relief collection piping and scrubbers.

In the case of a freestanding flare tower located adjacent to the platform, the substructure (i.e. structure from seabed and up to about bridge level or similar) is to be PBS coded under ABA or ABB (in the case of jacket or GBS ("bottle") type substructure). For bridges, see PBS AEJ.

AAG Deck appurtenances

Includes all purpose built support facilities not related to a specific physical area of a topside, such as

- lifeboat stations,
- cranes,

- mooring winches,
- other deck appurtenance.

As outlined and coded in the following:

AAGA Lifeboat stations

Includes stations for lifeboats and rafts, complete with support structure, davits or equivalent, lifeboats and rafts, machinery, etc.

The support structure may be an integrated part of the deck (see PBS codes under AAH).

AAGB Cranes

Included are platform cranes. Most applied are cranes of pedestal type, but other types may be relevant.

Pedestal cranes are sleeving/revolving cranes with fabricated steel pedestals/columns, which are placed on/within or incorporated in deck structures.

Pedestal cranes are typically used for platform service – movement of material onboard and offloading of material delivered by supply vessels. Pedestal cranes may be electrically and/or hydraulically operated/powered, and the cranes normally range from 6 tonnes to 50 tonnes lifting capacity.

For crane pedestal support structure being part of the deck (integrated), PBS codes under AAH apply. For gantry crane for FPSO turret servicing, see PBS ABMCB.

AAGC Mooring winches

This code covers mooring winches located in the topside area and includes winches, drivers, controllers and accessories.

Mooring winches located on a substructure are deemed to be PBS coded under substructure (see PBS AB codes). For mooring winches in FPSO turret, see PBS ABMCC.

AAGD Other deck appurtenances

Includes deck appurtenances other than previously listed, such as separate hoists, stairtowers, etc.

For bridges, see PBS AEJ.

AAH Deck structure

Included in this code are all main structures designed for support of topside facilities which could be in the form of prefabricated modules for lifting onto the deck structure or preassembled packages/pancakes for installation on the deck structure. The deck structure is supported by a substructure (GBS, jacket, etc., see PBS AB). Battery limits are defined under PBS code AA Topsides.

Deck structure as defined hereunder can either be a steel frame constructed as an open truss design which combined with infill structures, forms a complete deck structure, or a complete deck structure built up by plate girders, stiffeners/bulkheads and other plated construction. Alternatively, the deck structure may consist of single beams/girders, constructed of steel or concrete.

Primarily the code shall include the main structure itself, being steel or concrete. All functional items related to process, utility or support systems, etc., are in general to be coded within the relevant PBS AA codes.

The deck structure is subdivided and coded as outlined below.

AAHA Open truss

The open truss is constructed by prefabricated boxes and nodes, welded profiles and/or standard profiles. It will include connection arrangement to the substructure, installation/lifting attachments and may have minor structural outfitting such as walkways, ladders, integrated supports, etc.

AAHB Plated/plate girder

This deck structure consists of single plate-constructed girders or a frame constructed by prefabricated plate girders and plated deck constructions for installation of pre-assembled packages/pancakes. It will include connection arrangement to substructure, support/lifting attachments and may have minor structural outfitting such as ladders and walkways, integrated supports, etc.

For jack-up rigs, the "hull" is considered part of the substructure and included under PBS ABCA.

AAHC Concrete beams

This code includes single girders constructed in concrete. May include outfitting steel items as gangways and ladders for access.

AAHD Load transfer frame (LTF)

The frame is normally installed on top of a steel jacket, steel GBS or compliant tower for transfer of deck loads to the substructure in particular cases. It is built as a steel space frame (cone shaped) from standard or prefabricated profiles, including stabs for connection to substructure.

AB Substructures

The code includes all types of substructures normally designed for support of topside facilities. Battery limits are defined under the PBS code AA, topsides. Jacket and GBS substructures may also be applied as substructures for free standing flare towers.

The substructure may be constructed of steel or concrete, resting on seabed by its own weight with or without skirts/piled to the seabed, resting on bucket foundations or as in the case of floaters, held in position by means of anchors or tethers. Substructures may be equipped with product storage facilities,

In addition to the substructure itself and the piling/foundation system, the code also includes mooring and tethering systems, risers integrated in the structure (preinstalled), turrets and temporary outfitting for installation purposes.

ABA Jacket

A bottom founded fabricated steel structure. This structure may have three or more legs and can be either self-floated, barge launched or derrick barge placed.

The jacket will normally be fabricated and installed in one unit, but may be split in a lower and an upper section.

The jacket is subdivided and PBS coded as outlined in the following:

ABAA Jacket structure

Includes the legs and bracings constructed of steel tubulars and assembled by prefabricated leg nodes and bracing nodes, normally fit with sleeves and guiding structure for piles. Also including mudmats/skirts or bucket foundations and required framing/guides for production related outfitting within the structure. The structure is subdivided and coded as follows:

ABAAA Leg tubulars

All straight tubulars and conical transitions for legs including internal stiffeners.

ABAAB Bracing tubulars

All straight tubulars and conical transitions, vertical and horizontal bracings included internal stiffeners if applicable.

ABAAC Bracing nodes

Nodes or cans for vertical and horizontal bracings.

ABAAD Pile sleeves/mudmats

Pile sleeves

Tubulars which the piles are to be stabbed through. Gathered together to «pile clusters» and located at the bottom of each corner leg of the jacket.

Mudmats

Plane area underneath the leg/pile cluster to prevent excessive jacket penetration into the soil. Sometimes with skirts.

ABAAE Pile guides

Short tubulars with funnel-shaped top to guide the piles during piling operation. Normally located on each leg at certain elevations.

ABAAF Conductor framing

Horizontal framing with conductor guides within the jacket structure.

ABAAG Leg nodes

Nodes or cans for leg sections produced of steel plates, cast steel or forged steel.

ABAAH Bucket foundations

Bucket foundations (used instead of piling and mudmats) are normally prefabricated assemblies connected to the legs at the jacket yard.

The assemblies include plates and stiffeners, preinstalled accessories, transition piece/assembly and often part of the leg.

ABAB Outfitting

Includes all permanent outfitting related to the jacket, such as walkways, ladders and systems used for installation purposes e.g. mooring, ballasting, flooding, pumping, venting, grouting and instrumentation systems, which may be of permanent nature. Outfitting is subgrouped and coded as follows:

ABABA Installation system

Anchors, chains and mooring and ballasting systems necessary to ensure exact positioning above an already installed and predrilled template. Also included are permanent systems (incl. instrumentation) for bucket foundations related to installation (e.g. venting, pumping etc.); normally permanent, but some of it may be removed after installation.

ABABB Flooding and grouting

Pipes, valves and electrical cables for flooding and grouting purpose usually placed in caissons outside the jacket legs. This outfitting is normally permanent, but some of it may be removed after installation.

ABABC Walkways/ladders

Walkways, stairs, ladders and similar applied to the structure.

ABAC Temporary outfitting

Includes temporary arrangements used for installation purposes; floating tanks, installation control devices, lift appurtenances, and temporary systems for bucket foundation; i.e. arrangements, etc., which will be removed after jacket installation. They are subgrouped and coded as follows:

ABACA Auxilliary buoyancy

Floating tanks and clamps for fastening to the jacket legs. Tanks including clamps to be removed after jacket installation.

ABACB Floating and up-ending control system

Control capsule containing instruments to control the floating and installing operation of the jacket. The capsule is normally placed at the top of the jacket and is removed after jacket installation.

ABACC Lift appurtenances

Lifting devices to aid installation of structures.

ABACD Systems for bucket foundations

Temporary systems (or parts of systems) for bucket foundations not covered by previous ABAC codes.

The items are to be removed after jacket installation, such as pumping units, instrumentation, control units, flexible hoses etc.

ABAD Piles

Piles/followers are tubulars made from steel plates, stabbed into the soil through the legs (leg piles) or through the pile guides/pile sleeves (skirt piles) to transfer forces from the structure to the soil.

ABAE Risers/J-tubes and caissons

Risers and J-tubes are pipes, which extend from the wellhead or other surface areas through guides to the jacket base area or to a preinstalled subsea wellspacer/drilling template.

Preinstalled parts of risers and J-tubes are part of the substructure.

Export/import risers – may be installed in jacket structure conductor frames/guides prior to installation (preinstalled) or at field location.

J-tubes – conduits extending from surface facilities down jacket structure guide frames and exiting via long radius bends to the mudline/seabed for later pull-in of flowlines, pipelines, umbilical and cables.

Production risers – tie-back strings transfer wellstream from e.g. a subsea well spacer/drilling template to surface facilities, used for predrilled wells.

Also included hereunder are caissons for protection of small pipes.

Conductors are to be regarded as belonging to PBS code AC Wells.

The PBS ABAE outfitting is subgrouped and coded as follows:

ABAEA Production risers

Production risers transfer wellstream from e.g. a subsea placed well spacer/drilling templates to surface facilities.

Also included hereunder are injection risers which transfer treated water for injection or transfer gas for reinjection from wellbay manifolds to e.g. the subsea well spacer/drilling template.

See also explanation under the code following below:

ABAEB Export risers

Pipes, rigid or flexible, extending from either subsea riser bases or from subsea mechanical/hyperbaric tie-in point to surface facilities' import/export manifold connections for import/export of oil and gas. Risers may in general be

- a) preinstalled forming part of jacket structure outfitting, routed through conductor frames/guides in the jacket structure,
- b) post-installed,
- c) be pulled through J-tubes installed in jacket structure.

Risers of category b) and/or c) are deemed to be covered for under PBS codes AD Subsea production system and AE Transport systems, e.g. risers for flowlines or transport pipelines, etc.

ABAEC J-tubes

A string of steel pipe of varying diameters installed during mechanical outfitting of the jacket structure.

The J-tubes extends from surface facilities vertically through guidedecks/guides to the lower jacket base area where a long radius bend extends and exits above the mudline/seabed. J-tubes form a conduit for later pull-in, pull-through of flowlines, pipelines, umbilicals and cables from subsea entry point through the J-tube to surface facilities.

ABAED Caissons

Tubes/conduits of steel containing pipes for fire water, seawater, etc. This is to protect the smaller pipes against environmental exposure.

ABB Gravity base structure – GBS

A gravity base structure (GBS) is a platform substructure, constructed in concrete, which rests on the seabed and is kept in position by its own weight.

The gravity base structure contains all resources from design through tow-out from the dock, ballasting, mating of the deck, towing to installation at the deep water site.

This code covers GBS concrete structure, mechanical outfitting and (preinstalled) risers/J-tubes, subdivided and coded as outlined below.

Some particular references: In this coding structure GBS is meant to cover concrete structures. Steel GBS structures are considered to be jacket substructures with storage tanks. A GBS of simple type may be used as substructure for a free-standing flare tower; the flare tower is to be PBS coded under AAF.

ABBA Concrete structure

The concrete structure consists of

- bottom area with skirts and lower domes,
- cell area with cells, cells/shafts and upper domes,
- shaft area with shafts, top shafts and riegel (where relevant),
- solid ballast.

Subdivided and coded as outlined below.

The bottom area is completed in dry dock, while cell area and shaft area are completed at the deep water site (inshore) where also the ballasting takes place. Embedment items, reinforcement bars, prestressing cables, etc. are installed successively during the concrete construction.

The concrete structure is normally designed for oil storage in the cells, but some installations do not have this function.

The GBS has one to four shafts and therefore often characterised as monotower or multitower. The shafts include compartments for utilities, risers and J-tubes and drilling outfitting.

ABBAA Skirts

Bottom area construction is performed in dry dock and consists of skirts and lower domes. This code covers skirts.

Depending on soil conditions, either steel skirts or concrete skirts or a combination of both may be used. The purpose is to ensure lateral soil support when the platform is set down on location.

ABBAB Lower domes

Lower domes construction follows the completion of the skirts. Included are also conductor penetrations in the drill cells/shafts.

ABBAC Cells

The cell area consists of cell walls and upper domes. The construction starts in dry dock and is completed at the deep-water site. The lower part of the cells will often be slip-formed up to a certain elevation to secure sufficient buoyancy during tow-out of the dry dock. The remaining work, slip-forming of the upper parts of the cell walls and the upper domes, takes place at the deep-water site. Different tanks – e.g. diesel tanks, sludge tanks, etc. – are built into the cells. Installations of dowels are performed at deep-water site as well as mooring/towing foundations/pad eyes.

This code covers cells, which are closed by upper domes.

For upper domes, see PBS ABBAE.

ABBAD Cells/shafts

Some of the cells do not have upper domes, but continues directly as shafts.

The cells/shafts are dry and designed for non-storage purpose, i.e. for drilling and for housing of utility systems and various other mechanical outfitting.

Cells/shafts extend from lower domes up to about upper domes level.

ABBAAE Upper domes

With the completion of the upper domes – normally at inshore location – the cells are completed as "enclosed space" e.g. for oil storage.

ABBAAF Shafts

The shafts (or legs) consist of the shafts/legs extending from the top of the cell section level and up to the top shafts. The shafts are cones shaped normally with decreasing diameter upwards, and they are often slip-formed in one operation.

In the case of particular deep-water location – and long and slim shafts – the shafts may be built with a riegel (see PBS ABBAJ).

ABBAG Top shafts

The top shafts represent the continuation of the shafts up to the top of the GBS. The top shafts are cone shaped with increasing diameter upwards or cylindrical shaped, ending with the transition rings (or similar) below the topside deck. Transition rings may be in steel, concrete or as an elastomeric connection between GBS and deck. Transition rings and crushing tubes are part of the top shafts.

ABBAH Solid ballast

Included is solid ballast (located in the bottom area), for the purpose of regulating the GBS stability.

As material for solid ballast iron ore and/or olivin are often used.

ABBAJ Riegel

The riegel – a box like structure constructed in concrete – acts like a stiffening link between/for the GBS shafts. The purpose is to avoid/reduce structural vibrations (e.g. ringing) due to environmental impact (from wind, sea and other).

GBS' installed in particular deep waters – and thus have long and slim shafts – may be equipped with a Riegel, which separates the shaft area in shafts below and above the Riegel.

ABBB Mechanical outfitting

This code covers the mechanical outfitting of the GBS structure, i.e. facilities/systems for installation and operation of the GBS and for support of platform topside and drilling and production.

Mechanical outfitting may be performed fully by the GBS contractor, or partly whereas another contractor does the remaining.

This code excludes all risers and J-tubes, which are addressed separately. Conductors are to be PBS coded under AC.

Mechanical outfitting is subdivided and coded as outlined in the following:

ABBBA Ballast water and installation systems

This code consists of installations mainly in the bottom area of the GBS. These are both temporary and permanent systems/facilities needed for ballasting, towing, marine installing and removal purposes like

- ballast water systems,
- skirt evacuation system,
- grouting system,
- air cushion system,
- construction pumps, soil drain and other facilities for the above mentioned purposes.

ABBBB Drilling

Includes installations related to the platform drilling function, such as

- conductor guides,
- shale shute,
- oil skimmers,
- etc.

ABBBC Storage and reticulation

Systems for storage and reticulation and inlet/supply within the substructure for liquids and bulk, where relevant, such as

- gas and/or crude oil,
- diesel oil,
- fire water,
- sea water,
- service water,
- surfactants, etc.

Included is also all piping to and from storage.

ABBBB Utilities

Includes auxiliary systems and facilities within the GBS (primarily in the cells and cells/shafts) such as

- electrical power and lighting systems,
- instrumentation and controls for the outfitting systems, for fire and gas detection, corrosion protection and monitoring, water temperature measurements, etc.,
- personnel safety systems (fire extinguishers, hose reels, etc.),
- communication systems,
- HVAC-systems,
- hydraulic power,
- hoists and personnel lifts, cranes, etc.,
- utilities related to risers, J-tubes and for exterior outfitting (e.g. instrumentation, corrosion protection).

For structural outfitting related to risers, J-tubes and exterior outfitting see PBS code ABBBE. For risers and J-tubes, see under PBS ABBC.

ABBBE Structural outfitting

Includes secondary and outfitting steel items required within the substructure primarily for personnel access, support and safety, such as

- decks,
- ladders, stairs, gangways and handrails,
- manholes,
- pipe guides and supports,
- equipment supports and other structures,
- structural outfitting items for risers and J-tubes and for exterior outfitting.

ABBC Risers/J-tubes

Risers/J-tubes and conductors are pipes, which extend from the wellhead or other surface areas through guidedecks/guides/conductor frames in drill shafts/riser shafts:

Conductors – drilled/driven through plugged conduits installed in lower drill shaft domes. For concrete gravity base structures the conductor acts as a conduit for the surface casing. Conductors are deemed to be PBS coded under AC.

Export/import risers – installed in riser shafts or external to shaft(s) with tie-in connection points external to GBS structure.

J-tubes – conduits extending from surface facilities down shaft(s) exiting via long radius bends through cells/domes to the mudline/seabed for later pull-in of flowlines, pipelines and cables/umbilicals.

Production risers – tie-back string transfers wellstream from e.g. a subsea well spacer/drilling template to surface facilities.

The pipes hereunder are normally of rigid type. Flexible risers are deemed to be PBS coded under AD and/or AE depending on riser function.

Risers/J-tubes are subgrouped and coded as follows:

ABBCA Production risers

This code includes risers for production and injection:

Production risers transfer wellstream from e.g. subsea placed well spacer/drilling templates to surface facilities.

Injection risers transfer treated water for injection or transfer gas for reinjection from wellbay manifolds to the subsea well spacer/drilling template/area.

Predrilling of wells in combination with concrete GBS substructure installations has been considered for some recent development project concepts.

See also riser explanation under the code following below.

ABBCB Export risers

Pipes rigid or flexible extending from either subsea riser bases or from subsea mechanical/hyperbaric tie-in point to surface facilities' import/export manifold connections for import/export of oil, gas and water.

Risers in general may be

- a) preinstalled forming part of GBS structure outfitting, routed through riser shaft(s) or drill shaft(s),
- b) post-installed externally and/or internally fixed to shaft(s),
- c) be pulled through J-tubes installed in GBS structure.

Flexible risers and risers of category b) and c) are deemed to be covered for under PBS AD and AE depending on riser function.

ABBCC J-tubes

A string of steel pipe of varying diameters installed during mechanical outfitting of gravity base structure. The J-tube extends from surface facilities vertically through guidedecks/guides to the lower cell/dome area, where a long radius bend extends through the lower GBS and exits above the mudline/seabed. J-tubes form a conduit for later pull-in, pull-through of flowlines, pipelines and cables/umbilical from subsea entry point through the J-tube to surface facilities.

ABC Jack-up

Jack-up is one type of mobile drilling rig, which may be designed for other purposes such as production platforms, quarter platforms, etc.

Jack-up substructure is defined as including main components such as structure/hull, topside related equipment, legs, jacking arrangements, base/foundation structure and rigid risers where relevant. Included also are outfitting like

- marine related outfitting of the hull, the legs and the foundation (systems for ballast, etc.),
- mechanical outfitting related to oil storage systems in the foundation structure,
- mechanical outfitting related to topside systems.

The seabed foundation may include piles and storage, if any.

Outfitting, systems, structures, etc. related to production of oil and gas (production platforms) or for quarter platforms – i.e. topside related – are included under topsides PBS code AA.

Flexible risers are normally covered for under PBS codes AD Subsea production systems and AE Transport systems (e.g. risers for traditional flowlines or pipelines.).

ABCA Structure/hull

The structure/hull may be of two types:

- truss type structure with deck plating;
- plated/plate girder type structure ("deck box").

Prefabricated boxes and nodes, welded profiles and/or standard profiles, with deck plates, profiles and stiffeners, construct the truss type structure. Outfitting is normally located on the deck.

The box type – most in use – consists of plate-constructed girders or by prefabricated plate girders and plate deck constructions. Outfitting will be installed within the box (normally marine related) and process related (topside related) on the deck.

NOTE: Topside related outfitting etc. is to be included under PBS code AA Topsides.

ABCB Legs

All legs including jacking and locking arrangements. The legs may be of tubular or truss type construction. The jacking arrangement can be either electric or hydraulic driven (see also PBS ABCC following).

ABCC Outfitting

Outfitting of the jack-up substructure includes installations in the hull, legs and the base and can consist of items like:

ABCCA Hull outfitting

- walkways, ladders, etc.,
- marine related mechanical outfitting, systems, etc.,
- jacking/locking machinery with systems,
- outfitting related to oil storage in the base.

ABCCB Topside related systems

Jack-up may have topside related systems, equipment, etc. located in the substructure/hull in a varying degree. I.e. equipment, systems – typically utility, common process and support systems placed within the hull and which are required primarily to support the production of hydrocarbons and not considered to form part of the vessel storage/distribution system, marine systems –e.g. separate electrical power generation, control room equipment, etc.

ABCD Base

The base can be different kind of structures. Depending of soil conditions and purpose, the foundation(s) are designed to prevent excessive leg penetration into the soil. In some designs the base is a large steel mat which gives the name to the jack-up type-mat-supported jack-up. For a production platform oil storage may be integrated in the foundation. The bases may have piles.

ABCE Rigid risers

Risers are permanent pipes extending from e.g. a seabed well spacer/drilling template beneath the wellbay area and to the surface facilities, or pipes extending from a riser base which may form part of well spacer template to surface facilities for export/import of oil, gas and water.

Jack-up substructure may be equipped with rigid risers and/or flexible risers. Rigid risers allow "dry" surface installed x-mas trees.

This code and subsequent subcodes cover only rigid pipe risers (in connection with dry x-mas trees) for jack-ups. Flexible risers are deemed to be PBS coded under AD and/or AE depending on riser function.

For well spacer/drilling template, see PBS ADAA.

The permanent rigid risers hereunder are grouped into production risers and export risers, as outlined in the following:

ABCEA Production risers

Production risers transfer wellstream from e.g. a subsea well spacer/drilling template to surface facilities – wellbay area.

Included are also injection risers which transfer treated water for injection or transfer gas for reinjection from the wellbay manifolds to the subsea well spacer/drilling template.

ABCEB Export risers

Rigid pipes extending from e.g. riser bases which may form part of well spacer/drilling template to surface facilities for export/import of oil, gas and water.

ABD Compliant tower

A bottom founded steel structure with buoyancy tanks and/or guylines used in deep water areas. The compliant tower substructure is subdivided and PBS coded as outlined in the following:

ABDA Structure

Includes the legs and bracings built of steel tubulars and assembled by prefabricated leg nodes and bracing nodes, normally fit with sleeves and guiding structure for piles. Also including mudmats/skirts and required framing/guides for production related outfitting within the structure.

Compliant tower substructures will normally be fabricated and installed in one unit, but may be split in a lower and an upper section. Structure is subdivided and coded as follows:

ABDAA Leg tubulars

All straight tubulars and conical transitions for legs including internal stiffeners.

ABDAB Bracing tubulars

All straight tubulars and conical transitions, vertical and horizontal bracings including internal stiffeners if applicable.

ABDAC Bracing nodes

Includes the nodes or cans prefabricated for assembly of vertical and horizontal bracings.

ABDAD Pile sleeves/mudmatsPile sleeves

Tubulars which the piles are to be stabbed through, gathered together to "pile cluster" and located at the bottom of each corner leg of the compliant tower.

Mudmats

Plane area underneath the leg/pile cluster to prevent excessive structure penetration into the soil, sometimes with skirts.

ABDAE Pile guides

Short tubulars with funnel-shaped top to guide the piles during piling operation. Located on each corner leg at certain elevation.

ABDAF Conductor framing

Horizontal framing with conductor guides within the structure.

ABDAG Leg nodes

Includes the nodes or cans for leg sections produced of steel plates, cast steel or forged steel.

ABDB Outfitting

Includes all permanent outfitting related to the compliant tower, such as walkways, ladders and systems used for installation purposes. Installation systems, flooding and grouting systems and instrumentation systems which may be of permanent nature. Outfitting is subgrouped and coded as follows:

ABDBA Installation system

Anchors, chains and mooring and ballasting systems, etc. necessary to ensure exact positioning above an already installed and predrilled template.

ABDBB Flooding and grouting

Pipes, valves and electrical cables for flooding and grouting purpose usually placed in caissons outside the tower legs. Normally permanent, but some of it may be removed after installation.

ABDBC Walkways/ladders

Walkways, stairs, ladders and similar applied to the structure.

ABDC Temporary outfitting

Includes temporary arrangements used for installation purposes: floating tanks, installation control devices and lift appurtenances (outfitting that will be removed after installation). This outfitting is subgrouped and coded as follows:

ABDCA Auxiliary buoyancy

Floating tanks and clamps for fastening to the legs. Tanks including clamps to be removed after installation.

Buoyancy tanks not intended to be removed (integrated) should be PBS coded under ABDBA.

ABDCB Floating and up-ending control system

Control capsule containing instruments to control the floating and installing operation. The capsule is normally placed at the top of the substructure and removed after installation.

ABDCC Lift appurtenances

Lifting devices to aid installation of structures.

ABDD Mooring items

Guyed tower mooring system consists of a number of steel cables/guylines connected between clump weights with anchor piles and upper compliant tower structure. Guylines maintain constant tension due to clump weights.

Mooring winches will normally be part of the topsides facilities and then is PBS coded under AA. Fairleads and mooring winches located on the substructure are to be PBS coded under ABDBA.

ABDDA Mooring lines

Heavy chains and cables with connectors, connected to piles/anchors/clump weights placed on seabed and to fairleads/stoppers, may require as many as twelve or more mooring lines connected according to a variety of mooring patterns to the legs of the substructure.

ABDDB Anchors/piles

Including anchor piling – drilled, set and cemented piles in shallow boreholes connected to each mooring line. Piles conventionally driven by hydraulic pile drivers. Combined clump weight/piled systems as used for guyed towers. Other types of anchors and piles may also be applied.

ABDE Foundation/piles

For compliant towers due to the many and varied concepts (guyed, articulated, hybrid) this category may include separate or combined well and leg foundations with mudmats and piles (main piles) for structures and structure foundations.

ABDF Risers/J-tubes and caissons

Risers and J-tubes are pipes normally rigid for this type of substructure which extend from the wellhead or other surface areas through guides/conductor frames to the tower base area or to e.g. a preinstalled subsea wellspacer/drilling template.

Preinstalled parts of risers and J-tubes are part of the substructure.

Export/import risers; may be installed in the tower structure conductor frames/guides prior to installation or at field location.

J-tubes; conduits extending from surface facilities down tower structure guide frames and exiting via long radius bends to the mudline/seabed for later pull-in of flowlines, pipelines, umbilicals and cables.

Production risers; tie-back strings transfers wellstream from e.g. a subsea well spacer/drilling template to surface facilities, used for predrilled wells.

Also included hereunder are caissons for protection of small pipes.

Conductors are to be regarded as belonging to PBS code AC Wells.

This outfitting is subgrouped and coded as follows:

ABDFA Production risers

Production risers transfer wellstream from e.g. a subsea placed well spacer/drilling templates to surface facilities.

Included hereunder are also injection risers which transfer treated water for injection or transfer gas for reinjection from wellbay manifolds to e.g. the subsea well spacer/drilling template. See also explanation under the code following below.

ABDFB Export risers

Pipes extending from either subsea riser bases or from subsea mechanical/hyperbaric tie-in point to surface facilities' import/export manifold connections, for import/export of oil, gas and water. Risers may in general be

- a) preinstalled forming part of tower structure outfitting, routed through conductor frames/guides in tower structure,
- b) post-installed,
- c) be pulled through J-tubes installed in tower structure.

Risers of categories b) and/or c) are deemed to be covered for under PBS AD or AE depending on riser function.

ABDFC J-tubes

A string of steel pipe of varying diameters installed during mechanical outfitting of the tower structure.

The J-tube extends from surface facilities vertically through guidedecks/guides to the lower tower base area where a long radius bend extends and exits above the mudline/seabed. J-tubes forms a conduit for later pull-in, pull-through of flowlines, pipelines, umbilicals and cables from subsea entry point through the J-tube to surface facilities.

ABDFD Caissons

Tubes/conduits of steel containing pipes for fire water, seawater, etc. This is to protect the smaller pipes against environmental exposure.

ABK Semi submersible

A seabed anchored or dynamically positioned buoyant/floating substructure constructed in steel or concrete, which provides support for surface production facilities (topsides). The hull/substructure consists of pontoons, nodes, columns and bracings, within which are access, bilge/ballast, storage and auxiliary systems, and mooring items.

This code considers floating production systems of semi submersible type, which are either anchor moored or dynamically positioned. For semi submersibles a large number of design configurations are possible and built; from three columns to multi-column, from separate leg/column pontoons to twin submerged pontoons to ring pontoons and from circular sections/members/structures to rectangular or hybrids.

Semi submersible floating production systems are reliant on subsea production systems or adjacent fixed wellhead platform to provide wellstream for production/processing, storage and further transport. All known semi submersible production platforms use flexible risers and "wet" x-mas trees.

The multicolumn deep floater is in many respects similar to semi submersibles; the concept has a very deep draught and large displacement such that the structure has little vertical movement and restrained lateral movement allowing wellheads to be surface installed. Current concepts consider steel or concrete structures with four columns placed above ring pontoons. Multicolumn deep floaters are deemed to be PBS coded under ABP – (and single column deep floaters under PBS ABQ).

The substructure consists of the following main elements:

- structure;
- outfitting;
- mooring items.

These, with further subcoding, are outlined below.

Flexible risers are to be PBS coded under AD and/or AE (depending on riser function/use).

ABKA Structure

A hull/substructure constructed in steel or concrete, which consists of pontoons, columns, nodes and bracings as subcoded and outlined in the following:

ABKAA Columns

Vertical cylinders/sections between subsurface nodes/pontoons and deck structure. Columns may contain tanks, integral mooring systems (e.g. chain lockers, etc.), utilities and access systems to pontoons/nodes.

ABKAB Pontoons

Horizontal cylinders/sections between subsurface nodes/columns or ellipsoidal structures placed beneath each column. Pontoons may be ring pontoons connecting each column, twin submerged hull pontoons or ellipsoidal pontoons connected to individual columns. Pontoons may contain tanks for storage, de-ballasting and storage.

ABKAC Nodes

Transition structures between columns and pontoons and between bracings to structures.

ABKAD Bracings

Cylindrical steel tubulars between main structural components: columns/nodes/pontoons, to alleviate structural compliance.

ABKB Outfitting

Include mechanical outfitting of semi submersibles to complete integral systems after columns, nodes, pontoons and bracings are constructed/fabricated, assembled and erected into a complete structure.

Outfitting is grouped into

- ballast/bilge systems,
- storage and reticulation systems,
- utility systems,
- structural outfitting,
- propulsion/DP systems,

in the subcodes below.

Outfitting does not include mooring items, which are coded separately.

ABKBA Ballast/bilge

Systems installed within pontoons, nodes and columns to obtain required operating draught and for tank dewatering. Contains ballast water system, vent and drain systems and bilge system.

ABKBB Storage and reticulation

Systems for storage and reticulation and inlet/supply within pontoons, nodes and columns for liquid and bulk storage.

This code contains systems like

- seawater inlet system,
- fire water system,
- diesel storage system,
- potable water system,
- oil systems (where relevant).

ABKBC Utility systems

Auxiliary systems within the hull structure such as

- electrical power and lighting systems,
- instrumentation and controls,
- hydraulic power systems,
- fire and gas systems,
- personnel safety systems,
- HVAC systems,
- personnel access – hoists and personnel lifts.

ABKBD Structural outfitting

Primarily secondary and outfitting steel required within the structure normally for personnel access, support and safety:

- decks;
- structures;
- ladders;
- gangways;
- manholes;
- pipe guides and supports;
- equipment supports;
- fairleads and chain stoppers located on the substructure;
- anodes;
- etc.

Mooring winches, if located on the substructure, are to be coded hereunder. (Normally mooring winches for semi submersibles are part of topsides, see PBS code AAGC).

ABKBE Propulsion/DP system

Propulsion systems required for sailing to location (self-propulsion) and for station keeping – dynamic positioning (DP). May comprise of electrical/hydraulic drivers and screw propellers within hull pontoons for sailing to location or electrical driven azimuth thrusters located under pontoons. Propulsion systems include thrusters/propellers, electrical/hydraulic drivers, power supply and control/instrument systems required providing propulsion.

ABKC Mooring items

Mooring items include mooring lines and anchors/piles as outlined in the subcodes following. For other mooring outfitting, see also description under PBS code ABKBD.

ABKCA Mooring lines

Mooring lines comprise chains, connectors and cables – connected to piles/anchors on the seabed and running through fairleads to mooring winches/stoppers.

ABKCB Anchors/piles

Methods/arrangements for fixing and securing the mooring lines into the seabed may be

- anchors – conventional rated ship anchors placed/embedded into the seabed,
- anchor piling – drilled, set and cemented piles in shallow boreholes connected to each mooring line,
- piles conventionally driven by hydraulic pile drivers,
- suction anchors.

ABL Tension leg substructure – TLP

A seabed anchored buoyant/compliant substructure constructed in steel or concrete, which provides support for surface production facilities (Topsides).

The hull (structure) consists of pontoons, nodes, (bracings when relevant) and columns within which are access, bilge/ballast, storage and auxiliary systems.

The hull is anchored to the seabed between outer columns/nodes or external tie-down porches and foundation template/anchor base with coupled tethers/tendons. De-ballasting the buoyant hull/substructure tensions tethers/tendons. Tether/tendon deployment equipment may be either contained internally within hull columns/nodes or external to hull columns/nodes.

The TLP substructure is subdivided and PBS coded as follows:

ABLA Structure

A hull/substructure constructed in steel or concrete, which consists of Pontoons, Columns and Nodes (hull structure). Structure is subdivided and coded as follows:

- main TLP structural elements;
- TLP substructure.

ABLAA Columns

Vertical cylinders/sections between subsurface nodes/pontoons and deck structure. Columns may contain tanks, integral tether/tendon deployment equipment or may be configured with external tether/tendon deployment equipment.

ABLAB Pontoons

Horizontal cylinders/sections between subsurface nodes/columns contains tanks/compartments for storage, de-ballasting/tensioning of tethers/tendons. Ring pontoons is most applied.

ABLAC Nodes

Transition structures between columns and pontoons, which may contain tether conduits or external porches for tether/tendon installation.

ABLAD Bracings

Bracings – when relevant – consists of cylindrical tubulars between structural components: columns/nodes/pontoons, to alleviate structural compliance.

ABLB Outfitting

Includes mechanical outfitting of TLP hull/substructure to complete integral systems after columns, nodes and pontoons are constructed/fabricated, assembled and erected into a complete structure.

Outfitting does not include tethers/tendons or tether deployment equipment (see PBS code ABLC).

Outfitting is normally grouped into the following main categories: ballast/bilge systems, storage and reticulation systems, utility systems and structural outfitting as outlined in the following:

ABLBA Ballast/bilge

Systems installed within pontoons, nodes and columns for maintaining leg tensioning and tank dewatering. Contains ballast water systems, vent and drain systems and bilge systems.

ABLBB Storage and reticulation

Systems for storage and reticulation and inlet/supply within pontoons, nodes and columns for liquid and bulk storage.

This code contains systems like

- seawater inlet system,
- fire water system,
- diesel storage system,
- potable water system,
- oil systems – where relevant.

ABLBC Utility systems

Auxiliary systems within the hull structure:

- electrical power and lighting systems;
- instrumentation and controls;
- hydraulic power systems;
- fire and gas systems;
- personnel safety systems;
- HVAC systems;
- personnel access – hoists and personnel lifts.

ABLBD Structural outfitting

Includes primarily secondary and outfitting steel required within the structure for personnel access, support and safety:

- decks;
- structures;
- ladders;
- gangways;
- manholes;
- pipe guides and supports;

- equipment supports,
- anodes;
- etc.

ABLBE Propulsion/DP system

TLPs may in particular cases be equipped with propulsion/DP system:

Propulsion systems may be required for sailing to location (self-propulsion) and for station keeping – dynamic positioning (DP). May comprise of electrical/hydraulic drivers and screw propellers within hull pontoons for sailing to location or electrical driven azimuth thrusters located under pontoons. Propulsion systems include thrusters/propellers, electrical/hydraulic drivers, power supply and control/instrument system required to provide propulsion.

ABLC Tethering system

The tethering system includes all permanent system components from anchor connections – anchor latches/anchor base connectors to the tether/tendon tie-off assemblies and tether/tendon deployment equipment required for installation, subgrouped and coded below.

ABLCA Tether equipment

Includes tether/tendon deployment equipment/tool systems required to handle, move, connect, lower, tension and tie-off tethers/tendons at mooring flats or external porches. Equipment may be individual tools or combination tools required for installation of tethers/tendons though which are not further required unless for tether/tendon replacement.

Tether deployment equipment may comprise

- tensioner/motion compensator,
- torque tools,
- polar/radial cranes and handling equipment,
- rollers/guides,
- combination tooling.

ABLCB Tethers

Tethers/tendons are connected between anchor bases with anchor latches/connectors at the anchor base and the TLP substructure. Connection between tethers/tendons and substructure may be integral extending to cross-load bearings within the lower hull nodes/columns, through tether conduits to the mooring flat and further to tensioning and tie-off assemblies. Tethers/tendons may be connected externally to outer node/columns' tether/tendon tie-down porches and tensioned and tied-off.

Tethers/tendons may consist of the following components:

- anchor latches with flexible joints for connection to anchor base foundation;
- tethers/tendons which may be neutrally buoyant and consist of welded pipe for the total tether/tendon length, may comprise a number of tether elements with welded/screwed couplings for installation, or not-neutrally buoyant, forged tethers/tendons with screwed couplings;
- cross-load bearings placed within lower nodes to comply to environmental forces,
- tether/tendon tie-off assemblies for tie-off at internal mooring flat or external porch tie-off.

ABLCC Anchor base/foundations

Normally a piled seabed installed foundation for connection of tethers/tendons, of the following types:

- concrete foundation templates (CFT), constructed in concrete with skirt piles, lowered, ballasted and placed directly beneath TLP columns/nodes;
- fabricated steel foundation template structures placed beneath TLP columns/nodes and conventionally piled with tubular piles;

- combination foundation template/anchor base structures constructed in either concrete or steel and piled to the seabed.

ABLD Mooring items for positioning

Some TLP version concepts have also been designed with mooring for positioning/repositioning (shifting) of the TLP (e.g. in connection with drilling).

Mooring items for positioning of TLPs are subgrouped and PBS coded as follows:

ABLDA Mooring lines

ABLDB Anchors/piles

As the above is similar to mooring items for other floaters/submersibles, a reference to PBS ABKC regarding details and interface is given.

Mooring winches are normally located on the deck (topside) and should be PBS coded under AA. However for mooring winches and/or fairleads located on the substructure, the PBS code ABLBD applies.

ABLE Rigid risers

Risers are permanent pipes extending from the seabed well spacer/drilling template beneath the wellbay area and to the surface facilities, or pipes extending from a riser base which may form part of well spacer template to surface facilities for export/import of oil, gas and water.

TLPs are normally equipped with rigid risers, but may also have flexible risers. Rigid risers require motion compensation and allow "dry" surface installed x-mas trees; typical for TLPs and very advantageous for installation, workover and operation.

This code and subsequent subcodes cover only rigid pipe risers (in connection with dry x-mas trees) for TLPs. Flexible risers are deemed to be PBS coded under AD and/or AE depending on riser function.

For well spacer/drilling template, see PBS ADAA.

The permanent rigid risers hereunder are grouped into production risers and export risers for TLPs, as outlined in the following:

ABLEA Production risers

Production risers transfer wellstream from the subsea well spacer/drilling template to surface facilities – wellbay area.

Included are also: injection risers which transfer treated water for injection or transfer gas for reinjection from the wellbay manifolds to the subsea well spacer/drilling template.

ABLEB Export risers

Pipes extending from riser bases which may form part of well spacer/drilling template to surface facilities for export/import of oil, gas and water.

ABM Ship type substructure (monohull)

The substructure as defined herein considers floating production, storage and offshore loading (FPSO) systems, which are either

- purpose built ships, or
- converted trading tankers, which are used for the purpose of permanent field production.

For barge type FPSOs, see PBS ABN.

Production test ships, extended test ships, barges and offtake tankers are not included in codes hereunder.

Battery limits between topside facilities/production facilities and substructure monohull/shipshaped vessel are

- all facilities placed at/above (normally on a deck some meters above maindeck) or upon main deck level, hereunder; process units, modules, decks, process piping, utilities and flare system (i.e. topside facilities).

Monohull as defined hereunder comprises: hull structure and hull outfitting (including living quarter), turret systems and mooring items.

This version of the SCCS differs from the May-1992 version with the introduction of the SFI Group System for PBS-coding of ship/barge substructures.

The SFI Group System is a function oriented coding system applied in e.g. ship specifications, estimates, drawings, instruction material, purchasing and material administration, cost control, files, etc.

Shipping companies, shipyards, authorities, consultants, suppliers, etc. more than 800 companies and institutions in about 50 countries use the system.

The group system was developed by The Ship Research Institute of Norway – SFI. After reorganisations SpecTec AS was appointed responsible for marketing and updating of the system, hence inquiries concerning the system should be directed to

- SpecTecAS,
- www.spectec.no

The SFI Group System is structured as a three digit coding system. On the highest level the system divides the ship into 10 main groups, 0 to 9. Of these only 8 (main groups 1 – 8) are standardised in use.

Each of the main groups (first digit) consists of 10 groups (two digits), and each group is further subdivided into 10 sub groups (three digits).

An example of group system subdivision of main group 7 is given below:

main group	7	System for machinery main components
group	73	Compressed air systems
sub group	731	Starting air systems

The system documentation includes a code overview section, detail description and index. In addition and linked to the group system are a detail code ("component oriented") and a material code ("bulk oriented").

In the SCCS PBS code the main groups of the SFI Group System are reflected and adapted as follows:

ABM Ship type substructure (monohull)
Main group 1: Ship general is to be included hereunder due to the (common) nature of this main group.

ABMA Structure/hull
Includes main group 2: Hull

ABMB Outfitting
Includes main group 3–8 as follows:

ABMBA	Equipment for cargo (main group 3)
ABMBB	Ship equipment (main group 4)
ABMBC	Equipment for crew and passengers main group 5)
ABMBD	Machinery main components (main group 6)
ABMBE	Systems for machinery main components (main group 7)
ABMBF	Ship common systems (main group 8)
ABMBG	Other (reserved for main group 9 which is vacant at present).

For an outline of the PBS codes, see below. But observe; for full coding (all levels) and comprehensive use of the SFI Group System, the system documentation should be applied.

ABM Ship type substructure (monohull)

To be entered hereunder is main group 1: Ship general, i.e. details and costs which cannot be charged to any specific function on board, such as general arrangements, insurance, provisional rigging, launching, dry-docking, test and trials etc.

Some particular references: For production barge substructures, see PBS code ABN. For floating storage units substructures, see PBS AEC. Circular barge type substructure, see PBS ABR.

ABMA Structure/hull

Structure/hull as defined herein comprises:

- purpose built ships,
- purchased trading tankers converted to FPSOs.

The code includes hull: i.e. the structure for afterbody, engine area, cargo area, forebody and superstructure (living quarters) with particular hull details and material protection.

ABMB Ship outfitting

Includes outfitting as outlined and coded in the following, with examples that may be relevant for production ships:

ABMBA Equipment for cargo

Includes equipment/machinery, systems, etc. concerning the ships cargo, e.g. hatches, cargo handling equipment, rigging for cargo, loading/discharging systems for liquid cargo (e.g. hoses), heating systems for cargo, ventilation systems for cargo tanks, inert gas systems, cargo tank sounding systems, etc.

ABMBB Ship equipment

Includes equipment/machinery, systems, etc. which mainly are typical for ships, e.g. rudders and steering machinery, thrusters and dynamic positioning systems navigation aids, communication equipment, mooring winches (not in connection with fixed turrets), ordinary mooring outfitting for other than station keeping and fixed turrets (see also PBS ABMF), repair/maintenance and cleaning equipment, machinery lifting gear, etc.

ABMBC Equipment for crew and passengers

Includes equipment/machinery, systems, etc. which serve crew and passengers, e.g. lifesaving/protection and medical equipment, internal and external architectural outfitting (insulation, panels, partitions, doors and windows, handrails, ladders, deck covering, etc.), furniture/inventory, galley, pantry, laundry, personnel lifts, accommodation ventilation and air-condition, sanitary systems etc.

ABMBD Machinery main components

Includes primary components in the engine room, e.g. main engine and propulsion plant, boilers and steam generators, machinery for main and emergency power generation, etc.

ABMBE Systems for machinery main components

Includes systems that primarily serve the machinery main components, such as systems for fuel, lube oil, cooling, compressed air, exhaust and air intakes, steam/condensate and feed water, distilled and make up water and automation systems for the machinery.

ABMBF Ship common systems

Includes central ship systems such as ballast and bilge systems, gutter pipes, fire and lifeboat alarm, fire-fighting and wash down systems, air and sounding systems for non-cargo tanks, common hydraulic system, central heating system and electrical systems.

ABMBG Other (vacant – SFI main group 9)

The code is reserved for SFI Group System main group 9, which is vacant at present.

ABMBH Topside related systems

FPSO ships may have topside related systems, equipment, etc. located in the substructure/hull in a varying degree. I.e. equipment, systems – typically utility, common process and support systems placed within the hull and which are required primarily to support the production of hydrocarbons and not considered to form part of the vessel storage/distribution system, main propulsion system or marine systems – such as separate electrical power generation, control room equipment, etc.

The other elements of the ship substructure are as follows:

ABMC Fixed turret

The fixed turret defined hereunder relates to turret devices, which are located **within** the hull structure; placement is normally towards the bow fore of the ship centre. This non-disconnectable turret is independently installed from the main hull and provides full weathervaning capabilities. The turret essentially consists of three main structural components:

- turret collar;
- cylindrical tub;
- chain table.

For other types of ship turrets, see PBS ABMD and ABME.

Fixed turret is subdivided and coded as follows:

ABMCA Structure

The turret body is a cylindrical steel plate structure, which can rotate within the vessel moonpool by means of a bearing system. The bearing system is formed by bogies, which are positioned at the top of the turret between the turret collar and the vessel deck.

The structure (tub) consists of a single wall ring stiffened cylindrical structure strengthened by longitudinal webs.

ABMCB Outfitting

Turret outfitting (excl. mooring components) comprises all components not included (integrated) in the structure. The turret bearing system is located at the turret top at the vessel deck level. This system which comprises low friction bogies (side/lower wheels) and rails allows natural weathervaning capacity, some designs may require turning machines.

Turret outfitting comprises such as

- equipment mounted on or within the turret structure which includes such as: deck mounted manifold blocks and control console, the swivel stack support structure and swivel and riser installation gantry,
- equipment supported from the FPSO deck – hoisting gantry for swivel stack removal, swivel drive frame, manifold piping,
- flexible riser terminations, riser handling winches and associated equipment, all interconnecting piping between riser terminations and manifolds and all systems required in support of safe operation of the turret system.

Flexible risers are normally covered for under PBS code AD Subsea production systems and AE Transport systems (e.g. risers for traditional flowlines, umbilicals/cables or transport pipelines).

ABMCC Mooring equipment

Mooring equipment includes all equipment installed in connection with fixed (internal) turret, related to station keeping.

Mooring equipment comprises

- mooring line winches/reels,
- anchor winches and windlasses,
- cable lifters and anchor capstans,
- rotating chain jack tensioners,
- chain stoppers,
- fairleads and associated equipment.

For mooring chains, anchors, etc. see PBS ABMF.

ABMD Disconnectable turret system

This turret considers a hull docked disconnectable buoy solution and is an alternative to fixed internal turret, as a device for transferring e.g. wellstream to the FPSO and for mooring. Various concepts have been presented.

At present the STP system: submerged turret production – a pendant to STL: submerged turret loading for FSUs (PBS code AECCA) – both provided by APL, is often preferred.

The descriptions following reflect this concept. The disconnectable turret hereunder comprises two main elements:

- the disconnectable buoy docked in the hull during operation/production;
- outfitting incl. mooring of the buoy.

As outlined in the following:

ADMDA Structure

Structure includes the buoy, i.e. a buoyancy cone with internals, e.g. plating and stiffeners, turret shafts, bearings, riser connection tube, swivel, etc.

ABMDB Outfitting

Outfitting comprises

- turret equipment, etc. located outside the buoy and not integrated in the hull,
- mooring items for the buoy (part of the concept).

Turret equipment include such as

- buoy locking mechanism and other components located in the STP-compartment,
- pull-in winch and hydraulic power packs (normally located on deck),
- equipment to operate, monitor and control the turret system.

Mooring, also termed mooring leg, includes

- anchors (e.g. suction anchors)/anchor piles,
- anchor chains and connectors,
- anchor cable with connectors,
- mooring line buoyancy elements.
-

Flexible risers are to be coded under PBS codes AE and/or AD depending on riser function.

ABME Other turrets

Comprises turret functions other than internal fixed or disconnectable turrets, i.e. mainly solutions where the wellstream is transferred via bow/stern arrangements connected to towers or buoys (also termed single point or single buoy concepts).

The code may cover – depending of concept – main elements such as

- seabed founded compliant structures with base structure, articulated joint, rigid risers (integrated), swivel/weathervane bearings, hoist, jumper hoses and connectors,
- floating buoy structure with appurtenances and similar outfitting as above,
- mooring lines/guyed lines and anchors for above structures.

Some of the concept under PBS AEB Local offtake system might give an impression of possible solutions.

Flexible risers from seabed to vessel should be coded according to PBS AD or AE.

ABMF Mooring items

This code covers mooring items for fixed, internal turret solutions and for FPSO-ships with conventional spread mooring (no weathervaning capabilities) for station keeping.

For ship mooring in connection with disconnectable turret, see PBS ABMDB.

Mooring items are subgrouped and coded as follows:

ABMFA Mooring lines

Mooring lines comprise chains, cables and connectors – connected to piles/anchors on the seabed and to chain stoppers at e.g. the turret base chain table, as many as twelve or greater moorings are connected according to predefined mooring patterns.

ABMFB Anchors/piles

For FPSO ships pile anchors, suction anchors and fluke anchors are the most commonly used anchoring/piling types used for offshore mooring.

ABN Barge type substructure

The substructure as defined herein considers floating production, storage and offshore loading (FPSO) systems, which are either

- purpose built barges;
- converted barges.

Production test vessels, extended test vessels and offtake tankers are not included in codes hereunder.

Barges used as FPSOs are roomy, flat-bottomed vessels designed simpler as ships (“less ship shape”) and normally without propulsion, i.e. towed/pushed to location.

Battery limits between topside facilities/production facilities and substructure are

- all facilities placed at/above (normally on a deck some meters above main deck) or upon main deck level, hereunder; process units, modules, decks, process piping, utilities and flare system (i.e. all topside related).

FPSO – barges as defined hereunder comprise hull structure and hull outfitting (incl. living quarter), turrets and mooring items. The FPSO-barges are normally steel made, but may be built of concrete.

This version of the SCCS differs from the May 1992 version with the introduction of the SFI Group System for PBS-coding of ship/barge substructures. For information about the system, use and content, see the description of the analogous codes under PBS code ABM Ship type substructure (monohull).

As for ship substructures, the SFI Group System main group 1: Ship general – for barges – is to be PBS coded ABN due to the (common) nature of the main group.

For further subdivision of the FPSO-barges the following ABN codes apply (with main group (M.G.) numbers of the SFI Group System given to the right):

<u>PBS codes:</u>	<u>M.G.no.:</u>
ABNA Structure/hull	2
ABNB Ship outfitting	
ABNBA Equipment for cargo	3
ABNBB Ship equipment	4
ABNBC Equipment for crew and passengers	5
ABNBD Machinery main components	6
ABNBE System for machinery main components	7
ABNBF Ship common systems	8
ABNBG Other (vacant SFI main group)	9
ABNBH Topside related systems	

ABNBG is reserved for main group 9, which is vacant at present. For details regarding ABNBH, see analogous code ABMBH for production ship substructure.

As ships are normally more well equipped than barges, all details of the SFI Group System are not fully relevant for barge substructures.

The other main elements of the barge substructure are as follows:

ABNC Fixed turret

FPSO barges may be equipped with fixed internal turret, subdivided and coded as follows:

ABNCA Structure

ABNCB Outfitting

ABNCC Mooring equipment

For further details, see analogous description under PBS code ABMC.

For mooring items (chains, anchors, etc.) see ABNF. Flexible risers are covered under PBS codes AD and AE, e.g. risers for wellstream or for transport pipelines.

ABND Disconnectable turret system

Another turret solution for FPSO barges is the disconnectable turret system (via buoy), subdivided and coded as follows:

ABNDA Structure

ABNDB Outfitting

For further details, see analogous description under PBS code ABMD.

ABNE Other turrets

Comprises turrets other than fixed internal turrets or disconnectable turrets (via buoys docked in the hull during operation/production). I.e. mainly solutions where the wellstream is transferred via bow/stern arrangements connected to towers or buoys (also termed single point or single buoy concepts).

For further details, see analogous description under PBS code ABME.

ABNF Mooring items

This code covers mooring items for fixed internal turret solutions and for FPSO-barges with conventional spread mooring (no weathervaning capabilities) for station keeping. Mooring items consist of:

ABNFA Mooring lines**ABNFB Anchors/piles**

For further details, see analogous description under PBS code ABMF.

Barge mooring winches for conventional spread mooring for station keeping, are to be coded ABNBB.

ABP Multicolumn deep floater

A seabed anchored buoyant and deep floating substructure constructed in steel or concrete, which provides support for surface production facilities (topsides). The structure consists of pontoons, nodes, columns (and bracings where relevant), within which are access, bilge/ballast, storage and auxiliary systems (outfitting). Dynamical positioning may be relevant.

The multicolumn deep floater substructure is in many respects similar to semi submersibles regarding structure, outfitting and mooring. But the concept has a very deep draught and large displacement. Thus the structure has little vertical movement and restrained lateral movement which may allow wellheads to be surface installed – all relative to semi submersibles. Current concepts consider steel or concrete structures with 4 columns placed above ring pontoons.

For single column deep floater (e.g. SPAR) and circular barge type substructure, see PBS codes ABQ and ABR.

The multicolumn deep floater substructure includes the following subdivision and PBS codes:

ABPA Structure**ABPB Outfitting****ABPC Mooring items****ABPCA Mooring lines****ABPCB Anchors/piles**

As this concept is very similar to semi submersibles regarding structure, outfitting and mooring items a reference is given to PBS ABK (semi submersible) for content, details and interfaces.

ABPD Rigid risers**ABPDA Production risers**

ABPDB Export risers

A PBS ABP type substructure may use flexible risers (and "wet" x-mas trees), but will normally be equipped with rigid risers (and "dry" x-mas trees).

For flexible risers the PBS codes AD and/or AE applies depending on riser function/use.

For rigid risers for the multicolumn deep floater, PBS ABPD, with subcodes, apply. For further details concerning this riser solution, see similar description for e.g. a TLP; i.e. under PBS ABLE.

ABQ Single column deep floater

A seabed anchored buoyant/floating cylindrical substructure constructed in steel or concrete, which provides support for surface production facilities (topsides) and may have oil storage facilities.

The concept was considered for development of marginal and deepwater fields. The most used design is the SPAR concept:

- full cylinder substructure (called the "classic" SPAR);
- part cylinder/part truss substructure (called the Truss SPAR).

The single column deep floater may have flexible or rigid risers (the latter allowing wellheads to be surface installed, i.e. "dry" x-mas trees, typical for SPARs).

Single column deep floaters have up to now generally been catenary anchored. But in a new concept – the so-called buoyant tower – the cylindrical hull is fastened to the seabed by means of tethers (like a TLP).

The SPAR substructure is also applied in the SPAR buoy concept as part of a local offtake system. This application is to be PBS coded under AEBE.

For circular barge type substructure, see PBS ABR.

The single column deep floater substructure is subdivided and PBS coded as outlined in the following:

ABQA Structure

As two hull forms are possible (see previous information), one or both subcodes may be relevant:

ABQAA Column section

Vertical cylinder/section below deck structure (topside) with decks, bulkheads, spiral strakes, fixed ballast, compartments, etc.

The column may contain tanks (also for oil), integral mooring systems (e.g. chain lockers etc.), utilities, structural outfitting, etc. (see also PBS ABQB).

In the case of a subsequent truss below the cylindrical section, also "transition piece/assembly" for connecting the truss to the cylinder, is included.

ABQAB Truss section

The truss section is normally built up of vertical tubulars and bracing tubulars. The lower end contains tanks for tow out and fixed ballast, and square flats are installed at defined levels for damping of movements.

ABQB Outfitting

The single column deep floater substructure may have similar outfitting as other deep floaters/semi submersibles, such as

- bilge/ballast systems,
- storage and reticulation systems for water, diesel, oil (in the case of oil storage), etc.
- utility systems (electrical power, lighting, instrumentation, fire and gas, HVAC, etc.)

- structural outfitting including such as: ladders, manholes, anodes, fairleads, chain stoppers, mooring winches (normally located on top of the cylindrical section for SPARs), etc.
- hull outfitting for the tethers where relevant.

Due to the similarities with other deep floaters/semi submersibles' outfitting, a reference to PBS ABKB for outfitting details is given.

ABQC Tethering system

Buoyant tower type single column deep floaters (only conceptual at present) is designed with a tethering system which consists of and is PBS subcoded as follows:

ABQCA Tether equipment

ABQCB Tethers

ABQCC Anchor base/foundations

Due to the similarity with the TLP tethering system, a reference to PBS ABLC is given for further details.

ABQD Mooring items

Mooring items include mooring lines and anchors/piles as defined in the subcodes following below.

Mooring winches are in general normally located on/in the deck structure and are to be coded under PBS code AA Topsides. If the mooring winches are physically located on/in the substructure, code ABQB applies; e.g. for SPARs.

ABQDA Mooring lines

Mooring lines comprise chains, connectors and cables – connected to piles/anchors on the seabed and running through fairleads to mooring winches/stoppers.

ABQDB Anchors/piles

Methods/arrangements for fixing and securing the mooring lines into the seabed may be

- anchors – conventional rated ship anchors placed/embedded into the seabed,
- anchor piling – drilled, set and cemented piles in shallow boreholes connected to each mooring line,
- piles conventionally driven by hydraulic pile drivers,
- suction anchors.

ABQE Rigid risers

Risers for single column deep floaters may be rigid or flexible.

Flexible risers are deemed to be PBS coded under AD/or AE depending on function/use.

For rigid risers – relevant for e.g. SPAR and buoyant tower type substructures – the following PBS subcoding applies:

ABQEA Production risers

ABQEB Export risers

For SPAR type substructures the above riser codes also include the buoyancy elements of the risers contained within the hull section. For further details concerning rigid risers, see analogous description under PBS ABLE.

In the case of combined riser and tether in one dual function physical unit, PBS ABQE with subcodes is deemed to apply.

ABR Circular barge type substructure

The concept considers a seabed anchored circular barge type substructure, which provides support for surface facilities (topsides). The concept provides a weight efficient substructure with significant oil storage capability.

This code description comprises a floating production system of circular unit's type. For this purpose the substructure will normally contain oil storage facilities and will ordinarily be equipped with flexible risers, but may – for particular conditions – be equipped with rigid risers.

The circular barge type substructure is subdivided and PBS coded as outlined in the following

ABRA Structure

The structure (hull) consists of a cylinder shaped column. The hull is subdivided in several compartments/tanks for oil, slop, ballast, seawater, etc. and can have a sheltered moonpool for e.g. risers.

The structure consists of primary and secondary steel elements; plating, stiffeners, profiles, girders, etc.

ABRB Outfitting

ABRBA Hull outfitting

The circular barge type substructure may have similar outfitting as ship type substructure/barge type substructure/semi submersibles, such as

- ballast/bilge systems and permanent ballast,
- storage and reticulation systems (for e.g. oil, slop, seawater, firewater, potable water, etc.),
- utility systems (e.g. electrical and lighting systems, instrumentation, hoist and personnel lifts, etc.),
- structural outfitting like: ladders, walkways, manholes, fairleads, anodes, etc.

For an impression of further details see analogous description under PBS code ABKB. Mooring winches, if located on the substructure, are to be coded hereunder.

ABRB Topside related systems

The circular barge type substructure may have topside related systems, equipment, etc. located in the substructure/hull in a varying degree. i.e. equipment, systems – typically utility, common process and support systems placed within the hull and which are required primarily to support the production of hydrocarbons and not considered to form part of the vessel storage/distribution system, marine systems – such as separate electrical power generation, control room equipment, etc.

NOTE Other topside related equipment etc. is to be included under PBS code AA Topsides.

ABRC Mooring items

Mooring items include mooring lines and anchors/piles as outlined in the subcodes following below.

Mooring winches are normally located on/in the deck structure and are to be coded under PBS code AA Topsides (if the mooring winches are physically located on/in the substructure, code ABRB applies).

ABRCA Mooring lines

Mooring lines comprise chains, connectors and cables – connected to piles/anchors on the seabed and running through fairleads to mooring winches/stoppers.

ABRCB Anchors/piles

Methods/arrangements for fixing and securing the mooring lines into the seabed may be

- anchors – conventional rated ship anchors placed/embedded into the seabed,
- anchor piling – drilled, set and cemented piles in shallow boreholes connected to each mooring line,