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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 in scope of designing and technology of execution for telecommunication installations in buildings.

2 Scope 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

The following systems are not covered by this specification:

- BMS building automatics (Building Management System)
- audiovisual (projection, conference, interpreting, etc.)

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 Definitions and designations

4.1 Definitions

Terminal apparatus – a device converting messages on electric signal, or inversely

Installation train – cables and wires laid side by side, along with fitting elements

Connection socket – terminal element of installation, serving for connection of terminal apparatuses

Installation equipment – housings of distribution frames, trays, conduits, battens, boxes, etc.

Base – element of building, on/in which installation train is laid

Distribution frame – passive equipment, enabling connection of circuits in installation cables with circuits in line cables (external) or station equipment circuits

Station equipment – active telecommunication equipment (supplied from 230V mains, for example)

Outlet – terminal element of installation, reserve.

4.2 Designations

GLSA Grupa Lotos S. A.

BDF - building distribution frame

FDF - floor distribution frame

Note: The above listed designations are valid for new installations, which will be designed based on the standard. So far, there were used the following designations in documentation and in equipment labelling related to existing installations: MDF for building distribution frames (today BDF) and SDF or IDF for floor distribution frames (today FDF).

IK - degrees of protection against external mechanical impacts

IP - ingress protection

One should use designations of GLSA objects according to 6120 standard, given in chapter 5.

5 Description

5.1 General data

Assembly technology being specified applies to following systems:

- telecommunications (telephony, data transmission, dispatcher's)
- public address and emergency
- microphone installation of local sound amplification
- time signalling
- alarm and fire signalling
- access control
- burglar alarm signalling
- CCTV system
- AZART, TV SAT collective reception
- information and calling systems (bells, displays, etc.)
- DC current supply up to 24 V voltage

The specification does not cover:

- external cable lines (covered in Specifications N° 3750 and 3730)
- terminal devices (telephone sets, loudspeakers, sensors, cameras, etc.)
- station equipment (exchanges, power supply units, in-house broadcasting station)

- radiocommunication equipment (DECT, WLAN, PMR)

Requirements for installations within explosion hazard areas are included in Specification N° 3730.

5.2 Designing

The system designing shall be based on construction drawings of existing or designed objects. Names of rooms (specified way of their utilisation) shall be transferred from these drawings in particular. Installation trains as well as destination and types of cables will result from the design. Design and cost-estimate documentation shall in each case be prepared according to regulations listed in p. 6.1.

In order to meet basic requirements, it is necessary to put particular attention in course of designing on limited electromagnetic immunity and flammability of system elements variety.

5.3 System components

5.3.1 Cables and wires

Transmission requirements together with division on classes were defined in Specification N° 3740. Material requirements result from standards given in there, as well as from Enclosure 7.1 to this Specification.

5.3.2 Distribution frames and boards

Building Distribution Frames (BDF) and Floor Distribution Frames (FDF) shall be installed for telecommunication engineering system purposes. For purposes of announcing or signalling system, separate distribution boards with terminal strips shall be installed. IP and IK categories shall be specified in design, according to standards given in p. 6.2.

5.3.3 Sockets

Installations in common design shall be terminated with RJ sockets in vicinity of terminal devices installation places. Sockets and outlets in special installations shall be adapted to environmental conditions.

5.3.4 Joints

Joints on cables shall not be used. Leads can be connected in junction boxes only.

5.3.5 Installation equipment

Method of installation arranging shall be accommodated to conditions in buildings, in order to provide:

- long-term installation reliability
- easy access to sockets, distribution frames and boards
- possibility of defects elimination
- easy backfitting and development

Unified equipment shall be used, with adequate CE certificates. Telecommunication equipment in individual premises shall be similar to those of electric systems – in particular the same IP and IK categories for equipment shall be used.

5.3.6 Insulation of telecommunication trains

Telecommunication installations shall be routed in separate trains, while maintaining proper proximity and crossings distances to other building installations. These distances are specified in

Enclosures. The distances can be decreased provided that protections are employed. Cable passages cannot deteriorate fire resistance of walls and ceilings. Metallic elements of fittings shall be earthed.

5.3.7 Co-ordination of systems

Telecommunication engineering installations listed in p. 4.1 shall be routed in general:

- on common cable ladders
- in common cable trays and cable battens
- in separate cable conduits

Common routes of cables and wires are allowed with exception for following installations:

- public address and emergency system
- fire alarm signalling
- burglar alarm signalling
- AZART and TV SAT collective reception.

The requirements regarding transmission shall however be met in each case.

5.4 Installation materials

5.4.1 Cables and wires

Recommended types of cables and wires are given in Enclosure 7.1.

5.4.2 Terminal strips (blocks)

10-pair separable terminal blocks shall be used, which connect cables by means of insulation breaking and notching of cable core, with 0 – 9 inscriptions. Diameter range of connected cores shall cover 0.35 up to 0.9 mm^2 span at least (solid wires). Diameter range of connected cores shall cover 7 x (0.12 up to 0.32 mm^2) span at least (for stranded wires).

Insulation resistance	> $5x10^4$ MΩ
Resistance to voltage impulses	> 3,6 kV
Resistance to current impulses	> 5 kV
Voltage resistance of insulation	> 2,5 kV
Contact resistance	< 1 mΩ

5.4.3 Building Distribution Frames (BDF)

Distribution frames of 19" standard shall be used for telecommunication installations. Overall dimensions shall enable possibility of passive and active elements' assembly. Adequate power supply, grounding and ventilation shall be assured in particular. Distribution frames shall be equipped with self-clamping terminal blocks and panels with sockets. It is foreseen to use detached distribution frames of modular design in large objects. It is assumed to use distribution frames of single-side, wall design, furnished with 100-pair terminal blocks units, on line and station sides. Line side terminal blocks shall be mounted in 11-module panels. Descriptive overlay shall be provided for each 100-pair terminal block unit. Configuration of distribution frame shall be given, containing: height, capacity of line and station sides, number of risers and levels. Racks of distribution frames have to be equipped with cable guides, cross guides and earthing connection bus bar. Cable and cross guides must be coated with rubber substance for insulation of cables purposes.

5.4.4 Floor distribution frames (FDF)

Surface design [industrial buildings] or recess design [office buildings] is recommended. They shall be furnished with terminal blocks and terminal strips, as well as earthing connection. Wall-mounted and free-standing cabinets of 19" standard can be used, depths approximately 300 up to 1100 mm and heights from 8 up to 42 U, as well as wall-mounted and recess type telephone-boxes. All cabinets have to be key-locked.

5.4.5 Cable trays

Steel trays of 200 and 400 mm standardized widths, along with adequate fittings. Intended for use in installation shafts for large numbers of cables, and in industrial buildings.

5.4.6 Cable ducts

Steel ducts, perforated, of various widths, furnished with covers or without them. Intended for use in production and storage objects. In case of office and service buildings, mainly in spaces over suspended ceilings. Galvanised coatings shall be adapted to environmental conditions accordingly.

Cable trays on pipe racks and other civil structures shall meet requirements described in standard 4400 paragraph 3.5. After GLSA approval other dimensions of cable trays than there given (width below 200 mm, height below 100 mm) can be used.

5.4.7 Wall battens

Intended for use in office rooms – category IP30.

- Mini-channels of 20 x 10, 20 x 17, 35 x 17, 50 x 17, 60 x 25 mm profiles.
- Channels of 60 x 40, 90 x 40, 90 x 60 mm profiles and larger.

Application of separators for different cables in common cable battens is recommended. Especially, power supply cables and telecommunication cables, which are laid in common batten, shall be divided one from each other by means of separators.

5.4.8 Steel conduits

One shall use conduit of RS-P type and 13, 16, 21, 29, 36 mm internal diameters. They shall be used for assembly on base, in places exposed on mechanical damages or intensive sunlight operation.

5.4.9 PVC conduits

PVC installations can have several designs:

- Rigid conduits on holders
- Rigid conduits under plaster work
- Flexible conduits under plaster work
- Flexible conduits of Peschel type

Peschel type conduits shall be used for routing of fibre optic and antenna cables in inter-ceiling spaces, cellars, etc. Diameters of flexible pipes are not standardized in this specification. Rigid PVC conduits, of standardized 18, 22, 28, 37, 47 mm outer diameters. Rigid conduits laid under plaster work shall be used in installation risers, as well as in trains where further installation development is foreseen.

5.4.10 Terminal and distribution boxes

One shall use fittings adapted to conduit types (for example, metal boxes for steel conduits).

5.5 Scope of documentation

1. Technical description, including:
   - description of existing equipment
   - description of newly designed equipment
   - description of operation principles
   - detailed description of system components
   - instructions of operating, installation and maintenance
   - list of related standards and other documents.
2. Specification of materials
3. Specification of cables
4. Drawings
   - description of graphic symbols
   - block diagrams
   - layout drawings
   - wiring diagrams (cabling)
   - power supply diagrams
   - layout drawings for panels
   - assembly examples

5.6 Assembly of the system

5.6.1 Route survey

Installation routes shall be traced in such a way, that number of hindrances (culverts, crossings, etc.) is minimised. Routes shall be parallel to wall edges. Distances of 0.3 m from ceiling and 2.5 m from floor are recommended. Telecommunication systems shall be laid below electric system trains.

5.6.2 Multi-cable equipment

Ladders, trays and battens shall be mounted according to manufacturer instructions. Holders shall be durably fastened to the base, with spacing ensuring mechanical strength of installation train.

5.6.3 Installations in conduits

Handlers are to be installed as described above. Flexible couplings shall be employed, or keeping of conduit bend radiuses that ensure free pulling-in of wires. For numerous bends in installation train [90°], revision boxes shall be mounted.

In some rooms installations can be made as hermetic. Leak-proof tests shall then be completed, confirmed with adequate report.

5.6.4 Terminal boxes

Height of installation is analogous to those of electric system. It is recommended to mount telecommunication boxes on height 0.3 m above floor in office rooms, and 0.8 m above floor in industrial premises. Loudspeakers' and signalling sockets – according to project.

5.6.5 Cables and wires

Filling of trays, ducts or conduits with cables shall conform to design and instruction of manufacturers. Minimum bend radiuses determined by manufacturers shall be kept.

5.6.6 Crossings and proximities

Minimum allowable distances for installation proximities and crossings are given in Enclosures 7.2 and 7.3.

5.6.7 Distribution frames

External cables shall be formed on separable terminal blocks according to Specification 3750 and 3760. Examples of distribution frames have been presented there. Attention shall be paid on overvoltage protection. Distribution frames shall be mounted according to design and instructions of manufacturers.

5.6.8 Marking

Cable numbering scheme according to Specification N° 6120.

5.7 System acceptance

5.7.1 Visual inspection

The commission with participation of work manager and supervision inspector will check correctness of assembly for:

- all building and floor distribution frames
- all culverts (cable passages) on fire zones boundaries
- 20% of installation trains route length.

5.7.2 Conformance to design

Conformity of routes and materials to design shall be checked, with particular attention paid to proper shapes of trays, battens, installation conduits and cables.

5.7.3 Crossings and proximities

Distances of proximities and crossings to other installations shall be checked during visual inspection.

5.7.4 Assessment of tests results

The system submitted for testing shall be considered made accordingly to requirements of this specification, if test executed according to points 4.5.1, 4.5.2 and 4.5.2 gave positive results. The components, which have been negatively assessed during inspection, shall be rectified or replaced, and submitted for acceptance again.

5.7.5 As-built documentation

The following items shall be handed over to Orderer during acceptance:

- Design documentation with marked changes
- Factory documentation of equipment
- Producers' or vendors Declarations of conformity
- Detailed drawings with designations of system components

- Start-up check lists
- Acceptance report

6 Relevant documents

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

7 Regulations and standards

It is in each case understood that quoted standards, regulations, directives and orders are of their latest editions, along with amendments, annexes and supplements in force.

7.1 Building regulations

The Law of 7 July 1994, Building Law

1 Minister of Infrastructure order of 12 April 2002, on technical conditions that buildings and their location should comply with.
2 Minister of transport, construction and maritime economy order of 25 April 2012, on detailed scope and form of building project.

The Law of 16 April 2004, on building products

3 Dz. U 2004 nr 195 poz. 2011 - Minister of Infrastructure order of 11 August 2004 on conformity assessment systems, requirements that notified bodies taking part in conformity assessment should adhere to, and method of building products marking with CE mark.
4 Dz. U 2004 nr 237 poz. 2375 - Minister of Infrastructure order of 14 October 2004, on European technical approvals and Polish bodies authorized for issuing them.
5 M.P. 2004 nr 32 poz 571 - Minister of Infrastructure announcement of 5 July 2004, on specification of mandates granted by European Commission for elaboration of European harmonized standards and guidelines for European technical approvals, along with subject scope of these mandates.
6 Dz. U. 2004 nr 198 poz. 2041 - Minister of Infrastructure order of 11 August 2004 on methods of building products conformity declaring and method of marking them with building mark
7 Dz. U. 2004 nr 249 poz. 2497 - Minister of Infrastructure order of 8 November 2004, on technical approvals and organizational bodies authorised for issuing them.
8 Dz. U. 2011 nr 87 poz. 486 - Minister of Infrastructure order of 8 April 2011on method of keeping National Register of Questioned Building Products.
9 Dz. U. 2009 nr 144 poz. 1182 - Minister of Infrastructure order of 2 September 2009 on inspection of building products introduced to turnover
10 Dz. U. 2011 nr 23 poz. 122 - Minister of Infrastructure order of 25 January 2011 on samples of building products introduced to turnover.

7.2 Polish Standards

The standards regarding installation equipment are specified. Standards for cables and connecting equipment related to them, according to Specification 3740.

Item	Standard N^{o}	Title of standard
1.	PN-EN 50085-1	Cable trunking systems and cable ducting systems for electrical installations - Part 1: General requiremen

2.	PN-EN 50085-2-3	Cable trunking systems and cable ducting systems for electrical installations - Part 2-3: Particular requirements for slotted cable trunking systems intended for installation in cabinets
3.	PN-EN 50102	Degrees of protection against external mechanical impacts, provided by housings of electric equipment (IK Code).
4.	PN-EN 50262	Metrical culverts used in cable systems.
5.	PN-EN 60297-3-101	Mechanical structures for electronic equipment. Dimensions of mechanical constructions of the 482.6 mm series (19 inch). Part 3-101: Cassettes and their interacting packages.
6.	PN-EN 60297-3-102	Mechanical structures for electronic equipment. Dimensions of mechanical constructions of the 482.6 mm series (19 inch). Part 3-102: Injector/extractor handle.
7.	PN-EN 60297-3-103	Mechanical structures for electronic equipment. Dimensions of mechanical constructions of the 482.6 mm series (19 inch). Part 3-103: Keying and aligning pin.
8.	PN-EN 60529	Degrees of protection provided by housings (IP Code)
9.	PN-EN 60917-1	Modular order regarding development of mechanical structures for electronic infrastructures. Part 1. Common standard.
10	PN-EN 60917-2	Modular order regarding development of mechanical structures for electronic infrastructures. Part 2-1: Group specification. Co-ordination of interfaces' dimensions for 25 mm interfaces.
11	PN-EN 60917-2-1	Modular order regarding development of mechanical structures for electronic infrastructures. Part 2-1: Group specification. Co-ordination of interfaces' dimensions for 25 mm interfaces. Detailed specification. Dimensions of cabinets and racks.
12	PN-EN 60917-2-2	Modular order regarding development of mechanical structures for electronic infrastructures. Part 2-1: Group specification. Co-ordination of interfaces' dimensions for 25 mm dimensioned interfaces. Detailed specification. Dimensions of sub-racks, connection planes, front boards and plug-in members.
13	PN-EN 60950-1	Information technology equipment - Safety - Part 1: General requirements
14	PN-EN 61386-1	Conduit systems for electrical installations - Part 1: General requirements
15	PN-EN 61386-21	Conduit systems for electrical installations - Part 21: Detailed requirements. Rigid conduit systems.
16	PN-EN 61386-22	Conduit Systems for cable management - Part 22: Detailed requirements - Pliable conduit systems
17	PN-EN 61386-23	Conduit systems for cable management - Part 23: Particular requirements - Flexible conduit systems
18	PN-EN 61537	Systems of installation ducts and trays for cable management.
19	PN-EN 61587-1	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis
20	PN-EN 61587-2	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 2: Seismic tests for cabinets and racks
21	PN-EN 61587-3	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 3: Electromagnetic shielding performance tests for cabinets and subracks
22	PN-EN 62194	Method of evaluating the thermal performance of enclosures

8 Enclosures

- Enclosure No.1, Recommended types of cables and leads
- Enclosure No.2 Proximities and crossings distances to electric systems
- Enclosure No.3 Proximities and crossing distances to pipelines

9 Record of changes

No.	Date	Description	Introduced by
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

Grupa LOTOS S.A.	**ENCLOSURE No. 1**	Spec. N^{o}
	Recommended types of cables and leads	3720

Copper – ordinary conditions

Stringency type	Industrial buildings					Safety systems, evacuation routes				
Cable type	YTKSY, YnTKSY ekw,ekp	UTP, FTP STP	RPX, YRPX YnRPX	YDY	YWD, YWL	NTKSX ekw	UTP STP [LSHF]	HDGs ekw	HTKSH ekw	H05S -U
profile	1x2 up to 10x2	4x2	1x2 1x4	2x1 do 4x1	75Ω	2x2 up to 21x2	4x2	2x1 Nx1	1x2	Nx2 [pairs]
cores	0,8	0,5	0,9 ; 1,2	0,5 ; 2,5	0,6/3,7	0,8	0,5	1,5;2,5	1,0	0,5;2,5
Telecomm. cat. < 3	X					X				X
Telecomm. cat. ≥ 5		X								
Loud speaker system	X		X				X		X	X
Sound distribution system			X							X
Fire signalling	X	X						X	X	
Access control	X	X		X						
Burglary signalling	X	X								
AZART, TV SAT, CCTV		X			X					

Fibre optic – ordinary conditions

Cable type*	W-NOTKSd [indoor]					YnYOTKS, [distribution]				
Optical fibre**[up to 12]	Js	Jp	Jn	G5	G6	Js	Jp	Jn	G5	G6
colour	yellow	red	brown	orange	green	yellow	red	brown	orange	green
External links	X	X	X	-	-	X	X	X	-	-
Generic cabling	X	-	-	-	X	X	-	-	-	X

* Marking according to domestic manufacturer, ** Marking according to Specification 3750

Copper cables – special conditions

Stringency type	Industrial buildings					Safety systems, evacuation routes				
Cable type	YTKSY, YnTKSY ekw,ekp	UTP, FTP STP	RPX, YRPX YnRPX	YDY	YWD, YWL	NTKSX ekw	UTP STP [LSHF]	HDGs ekw	HTKSH ekw	H05S -U
profile	1x2 up to 10x2	4x2	1x2 1x4	2x1 do 4x1	75Ω	2x2 up to 21x2	4x2	2x1 Nx1	1x2	Nx2 [pairs]
cores	0,8	0,5	0,9 ; 1,2	0,5 ; 2,5	0,6/3,7	0,8	0,5	1,5;2,5	1,0	0,5;2,5
Telecomm. cat. < 3	X					X				X
Telecomm. cat. ≥ 5		X								
Loud speaker system	X		X				X		X	X
Sound distribution system			X							X
Fire signalling	X	X						X	X	
Access control	X	X		X						
Burglary signalling	X	X								
AZART, TV SAT, CCTV		X			X					

NOTES:

1. YTKSY cables according to PN-92/T-90320 standard group
2. H05S-U cables according to PN-E-90550 [mft. Eltron-Jaworzno]
3. On evacuation routes, LSHF [low smoke halogen free] cables are to be used
4. In safety systems, cables resistant to high temperature shall be used
5. Construction details and technical requirements for respective cables are given in standard no 3760 Telecommunication Cables

Optical fibres – special conditions

In internal installations, halogen-free cables shall be used: NOTKS as station cables and NNOTKS as distribution cables.

Uncovered cables

systems	Minimum distance to crossing [cm]					Minimum proximity distance [cm]				
	230/400V	microphone, telecomm.	loudspeakers	signalling	CCTV	230/400V	microphone, telecomm.	loudspeakers	signalling	CCTV
telecommunication – category < 3	10	N/L	5	N/L	N/L	5	N/L	5	3	3
telecommunication – category ≥ 5	10*	N/L	5	N/L	N/L	15*	N/L	10*	3	3
loudspeaker	10	N/L	N/L	5	5	15	5	N/L	5	5
signalling	10	N/L	5	N/L	N/L	5	3	5	N/L	N/L
television	10	N/L	5	N/L	N/L	15	3	5	N/L	N/L

N/L – no limit

Cables in metal covers

systems	Minimum distance to crossing [cm]					Minimum proximity distance [cm]				
	230/400V	microphone, telecomm.	loudspeakers	signalling	CCTV	230/400V	microphone, telecomm.	loudspeakers	signalling	CCTV
telecommunication – category < 3	5	N/L	3	N/L	N/L	3	N/L	2	N/L	N/L
telecommunication – category ≥ 5	5*	N/L	3	N/L	N/L	5*	N/L	5*	N/L	N/L
loudspeaker	5	3	N/L	3	3	5	5	N/L	2	2
signalling	5	N/L	3	N/L	N/L	3	N/L	2	N/L	N/L
television	5	N/L	3	N/L	N/L	5	N/L	2	N/L	N/L

*) Stringency does not apply to fibre optic cables

Grupa LOTOS S.A.	**ENCLOSURE No. 3**	Spec. N^{o}
	Proximities and crossing distances to pipelines	3720

Table A

systems	Minimum distance to crossing [cm]					Minimum proximity distance [cm]				
	water supply	sewerage	heating	gas	air-condition	water supply	sewerage	heating	gas	air-condition
Telecomm. eng. **- without cover**	30	50	100	20	20	30	50	100	20	20

Table B

systems	Minimum distance to crossing [cm]					Minimum proximity distance [cm]				
	water supply	sewerage	heating	gas	air-condition	water supply	sewerage	heating	gas	air-condition
Telecomm. eng. **- in PVC cover**	10	30	100	25	10	20	30	100	20	15

Table C

systems	Minimum distance to crossing [cm]					Minimum proximity distance [cm]				
	water supply	sewerage	heating	gas	air-condition	water supply	sewerage	heating	gas	air-condition
Telecomm. eng. **- in metal cover**	10	30	25	15	10	20	30	30	20	20