Contents

1 Subject of specification 2
2 Range of validity 2
2.1 Deviations 2
2.2 Exclusions 2
3 Hierarchy of documents 2
4 Description 3
4.1 General requirements 3
4.2 Technical documentation 3
4.3 Loads acting on reinforced concrete structures 4
4.4 Combinations of loads 4
4.5 Materials 4
4.6 Basic criteria for designing and execution of reinforced concrete structures 4
5 Related documents 5
6 Standards and regulations 5
7 Record of changes 7

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1 Subject of specification

This specification used in conjunction with other technical specifications of LOTOS Group S.A., establishes minimal requirements regarding designing and execution of reinforced concrete structures.

2 Range of validity

This specification shall be used when preparing both quotations and Purchase Orders concerning planned LOTOS Group S.A. new investments and modernizations.

It shall also be a base for preparation of other detailed specifications and quotations relevant for package units or other equipment deliveries.

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 SA. 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 SA or non-compliance with the referred documents / standards and obtain a written explanation from Grupa LOTOS SA.

2.2 Exclusions

This specification does not include transportation structures (bridges, viaducts), as well as chimney stacks, which have been covered in separate study.

3 Hierarchy of documents

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 with GLSA
- Data Sheets approved by GLSA
- This specification
- Other Specifications
- Drawings and other documents
- Standards

4 Description

4.1 General requirements

Technical documentation of reinforced concrete structures shall be prepared according to valid regulations and standards (which are listed in further part of this specification).

Execution of reinforced concrete structures can be led after building permission (if such is required) is granted, basing on technical documentation and construction organization project.

Completed stages of works and elements becoming buried in course of further works (excavations, concrete reinforcement, piling) require technical acceptance concluded with report of acceptance.

Introducing of changes in course of construction requires prior approval of project author, Orderer, as well as including them in as-built documentation.

4.2 Technical documentation

Technical documentation should be numbered on each stage according to procedure of documentation numbering valid in LOTOS Group S.A.

Scope of documentation elaboration:

- building project (in order to obtain building permit)
- technical projects (execution) of objects
- as-built documentation.

Required contents of building project:

- in accordance with Minister of Transport, Construction and Marine Economy order of April 27th 2012 (Rozporządzenie Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 27kwietnia 2012r (Dz. U. poz. 462) w sprawie szczegółowego zakresu i formy projektu budowlanego z późniejszymi zmianami).
- additional information is given in Specification No. 5100.

Required contents of technical projects (execution):

- according to Specification No. 5100

As-built documentation

As-built documentation should contain the full set of situation, formwork and concrete reinforcement drawings, with marked changes that have been introduced during realization of subject structures.

4.3 Loads acting on reinforced concrete structures

- according to Specification No. 5100

4.4 Combinations of loads

- according to Specification No. 5100

4.5 Materials

Classes of construction materials (concrete, steel, bolts) which are recommended for building structures should be adjusted to occurring loads, as well as conditions of work of the structure and its elements in accordance with applicable standards.

4.6 Basic criteria for designing and execution of reinforced concrete structures

General requirements:

- Reinforced concrete structures should be designed and executed in a manner ensuring satisfying the ultimate and serviceability limit states.
- In analyses of serviceability limit states one should demonstrate, that allowable values of deflection and cracking are not exceeded.
- Adequate protective insulation should be designed for structures exposed to direct influence of chemical agents.
- Reinforced concrete foundations for equipment and steel structures should be settled on depth of at least 1,00 m below ground level.
- For deep settled foundations, and those settled below ground water level, it is necessary to prepare method of excavations securing and draining.
- Foundations should not be located directly over underground territorial development system. Protections (protective tubes, etc.) should be used when necessary.
- Equipment or structures that are based on reinforced concrete foundations must be anchored according to orders given in PN-B-03215 standard.
- Minimum distances from anchor bolt axis to foundation edge are:
  - for foundations of structures and pumps: 150 mm
  - for foundations of columns: 300 mm

Requirements regarding execution of structure

- Concrete must reach its guaranteed strength (class of concrete) assumed in documentation, before construction takes over full load.
- All stages of reinforced concrete structures execution are subjected to inspection of adequately authorized persons.

  This concerns mainly the following activities:
  - preparation of excavations and their acceptance
  - preparation of formwork

- execution and assembly of reinforcement
- supervision of concrete mixt components and dosing (according to recipe)
- transportation of concrete mix, its placing and consolidation
- curing of concrete
- removal of formwork

- All concrete mineral additives and chemical admixtures should have valid approvals of scientific research entity.
- Simultaneous placing of concrete on structure is recommended. Possible technical breaks should be located in places that are foreseen in documentation and according to dispositions comprised in standards.

5 Related documents

Any "Technical Specification" issued by GRUPA LOTOS S.A. listed in Contract Files.

6 Standards and regulations

List of relevant standards valid in course of designing and execution of building structures:

- Standards regarding loading of building:

PN-EN 1991-1-1:2004	Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight and imposed loads
PN-EN 1991-1-3:2005	Eurocode 1: Actions on structures – Part 1-3: General actions – Snow loads
PN-EN 1991-1-4:2008	Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions
PN-EN 1991-1-5:2005	Eurocode 1: Actions on structures – Part 1-5: General actions – Thermal actions
PN-EN 1991-1-7:2008	Eurocode 1: Actions on structures – Part 1-7: General actions – Accidental actions
PN-EN 1991-3:2009	Eurocode 1: Actions on structures – Part 3: Actions induced by cranes and machinery
PN-EN 1991-4:2008	Eurocode 1: Actions on structures – Part 4: Silos and tanks

- Standards regarding designing and execution of structures:

PN-EN 1992-1-1:2008	Eurocode 2: Design of concrete structures – Part 1-1: General – Common rules for building and civil engineering structures
PN-EN 1992-1-2:2008	Eurocode 2: Design of concrete structures – Part 1-2: General – Structural fire design
PN-EN 1992-3:2008	Eurocode 2: Design of concrete structures – Part 3: Liquid retaining and containment structures
PN-B-03215	Joints with foundations
PN-EN 1997-1:2008	Eurocode 7: Geotechnical design – Part 1: General rules

- Standards regarding materials:

PN-EN 206-1	Concrete – Requirements, properties, production and conformity.
PN-ISO 6935-2	Concrete reinforcing steel, smooth bars
PN-ISO 6935-1/Ak:1998-	Concrete reinforcing steel, smooth bars
PN-ISO 6935-2Ap1:1999-	Concrete reinforcing steel, ribbed bars

- Standards regarding protections:

PN-B-01801:1982	Anti-corrosion protections in building industry. Concrete structures – Basic designing principles.

7 Record of changes

No.	Date	Description	Introduced by
0		This specification entirely replaces the former LOTOS Group S.A. standard No. PR 07 511 with the same title.	M. Puzio
1	17-11-2006	Change in item 3.5	M. Puzio
2	27-11-2009	Change item 3.6, 4 –actualization of the nomenclature and legal status. Change item 3.3 - actualization of the snow loads zone	Miłosz Puzio
3	30-11-2013 (rev. 3)	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