Contractor: **EGÚ Brno. a. s.**
Electrical Network Department

Client: **MATEICIUC a.s.**
Ke Koupališti 370/15
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DOCUMENTS FOR DESIGNING PLASTIC CABLE DUCTS

MATEICIUC a.s.

Introduction

The executed background material for plastic protective pipe project design is based on the “Sizing protective pipes” methodology to determine loading capacity.

The following tables give total load values for individual types of surface load, including the impact of dynamic effects and soil load.

Cases when the permitted load value was exceeded are given in the tables in bold and with shading for the specified suppliers and offered range of protective pipes.

The permitted load on protective pipe is determined with regard to a maximum deformation of 5 %.

When protective pipes pass through or are laid in Czech Rail track, deformation must not exceed 3 %.

Protective pipes laid in track is sized to resist the load of an UIC 71 train.

PE double-walled corrugated
DUOFLEX and DUOHARD protective pipes

Type	Outer diameter	Inner diameter	Ring stiffness	Permissible load at	
				3% deformation	5% deformation
	[mm]	[mm]	[kPa]	[kPa]	[kPa]
DUOFLEX					
40	40	32	17.40	166.89	278.14
50	50	40	13.45	143.93	239.88
63	63	51	9.47	120.91	201.52
75	75	61	10.70	128.02	213.37
90	90	75	11.20	130.90	218.20
110	110	94	9.70	122.20	203.70
125	125	107	12.18	136.60	227.60
160	160	137	9.15	119.10	198.40
200	200	173	9.79	122.80	204.60
DUOHARD					
110	110	94	8.18	113.50	189.10
125	125	107	9.62	121.80	203.00
160	160	137	8.01	112.50	187.50
200	200	173	8.36	114.50	190.80

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 40

Ring stiffness according to ČSN EN ISO 9969 S = 17.40 kPa
Loading capacity at 5% deformation is Q = 278.14 kPa
Loading capacity at 3% deformation is Q = 166.89 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	223.6	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	221.2	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.0	105.4	85.7	90.2	98.3	107.9	118.4	129.6	141.4	153.7

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.4	106.2	87.4	93.0	101.9	111.8	122.4	133.5	145.1	157.2

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables using **shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 50

Ring stiffness according to ČSN EN ISO 9969 S = 13.45 kPa
Loading capacity at 5% deformation is Q = 239.88 kPa
Loading capacity at 3% deformation is Q = 143.93 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	223.6	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	221.2	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.0	105.4	85.7	90.2	98.3	107.9	118.4	129.6	141.4	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.4	106.2	87.4	93.0	101.9	111.8	122.4	133.5	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 63

Ring stiffness according to ČSN EN ISO 9969 S = 9.47 kPa
Loading capacity at 5% deformation is Q = 201.52 kPa
Loading capacity at 3% deformation is Q = 120.91 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 75

Ring stiffness according to ČSN EN ISO 9969 S = 10.70 kPa
Loading capacity at 5% deformation is Q = 213.37 kPa
Loading capacity at 3% deformation is Q = 128.02 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	122.4	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 90

Ring stiffness according to ČSN EN ISO 9969 S = 11.20 kPa
Loading capacity at 5% deformation is Q = 218.20 kPa
Loading capacity at 3% deformation is Q = 130.90 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	**170.6**	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	**105.4**	85.7	90.2	98.3	**107.9**	**118.4**	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	122.4	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 110

Ring stiffness according to ČSN EN ISO 9969 S = 9.70 kPa
Loading capacity at 5% deformation is Q = 203.70 kPa
Loading capacity at 3% deformation is Q = 122.20 kPa

Type of load		Soil load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		Class A road load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		Class B road load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		Entrance load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		Pavement and cycle route load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		Tram traffic load								
Cover height	[m]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	[kPa]	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		UIC 71 single-track train load									
Cover height	[m]	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	[kPa]	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		UIC 71 double track train load									
Cover height	[m]	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	[kPa]	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 125

Ring stiffness according to ČSN EN ISO 9969 S = 12.18 kPa
Loading capacity at 5% deformation is Q = 227.60 kPa
Loading capacity at 3% deformation is Q = 136.60 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	**105.4**	85.7	90.2	98.3	107.9	118.4	129.6	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	122.4	133.5	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 160

Ring stiffness according to ČSN EN ISO 9969 S = 9.15 kPa
Loading capacity at 5% deformation is Q = 198.40 kPa
Loading capacity at 3% deformation is Q = 119.10 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOFLEX 200

Ring stiffness according to ČSN EN ISO 9969 S = 9.79 kPa
Loading capacity at 5% deformation is Q = 204.60 kPa
Loading capacity at 3% deformation is Q = 122.80 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	122.4	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOHARD 110

Ring stiffness according to ČSN EN ISO 9969 S = 8.18 kPa
Loading capacity at 5% deformation is Q = 189.10 kPa
Loading capacity at 3% deformation is Q = 113.50 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	**118.4**	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOHARD 125

Ring stiffness according to ČSN EN ISO 9969 S = 9.62 kPa
Loading capacity at 5% deformation is Q = 203.00 kPa
Loading capacity at 3% deformation is Q = 121.80 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	118.4	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOHARD 160

Ring stiffness according to ČSN EN ISO 9969 S = 8.01 kPa
Loading capacity at 5% deformation is Q = 187.50 kPa
Loading capacity at 3% deformation is Q = 112.50 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	**141.8**	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	**118.4**	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: DUOHARD 200

Ring stiffness according to ČSN EN ISO 9969 S = 8.36 kPa
Loading capacity at 5% deformation is Q = 190.80 kPa
Loading capacity at 3% deformation is Q = 114.50 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	**223.6**	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	**221.2**	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	**211.1**	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.0**	105.4	85.7	90.2	98.3	107.9	**118.4**	**129.6**	**141.4**	**153.7**

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	**137.4**	106.2	87.4	93.0	101.9	111.8	**122.4**	**133.5**	**145.1**	**157.2**

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

Single-walled protective pipes OPTOHARD

Type	Outer diameter	Inner diameter	Wall thickness	Ring stiffness	Permissible load at	
					3% deformation	5% deformation
	[mm]	[mm]	[mm]	[kPa]	[kPa]	[kPa]
OPTOHARD						
32	32	26.6	2.7	30.82	244.38	407.30
40	40	34	3	18.42	172.67	287.78
40	40	33	3.5	58.71	405.67	676.12

MATEICIUC plastic cable protection ducts

Type: OPTOHARD 32/2.7

Ring stiffness according to ČSN EN ISO 9969 S = 30.82 kPa
Loading capacity at 5% deformation is Q = 407.30 kPa
Loading capacity at 3% deformation is Q = 244.38 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	315.3	223.6	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	340.2	221.2	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	297.4	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	365.6	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.0	105.4	85.7	90.2	98.3	107.9	118.4	129.6	141.4	153.7

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.4	106.2	87.4	93.0	101.9	111.8	122.4	133.5	145.1	157.2

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: OPTOHARD 40/3

Ring stiffness according to ČSN EN ISO 9969 S = 18.42 kPa
Loading capacity at 5% deformation is Q = 287.78 kPa
Loading capacity at 3% deformation is Q = 172.67 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	**489.6**	**315.3**	223.6	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**604.7**	**340.2**	221.2	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**297.4**	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**365.6**	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.0	105.4	85.7	90.2	98.3	107.9	118.4	129.6	141.4	153.7

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.4	106.2	87.4	93.0	101.9	111.8	122.4	133.5	145.1	157.2

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

MATEICIUC plastic cable protection ducts

Type: OPTOHARD 40/3.5

Ring stiffness according to ČSN EN ISO 9969 S = 58.71 kPa
Loading capacity at 5% deformation is Q = 676.12 kPa
Loading capacity at 3% deformation is Q = 405.67 kPa

Type of load		**Soil load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	8.55	11.40	14.25	17.10	19.95	22.80	25.65	28.50	31.35

Type of load		**Class A road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	**857.6**	489.6	315.3	223.6	170.6	138.1	117.1	103.3	93.9

Type of load		**Class B road load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	604.7	340.2	221.2	159.1	123.5	102.0	88.6	79.9	74.4

Type of load		**Entrance load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	297.4	170.4	113.8	84.9	68.8	59.6	54.3	51.4	50.1

Type of load		**Pavement and cycle route load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	63.4	42.0	33.7	30.5	29.8	30.3	31.6	33.3	35.4

Type of load		**Tram traffic load**								
Cover height	**[m]**	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
Total load	**[kPa]**	365.6	211.1	141.8	106.1	86.3	74.9	68.4	64.8	63.1

Type of load		**UIC 71 single-track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.0	105.4	85.7	90.2	98.3	107.9	118.4	129.6	141.4	153.7

Type of load		**UIC 71 double track train load**									
Cover height	**[m]**	0.8	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Total load	**[kPa]**	137.4	106.2	87.4	93.0	101.9	111.8	122.4	133.5	145.1	157.2

Pipes cannot be used in cases when the considered load exceeds the value of the loading capacity. These cases are identified in the tables **using shading and bold font.**

Laying plastic protective pipes

Designing cable routes requires that industry regulations (power engineering, telecommunications, cable television, computer networks, etc.) be observed in addition to the valid the standards. Only the general rules for laying plastic protective pipes, which the project designer should respect, are given.

Cable trench

The bottom of the excavated cable trench must be levelled and any stones must be removed. A pipe bed is created on the bottom of the ditch by the addition of approx. 5 cm of sieved soil or sand. The pipe bed is subsequently levelled (by hand if possible). The cable trench is then prepared for laying protective pipes.

Laying the protective pipe

Protective pipe is laid in the centre of the cable trench and must not undulate horizontally or vertically. The minimum bend radius must not be less than 10 times the Outer diameter of the pipe for OPTOHARD pipes. The minimum bend radius for DUOFLEX and DUOHARD pipes is: 40/32 min. 0.2 m, 50/40 min. 0.23 m, 63/51 min. 0.26 m, 75/61 min. 0.33 m, 90/75 min. 0.35 m, 110/94 min. 0.40 m, 125/105 min. 0.50 m, 160/136 min. 0.64 m, 200/171 min. 0.75 m.

When laying multiple protective pipes in one trench. they must not overlap.

Coupling protective pipes

Protective OPTOHARD pipes are connected using threaded couplings.

Protective DUOFLEX and DUOHARD pipes are connected using double insertable couplings. We recommend marking the last visible corrugation peak in front of the coupling to ensure that the pipe is inserted all the way to the end of the coupling. Each manufactured length (6 m, 50 m) has a coupling installed at one end, which is part of the delivery. The coupling can have sealing rings installed (the profile sealing ring must be inserted into the shaped corrugation trough and must be covered in lubricant).
Couplings may only be used on straight sections of the cable routes.
We recommend that plastic protective pipes be coupled a day after laying so that their temperature is equalised with the soil temperature. Pipes may come loose from their couplings as a result of thermal expansion of the plastic if the plastic pipes are coupled immediately after being laid in the cable trench.

Covering the protective pipes

Before the trench with the protective pipe is filled in, the investor’s construction supervisor inspects the work.

Protective pipes are covered with sand or possibly sieved soil. The material is compacted along the sides of the protective pipes. The compacted infill must cover the upper edge of the protective pipes by at least 10 cm.
The trench is then filled in by thin layers and compacted to a height of 20–30 cm above the upper edge of the protective pipe. Warning tape is subsequently laid. The remainder of the trench is then filled in with excavated soil to a height above the level of the surrounding soil and will subsequently settle to become level with the surrounding terrain.
The position and height of the actual cable routes must be documented.

List of related standards

1 ČSN EN 61386-1 Pipe systems for laying cables.
Part 1: General requirements.

2 ČSN EN 61386-24 Pipe systems for laying cables.
Part 24: Special requirements – Pipe systems installed in the ground.

3. ČSN EN 50 086 – 1 Pipe systems for electrical installations.
Part 1: General requirements.

4. ČSN EN 50 086 – 2 – 1 Pipe systems for electrical installations.
Part 2–1: Special requirements for rigid pipe systems.

5. ČSN EN 50 086 – 2 – 2 Pipe systems for electrical installations.
Part 2–2: Special requirements for flexible pipe systems.

6. ČSN EN 50 086 – 2 – 3 Pipe systems for electrical installations.
Part 2–3: Special requirements for flexible pipe systems.

7. ČSN EN 50 086 – 2 – 4 Pipe systems for electrical installations.
Part 2–4: Special requirements for pipe systems installed in the ground.

8. ČSN 64 00 90 Plastics. Storage of plastic products.

9. ČSN 33 33 00 Electrotechnical regulations. Construction of power lines.

10. ČSN 33 33 20 Electrotechnical regulations. Electric power supply connections.

11. ČSN 33 20 00 – 5 – 52 Electrotechnical regulations. Electrical equipment. Selection of systems and construction of lines.

12. ČSN 33 40 50 Regulations for underground communications lines.

13. ČSN 73 60 05 Spatial layout of technical equipment networks

14. ČSN 73 60 06 Identification of underground lines using warning tape.

15. ČSN 73 75 05 Combined routes for municipal technical equipment lines.

16. ČSN EN 13501-1 Fire rating of building products and building structures.
Part 1: Rating by fire reaction test results.