

INSPECTION CERTIFICATE

Supplier: TTP-YHTIÖT OY
PL 6
41401 LIEVESTUORE

Order number/id.nr: M00367/Empower Tarto – Sindi, Lot 2

Products: 89 pcs guyed steel towers

Standards which are used: Galvanizing **SFS-EN ISO 1461 B**
Measurement **SFS-EN ISO 2178**

Zinc coating thickness:

t>6 mm	min 100 µm	mean 115 µm
3<t≤6 mm	min 85 µm	mean 95 µm
1<t≤3 mm	min 60 µm	mean 70 µm

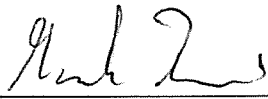
Our galvanizing process is following:

Pickling in hydrochloric acid-rinsing in water-flux solution-dipping in zinc bath (>98,5 %/T=455°C)-finishing-weighing and inspection.

Articles are consistent with standard **SFS-EN ISO 1461.**

Differences in articles and handling:

Lievestuore 16.12.2011
Place and date


Inspector Marko Rossi

Appendix 11 pcs measurement lists of thickness according standard
SFS-EN ISO 2178.

Measured values in mikrometrit (µm)

Tower parts (µm)					
1:	337,0	26:	286,0	51:	209,0
2:	213,0	27:	170,0		
3:	289,0	28:	353,0		
4:	201,0	29:	341,0		
5:	215,0	30:	523,0		
6:	175,0	31:	285,0		
7:	190,0	32:	260,0		
8:	253,0	33:	280,0		
9:	290,0	34:	197,0		
10:	332,0	35:	205,0		
11:	201,0	36:	197,0		
12:	182,0	37:	219,0		
13:	211,0	38:	209,0		
14:	227,0	39:	206,0		
15:	220,0	40:	174,0		
16:	322,0	41:	172,0		
17:	261,0	42:	167,0		
18:	412,0	43:	159,0		
19:	240,0	44:	194,0		
20:	173,0	45:	279,0		
21:	175,0	46:	202,0		
22:	156,0	47:	245,0		
23:	174,0	48:	306,0		
24:	171,0	49:	300,0		
25:	286,0	50:	324,0		

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	51	Readings Above High Limit:	-
Creation Date:	15.12.2011 11:28:00	Percent Below Low Limit:	-
Update Date:	15.12.2011 11:28:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	242,5 µm	Probe Serial:	LG63629-081
Standard Deviation:	72,9 µm	Probe Type:	F1
Coefficient of Variation:	30,1	Probe Sub Types:	F1
Max:	523,0 µm	Gauge Type:	Elcometer 456
Min:	156,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	367,0 µm	Calibration Method:	Kaksipiste

Note:

Readings:
1 - 9 Leg upper middle part
10-18 Leg upper part
19-27 Fixing parts
28-33 Hinged droppers
34-42 Earth wire extensions
43-51 Leg lower part

Batch Name: tension bars
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

tension bars (μm)	
1.	186,0
2.	192,0
3.	187,0
4.	214,0
5.	218,0
6.	280,0
7.	252,0
8.	252,0
9.	222,0
10.	216,0
11.	225,0
12.	166,0
13.	178,0
14.	172,0
15.	168,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	15	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:28:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:28:00	Percent Above High Limit:	-
High Limit:	-	80/20 Rule	-
Nominal:	-	No. below reasonable	-
Low Limit:	-	Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	208,5 μm	Probe Serial:	HF13307-018
Standard Deviation:	34,3 μm	Probe Type:	F1
Coefficient of Variation:	16,5	Probe Sub Types:	F1
Max:	280,0 μm	Gauge Type:	Elcometer 456
Min:	166,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	114,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: support beam
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

support beam (μm)	
1:	229,0
2:	227,0
3:	241,0
4:	286,0
5:	234,0
6:	194,0
7:	476,0
8:	332,0
9:	289,0
10:	249,0
11:	186,0
12:	204,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:38:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:38:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	262,3 μm	Probe Serial:	HF13307-018
Standard Deviation:	79,5 μm	Probe Type:	F1
Coefficient of Variation:	30,3	Probe Sub Types:	F1
Max:	476,0 μm	Gauge Type:	Elcometer 456
Min:	186,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	290,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Leg, upper part
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

Leg, upper part (μm)	
1:	279,0
2:	271,0
3:	260,0
4:	262,0
5:	237,0
6:	229,0
7:	367,0
8:	261,0
9:	239,0
10:	226,0
11:	226,0
12:	272,0
13:	237,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	13	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:30:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:30:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	258,9 μm	Probe Serial:	HF13307-018
Standard Deviation:	37,5 μm	Probe Type:	F1
Coefficient of Variation:	14,5	Probe Sub Types:	F1
Max:	367,0 μm	Gauge Type:	Elcometer 456
Min:	226,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	141,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Leg, middle part
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

Leg, middle part (μm)	
1:	387,0
2:	224,0
3:	282,0
4:	212,0
5:	201,0
6:	327,0
7:	201,0
8:	210,0
9:	247,0
10:	421,0
11:	238,0
12:	231,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	26.9.2011 12:28:00	Percent Below Low Limit:	-
Update Date:	26.9.2011 12:28:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	265,1 μm	Probe Serial:	LG63629-081
Standard Deviation:	74,6 μm	Probe Type:	F1
Coefficient of Variation:	28,2	Probe Sub Types:	F1
Max:	421,0 μm	Gauge Type:	Elcometer 456
Min:	201,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	220,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Leg, lower part
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

Leg, lower part (μm)	
1	203,0
2	222,0
3	815,0
4	153,0
5	143,0
6	152,0
7	157,0
8	131,0
9	132,0
10	255,0
11	211,0
12	263,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:36:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:36:00	Percent Above High Limit:	-
High Limit:	-	80/20 Rule	-
Nominal:	-	No. below reasonable	-
Low Limit:	-	Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	236,4 μm	Probe Serial:	HF13307-018
Standard Deviation:	188,0 μm	Probe Type:	F1
Coefficient of Variation:	79,5	Probe Sub Types:	F1
Max:	815,0 μm	Gauge Type:	Elcometer 456
Min:	131,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	684,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Grossarm half
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

Grossarm half (μm)	
1:	194,0
2:	156,0
3:	173,0
4:	347,0
5:	245,0
6:	193,0
7:	397,0
8:	182,0
9:	182,0
10:	374,0
11:	223,0
12:	184,0
13:	399,0
14:	204,0
15:	183,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	15	Readings Above High Limit:	-
Creation Date:	26.9.2011 12:20:00	Percent Below Low Limit:	-
Update Date:	26.9.2011 12:20:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	242,4 μm	Probe Serial:	LG63629-081
Standard Deviation:	88,6 μm	Probe Type:	F1
Coefficient of Variation:	36,5	Probe Sub Types:	F1
Max:	399,0 μm	Gauge Type:	Elcometer 456
Min:	156,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	243,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Grossarm 110 kV
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (µm)

Grossarm 110 kV (µm)	
1.	285,0
2.	283,0
3.	235,0
4.	228,0
5.	327,0
6.	233,0
7.	215,0
8.	216,0
9.	218,0
10.	200,0
11.	196,0
12.	184,0
13.	198,0
14.	170,0
15.	288,0
16.	226,0
17.	235,0
18.	181,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	18	Readings Above High Limit:	-
Creation Date:	26.9.2011 12:26:00	Percent Below Low Limit:	-
Update Date:	26.9.2011 12:26:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	228,8 µm	Probe Serial:	LG63629-081
Standard Deviation:	42,3 µm	Probe Type:	F1
Coefficient of Variation:	18,5	Probe Sub Types:	F1
Max:	327,0 µm	Gauge Type:	Elcometer 456
Min:	170,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	157,0 µm	Calibration Method:	Kaksipiste

Note:

Batch Name: Fixing parts
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

Fixing parts (μm)	
1:	150,0
2:	153,0
3:	148,0
4:	230,0
5:	183,0
6:	227,0
7:	193,0
8:	183,0
9:	192,0
10:	200,0
11:	278,0
12:	147,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	26.9.2011 12:24:00	Percent Below Low Limit:	-
Update Date:	26.9.2011 12:24:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	190,3 μm	Probe Serial:	LG63629-081
Standard Deviation:	39,9 μm	Probe Type:	F1
Coefficient of Variation:	21,0	Probe Sub Types:	F1
Max:	278,0 μm	Gauge Type:	Elcometer 456
Min:	147,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	131,0 μm	Calibration Method:	Kaksipiste

Note:

Batch Name: Earth wire extension
 File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (µm)

Earth wire extension (µm)	
1:	222,0
2:	387,0
3:	198,0
4:	139,0
5:	171,0
6:	209,0
7:	230,0
8:	202,0
9:	222,0
10:	279,0
11:	202,0
12:	247,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:43:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:43:00	Percent Above High Limit:	-
High Limit:	-	80/20 Rule	-
Nominal:	-	No. below reasonable	-
Low Limit:	-	Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	225,7 µm	Probe Serial:	HF13307-018
Standard Deviation:	61,8 µm	Probe Type:	F1
Coefficient of Variation:	27,4	Probe Sub Types:	F1
Max:	387,0 µm	Gauge Type:	Elcometer 456
Min:	139,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	248,0 µm	Calibration Method:	Kaksipiste

Note:

Batch Name: crossarm 110 kV
File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (μm)

crossarm 110 kV (μm)	
1:	208,0
2:	196,0
3:	280,0
4:	291,0
5:	427,0
6:	536,0
7:	325,0
8:	303,0
9:	300,0
10:	308,0
11:	290,0
12:	458,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 μm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	9.9.2011 9:40:00	Percent Below Low Limit:	-
Update Date:	9.9.2011 9:40:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 μm	Max below 3* Nominal	-
Mean Average:	326,8 μm	Probe Serial:	HF13307-018
Standard Deviation:	99,4 μm	Probe Type:	F1
Coefficient of Variation:	30,4	Probe Sub Types:	F1
Max:	536,0 μm	Gauge Type:	Elcometer 456
Min:	196,0 μm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	340,0 μm	Calibration Method:	Kaksipiste

Note:

INSPECTION CERTIFICATE

Supplier: TTP-YHTIÖT OY
PL 6
41401 LIEVESTUORE

Order number/id.nr: M00368 Empower AS Tartto-Sindi Lot.2

Products: AT2G parts

Standards which are used: Galvanizing **SFS-EN ISO 1461 B**
Measurement **SFS-EN ISO 2178**

Zinc coating thickness:

t>6 mm	min 100 µm	mean 115 µm
3<t≤6 mm	min 85 µm	mean 95 µm
1<t≤3 mm	min 60 µm	mean 70 µm

Our galvanizing process is following:

Pickling in hydrochloric acid-rinsing in water-flux solution-dipping in zinc bath (>98,5 %/T=455°C)-finishing-weighing and inspection.

Articles are consistent with standard **SFS-EN ISO 1461.**

Differences in articles and handling:

Lievestuore 16.12.2011
Place and date


Inspector Marko Rossi

Appendix 3 pcs measurement lists of thickness according standard
SFS-EN ISO 2178.

Measured values in mikrometrit (µm)

AT2G Parts 28.9.-11 (µm)	
1.	152,0
2	175,0
3	193,0
4.	176,0
5.	178,0
6	179,0
7.	149,0
8.	147,0
9.	170,0
10.	335,0
11.	270,0
12.	277,0
13.	301,0
14.	184,0
15.	176,0
16.	166,0
17.	339,0
18.	315,0
19.	339,0
20.	184,0
21.	188,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	21	Readings Above High Limit:	-
Creation Date:	28.9.2011 9:33:00	Percent Below Low Limit:	-
Update Date:	28.9.2011 9:33:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	218,7 µm	Probe Serial:	LG63629-081
Standard Deviation:	69,6 µm	Probe Type:	F1
Coefficient of Variation:	31,8	Probe Sub Types:	F1
Max:	339,0 µm	Gauge Type:	Elcometer 456
Min:	147,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	192,0 µm	Calibration Method:	Kaksipiste

Note:
AT2G Parts 12 538 kg

Measured values in mikrometrit (µm)

AT2G Parts 18.8.-11 (µm)	
1:	165,0
2:	313,0
3:	174,0
4:	334,0
5:	159,0
6:	327,0
7:	197,0
8:	372,0
9:	157,0
10:	189,0
11:	170,0
12:	173,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	12	Readings Above High Limit:	-
Creation Date:	18.8.2011 14:50:00	Percent Below Low Limit:	-
Update Date:	18.8.2011 14:50:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	227,5 µm	Probe Serial:	LG63629-081
Standard Deviation:	82,3 µm	Probe Type:	F1
Coefficient of Variation:	36,2	Probe Sub Types:	F1
Max:	372,0 µm	Gauge Type:	Elcometer 456
Min:	157,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	215,0 µm	Calibration Method:	Kaksipiste

Note:

Batch Name: AT2G parts 15.12.-11
 File Path: Data\TTP, Empower Tartu-Sindi lot2\

elcometer

Measured values in mikrometrit (µm)

AT2G parts 15.12.-11 (µm)	
1:	174,0
2:	172,0
3:	174,0
4:	217,0
5:	145,0
6:	140,0
7:	140,0
8:	137,0
9:	150,0
10:	179,0
11:	183,0
12:	178,0
13:	299,0
14:	292,0
15:	327,0
16:	318,0
17:	328,0
18:	325,0
19:	177,0
20:	181,0
21:	187,0
22:	167,0
23:	175,0
24:	161,0

H = Above High Limit L = Below Low Limit O = Offset Applied (0,0 µm) C = Cancelled Reading E = Edited Reading

Batch Type:	Pinnoite	Readings Below Low Limit:	-
Readings:	24	Readings Above High Limit:	-
Creation Date:	15.12.2011 11:25:00	Percent Below Low Limit:	-
Update Date:	15.12.2011 11:25:00	Percent Above High Limit:	-
High Limit:	-		
Nominal:	-	80/20 Rule	-
Low Limit:	-	No. below reasonable	-
		Mean above nominal	-
Offset:	0,0 µm	Max below 3* Nominal	-
Mean Average:	205,3 µm	Probe Serial:	LG63629-081
Standard Deviation:	67,3 µm	Probe Type:	F1
Coefficient of Variation:	32,8	Probe Sub Types:	F1
Max:	328,0 µm	Gauge Type:	Elcometer 456
Min:	137,0 µm	Gauge Measure Type:	Laskettu keskiarvo (5)
Range:	191,0 µm	Calibration Method:	Kaksipiste

Note: