



Engineering Standard

SAES-A-007

18 August 2019

Hydrostatic Testing Fluids and Lay-up Requirements

Document Responsibility: Corrosion Control Standards Committee

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1 Scope

- 1.1 This standard establishes requirements to control internal corrosion during and after hydrostatic testing and lay-up of new, revalidated, and repaired assets when tested in accordance with SAES-A-004, SAES-L-150 or as required by other standards that specifically reference SAES-A-007.
- 1.2 Assets covered by this standard includes, but are not limited to, storage tanks, pressure containing vessels, plant piping, and pipelines both onshore and offshore.
- 1.3 Materials of construction covered by this standard include; carbon steel, low alloy steel, galvanized steel, austenitic and super austenitic stainless steel, duplex and super duplex stainless steel, nickel alloys, copper alloys, titanium alloys, non-metallic materials, internally-lined with non-metallic materials, and internally coated materials.
- 1.4 For acceptable lay-up and preservation methods, refer to SAEP-1026 for steam generation systems and SAEP-43 for all other assets.
- 1.5 For hydrostatic testing fluids and lay-up requirements for plumbing and utility piping, refer to SAES-S-060 and SAES-S-070, respectively, for lube and seal oil piping refer to SAES-L-150, and for instrument and plant air piping refer to SAES-J-901.
- 1.6 Refer to SAEP-385 for preservation of project materials and equipment not associated with on-site hydrostatic testing including procurement, construction, pre-commissioning, commissioning, and start-up stages.

2 Conflicts and Deviations

Any conflicts between this document and other applicable Mandatory Saudi Aramco Engineering Requirements (MSAERs) shall be addressed to the EK&RD Coordinator.

Any deviation from the requirements herein shall follow internal company procedure SAEP-302.

3 References

The selection of material and equipment, and the design, construction, maintenance, and repair of equipment and facilities required by this standard shall comply with the latest edition of the references listed below, unless otherwise noted.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

SAEP-43	Lay-up and Preservation Methods
SAEP-302	<i>Waiver of a Mandatory Saudi Aramco Engineering Requirement</i>
SAEP-385	<i>Preservation of Project Materials and Equipment</i>
SAEP-1026	<i>Lay-up and Preservation of Steam Generation Systems</i>

Saudi Aramco Engineering Standards

SAES-A-004	<i>General Requirements for Pressure Testing</i>
SAES-A-008	Chemical Cleaning Requirements
SAES-A-133	Internal Corrosion Protection Requirements
SAES-A-134	External Corrosion Protection Requirements
SAES-J-901	<i>Instrument and Plant Air Supply Systems</i>
SAES-L-150	<i>Pressure Testing of Plant Piping and Pipelines</i>
SAES-S-060	<i>Saudi Aramco Plumbing Code</i>
SAES-S-070	<i>Installation of Utility Piping Systems</i>

3.2 Industry Codes and Standards

American Petroleum Institute (API)

API RP 1110	Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide
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4 Definitions

Biocide: A chemical added to preserve fluids and systems by controlling the proliferation and [growth of micro-organisms that can affect corrosion](#) and system cleanliness.

Corrosion: Deterioration of a material [that results from an electrochemical reaction with its environment](#). For the purposes of this document, corrosion includes general and localized corrosion mechanisms, as well as environmental cracking mechanisms that could be a result of presence of microbes, chlorides, hydrogen sulfide, oxygen, or any other possible corrodent in the water.

Dew Point: The temperature at which a given concentration of water vapor in a gas will form moisture (liquid water). The lower a gas dew point temperature becomes, the less amount of moisture is in the gas.

Flash Point: The lowest temperature at which vapors of a volatile material will ignite in presence of an ignition source.

General Aerobic Bacteria (GAB): Prokaryotic (Bacteria and Archaea) micro-organisms that obtain their biochemical energy and reproduce in the presence of oxygen, e.g. acid-producing bacteria and iron-oxidizing bacteria.

Hydrostatic Test: A pressure test conducted to piping or equipment by subjecting it to an internal pressure using water or other approved liquid as the test medium to ensure strength of the system at the test pressure.

Lay-up: The temporary preservation process of equipment, piping system or pipeline generally after a hydrostatic test to prevent equipment from corrosion. Lay-up process could include wet, dry, inert gas and ambient lay-up.

Microbiologically-Influenced Corrosion (MIC): Refers to corrosion mechanisms attributed to micro-organisms including bacteria, archaea, fungi and their by-products.

Oxygen Scavenger: A chemical added to the process/water to help remove or decrease the level of dissolved oxygen in the system to control corrosion.

Pipelines: Include cross-country and offshore transportation lines, flowlines, trunklines, tie-lines, water supply and injection lines and pipeline branches such as jump-overs. SAES-L-100 defines major types of pipelines in Saudi Aramco.

Piping: Includes above and below-ground piping inside a plant area and at wellhead, as defined in SAES-L-100.

Pitting Resistance Equivalent Number (PREN): A qualitative factor developed to predict the pitting resistance of a Corrosion Resistant Alloy (CRA) based on its minimum chromium (Cr), molybdenum (Mo), tungsten (W), and nitrogen (N) % contents. PREN can be calculated using below equation, per NACE MR0175/ISO 15156:

$$\text{PREN} = \text{Cr}\% + 3.3 (\text{Mo}\% + 0.5 \text{ W}\%) + 16 \text{ N}\%$$

Sour Service: Environments and system that contain sulfide species per SAES-A-133.

Sulfate-Reducing Bacteria (SRB): Prokaryotic (Bacteria and Archaea) micro-organisms that obtain their biochemical energy by metabolizing sulfate with natural organic compounds to produce hydrogen sulfide and sulfide (H_2S , HS^-) as metabolic by-products in anaerobic environments.

System: Includes a piping circuit, equipment and/or pipeline segment which is subject to contact with water as part of the hydrostatic test and/or lay-up.

Tank: Includes atmospheric and low pressure tanks per SAES-D-100.

Total Bacteria: Prokaryotic (Bacteria and Archaea) micro-organisms that obtain their biochemical energy, grow and re-produce in the presence of oxygen-rich (aerobic) environments and/or oxygen-free (anaerobic) environments. It is the sum of SRB and GAB in the water sample.

Total Dissolved Solids (TDS): A measure of the combined content of all inorganic and organic substances contained in a liquid.

Total Suspended Solids (TSS): A measure of the dry weight of particles contained in a liquid trapped by a filter.

Volatile Corrosion Inhibitor (VCI): A chemical whose molecules are transported by diffusion in a gas or vapor state from the source to be absorbed onto metal surfaces forming a thin layer.

5 Materials of Construction Categories

In order to ensure adherence to this standard's requirements, materials of construction are categorized into the following to align water quality, chemical treatment and lay-up requirements; refer to Table 1. For corrosion resistant alloys not listed below, the PREN equation in section 4 shall be used to categorize them.

Table 1 – Material Categories and Sub-Categories

Materials Category	Category Description	Alloy Types	UNS No.	PREN
I	Carbon, Galvanized, and Low Alloy Steel	Varies	Varies	Not applicable
II (A)	PREN (min.) ≤ 30	304	S30400	18.0
		304L	S30403	18.0
		316	S31600	22.6
		316L	S31603	22.6
		317	S31700	27.9
		321	S32100	17.0
		347	S34700	17.0

Materials Category	Category Description	Alloy Types	UNS No.	PREN
		Alloy 20	N08020	25.6
		Alloy 825	N08825	27.8
II (B)	30 < PREN (min.) ≤ 40	22Cr DSS	S31803/S32205	30.5
		25Cr DSS	S32750	37.7
		904L	N08904	32.2
II (C)	PREN (min.) > 40	6%Mo	S31254	42.2
		Alloy 625	N06625	46.4
		Alloy C-276	N10276	73.9
II (D)	Copper-containing alloy (Cu > 30%)	Alloy 400	N04400	Not applicable
		90/10 Cu-Ni	C70600	Not applicable
II (E)	Titanium Alloy	All	R5xxxx	Not applicable
III	Nonmetallic, nonmetallic-lined, and internally coated materials	Varies	Varies	Not applicable

Commentary Note:

Systems that are partially internally coated, for example where coating does not cover girth welds and/or bends, then the system shall be treated similar to the bare material.

6 Water Quality Specifications

Commentary Note:

Non-toxic liquids other than water may be used for pressure testing if the operating fluid or the equipment and piping can be adversely affected by water or by freezing conditions. Water/methanol or water/glycol mixtures may be required in locations where freezing is a concern. Such fluids shall not have a flash point below 54°C (129°F).

- 6.1 The requirements in this standard are designed to prevent corrosion specifically due to oxygen (air) ingress, to prevent microbiologically-influenced corrosion (MIC) and prevent chloride pitting. Hydrostatic testing and lay-up shall prevent oxygen ingress except as specifically allowed in this standard. Therefore, water used for any part of the hydrostatic testing or subsequent wet lay-up shall meet the following requirements before water filling; Table 2 provides a summary of these requirements.

Table 2 - Hydrostatic Testing/Wet Lay-up Water Quality

Material Category	Total Bacteria (per mL)	SRB (per mL)	O ₂ Conc. (ppb)	pH Range	TSS (ppm)	Chloride Conc. (ppm)
I	$\leq 10^4$	$\leq 10^3$	≤ 20	6 - 9	≤ 50	No restriction
II (A)	$\leq 10^4$	$\leq 10^3$	≤ 20	6 - 9	≤ 50	≤ 50
II (B)	$\leq 10^4$	$\leq 10^3$	≤ 20	6 - 9	≤ 50	≤ 500
II (C)	$\leq 10^4$	$\leq 10^3$	No restriction	6 - 9	≤ 50	No restriction
II (D)	$\leq 10^4$	$\leq 10^3$	No restriction	6 - 9	≤ 50	No restriction
II (E)	$\leq 10^4$	$\leq 10^3$	No restriction	6 - 9	≤ 50	No restriction
III	No restriction	No restriction	No restriction	6 - 9	≤ 50	No restriction

Commentary Note:

If these tests are reported by water treatment plants, then current data from the plant is enough and there is no need for additional testing unless there are operational upsets.

- 6.2 If the water is treated with oxidizing chemistry (typically Cl₂, HClO, or ClO₂), as a first pass to remove bacteria, then the residual level of chlorine shall be less than 0.3 ppm to avoid excessive corrosion, deactivation of the non-oxidizing biocide and the initiation of MIC.
- 6.3 For Category I piping materials operating in sour service, water containing hydrogen sulfide (H₂S) shall only be used for hydrostatic testing or subsequent wet lay-up after mechanical stripping and/or chemical scavenging of H₂S to a maximum limit of 1 ppm.

7 Chemical Treatment Specifications

- 7.1 After meeting requirements in section 6, an oxygen scavenger per SAEP-43 shall be added in case of wet lay-up and also to hydrostatic testing water for the following conditions:
- 7.1.1 Category I materials: when the total water contact time can exceed 14 days unless restricted by section 7.1.2.
- 7.1.2 Category I materials: regardless of contact time for any of the hydrocarbon services outlined in SAES-A-008, sections 5.1.1 and 5.2.

The chemicals used shall not have any adverse effect on the pipeline service as per API RP 1110.

7.1.3 Categories II (A & B) materials: regardless of contact time.

Commentary Note:

The addition of an oxygen scavenger is not required for atmospheric and low pressure tanks if water filling takes weeks. In these cases, the chemical will be initially consumed due to the abundance of air contact during filling. Alternatively, an oil-based corrosion inhibitor that can coat the tank internal surface shall be used.

7.2 After meeting requirements in section 6, a biocide per SAEP-43 shall be added in case of wet lay-up and also to hydrostatic testing water for the following conditions:

7.2.1 **Category I materials:** when the total water contact time can exceed 30 days unless restricted by section 7.2.2.

7.2.2 **Category I materials:** regardless of contact time for any of the hydrocarbon services outlined in SAES-A-008, sections 5.1.1 and 5.2. The chemicals used shall not have any adverse effect on the pipeline service as per API RP 1110.

7.2.3 **Categories II (A & B) materials: regardless of contact time.**

7.2.4 **Categories II (C, D & E) materials:** when the total water contact time can exceed 30 days.

7.3 Hydrostatic testing of mixed material categories and/or sub-categories is not recommended. If a hydrostatic test loop consists of mixed categories/sub-categories, then the whole system shall be chemically treated if required per above.

Commentary Note:

For example, if duplex stainless steel (Category II B) piping need to be hydrostatically tested with austenitic stainless steel (Category II A), then the more stringent water quality requirements for the latter shall be used for the whole system.

7.3.1 It is prohibited to hydrostatically test galvanized steel with Materials Category II (A or B) due to the likelihood of zinc-contamination of the latter alloys that may lead to their accelerated corrosion and/or cracking.

7.3.2 It is prohibited to hydrostatically test Materials Category II (D) with other categories due to the likelihood of cross-contamination of other alloys with copper (Cu) corrosion products that may lead to their accelerated corrosion.

- 7.3.3 Valve trim, floating roof tanks' seal, or vessels internals made of Materials Categories II (A and B) shall not be a sufficient sole criterion for re-classifying the whole system for the purpose of applying section 6 unless there are also other components that are constructed of Materials Categories II (A and B).
- 7.4 When multiple treating chemicals are required, then the proposed chemicals shall be compatible and do not lead to adverse reactions impacting the function of some or all of the chemicals.
- 7.4.1 A non-oxidizing biocide shall be used when an oxygen scavenger is required.
- 7.4.2 Separate proportioning pump shall be used for each chemical to avoid adverse reactions. A spare shall always be provided to ensure adequate chemical dosage.
- 7.4.3 The oxygen scavenger, biocide and corrosion inhibitor shall not be mixed prior to injection. Multi-component products, as provided by the chemical vendors, are exempt from the pre-mixing restriction.
- 7.5 Any treatment chemicals shall be continuously injected at a rate that will provide the specified concentration while filling the system with water in preparation for the hydrostatic test. The chemicals' injection and hydrostatic testing water rates shall be monitored on-site per approved procedures; refer to SAEP-43.
- 7.6 For pipelines, batching scrapers and a slug of nitrogen shall be used to separate the air in the system from coming in contact with the treated water.

8 Water Preparation Requirements

The quality of water to be used for hydrostatic testing and for wet lay-up shall be determined well ahead of the actual testing date so that alternative water sources may be identified if the original source water fails to meet the abovementioned requirements.

Commentary Note:

A fixed testing timeframe for the water quality initial test shall be determined on a case-by-case basis depending on the source of the water. In general, initial testing of the water source that will be used for hydrostatic testing could start during the initial phase of construction; e.g. two months from construction start. A retest is required to reconfirm the water quality at least two weeks before the hydrostatic test is performed.

- 8.1 The quality of water shall be reconfirmed by sample testing within two (2) weeks before initial water filling in preparation for the hydrostatic testing.

- 8.2 In case multiple water sources or water tanker trucks are used, representative water sample(s) shall be drawn for testing from each source and/or tanker.
- 8.3 If the water used in the hydrostatic test or wet lay-up process is from more than one source, ensure that mixing the waters will not cause scaling.

Commentary Notes:

Saudi Aramco engineers may contact the Formation Damage & Stimulation Unit, EXPEC Advanced Research Center (EXPEC-ARC), to run scale prediction programs or tests, as necessary. Scaling is affected by three major parameters; composition (mainly calcium, magnesium, carbonate and sulfate), pH and temperature.

For carbonate scaling, the Langelier Saturation Index (LSI) and Stiff & Davis Stability Index (S&DSI) can be used to determine the potential of water to form carbonate scale. LSI is used for low salinity water (TDS < 10,000 ppm) while S&DSI is used for high salinity water (TDS > 10,000 ppm). Negative LSI indicates no scale potential. For sulfate scaling, ion product calculation can be used in comparison with the solubility constant.

- 8.4 Water can be re-used for hydrostatic testing of similar materials categories as in transferring water from a pipeline segment to another or from a tank to another. The water shall meet water quality requirements in section 6 and shall be chemically treated to meet all requirement in section 7.

Commentary Notes:

The chemical injection shall be done in a manner to ensure homogenous mixing of the chemicals in the receiving pipeline segment and/or tank.

- 8.5 Water used for hydrostatic testing of Materials Category I shall not be re-used for Materials Category II (A or B) under any circumstance due to ferrite contamination.

9 Lay-up Requirements

Hydrostatic testing and lay-up procedures shall contain safe-guards to prevent oxygen ingress except as specifically allowed in this standard.

- 9.1 The introduction of hydrostatic test water shall be properly planned and scheduled as close as possible to the equipment and/or system start-up date. Partial or complete refilling of the system counts as continuous, cumulative time.
- 9.2 Assets shall be laid-up per section 9.4 if water contact time exceeds the limits set in Table 3. This is regardless of the purpose behind water usage; e.g. flushing, cleaning, etc.
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Table 3 – Maximum Water Contact Time Limits

Assets	Materials Category	Maximum Water Contact Time Limits
Pipelines, Piping and Pressure Vessels	I, II (C, D & E) and III	30 days
	II (A & B)	14 days
Heat Exchanger and Fin-Fan Coolers	All	14 days
Tanks	All	90 days

- 9.3 Once assets have been laid up, lay-up shall be maintained until preparing for start-up activities.

Commentary Note:

For pipelines, piping and equipment, location of drains, sizing of drain lines, size of drainage system, size of evaporation pond and all other logistics' requirements shall take into account this requirement. This information shall be part of the initially developed hydrostatic test and lay-up procedures as per SAEP-43.

Lay-up procedures shall include remedial action(s) to be implemented in case of hydrostatic testing/lay-up breach and/or failure.

- 9.4 Table 4 outlines the recommended, acceptable and prohibited lay-up methods for pressure equipment, piping and pipelines. Refer to SAEP-43 for lay-up methods' application.

Table 4 – Lay-up Methods for Pressure Vessels, Piping and Pipelines

Material Category	Lay-up Methods			
	Dry	Wet	Inert Gas	Ambient
I	Acceptable	Acceptable	Acceptable	Acceptable
II (A)	Recommended	Acceptable	Prohibited	Prohibited
II (B)	Recommended	Acceptable	Prohibited	Prohibited
II (C)	Acceptable	Acceptable	Acceptable	Recommended
II (D)	Acceptable	Acceptable	Acceptable	Recommended
II (E)	Acceptable	Acceptable	Acceptable	Recommended
III	Acceptable	Acceptable	Acceptable	Recommended

Commentary Notes:

Acceptable methods may be further restricted or prohibited by requirements in below sections of this standard.

- 9.4.1 For Materials Category I, all lay-up methods are acceptable. Ambient lay-up can be used when all below conditions are met:

9.4.1.1 Water is drained from all low points to ensure it is completely removed.

9.4.1.2 Corrosion allowance is adequate and pitting can be tolerated, if it occurs.

9.4.1.3 Rust deposits can be tolerated during operations, e.g. for cases where there is no strict product specifications and where Black Powder is not an operational concern.

- 9.4.2 For pipelines and piping, it is highly recommended to remove valves prior to hydrostatic testing especially type 400-series stainless steel trimmed valves since they are highly prone to corrosion after hydrostatic testing. Valve cavities will be difficult to dry out completely. If these valves cannot be removed, then ambient lay-up shall be prohibited.

- 9.4.3 For Materials Categories II (A & B), it is recommended to use dry lay-up procedures to mitigate premature corrosion and failure. Wet lay-up is an optional procedure in case drying the systems is impractical. Inert gas and ambient lay-up procedures are prohibited since they do not ensure dew point control of the piping system leading to susceptibility to pitting, crevice corrosion, and/or MIC.

- 9.4.4 For Materials Categories II (C, D, & E) and III, ambient lay-up is recommended since the materials are highly resistant to corrosion. Dry, wet, or inert gas lay-up can also be used.

- 9.4.5 In case lay-up procedures consist of multiple materials categories including II (A or B), then the whole system shall be treated as Materials Categories II (A or B) and dry lay-up shall be recommended and inert/ambient lay-up methods shall be prohibited.

Commentary Note:

For example, if stainless steel type 904L (Materials Category II (B)) need to be laid-up/preserved with super austenitic stainless steel type 6% Mo

(Materials Category II (C)), then dry lay-up is recommended and ambient lay-up cannot be used.

9.4.6 It is prohibited to lay-up galvanized steel with Materials Category II (A or B) due to the likelihood of zinc-contamination of the latter alloys that may lead to their accelerated corrosion and cracking.

9.4.7 It is prohibited to lay-up Materials Category II (D) with other categories due to the likelihood of cross-contamination of other alloys with copper (Cu) corrosion products that may lead to their accelerated corrosion.

9.5 Table 5 outlines the recommended lay-up methods for tanks.

Table 5 – Lay-up Methods for Tanks

Tank Type	Materials Category	Lay-up Method	Additional Requirements
Fixed Roof	I	Ambient	Apply VCI
	II	Ambient	-
	III	Ambient	-
Floating Roof	-	Ambient	Apply VCI below roof

9.5.1 For all tank types, ambient is the recommended lay-up method. All remaining hydrostatic testing water shall be properly drained and manways closed to ensure no foreign debris enter the tanks.

9.5.2 VCI application shall be either by addition to the hydrostatic testing water before filling or after draining by a fogging application method. VCI shall be compatible with existing coating systems.

9.5.3 For the internal walls above the floating roof, solvent cut-back preservatives shall be applied if the area classification is “Severely Corrosive” or “Highly Corrosive” per SAES-A-134. This requirement includes tanks with internal floating roofs, if the dome roof is not installed before the maximum period outlined in Table 3

Revision Summary

18 August 2019 Major revision.

Summary of Change Form

No.	Paragraph Number	Change Type (New, Modification,...)	Technical Change(s)
1	1.3 (new)	New	Added new materials of construction
2	1.3 (old)	Deleted	Moved to paragraph 6

No.	Paragraph Number	Change Type (New, Modification,...)	Technical Change(s)
3	1.4 (old)	Deleted	Moved to paragraph 6 and deleted reference to CSD
4	1.4 (new)	New	Added reference to SAEP-1026 and SAEP-43 for detailed procedures
5	1.5 (old)	Deleted	Deleted since the section was moved to SAEP-43
6	1.5 (new)	New	Added reference to SAES-S-060/070 for plumbing and utilities, SAES-L-150 for lube/seal oil and SAES-J-901 for instrument and plant air piping.
7	1.6 (new)	New	Added reference to SAEP-385 for preservation of project materials and equipment.
8	3	Modification	Added new references SAEP-43, SAES-A-008, SAES-A-133 & SAES-A-134. Moved all other relevant references to new SAEP-43.
9	4	Modification	Added definitions for biocide, GAB, MIC, PREN, sour service, SRB, system, tanks and Total Bacteria. Moved all other definitions to new SAEP-43.
10	5 (new)	New	Added new paragraph on "Materials of Construction Categories"
11	5 (old)	Deleted	Moved to new SAEP-43
12	6	Modification	Changed title to "Water Quality Specifications"
13	6	Modification	Changed Table 1 to 2 and updated based on new paragraph 5.
14	6.1	New	Added requirement to meet Total Bacteria count in line with new SAES-A-133
15	6.1 – 6.3	Modification	Aligned with new Table 2.
16	7 (new)	New	Added new paragraph on "Chemical Treatment Specifications". Moved paragraphs 6.2.3 – 6.2.5 (old) to new section and aligned with new section 5.
17	7.2.1 (old)	Deleted	Not technically acceptable to use water with more than 50 ppm chlorides for Materials Category II (A)
18	7.2.2 (old)	Modification	Align with new Materials Categories and move to be paragraph 7.3.2
19	7.2.3 (old)	Modification	Align with new Materials Categories and move to be paragraph 9.4.2
20	7.3 – 7.8 (old)	Deleted	Moved to new SAEP-43
21	8.1 & 8.2 (old)	Deleted	Moved to paragraph 5.1.3
22	8.3 (old)	Deleted	Moved to paragraph 1.5
23	8.4 & 8.5 (old)	Deleted	Moved to new SAEP-43
24	8.6.1 (old)	Deleted	Moved to paragraph 9.5
25	8.6.2 (old)	Deleted	Moved to paragraph 5.1.1
26	8.6.3 (old)	Deleted	Moved to new SAEP-43
27	8 (new)	New	Added new paragraph on "Water Preparation Requirements". Moved paragraphs 6.2.1/6.2.2 (old) to new section.
28	9 (old)	Deleted	Moved to new SAEP-43
29	9 (new)	New	Added new paragraph on "Lay-up Requirements". Moved paragraph 7.1 to new section.
30	9.2 (new)	New	Added new Table 3 with water contact limits for different assets and different materials categories.
31	9.4 (new)	New	Added new Table 4 for Pressure Vessels, Piping and Pipelines lay-up methods
32	9.5 (new)	New	Added new Table 5 for Tanks lay-up methods.
33	Appendices A-D	Deleted	Moved to new SAEP-43