Engineering Standard

SAES-H-101 29 June, 2005
Approved Protective Coating
Systems for Industrial Plants & Equipment

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Previous Issue: 31 August, 2003 Next Planned Update: 1 July, 2010
Revised paragraphs are indicated in the right margin

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1 Scope

This Standard describes various approved protective coating systems (APCS's) specified in other Saudi Aramco Engineering Standards. This Standard, in conjunction with SAES-H-100 and the appropriate Saudi Aramco Data Sheets (SAES-H-101V) gives the application requirements for Saudi Aramcoapproved protective coating systems.

Individual APCSs of this standard may be attached to, and made part of, purchase orders.

2 Conflicts and Deviations

2.1 Any conflicts between this standard and other applicable Saudi Aramco Engineering Standards (SAESs), Materials System Specifications (SAMSSs), Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

2.2 Direct all requests to deviate from this standard in writing to the Company or Buyer Representative, who shall follow internal company procedure SAEP-302 and forward such requests to the Manager, Consulting Services Department of Saudi Aramco, Dhahran.

3 References

All referenced specifications, standards, codes, forms, drawings, and similar material shall be of the latest issue (including all revisions, addenda, and supplements) unless stated otherwise.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

SAEP-302	*Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement*

Saudi Aramco Engineering Standards

SAES-H-001	*Selection Requirements for Industrial Coatings*
SAES-H-100	*Painting Requirements for Industrial Facilities*
SAES-H-101V	*Approved Saudi Aramco Data Sheets - Paints and Coatings*

SAES-H-003	*General Requirements for Industrial Concrete Coatings*

Saudi Aramco Materials System Specifications

09-SAMSS-021	*Alkyd Enamel Coating System (APCS - 6)*
09-SAMSS-030	*Conversion Coating / Alkyd Coating System (APCS - 7)*
09-SAMSS-035	*Aluminum Pigmented Alkyd Coating System (APCS - 4)*
09-SAMSS-067	*Epoxy Coating for Immersion Service*
09-SAMSS-068	*Qualification Requirements for Coal Tar Epoxy in Buried or Immersion Services (APCS-3)*
09-SAMSS-069	*Epoxy Coating for Atmospheric Service (with and without Polyurethane Topcoat)*
09-SAMSS-070	*Epoxy Splash Zone Compound (APCS - 19A and APCS - 19B)*
09-SAMSS-071	*Inorganic Zinc Primer (APCS - 17A and APCS - 17B)*
09-SAMSS-087	*Epoxy Coating for Application on Damp Steel Surfaces*
09-SAMSS-101	*Epoxy Mastic Coating (Self-Priming, with and without Polyurethane Topcoat)*
09-SAMSS-103	*Qualification Requirements for High Temperature External Coatings in Atmospheric Services (APCS-11A) and (APCS-11B*

3.2 Industry Codes and Standards

Swedish Standard Institute

SIS 05 59 00	*Pictorial Surface Preparation Standard for Painting Steel Surfaces*

The Society for Protective Coatings

SSPC	*Steel Structures Painting Manual*

4 Definitions

4.1 Abbreviations

The following abbreviations of metal surface cleanliness grades have been used in this Standard:

SSPC SP1	Solvent cleaning
St 2 (SSPC SP2)	Hand tool cleaning
St 3 (SSPC SP3)	Power tool cleaning
Sa 1 (SSPC SP7)	Brush-off blast cleaning
Sa 2 (SSPC SP6)	Commercial blast cleaning
Sa 2 1/2 (SSPC SP10)	Near white blast cleaning
Sa 3 (SSPC SP5)	White metal blast cleaning

Detailed definitions of the above can be obtained in SIS 05 59 00 and the Steel Structures Painting Councils "Steel Structures Painting Manual".

4.2 Saudi Aramco Data Sheets (SAES-H-101V)

These data sheets give the mandatory technical properties and the storage, mixing, and application requirements specific to each individual coating product covered by this Standard. These data sheets are issued (and signed) jointly by the Saudi Aramco Responsible Standardization Agency representative (See definition of the RSA in SAES-H-001) and the coating Manufacturer (or Vendor). The Saudi Aramco Data Sheets are not stand-alone documents; they must be used in conjunction with the applicable APCS sheet in this Standard.

5 Approved Protective Coating Systems

5.1 Index

APCS-1A Epoxy Coating System for Atmospheric Service (with Inorganic Zinc Primer)

APCS-1B Epoxy Coating System for Atmospheric Service (with Epoxy Primer)

APCS-1C Epoxy Coating System for Atmospheric Service (with Zinc-Rich Epoxy Primer)

APCS-1D Epoxy/Polyurethane Coating System for Atmospheric Service (with Inorganic Zinc Primer)

APCS-1E Epoxy/Polyurethane Coating System for Atmospheric Service (with Epoxy Primer)

APCS-1F	Epoxy/Polyurethane Coating System for Atmospheric Service (with Zinc-Rich Epoxy Primer)
APCS-2A	Phenolic Epoxy Coating System for General Immersion Service (Self-Priming)
APCS-2B	Phenolic Epoxy Coating System for Potable Water Immersion Service (Self-Priming)
APCS-2C	Phenolic Epoxy Coating System for Immersion Service, at temperatures up to 120°C
APCS-2D	Epoxy Coating System for Interior of Steel Aviation Fuel Storage Tanks and Piping
APCS-2E	Solvent Free Epoxy Coating System for Immersion Service at temeprature up to 90^{o}C
APCS-2F	Glass Flake Reinforced Polyester Coating System for Immersion Service at temperature up to 95^{o}C
APCS-2G	Glass Flake Reinfoced Vinyl Ester Coating System for Immersion Service at Temperature up to 105^{o}C
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APCS-7	Rust Conversion Primer/Alkyd Topcoat System for Use on Slightly Rusted Steel
APCS-9	Chlorinated Rubber Coating System
APCS-10	Bituminous Paint for Moderate Temperature, Buried or Immersion Service (Self-Priming)
APCS-11A	High Temperature Coating System for Atmospheric Service Between 150°C - 400°C
APCS-11B	Ultra High Temperature Coating System for Atmospheric Service Between 400°C - 540°C

APCS-12	Nonskid Epoxy Coating System for Floors and Decks
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APCS-17B	Inorganic Zinc Primer, Water Based
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APCS–22A	Epoxy Coating for Application onto Damp Steel Surfaces
APCS-22B	Single - Coat Epoxy Coating for Offshore Application onto Damp Steel Surfaces
APCS-23	High Temperature Mastic Paint for Buried or Immersion Service (Self-Priming)
APCS-26	Mastic Epoxy Coating (Self-Priming)
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APCS-27	Solvent Free Two-component Ultra Hybrid Epoxy Coating System for Immersion Serivce at Temperautre up to 156ºC.
APCS-28	Specialty Coating Systems for Repiar and Reconditioning of Pumps and Valves Internals.

5.2 Service condition limitations for the APCS's assume continuous service. For intermittent service, contact the RSA in the Consulting Services Department.

5.3 The APCS coating systems shall not be used under conditions that violate service limitations or other requirements in the applicable APCS data sheets. Only approved products shall be used. (See definitions in SAES-H-001).

5.4 In cases a coating system appears otherwise acceptable but has been applied at thicknesses greater than the specified maximum, consult the RSA, to determine if the intent of the standard has been violated and what corrective action is needed.

5.5 When an APCS system is used to coat concrete surfaces, the surface preparation and coating application requirements shall be in accordance with SAES-H-003.

5.6 Coatings that have exceeded their shelf life shall not be used unless written approval is obtained from the RSA.

Revision Summary

29 June, 2005	Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with minor revisions.

APCS-1A

1 Type of Coating

Epoxy Coating System for Atmospheric Service (with Inorganic Zinc Primer).

2 General Data

2.1 Typical Use

Severe atmospheric exposure, particularly for offshore construction. Not generally specified for maintenance painting.

2.2 Service Condition Limitations

Maximum Service Temperature: 150°C

2.3 Purchase Specifications

2.3.1 Primer: 09-SAMSS-071

2.3.2 Topcoats: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1	Primer:	1000194146 (09-611-958) / 1000194182 (09-611-969) solvent or water based.
	Thinner:	1000198445 (09-738-220)
2.4.2	Topcoat:	1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.
	Thinner:	1000198452 (09-738-260)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m² Use APCS-1C zinc-rich epoxy for primer repair

3.2	Profile:	40-65 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1	Primer:	One Coat 65-100 micrometers, minimum-maximum
4.1.2	Topcoats:	Two or more coats 150 micrometers, maximum per coat
4.2	Total System:	Minimum three coats 275-400 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-1B

1 Type of Coating

Epoxy Coating System for Atmospheric Service (with Epoxy Primer).

2 General Data

2.1 Typical Use

Severe atmospheric exposure including exposure to many acids and alkalis; primer can be used with APCS-12.

2.2 Service Condition Limitations

Maximum Service Temperature: 150°C

2.3 Purchase Specifications

2.3.1 Primer: 09-SAMSS-069

2.3.2 Topcoats: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1 Primer: 1000194626 (09-612-362)

Thinner: 1000198455 (09-738-280)

2.4.2 Topcoat: 1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.

Thinner: 1000198452 (09-738-260)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m^2

3.2	Profile:	40-65 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900).

4 Dry Film Thickness Requirements

4.1	Each Coat	
4.1.1	Primer:	One coat 50-100 micrometers, minimum-maximum
4.1.2	Topcoats:	Two or more coats 150 micrometers, maximum per coat
4.2	Total System:	Minimum three coats 275-400 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-1C

1 Type of Coating

Epoxy Coating System for Atmospheric Service (with Zinc-Rich Epoxy Primer).

2 General Data

2.1 Typical Use

Maintenance painting for severe atmospheric exposures; primer can be used with APCS-12.

2.2 Service Condition Limitations

Maximum Service Temperature: 150°C

2.3 Purchase Specifications: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1	Primer:	1000195348 (09-612-580), 1000195361 (09-612-590) or 1000195361 (09-612-590) depending on can size
	Thinner:	1000198449 (09-738-240)
2.4.2	Topcoat:	1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.
	Thinner:	1000198452 (09-738-260)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2

3.2 Profile: 25-40 micrometers, minimum-maximum

Abrasive: 1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900).

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1 Primer:	One coat 40-75 micrometers, minimum-maximum
4.1.2 Topcoats:	Two or more coats 150 micrometers, maximum per coat

4.2 Total System:

Minimum three coats
250-375 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-1D

1 Type of Coating

Epoxy with Top-coat Polyurethane Coating System for Atmospheric Service (with Inorganic Zinc Primer).

2 General Data

2.1 Typical Use

Severe atmospheric exposure, when added gloss retention, color retention and abrasion resistance are required (usually outdoors). Not generally specified for maintenance painting.

2.2 Service Condition Limitations

Maximum Service Temperature: 80°C

2.3 Purchase Specifications

2.3.1 Primer: 09-SAMSS-071

2.3.2 Topcoats: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1	Primer:	1000194146 (09-611-958) / 1000194182 (09-611-969) solvent or water based.
	Thinner:	1000198445 (09-738-220)
2.4.2	Intermediate coat:	1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.
	Thinner:	1000198452 (09-738-260)
2.4.3	Topcoat:	1000194672 (09-612-365), 1000194675 (09-612-366), 1000194793 (09-612-367), 1000194795 (09-612-368) or 1000194851 (09-612-371) depending on color.
	Thinner:	1000198479 (09-738-345)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2 Use APCS - 1C zinc-rich epoxy for primer repair.

3.2 Profile:40-65 micrometers, minimum-maximum

Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1	Primer:	One coat 65-100 micrometers, minimum-maximum
4.1.2	Intermediate Coat:	One or more coats 100-150 micrometers, minimum-maximum
4.1.3	Topcoat:	One coat 25-65 micrometers, minimum-maximum

4.2 Total System: Minimum three coats, 190-315 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-1E

1 Type of Coating

Epoxy with Top-coat Polyurethane Coating System for Atmospheric Service (with Epoxy Primer).

2 General Data

2.1 Typical Use

Severe atmospheric exposure including exposure to many acids and alkalis, when added gloss retention, color retention and abrasion resistance are required (usually outdoors).

2.2 Service Condition Limitations

Maximum Service Temperature: 80°C

2.3 Purchase Specifications: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1	Primer :	1000194626 (09-612-362)
	Thinner:	1000198455 (09-738-280)
2.4.2	Intermediate coat:	1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.
	Thinner:	1000198452 (09-738-260)
2.4.3	Topcoat:	1000194672 (09-612-365), 1000194675 (09-612-366), 1000194793 (09-612-367), 1000194795 (09-612-368) or 1000194851 (09-612-371) depending on color.
	Thinner:	1000198479 (09-738-345)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)

3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2
3.2	Profile:	40-65 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat	
4.1.1	Primer:	One coat 50-100 micrometers, minimum-maximum
4.1.2	Intermediate Coat:	One or more coats 100-150 micrometers, minimum-maximum
4.1.3	Topcoat:	One coat 25-65 micrometers, minimum-maximum
4.2	Total System:	Minimum three coats 175-315 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-1F

1 Type of Coating

Epoxy with Top-coat Polyurethane Coating System for Atmospheric Service (with Zinc-Rich Epoxy Primer).

2 General Data

2.1 Typical Use

Maintenance painting for severe atmospheric exposures when added gloss retention, color retention and abrasion resistance are required (usually outdoors).

2.2 Service Condition Limitations

Maximum Service Temperature: 80°C

2.3 Purchase Specifications: 09-SAMSS-069

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1	Primer:	1000195348 (09-612-580), 1000195361 (09-612-590) or 1000195361 (09-612-590) depending on can size
	Thinner:	1000198449 (09-738-240)
2.4.2	Intermediate coat:	1000194629 (09-612-364), 1000194797 (09-612-369) or 1000194960 (09-612-375) depending on color.
	Thinner:	1000198452 (09-738-260)
2.4.3	Topcoat:	1000194672 (09-612-365), 1000194675 (09-612-366), 1000194793 (09-612-367), 1000194795 (09-612-368) or 1000194851 (09-612-371) depending on color.
	Thinner:	1000198479 (09-738-345)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)

3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2

3.2 Profile:25-40 micrometers, minimum-maximum

Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1	Primer:	One coat 40-75 micrometers, minimum-maximum
4.1.2	Intermediate Coat:	One or more coats 125-175 micrometers, minimum-maximum
4.1.3	Topcoat:	One coat 25-65 micrometers, minimum-maximum

4.2	Total System:	Minimum three coats 190-315 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-2A

1 Type of Coating

Phenolic Epoxy Coating System for General Immersion Service (Self-Priming).

2 General Data

2.1 Typical Use:

Immersion service particularly for raw or treated waters and for GOSP traps handling hot crude oil/brine solutions. Not suitable for potable water.

2.2 Service Condition Limitations

2.2.1	Maximum Service Temperature:	90°C
2.2.2	Maximum Service Pressure:	6890 kPa (ga) (1000 psig)
2.2.3	Maximum Partial Pressure H_2S, CO_2:	345 kPa (ga) (50 psig)
2.2.4	Requires 7 days curing time at 25ºC	

2.3 Purchase Specification: 09-SAMSS-067

2.4 SAP Material Numbers (SAMS Stock Numbers)

Coating:	1000195232 (09-612-425) or 1000195235 (09-612-453) depending on color
Thinner:	1000198377 (09-738-140)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 3 (SP5)
3.1.2	Touch-up:	Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than 0.1 m².

3.2	Profile:	40-65 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat:	Three or more coats 125 microns, maximum per coat
4.2	Total System:	Minimum three coats 275-375 microns, minimum-maximum

4.3 Coating thickness within 2 m of anode connections shall be 30% greater than the specified dry film thickness range.

4.4 Succeeding coats shall be of contrasting colors.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-2B

1 Type of Coating

Phenolic Epoxy Coating System for Potable Water Immersion Service (Self-Priming).

2 General Data

2.1 Typical Use: Immersion service for potable water application.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 90°C

2.2.2 Maximum Service Pressure: 3445 kPa (ga) (500 psig)

2.2.3 Requires current 24 months certificate stating that the product is tested and used for potable water application

2.3 Purchase Specification: 09-SAMSS-067

2.4 SAP Material Numbers (SAMS Stock Numbers)

Coating:	1000195317 (09-612-518) or 1000195341 (09-612-546) depending on color
Thinner:	1000198372 (09-738-100)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial:	Sa 3 (SP5)
3.1.2 Touch-up:	Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than 0.1 m².

3.2 Profile:	40-65 micrometers, minimum-maximum
Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat:	Three or more coats 125 microns, maximum per coat

4.2	Total System:	Minimum three coats 275-375 microns, minimum-maximum.

4.3 Coating thickness within 2 m of anode connections shall be 30% greater than the specified dry film thickness range.

4.4 Succeeding coats shall be of contrasting colors.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-2C

1 Type of Coating

Phenolic Epoxy Coating System for Immersion Service, at temperatures up to 120°C.

2 General Data

2.1 Typical Use: Immersion service for de-mineralized water and boiler skim tanks.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 120°C

2.2.2 Maximum Service Pressure: 3445 kPa (ga) (500 psi)

2.2.3. Requires 7 days curing time at 25°C

2.3 Purchase Specification: 09-SAMSS-067

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1 Primer: 1000194295 (09-612-312)

2.4.2 Topcoat: 1000194298 (09-612-313) or 1000194352 (09-612-314) depending on color

Thinner: 1000198483 (09-738-380)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 3 (SP5)

3.1.2 Touch-up: Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than 0.1 m²

3.2 Profile: 40-65 micrometers, minimum-maximum

Abrasive: 1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1	Primer:	One coat, See Saudi Aramco data sheets (SAES-H-101V) for the primer dry film thickness.
4.1.2	Topcoats:	Two or more coats 125 micrometers, maximum per coat
4.2	Total System:	Three or more coats 275-375 micrometers, minimum-maximum

4.3 Coating thickness within 2 m of anode connections shall be 30% greater than the specified dry film thickness range.

4.4 Succeeding coats shall be of contrasting colors.

4.5 APCS-2C is not normally recommended for potable water immersion service. In these cases, consult the RSA.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-2D

1 Type of Coating

Epoxy Coating System for Interior of Steel Aviation Fuel Storage Tanks and Piping.

2 General Data

2.1	Typical Use:	Immersion service for aviation fuels, turbine fuels and kerosene
2.2	Service Condition Limitations	
	Maximum Service Temperature:	90°C
2.3	Purchase Specification(s):	MIL-C-4556E, QPL-4556E, or the Defense Standard DStan80-97-3 for products manufactured by European manufacturers.
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer (Yellow):	1000194354 (09-612-316)
2.4.2	Topcoat (White):	1000194357 (09-612-317)
2.4.3	Thinner:	1000198458 (09-738-290)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 3 (SP5)
3.1.2	Touch-up:	Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than0.1 m²
3.2	Profile:40-65 micrometers, minimum-maximum	
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat:	Two or more coats 125 micrometers, maximum per coat

4.2	Total System:	Minimum two coats 200 - 250 micrometers, minimum-maximum

4.3 The total system thickness shall be applied in a minimum of two coats of contrasting colors.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS–2E

1 Type of Coating

Solvent Free Epoxy Coating for General Immersion Service (Self-Priming).

2 General Data

2.1	Typical Use:	Immersion service such as hydrocarbon, aqueous and corrosive chemical environments.
2.2	Service Condition Limitations	
2.2.1	Maximum Service Temperature:	90°C
2.2.2	Maximum Service Pressure:	20,700 kPa (ga) (3,000 psig)
2.3	Purchase Specification:	09-SAMSS-067
2.4	SAP Material Numbers (SAMS Stock Numbers)	
	Coating:	1000658840 (09-000-472) or 1000683474 (09-000-496) depending on color
	Thinner:	1000647354 (09-000-465)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 3 (SP5)
3.1.2	Touch-up:	Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than 0.1 m².
3.2	Profile:	40 - 100 microns, minimum-maximum
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900).

4 Dry Film Thickness Requirements

4.1	Each Coat:	Two coats 300 – 400 microns, maximum per coat

4.2 Total System: Minimum two coats
500 – 800 microns, minimum-maximum.

4.3 Coating thickness within 2 m of anode connections shall be 30% greater than the specified dry film thickness range.

4.4 Succeeding coats shall be of contrasting colors.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-2F

1 Type of Coating

Glass Flake Polyester Coating System for General Immersion Service (Single coat).

2 General Data:

2.1 Typical use: Immersion service such as hydrocarbon, seawater, raw water, aqueous and corrosive chemical environments.

2.2 Service Limitation:

2.2.1 Maximum Service Temperature: 95°C

2.2.2 Maximum Service Pressure: 20,700 kPa (ga) (3,000 psig)

2.2.3 Not suitable for demineralised water and polar solvents.

2.3 Purchase Specification: 09-SAMSS-067

In addition to the following specifications: tensile strength > 3700psi, elongation at break 1.3% in immersion condition, abrasion resistance < 430 gm loss per 1000 cycles per 1000 gm load, and Hardness > 40 Barcol after full cure.

2.4 SAMS Stock Numbers: Contact RSA

3 Surface Preparation

3.1 Minimum Cleanliness Level

3.1.1 Initial : Sa 3 (SP5)

3.1.2 Touch-up: Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than0.1 m^2

3.2 Profile: 65 - 100 micrometers, minimum-maximum

Abrasive: S/N 08-220-865, 08-220-895, or 08-202-900.

4 Application and Dry Film Thickness Requirements

4.1 Application: Single coat application by airless equipment (45:1) to build up the required thickness

	Stripe Coating:	Weld lines, appurtenances, welded bracket should be stripe coated prior to spray apply coating.
4.2	Total Film Thickness:	Maximum two coats 600 - 1000 micrometers, minimum-maximum

4.3 The total system thickness shall be applied in a single coat or two coats wet on wet. Use contrasting colors if the second coat is to be applied within the allowed re-coating intervals.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS–2G

1 Type of Coating

Glass Flake Vinyl Ester Coating System for Heavy-Duty Immersion Service (Single coat).

2 General Data

2.1 Typical Use: Immersion service such as hydrocarbon, seawater, raw water, aqueous and corrosive chemical environments. Suitable for immersion service at GOSPS pressure vessels and headers.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 105°C

2.2.2 Maximum Service Pressure: 20,700 kPa (ga) (3,000 psig)

2.2.3 Not suitable for demineralised water and polar solvents.

2.3 Purchase Specification: 09-SAMSS-067

In addition to the following specifications: tensile strength > 38740psi, elongation at break 1.6% in immersion condition, abrasion resistance < 134 gm loss per 1000 cycles per 1000 gm load, and Hardness > 45 Barcol after full cure.

2.4 SAMS Stock Numbers (SAP Material Numbers)

Coating: 09-000-502 (1000709300)

Inhibitor (Retarder): 09-000-505 (1000709303)

Cleaner: 09-000-503 (1000709301)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 3 (SP5)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m^2

3.2	Profile:	65-100 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Total System:	One Coat 600-1000 micrometers, minimum-maximum

4.2 Film thickness higher than 600 microns shall be applied in two coats with minimum over coating intervals as per the manufacturer data sheet.

4.3 Applications require higher dry film thickness shall be consulted with the coating RSA.

4.3 Coating thickness within 2 m of anode connections shall be 30% greater than the specified dry film thickness range.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-3

1 Type of Coating

Coal Tar Epoxy Coating System for Immersion Service (Self-Priming).

2 General Data

2.1	Typical Use:	Immersion service in tanks containing hydrocarbons, seawater, fresh water and most alkalis; intermittent contact with acids and solvents.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature (Immersion): 70°C

2.2.2 Not for use in pressure vessels.

2.2.3 Not suitable for use in direct sunlight.

2.3	Purchase Specification:	09-SAMSS-068

2.4 SAP Material Numbers (SAMS Stock Numbers)

Coating:	1000194372 (09-612-318); red, 1000194375 (09-612-320); black
Thinner:	1000198441 (09-738-180)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) Refer to repair procedure in SAES-H-100 for areas less than 0.1 m^2.

3.2 Profile:65-100 micrometers, minimum-maximum

Abrasive:	1000161168 (08-220-878) or 1000160377 (08-202-910).

4 Dry Film Thickness Requirements

4.1	Each Coat:	Two or more coats 300 micrometers, maximum per coat
4.2	Total System:	Minimum two coats 400-600 micrometers, minimum-maximum

4.3 Succeeding coats shall be of contrasting colors. If a holding primer is used, it shall constitute an additional coat.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-4

1 Type of Coating

Aluminum - Pigmented Alkyd Coating System.

2 General Data

2.1	Typical Use:	Structural steelwork, tanks, vessels, pipes and equipment subject to moderate industrial atmospheres including H_2S fumes and high humidity. Not generally recommended for shop applications or when handling is required after coating. (See APCS - 26/26T).
2.2	Service Condition Limitations	
	Maximum Service Temperature:	80°C
2.3	Purchase Specifications:	09-SAMSS-035
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	1000197976 (09-708-133) or 1000198011 (09-708-137) depending on can size
2.4.2	Topcoat:	1000196402 (09-686-354)
	Thinner:	1000198474 (09-738-340)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial :	Sa 2 (SP6)
3.1.2	Touch-up:	Sa 2 (SP6) St 3 (SP3) for areas less than 1.0 m².
3.2	Profile:	Min.: Not critical Max.: 40 micrometers
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1 Primer:	Two or more coats 50 micrometers, maximum per coat 75 micrometers, minimum primer total
4.1.2 Topcoats:	One or more coats 40 micrometers, maximum per coat
4.2 Total System:	Minimum three coats 115-180 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS–5

1 Type of Coating

Thermal Reflective and Insulating External Coating System.

2 General Data

2.1 Typical Use: External coating for petroleum tanks, vessels and drums to reduce the solar heat gain and to minimize the evaporation losses. Suitable as alternative for safety protection for hot piping surfaces in the Plant.

2.2 Service Condition Limitations

Maximum Service Temperature: 450 °F (232 °C)

Used with approved primer and top coat for color retention.

2.3 Purchase Specifications

Solar Reflectance shall not be less than 80% as per ASTM-903.

Emittance Value shall not be less than 90% as per ASTM-408.

The coating shall pass 1500 hour of Salt fog test ASTM B-117 without any rust creep, blistering and cracking.

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m²
Use APCS - 1C (zinc-rich epoxy) as primer for repair

3.2 Profile:40-65 micrometers, minimum-maximum

Abrasive: 1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

For tanks, vessels, and drums 300 – 500 microns, minimum- maximum

For hot piping (safety) 500 microns reduce substrate temp. 40°F

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-6

1 Type of Coating

Alkyd Enamel Coating System.

2 General Data

2.1	Typical Use:	Structural steels, machinery and equipment in marine and industrial environments including intermittent exposure to H_2S fumes and high humidity. Not recommended for shop application or when handling is required after coating. (See APCS-26/26T).
2.2	Service Condition Limitations	
	Maximum Service Temperature:	70°C
2.3	Purchase Specifications:	09-SAMSS-021
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer :	1000197976 (09-708-133) or 1000198011 (09-708-137) depending on can size
2.4.2	Topcoat:	1000195487 (09-630-753), 1000195490 (09-630-758), 1000195495 (09-630-763), 1000195532 (09-630-768), 1000195571 (09-630-769), 1000195577 (09-630-770), 1000195631 (09-630-771), 1000195637 (09-630-773), 1000195650 (09-630-785), 1000195683 (09-630-794), 1000195685 (09-630-796), 1000195687 (09-630-798), 1000195689 (09-631-301), 1000195742 (09-631-322), 1000195745 (09-631-450), 1000195747 (09-631-455), 1000195749 (09-631-462), 1000195801 (09-631-465), 1000195803 (09-631-590) or 1000195831 (09-631-645) depending on color
2.4.3	Thinner:	1000198474 (09-738-340)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial:	Sa 2 (SP6)
3.1.2 Touch-up:	Sa 2 (SP6) St 3 (SP3) for areas less than 1.0 m^2

3.2 Profile:	Min.: Not Critical Max.: 40 micrometers
Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1 Primer:	Two or more coats 50 micrometers, maximum per coat 75 micrometers, minimum primer total
4.1.2 Topcoats:	One or more coats 50 micrometers, maximum per coat

4.2 Total System:	Minimum three coats 125-200 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-7

1 Type of Coating

Rust Conversion Primer/Alkyd Topcoat System for Use on Slightly Rusted Steel.

2 General Data

2.1	Typical Use:	Maintenance coating system for APCS-4 and APCS-6. Applied directly to bare, slightly rusted steel surfaces. Not intended as an intermediate or tie coat over sound coatings.
2.2	Service Condition Limitations	
	Maximum Service Temperature:	70°C
2.3	Purchase Specification:	09-SAMSS-030
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Conversion Coating:	1000195390 (09-612-730)
2.4.2	Topcoat:	Rust conversion coatings are only approved for use with specific topcoats. Refer to 09-612-730 or to the RSA for acceptable conversion coating/topcoat combinations.

3 Surface Preparation Requirements

3.1	Required Cleanliness Level	
	Slightly Rusted Steel:	St 2 (SP 2) or St 3 (SP 3)
	Note: Roughen (feather) adjacent sound coating.	
3.2	Profile:	Not critical

4 Dry Film Thickness Requirements

4.1	Rust Converter:	One or more coats to the minimum thickness shown on the Saudi Aramco data sheet in SAES-H-10lV.

4.2	Topcoats:	One or more coats. 40 micrometers (1.5 mils) maximum per coat for aluminum alkyds 50 micrometers (2.0 mils) maximum per coat for alkyd enamels.

4.3 Total System: Minimum three coats.

Alkyd enamels:	50-100 micrometers (2-4 mils) above the thickness of the rust converter.
Aluminum alkyds:	37-75 micrometers (1-½ to 3 mils) above the thickness of the rust converter.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-9

1 Type of Coating

Chlorinated Rubber Coating System.

2 General Data

2.1	Typical Use:	Metallic and concrete surfaces exposed to salts, high humidity, and spillage of acids and alkalis.
2.2	Service Condition Limitations	
	Maximum Service Temperature:	60°C
2.3	Purchase Specifications	
2.3.1	Primer:	None
2.3.2	Topcoat:	None
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	1000196351 (09-685-442)
2.4.2	Topcoat:	1000196312 (09-685-436), 1000196317 (09-685-438), 1000196355 (09-685-448), 1000196359 (09-685-450) depending on color

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level	
Initial:	Metallic Surfaces: Sa 2-1/2 (SP10)
	Nonmetallic Surfaces: Surface shall be dry and free of all contaminants such as grease, oil, dirt and loose paint.
Touch-up:	Metallic Surfaces: Sa 2-1/2 (SP10) St 3 (SP3) for area less than 0.1 m^2
	Nonmetallic Surfaces: Surface shall be dry and free of all contaminants such as grease, oil, dirt, and loose paint.

3.2	Profile:	25-50 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat	
4.1.1	Primer:	One or more coats 50-75 micrometers, minimum-maximum
4.1.2	Topcoat:	One or more coats 50-100 micrometers, minimum-maximum
4.2	Total System:	Minimum two coats 100-175 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-10

1 Type of Coating

Bituminous Paint for Moderate Temperature, Buried or Immersion Service (Self-Priming).

2 General Data

2.1 Typical Use: Buried and immersed steel. Resistant to water and acidic fumes.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 60°C

2.2.2 Not suitable for exposure to direct sunlight or hydrocarbon solvents.

2.3 Purchase Specification: None

2.4 SAP Material Numbers (SAMS Stock Numbers):

Coating: 1000194025 (09-611-715), 1000194029 (09-611-720) or 1000194032 (09-611-725) depending on can size

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level, Initial and Touch-up:

3.1.1 Pipelines in hydrocarbon service and all pipelines in road and camel crossings: Sa 2 (SP6)
St 3 (SP3) if less than 3m long.

3.1.2 General Steelwork: St 3 (SP3)

3.2 Profile: Not Critical

4 Dry Film Thickness Requirements

4.1 Each Coat:

See Saudi Aramco data sheets (SAES-H-101V) for dry film thickness per coat and number of coats.

4.2 Total System

4.2.1 Buried: 750 micrometers, minimum

4.2.2 Immersed: 1150 micrometers, minimum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-11A

1 Type of Coating

High Temperature External Coating System for Atmospheric Service between 150°C-400°C (with Inorganic Zinc Primer).

2 General Data

2.1	Typical Use:	Steel in atmospheric service at elevated temperature.
2.2	Service Condition Limitations	
	Service Temperature:	150°C-400°C
2.3	Purchase Specifications	
2.3.1	Primer:	09-SAMSS-071
2.3.2	Topcoat:	09-SAMSS-103
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	1000194146 (09-611-958) / 1000194182 (09-611-969) solvent or water based
2.4.2	Thinner:	1000198445 (09-738-220)
2.4.3	Topcoat:	1000196488 (09-687-325)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-Up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2
3.2	Profile:40-65 micrometers, minimum-maximum	
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 Each Coat

4.1.1 Primer: One coat
25-65 micrometers, minimum-maximum

4.1.2 Topcoat(s): One coat
15-40 micrometers, minimum-maximum

4.2 Total System: Two coats
40-105 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-11B

1 Type of Coating

Ultra High Temperature External Coating System for Atmospheric Service Between 400°C and 540°C.

2 General Data

2.1	Typical Use:	Steel in atmospheric service at elevated temperatures.
2.2	Service Condition Limitations	
	Service Temperature:	400°C-540°C
2.3	Purchase Specification:	09-SAMSS-103
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	N/A
2.4.2	Topcoat:	N/A
2.4.3	Self Priming:	1000196502 (09-687-330)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 3 (SP5)
3.1.2	Touch-up:	Sa 3 (SP5)
3.2	Profile:	25 micrometers, maximum
	Abrasive:	1000161068 (08-220-865) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Primer:	One coat 15-40 micrometers, minimum-maximum
4.2	Topcoat:	One coat 15-40 micrometers, minimum-maximum

4.3	Total System:	Two coats 30-80 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-12

1 Type of Coating

Non-skid Epoxy Coating System for Floors and Decks.

2 General Data

2.1	Typical Use:	Light duty Non-skid surface on interior and exterior floors and walkways.
2.2	Service Condition Limitations	
	Maximum Service Temperature:	150°C
2.3	Purchase Specifications	
2.3.1	Primer:	09-SAMSS-069
2.3.2	Topcoats:	09-SAMSS-069
2.3.3	Aggregate:	Nonskid aggregate shall be provided by the coating material manufacturer subject to approval by Saudi Aramco.
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	1000194626 (09-612-362), 1000195348 (09-612 580) or 1000195361 (09-612-590) depending on generic type and can size.
	Thinner:	1000198455 (09-738-280) for epoxy primer, and 1000198449 (09-738-240) for zinc rich primer
2.4.2	Topcoat:	1000194629 (09-612-364),1000194797 (09-612- 369) or 1000194960 (09-612-375) depending on color.
	Thinner:	09-738-260

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10)

3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2.
3.2	Profile:	40-65 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat	
4.1.1	Primer:	One or more coats 50-100 micrometers, minimum-maximum
4.1.2	Topcoats:	Two or more coats 150 micrometers, maximum per coat Non-skid aggregate shall be broadcast into the next to last topcoat while it is still wet. A final topcoat shall be applied over the aggregate sealing it in.
4.2	Total System:	Minimum three coats 275-400 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-17A

1 Type of Coating

Inorganic Zinc Primer (Solvent Based).

2 General Data

2.1 Typical Uses:

a) Under thermal insulation in certain cyclic cryogenic and high temperature services.

b) A one-coat atmospheric coating system, with written RSA approval.

2.2 Coating Application Limitations: Relative humidity must exceed 50% during coating application and curing.

2.3 Service Condition Limitations:

Maximum Service Temperature: 400°C

2.4 Purchase Specification: 09-SAMSS-071

2.5 SAP Material Numbers (SAMS Stock Numbers)

2.5.1 Coating: 1000194146 (09-611-958)

2.5.2 Thinner: 1000198445 (09-738-220)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m²

3.2 Profile: 40-65 micrometers, minimum-maximum

Abrasive: 1000161068 (08-220-865) or 1000160374 (08-202-900).

4 Dry Film Thickness Requirements

Total System:	One coat 65-100 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-17B

1 Type of Coating

Inorganic Zinc Primer (Water-Based).

2 General Data

2.1 Typical Uses:

a) Under thermal insulation in certain cyclic cryogenic and high temperature services.

b) A one-coat atmospheric coating system, with written RSA approval.

2.2 Coating Application Limitations: Relative humidity must be less than 50% during coating application and curing.

2.3 Service Condition Limitations

Maximum Service Temperature: 400°C

2.4 Purchase Specification: 09-SAMSS-071

2.5 SAP Material Number (SAMS Stock Number): 1000194182 (09-611-969)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m²

3.2 Profile: 40-65 micrometers, minimum-maximum

Abrasive: 1000161068 (08-220-865) or
1000160374 (08-202-900)

4 Dry Film Thickness Requirements

Total System:	One coat 65-100 micrometers, minimum-maximum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-19A

1 Type of Coating

Splash Zone Compound, Hand Applied Grade.

2 General Data

2.1 Typical Use: Temporary maintenance coating on boat landings and non-critical steel surfaces in splash zone or immersion service. Patch repairs to APCS-19A and APCS-19B.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 80°C

2.2.2 Not suitable for use in contact with potable water.

2.3 Purchase Specification: 09-SAMSS-070

2.4 SAP Material Number (SAMS Stock Number): 1000194524 (09-612-345)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m^2

3.2 Profile: 75 micrometers, minimum

Abrasive: 1000161063 (08-220-850), 1000161200 (08-220-890) or 1000160377 (08-202-910).

4 Dry Film Thickness Requirements

Total System: One coat
2500 micrometers, minimum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-19B

1 Type of Coating

Splash Zone Compound, Spray Applied Grade.

2 General Data

2.1 Typical Use: Certain steel surfaces in splash zone areas of marine structures such as offshore platforms, jetties, and steel pilings. Also as a pipe coating at above/below ground transitions and road crossings.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 80°C

2.2.2 Not suitable for use in contact with potable water.

2.3 Purchase Specification: 09-SAMSS-070

2.4 SAP Material Number (SAMS Stock Number): 1000194520 (09-612-339)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2-1/2 (SP10)

3.1.2 Touch-up: Sa 2-1/2 (SP10)
St 3 (SP3) for areas less than 0.1 m²

3.2 Profile: 75 micrometers (3 mils), minimum

Abrasive: 1000161063 (08-220-850), 1000161200 (08-220-890) or 1000160377 (08-202-910)

4 Dry Film Thickness Requirements

Total System: One coat
2500 micrometers, minimum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-20A

1 Type of Coating

Fiberglass Reinforced Coatings, Hand Lay-Up.

2 General Data

2.1	Typical Use:	Repair of badly corroded steel tank interiors. Applied at increased thicknesses if strengthening is required.
2.2	Service Condition Limitations	
	Maximum Service Temperature:	Varies with resin used.
2.3	Purchase Specifications	
2.3.1	Primer:	None
2.3.2	Resin:	None
2.3.3	Fiberglass Mat:	None
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	None
2.4.2	Resin:	None
2.4.3	Fiberglass Mat:	None

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10)
		All sharp dimensional changes, such as fillets shall be filled with the coating manufacturers recommended patching compound to obtain a smooth contour. The minimum throat dimension of shell-to-bottom fillets in storage tanks shall be 25 mm.

3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2
3.2	Profile:	As recommended by the Coating Manufacturer.

4 Other Requirements

4.1 Entrapped air, entrapped sand or other foreign matter, wrinkles, sags and dry spots in the coating shall be removed and the affected area repaired.

4.2 Use 2 layers of glass cloth with a 3:1 ratio of resin: reinforcement by weight.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-20B

1 Type of Coating

Glass Flake or Chopped Fiberglass Reinforced Coatings (Spray Applied) for Storage Tanks Interior Application.

2 General Data

2.1	Typical Use:	Repair of badly corroded steel tank interiors where spray application is preferred.
2.2	Service Condition Limitations	
	Maximum Service Temperature:	Varies with product used
2.3	Purchase Specifications	
2.3.1	Primer:	None
2.3.2	Epoxy Resin:	None
2.3.3	Chopped Fiberglass:	None
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	None
2.4.2	Epoxy Resin:	None
2.4.3	Chopped Fiberglass:	None

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10). All sharp dimensional changes such as fillets shall be filled with the coating manufacturers recommended patching compound to obtain a smooth contour. The minimum throat dimensions of shell to bottom fillets in storage tanks shall be 25 mm.
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2

3.2	Profile:	As recommended by the Coating Manufacturer.

4 Other Requirements (refer to APCS-2F and 2G)

Entrapped air, entrapped sand, or other foreign matter, wrinkles, sags, and dry spots in the coating shall be removed and the affected areas repaired.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS–22A

1 Type of Coating

Epoxy Coating for Application onto Damp Steel Surfaces; Two-Coat System.

2 General Data

2.1	Typical Use:	Offshore Steel Structures in above-water areas. Can be applied in conditions of high humidity to a slightly damp substrate.
2.2	Service Condition Limitations	
2.2.1	Maximum Service Temperature:	150°C
2.2.2	Not normally suitable for immersion service.	
2.3	Purchase Specifications:	09-SAMSS-087
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Primer:	1000194560 (09-612-352) or 1000195239 (09-612-459) depending on can size
2.4.2	Topcoat:	1000194565 (09-612-357), 1000194568 (09-612-358), 1000194590 (09-612-359), 1000195273 (09-612-462), 1000195277 (09-612-465) or 1000195314 (09-612-467) depending on color and can size
2.4.3	Thinner:	1000198471 (09-738-300)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2
3.2	Profile:	40-75 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1	Each Coat:	Two or more coats 200 micrometers, maximum per coat.
4.2	Total System:	Minimum two coats 300-400 micrometers, minimum-maximum.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS–22B

1 Type of Coating

Epoxy Coating for Application onto Damp Steel Surfaces; One-Coat System.

2 General Data

2.1	Typical Use:	Offshore Steel Structures in above-water areas. It can be applied on slightly damp substrate and in high humidity conditions.
2.2	Service Condition Limitations	
2.2.1	Maximum Service Temperature: 150°C	
2.2.2	Not normally suitable for immersion service.	
2.3	Purchase Specifications:	09-SAMSS-087 (modified)
2.4	SAP Material Numbers (SAMS Stock Numbers)	
2.4.1	Coating:	1000647350 (09-000-461), 1000647351 (09-000-462), 1000647352 (09-000-463), 1000647353 (09-000-464), 1000669337 (09-000-489), 1000669338 (09-000-490), 1000669339 (09-000-491) or 1000669590 (09-000-492) depending on color
2.4.2	Thinner:	1000647354 (09-000-465)

3 Surface Preparation Requirements

3.1	Minimum Cleanliness Level	
3.1.1	Initial:	Sa 2-1/2 (SP10)
3.1.2	Touch-up:	Sa 2-1/2 (SP10) St 3 (SP3) for areas less than 0.1 m^2
3.2	Profile:	40-75 micrometers, minimum-maximum
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

Total System	One coat 350-500 micrometers for atmospheric service 400-575 micrometers for splash zone service

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-23

1 Type of Coating

High Temperature Mastic Coating for Buried or Immersion Service (Self-Priming).

2 General Data

2.1 Typical Use: Buried steel pipe, tanks and structures.

2.2 Service Condition Limitations.

2.2.1 Maximum Service Temperature: 95°C.

2.2.2 Not suitable for exposure to sunlight or hydrocarbons.

2.3 Purchase Specification: None

2.4 SAP Material Numbers (SAMS Stock Numbers): 1000194097 (09-611-754) or 1000194111 (09-611-757) depending on can size

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 Initial: Sa 2 (SP10)

3.1.2 Touch-up: Sa 2 (SP10)
St 3 (SP3) for areas less than 0.1 m^2

3.2 Profile: 65 micrometers, minimum

4 Dry Film Thickness Requirements

4.1 Each Coat: See Saudi Aramco data sheets (SAES-H-101V) for dry film thickness per coat and number of coats.

4.2 Total System: 500 micrometers, minimum

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-26

1 Type of Coating

Mastic Epoxy Coating System (Self-Priming).

2 General Data

2.1 Typical Use:

a) One coat for coating maintenance works as alternative to APCS-4 and APCS-6.

b) A coating for galvanized steel and aluminum for appearance, safety color coding or increased chemical resistance.

c) A maintenance coating over existing sound coatings.

d) For new steel structures use two coats as minimum to build nominal dry film thickness of 200 -300 microns.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 120°C

2.2.2 Not suitable for buried service

2.3 Purchase Specification: 09-SAMSS-101

2.4 SAP Material Numbers (SAMS Stock Numbers)

2.4.1 Coating: 1000194381 (09-612-330), 1000194386 (09-612-331), 1000194401 (09-612-332), 1000194407 (09-612-333), 1000194420 (09-612-334), 1000194427 (09-612-335) or 1000194471 (09-612-336) depending on color

2.4.2 Thinner: 1000198487 (09-738-420)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1 New Construction: Sa 3 (SP5)

Touch-Up: Sa 3 (SP5)
St 2.5 (SP10) for areas less than 0.1 m²

3.1.2 Maintenance Coating Steel Surfaces:

Exposed Steel: Sa 2 (SP6) for areas greater than 0.1 m²
St 2 (SP2) for areas less than 0.1 m²

Sound Coating: Pressure water wash

3.1.3 Galvanized Steel and Aluminum: Sweep blast to lightly roughen the surface. On new galvanizing, solvent clean prior to sweep blasting.

3.2 Profile: New Coating 40-75 micrometers, min. - max.
Maintenance Coating N/A

Abrasive: 1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 For Maintenance

4.1.1 Each Coat: One or more coats
125-200 micrometers, minimum-maximum

4.1.2 Total System: Minimum one coat
125-200 micrometers minimum-maximum
(above the thickness of any existing coating).

4.2 For New Construction

4.2.1 Each Coat: Two or more coats

200 – 300 microns, minimum-maximum

4.2.2 Total System: Two coats 200 – 300 microns

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APCS-26T

1 Type of Coating

Mastic Epoxy with Top-Coat Polyurethane Coating System.

2 General Data

Mastic Epoxy with Top-coat Polyurethane Coating System for use outdoors when gloss and color retention, and abrasion resistance are required.

2.1 Typical Use:

a) A single coat with Polyurethane top-coat as alternative to APCS-4 and APCS-6.

b) Suitable for galvanized steel and aluminum for appearance retention or to increase chemical resistance.

c) Maintenance coating for use over existing sound coatings.

2.2 Service Condition Limitations

2.2.1 Maximum Service Temperature: 80°C

2.2.2 Not suitable for buried service

2.3 Purchase Specifications: 09-SAMSS-101

2.4 SAP Material Numbers (SAMS Stock Numbers):

2.4.1	Primer:	1000194381 (09-612-330), 1000194386 (09-612-331), 1000194401 (09-612-332), 1000194407 (09-612-333), 1000194420 (09-612-334), 1000194427 (09-612-335) or 1000194471 (09-612-336) depending on color
	Thinner:	1000198487 (09-738-420)
2.4.2	Topcoat:	1000194672 (09-612-365), 1000194675 (09-612-366), 1000194793 (09-612-367), 1000194795 (09-612-368) or 1000194851 (09-612-371) depending on color
	Thinner:	1000198479 (09-738-345)

3 Surface Preparation Requirements

3.1 Minimum Cleanliness Level

3.1.1	New Bare Steel:	Sa 2 (SP6)
	Touch-Up:	Sa 2 (SP6) St 2 (SP2) for areas less than 0.1 m^2
3.1.2	Maintenance Coating	
	Exposed Steel:	Sa 2 (SP6) for areas greater than 0.1 m^2 St 2 (SP2) for areas less than 0.1 m^2
	Sound Coating:	Pressure water wash to remove lose piants and scales.

3.1.3 Galvanized Steel and Aluminum: Sweep blast to lightly roughen the surface. On new galvanizing, solvent clean prior to sweep blasting.

3.2	Profile:	New Coating 40-65 micrometers, min. – max. Maintenance Coating N/A
	Abrasive:	1000161068 (08-220-865), 1000161203 (08-220-895) or 1000160374 (08-202-900)

4 Dry Film Thickness Requirements

4.1 For Maintenance

Each Coat

4.1.1	Primer:	One or more coats 125-200 micrometers, minimum-maximum
4.1.2	Topcoat:	One coat 25-65 micrometers
4.1.3.	Total Film Thickness:	Two coats, 150-260 micrometers, minimum-maximum above the thickness of any existing coating.

4.2 For New Construction

4.2.1	Primer:	Two or more coats 200 – 300 microns, minimum-maximum

4.2.2	Topcoat	One coat 40 – 60 microns, minimum-maximum
4.2.3	Total Thickness:	240 – 360 microns

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).Coating Application.

APCS-27

1 Type of Coating

Solvent Free Two-component Ultra Hybrid Epoxy Coating System for Immersion Serivce at High Temperautre up to 150ºC.

2 General Data

2.1	Typical use:	Immersion service for GOSP vessels handling hydrocarbon solutions at temperature up to 150°C. Suitable for immersion in DGA (Di-Glycol Amine) columns, Sulphur recovery units, sour gas treating units
2.2.	Service limitation:	Not suitable for potable water serivces.
2.3	Purchase Specification:	09-SAMSS-067, in addition to the following minimum mandatory requriements; CP Disbonding max. 20 mm as ASTM G42 @ 90ºC, Adhesion strength (> 290 kg/cm2), Elongation at break (>1.8%), Barcol hardness (> 45) at full cure.
2.4	SAMS Stock Numbers:	N/A (Consult with the coating RSA)

3 Surface Preparation

3.1	Minimum Cleanliness Level		
	3.1.1	Initial :	Sa 3 (SP5)
	3.1.2	Touch-up:	Sa 3 (SP5) Refer to repair procedure in SAES-H-100 for areas less than0.1 m²
3.2	Profile:		65 - 100 microns, minimum-maximum
	Abrasive:		1000161063 (08-220-850), 1000161200 (08-220-890) or 1000160377 (08-202-910)

4 Application and Dry Film Thickness Requirements

4.1	Application:	Single coat application by airless equipment (45:1) to build up the required thickness
	Stripe Coating:	Weld lines, appurtenances, welded barckets, nozzles, and corners should be stripe coated prior to spray apply the coating. Use Hand brushing grade to wet out surfaces.
4.2	Total Thickness:	One or Two coats to build up 600 - 1000 microns, minimum-maximum.

4.3 The total dry film thickness shall be applied in a single coat or two coats (wet on wet). Use contrasting colors if the second coat is to be applied within the allowed re-coating intervals.

Thicknesses higher than the recommended above shall be consulted with RSA and the coating manufacturer.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).

APSC-28

1 Type of Coating

Specialty Coating Systems for Renovation and Repair of Pumps and Valves Interiors.

2 General Data

2.1 Typical Use: Suitable for pump casing and valve body repair and protection in immersion seawater and hydrocarbon services where good corrosion, abrasion, and chemical resistnce are required.

2.2 Service Condition Limitations:

- Poor resistance to polar solvents and alkaline at temperature above 60^{o}C.
- For services handling Soduim Hydroxide and Soduim Hypochlorite consult the RSA for appropriate product and application.

2.3 Purchase Specifications: 09-SAMSS-067 in addition to the following minimum mandatory requriements; Tensile Strength (62 MPa - 85 MPa), Elongation (1.2% - 2.3%), Dielectric Strength (>20 Kv/mm), Flexural Stregth (113 MPa – 139MPa), Barcol Hardness (>38) at full cure.

2.4 SAMS Stock Numbers: N/A

Due to the multipe service conditions and the variaty of the products that can be used for the repair, consult the RSA for selecting the appropriate product and application as given in SAES-H-101V.

3 Surface Preparation Requirements

3.1 Chloride Salts Decontamination: Surface shall be free from soluble salts before coating application. Refer to SAES-H-100 for the acceptbale salt contaminants and method of decontamination.

3.2 Minimum Cleanliness Level

3.2.1 New Bare Steel: Sa 3 (SP5)

Touch-Up: Sa 2.5 (SP10)
St 2 (SP2) for areas less than 0.1 m²

3.2.2 Maintenance Coating:

Exposed Steel:	Sa 2.5 (SP10) for areas greater than 0.1 m²

3.3 Profile: 60 - 100 microns, min. – max.

Abrasive: 1000161063 (08-220-850), 1000161200 (08-220-890) or 1000160377 (08-202-910)

4 Dry Film Thickness Requirements

4.1 For use as maintenance coating

Priming:	All clean blasted surfaces shall be primed with a primer grade of the product used. The primer shall wet out all blasted surfaces immediately after blasting.
Filling:	Pits and worn out sections shall be built up using the filler grade of the product used or any approved compatible filler.
UnderCoat:	One or more coats of the product used 500-1000 microns, minimum-maximum.
Topcoat:	One coat 250 – 500 microns, minimum-maximum.

4.2 Total Thickness:

There is no maximum limit to the total film thickness of using these products. However, each application shall be determined by the service condition and amout of building up of the worn out sections.

4.3 For use as protection on new Pumps and Valves

Use undercoat and top coat as per 4.1 with a total film thickness between 750 – 1500 microns.

Commentary Note:

Mandatory technical properties and storage, mixing, and application requirements shall be as given in the Saudi Aramco Data Sheets (SAES-H-101V).