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1 Subject of specification

This specification and other documents referenced herein establish the minimum requirements for the design, manufacture, testing, supply, commissioning, performance testing of the painting for exterior surfaces of equipment, piping and structural steel.

2 Scope of validity

This specification applies to the preparation of tender documents, inquiries and contracts concerning new investments and modernization projects planned by Grupa LOTOS S.A.

It shall also be a basis for preparing both detailed specifications and inquiries for individual or package unit supplies.

2.1 Deviations

Any deviation from this specification and the relevant specifications, standards and related documents including proposals, which the bidder claims to be economically and / or technically superior solutions must be submitted in writing for review and approval by Grupa LOTOS S.A. Non-approved exceptions are not acceptable by Grupa LOTOS S.A.

The supplier must report in writing any ambiguity in this or any other specifications of Grupa LOTOS S.A. or non-compliance with the referred documents / standards and obtain a written explanation from Grupa LOTOS S.A.

2.2 Order of Precedence

In case of conflicts existing between this specification and other documents, the following order of precedence shall govern:

- The current Polish legislation
- Terms of purchase order / contract and other requirements agreed in writing Grupa LOTOS S.A.
- Data Sheets approved by Grupa LOTOS S.A.
- This specification
- Other Specifications
- Drawings and other documents
- Standards

3 General

Information concerning required anticorrosion protection is shown in technical documentation:

- in the specification of pipelines – by the appropriate symbol of the anti-rust paint system
- in the title block of the pipeline isometric drawing – by the appropriate symbol, symbol of the anti-rust paint system
- equipment drawings or/and data sheets

3.1 Environment corrosive aggressiveness assessment

The environment in the Refinery Grupa LOTOS S.A. in Gdansk area is characterized by a high content of acid-forming pollutants in air, such as SO_2, NO_x, CO_x.

We define the type of atmosphere as maritime and seaside – high air humidity, frequent fog and salt aerosol in air.

The aggressiveness of the environment has been classified in accordance with the standard PN-EN ISO 12944-2:

- atmospheric environment C5- I/C5-M very strong (industrial) – industrial areas of high air humidity and aggressive sea atmosphere
- immersion medium Im3 (soil)

In Grupa LOTOS S.A. refinery there is an exposure to corrosive factors, which may include the following:

- chemical reaction (action of acids, aggressive solvents, aggressive gases, dust)
- mechanical exposure (abrasion, impact)
- medium and high temperature exposure (150°C- 500°C)

4 Painting schedule

The following types of paint systems specified in table 2 have been accepted for anticorrosion protection of the surfaces of steel structures, equipment, vessels and pipelines specified in table 1.

4.1 Table No. 1. Painting schedule

	Name of equipment with protected surfaces	Temperature range °C	Symbol of paint system from table 2
Protection against corrosion of non-insulated surfaces			
1	Steel structures, bridges, pedestals, brackets of equipment	up to 60	A
2	Pipes, fastening pipe shapes, flanges	up to 90	B
		90-200	C
		200-500	D
3	Pipes in excavations	up to 60	H
4	External surfaces of vessels, tanks, heat exchangers, columns	up to 90	B
		90-200	C
		200-500	D
5	External surfaces of heaters, stacks, flues	90-200	C
6	Platforms, ladders, railing	up to 60	A
7	Outer surfaces of storage tanks	up to 60	B
8	External surfaces of cable ducts	up to 60	A
9	Steel surfaces, galvanized or of other nonferrous metals	up to 60	E
Anticorrosion protection of steel surfaces coated with fire-retardant paint and concrete			
10	All equipment protected with fire-retardant layers	up to 60	I
Protection of outer surfaces of fire-retardant swelling coatings			
11	All equipment protected with fire-retardant coatings of swelling paint	up to 60	J
Protection of outer surfaces of fire-retardant coatings of fire-retardant concrete			
12	All equipment protected with fire-retardant concrete	According to the specification of the supplier of the materials for fire-retardant concrete	
Anticorrosion protection of insulated steel surfaces			
13	Vessels, tanks, heat exchangers, pipelines, fastening pipe shapes and flanges	up to 400	F
		200-500	G
Prime coat repair			
14	Ground coat repair according to the painting material supplier's specification; preferred shall be repair materials suitable for use for not-so-well-prepared surfaces, i.e. materials that do not require blast cleaning		
Interior surfaces of vessels			
15	Coats for interior surfaces of vessels shall be selected individually by LOTOS Group depending on the type of medium		

4.2 Table No. 1. Paint systems

	System symbol	Name of products forming the anticorrosion system	Required degree of cleanliness of the substrate PN ISO 8501-1	Application method	Number of layers	Thicness of one layer of dry coat µm	Total thickness of dry coat µm	Thinner
1	A	1. Epoxy priming paint with a barrier pigment Hardener for epoxy paint 2. Thick-coat epoxy primer Hardener for epoxy paint 3. Two-component polyurethane enamel e.g. EMAPUR Hardener for polyurethane enamel	Sa2.5	airless spraying	1 1 2	~~40~~80 ~~80~~140 ~~40~~50	~~220~~320	for epoxy products for epoxy products for polyurethane products
2	B	1. Epoxy priming paint with an active pigment (pigmented with zinc or zinc phosphate) 2. Epoxy priming paint with a barrier pigment Hardener for epoxy paint 3. Two-component polyurethane enamel Hardener for polyurethane enamel	Sa2.5	airless spraying	1 1 2	100 100 40	280	for epoxy product for epoxy product for polyurethane products
3	C	1. Ethyl silicate paint, one-component, pigmented with zinc dust, or silicate-zinc two-component paint 2. Topcoat paint based on silicone or mixed silicone vehicle, heat resistant up to 200°C	Sa2.5	airless spraying	1 2	70 20	110	KBF 8111-724-000 or painter's naphtha (mineral spirits)

Note: change introduced for unification with polish version of this specification. T. Wróbel, 2016-06-21

	System symbol	Name of products forming the anticorrosion system	Required degree of cleanliness of the substrate PN ISO 8501-1	Application method	Number of layers	Thicness of one layer of dry coat µm	Total thickness of dry coat µm	Thinner
4	D	1. Ethyl silicate paint, one-component, pigmented with zinc dust, or silicate-zinc two-component paint 2. Topcoat paint based on silicone or mixed silicone vehicle, heat resistant up to 500°	Sa2.5	airless spraying	1 2	70 15	100	KBF 8157-779-000
5	E	1. Epoxy paint for galvanised or light-metal substrates 2. Two-component polyurethane enamel Hardener for polyurethane enamel	Dry base, degreased, free from corrosion products	airless spraying	2 2	40 40	160	for epoxy products for polyurethane products
6	F	Ethyl silicate paint, one-component, pigmented with zinc dust, or silicate-zinc two-component paint	Sa2.5	airless spraying	1	70	70	KBF
7	G	Priming paint based on silicone or mixed silicone vehicle do heat resistant up to 500ºC	Sa2.5	airless spraying	1	20 do 25	25	
8	H	1. Epoxy priming paint with a barrier pigment Hardener for epoxy paint 2. Thick-coat epoxy primer Hardener for epoxy paint	Sa2.5	airless spraying	1 3	40 150	49	for epoxy products for epoxy products

	System symbol	Name of products forming the anticorrosion system	Required degree of cleanliness of the substrate PN ISO 8501-1	Application method	Number of layers	Thicness of one layer of dry coat µm	Total thickness of dry coat µm	Thinner
Paint systems for painting substrates protected with fire-protecting coats								
9	I	Thick-coat epoxy primer compatible with the text of ITB's or other certification body's approval for fire-protecting paints Hardener for epoxy paint	Sa2.5	airless spraying	1	60	60	for epoxy products
10	J	Two-component polyurethane enamel compatible with the text of ITB's or other certification body's approval for fire-protecting paints Hardener for polyurethane enamel		airless spraying	2	50	100	for epoxy products

Note:

1. With the exception of I and J all system components must come from the same supplier / manufacturer
2. The following should be taken into account when selecting the vendor:
   - references for the refinery and petrochemical industry
   - product availability on the Polish market
3. The trade names of the products for which the tender has been made shall be revealed in the tender for approval by LOTOS Group.

5 Organization of anticorrosion work

Anticorrosion work can be divided into two steps.

5.1 Workshop work

This work is done at the steel elements manufacturer's workshop and it includes:

- preparation of the base for painting
- application of the priming coat
- the application of the intermediate coat, unless the time of application of successive coats is limited
- if a structure is to be protected with fire-protecting insulation, then only the prime coat shall be applied in workshop conditions

Note:
If full hardening does not take place in ambient temperature, soaking should be provided to harden the product.

5.2 Post-erection work

This work is done on site after the erection of steel structures and it covers the following:

- preparation of places damaged during storage, transport and erection (mechanical cleaning, degreasing) for painting
- repair of painting coats
- top coating
- performance of topcoats on the surface of fire-retardant insulation

6 Surface preparation

- Recommendations set out in the standard PN- EN ISO 12944-4 shall be complied with.
- Before cleaning of new vessels, equipment, pipelines, steel structures begins, all welds and other irregularities of surface should be ground . Remove metal spattering, rust, scale and round sharp edges.
- Surfaces intended as base under protective paint coating should be blast-cleaned of degree of cleanliness according to PN-ISO 8501-1. Before commencing cleaning, protect flange faces and threads against damage and blind openings..
- Surface roughness must comply with the primer manufacturer's requirements.
- Dust the surfaces with an industrial vacuum cleaner to obtain the required dusting efficiency class in accordance with PN-EN ISO 8503-1 and according to the requirements for individual primers.

- Prior to painting, galvanized surfaces should be:
- cleaned to removed mechanical impurities
- degreased with solvent or hot water with detergent
- cleaned with clean water
- dried
- The first priming coat should be applied at a predefined time or at stabilised conditions in compliance with the painting product manufacturer's / supplier's recommendations.

7 Painting application

The standard PN-EN ISO 12944-7 shall be complied with.

The quality and durability of a paint coat depends to a great extent upon the conditions in which work has proceeded.

The basic requirement is performance of painting work in conditions assuring a proper formation of individual layers of the protective system. They include:

- the temperature of air and the painted surface
- air humidity
- air pollution in the protected object environment

Special conditions of applying painting coats shall be developed in accordance with the standard PN-EN ISO 12944-5.

8 Colour coding identification

	Name of the painted surface	Color	Color acc. to RAL
The maximum temperature of the painted surface 80ºC			
1	Steel structures	Blue	5017
2	Intermediate railings, ladders, ladder guards	Yellow	1023
3	Upper railing	Orange	2009
4	Vessels	Grey	7040
5	Vessels containing easily evaporating media	White	of sunshine reflecting power (proved by a test certificate) in excess of 70%
6	Pumps and compressors	Acc. to manufacturer's specifications	
7	Electric motors	Light grey	7035
8	Fire protection equipment	Red	3000
9	Handwheels	Orange	2009
The maximum temperature of the painted surface 80 ºC			

10	All equipment	Bright aluminum	9006

9 Relevant documents

Any “Technical Specification” issued by Grupa LOTOS S.A. listed in Contract Files.

10 Norms and standards

Norms and standards listed below form part of this specification. Each publication shall be the latest revision and addendum in effect at the Contract award, unless otherwise specified

- PN-ISO 8501-1
  Przygotowanie podłoży stalowych przed nakładaniem farb i podobnych produktów. Wzrokowa ocena czystości powierzchni. Stopnie skorodowania i stopnie przygotowania niezabezpieczonych podłoży stalowych oraz podłoży stalowych po całkowitym usunięciu wcześniej nałożonych powłok
- PN-EN ISO 8503-1
  Przygotowanie podłoży stalowych przed nakładaniem farb i podobnych produktów. Charakterystyki chropowatości powierzchni podłoży stalowych po obróbce strumieniowo-ściernej. Wyszczególnienie i definicje wzorców ISO profilu powierzchni do oceny powierzchni po obróbce strumieniowo-ściernej
- PN-EN ISO 12944–2
  Farby i lakiery. Ochrona przed korozją konstrukcji stalowych za pomocą ochronnych systemów malarskich. Część 2: Klasyfikacja środowisk
- PN-EN ISO 12944–4
  Farby i lakiery. Ochrona przed korozją konstrukcji stalowych za pomocą ochronnych systemów malarskich. Część 4: Rodzaje powierzchni i sposoby przygotowania powierzchni
- PN-EN ISO 12944–5
  Farby i lakiery. Ochrona przed korozją konstrukcji stalowych za pomocą ochronnych systemów malarskich. Część 5: Ochronne systemy malarskie
- PN-EN ISO 12944–7
  Farby i lakiery. Ochrona przed korozją konstrukcji stalowych za pomocą ochronnych systemów malarskich. Część 7: Wykonywanie i nadzór prac malarskich
- PN-EN ISO 8502-2÷9
  Przygotowanie podłoży stalowych przed nakładaniem farb i podobnych produktów. Badania służące do oceny czystości powierzchni
- PN-EN ISO 4628-1÷6
  Farby i lakiery. Ocena zniszczenia powłok. Określenie ilości uszkodzeń oraz intensywności jednolitych zmian w wyglądzie.
- PN-EN ISO 2808
  Farby i lakiery. Ocena grubości powłoki.
- PN-EN ISO 2409
  Farby i lakiery. Badania metodą siatki nacięć.
- PN-EN ISO 4624
  Farby i lakiery. Próba odrywaniado oceny przyczepności.

11 Record of changes

No.	Date	Description	Introduced by
0		This specification substitutes in whole the previous LOTOS Group's standard No. PR 07 260 identically titled.	B. Kowalewski
1	30-11-2013 (rev. 1)	Review, update, standardize and changes to the Standard within scope of order No. OK/990/2012	Editorial board coordinated by T.Wróbel
-	31-08-2015	Page layout corrections, no contents changes.	T. Wróbel