Installation of Radius Systems Polyethylene Pipes using Pipeline Pulling Techniques

The following is intended as general guidance for the installation of PE100 pipes using No Dig techniques, it is applicable to pipe and pipe materials approved to the requirements of BS EN12201.

During the installation of a polyethylene pipe using a recognised installation pulling technique, the pipe material will be subjected to a tensile force. Radius Systems recommend that the following guidance is used and that the maximum tensile force values shown in the tables below are not exceeded. They are based on the following criteria:

- **PE100 pipe and pipe materials approved to the requirements of BS EN12201**
- Pipe diameter and wall thickness based on minimum dimensions
- Maximum period which the tensile force is applied to the pipeline, **not exceeding 30 minutes**
- Maximum upper temperature of the pipe material during the pulling operation, **not exceeding 20°C.**
- The tensile force being applied as a series of intermittent pull/hold/rest cycles and applied direct in line to direction of motion.

Installation Considerations

Pipe pulling techniques are routinely used to install polyethylene pipes for NO-Dig installations, examples of such techniques include slip lining, horizontal directional drilling, and pipe bursting.

When applying the tensile force to the pipeline, it should wherever possible be applied in a gradual and uniform manner, in straight and direct line with the leading end of the pipeline.

The tables of tensile force values shown below, have been developed for BS EN12201 approved PE100 materials, where the duration of the applied tensile force will not exceed 30 minutes and where the temperature of the pipe material during installation will not exceed 20°C. They identify maximum allowable tensile force values for a given pipe Standard Dimension Ratio and pipe external diameter.

NOTE: Where the tensile force values identified in the following tables are applied for periods in excess of 30 minutes and / or where the temperature of the pipe material exceeds 20°C, this may result in the pipe material being subjected to excessive strain and should be avoided. Where the temperature of the pipe material during installation is expected to exceed 20°C or where the tensile force will be applied for a duration exceeding 30 minutes , then the values in the tables below must be reduced accordingly, please contact Radius Systems for additional guidance on this subject.

Once installed the polyethylene insertion pipe should be allowed to relax fully before connections are made to it.

Equipment

The method of connection to the pipe is important to ensure that the pipe is not damaged during the installation process, propriety towing heads are available for this purpose, please confirm suitability with the towing head manufacturer.

Break Away Connectors are available, which limit the tensile force applied to the pipeline and ensure that the recommended maximum tensile force values identified with the tables below are not exceeded. Where there is a possibility that the pipe may be subjected to rotational or torsional stress during the pipe insertion process than a swivel connector should be used.

Considerations to minimise the required tensile force for pipeline insertion.

With careful project planning, it may be possible to install the pipeline using a combination of pushing and pulling techniques, thus reducing the tensile force required for pipe insertion. Wherever possible the insertion pipe should be pulled in a straight line.

Consideration should be given to the use pipe rollers when pulling the insertion pipe over footpaths and roadways, this will help to minimise the abrasion and scoring to the polyethylene pipe and help to reduce the frictional resistance associated with insertion.

Where polyethylene pipes are pulled through existing metallic mains, cleaning the bore of the metallic main will help provide a smooth surface for the polyethylene liner pipe to pass over, therefore helping to minimise damage to the insertion pipe whilst reducing the tensile force required for installation.

The Following tables should be considered as general guidance values, Radius Systems will be pleased to project specific guidance on request.

BS EN 12201-2 - PE100 Maximum Pull Duration 30 minutes Maximum Material Temperature <=20°C				
Outside Diameter (mm)	SDR (-)	Maximum Tensile Force (newton)	Maximum Tensile Force (Kilonewton)	Maximum Tensile Force (tonnes force)
90	SDR 11	17385	17.38	1.70
110	SDR 11	25918	25.92	2.60
125	SDR 11	33565	33.57	3.40
140	SDR 11	41902	41.90	4.20
160	SDR 11	55020	55.02	5.60
180	SDR 11	69539	69.54	7.00
200	SDR 11	85757	85.76	8.70
225	SDR 11	108655	108.66	11.00
250	SDR 11	133730	133.73	13.60
280	SDR 11	167608	167.61	17.00
315	SDR 11	212297	212.30	21.60
355	SDR 11	269397	269.40	27.40
400	SDR 11	342179	342.18	34.80
450	SDR 11	433667	433.67	44.20
500	SDR 11	534920	534.92	54.50
560	SDR 11	670434	670.43	68.30
630	SDR 11	849186	849.19	86.50

Table 1. Maximum tensile force for SDR11 PE100 pipes manufactured from materials approved to BS EN 12201, when applied for a duration not exceeding 30 minutes and for a pipe material temperature not exceeding 20°C.

BS EN 12201-2 - PE100 Maximum Pull Duration 30 minutes Maximum Material Temperature <=20°C				
Outside Diameter (mm)	SDR (-)	Maximum Tensile Force (newton)	Maximum Tensile Force (Kilonewton)	Maximum Tensile Force (tonnes force)
90	SDR 17	11840	11.84	1.20
110	SDR 17	17688	17.69	1.80
125	SDR 17	22555	22.56	2.20
140	SDR 17	28331	28.33	2.80
160	SDR 17	37056	37.06	3.70
180	SDR 17	46951	46.95	4.70
200	SDR 17	58015	58.01	5.90
225	SDR 17	73489	73.49	7.40
250	SDR 17	90220	90.22	9.10
280	SDR 17	113326	113.33	11.50
315	SDR 17	143607	143.61	14.60
355	SDR 17	182601	182.60	18.60
400	SDR 17	231146	231.15	23.50
450	SDR 17	292930	292.93	29.80
500	SDR 17	362022	362.02	36.90
560	SDR 17	453302	453.30	46.20
630	SDR 17	574430	574.43	58.50

Table 2. Maximum tensile force for SDR17 PE100 pipes manufactured from materials approved to BS EN 12201, when applied for a duration not exceeding 30 minutes and for a pipe material temperature not exceeding 20°C.

BS EN 12201-2 - PE100 Maximum Pull Duration 30 minutes Maximum material temperature <=20°C				
Outside Diameter (mm)	SDR (-)	Maximum Tensile Force (newton)	Maximum Tensile Force (Kilonewton)	Maximum Tensile Force (tonnes force)
90	SDR 21	9551	9.55	0.90
110	SDR 21	14382	14.38	1.40
125	SDR 21	18506	18.51	1.80
140	SDR 21	23148	23.15	2.30
160	SDR 21	30394	30.39	3.00
180	SDR 21	38204	38.20	3.80
200	SDR 21	47374	47.37	4.80
225	SDR 21	59958	59.96	6.10
250	SDR 21	73436	73.44	7.40
280	SDR 21	92591	92.59	9.40
315	SDR 21	116632	116.63	11.80
355	SDR 21	148093	148.09	15.10
400	SDR 21	188559	188.56	19.20
450	SDR 21	238777	238.78	24.30
500	SDR 21	294917	294.92	30.00
560	SDR 21	369051	369.05	37.60
630	SDR 21	466527	466.53	47.50

Table 3. Maximum tensile force for SDR21 PE100 pipes manufactured from materials approved to BS EN 12201, when applied for a duration not exceeding 30 minutes and for a pipe material temperature not exceeding 20°C.