

# MINIMUM RESTRAINING LENGTH (m) TABLE

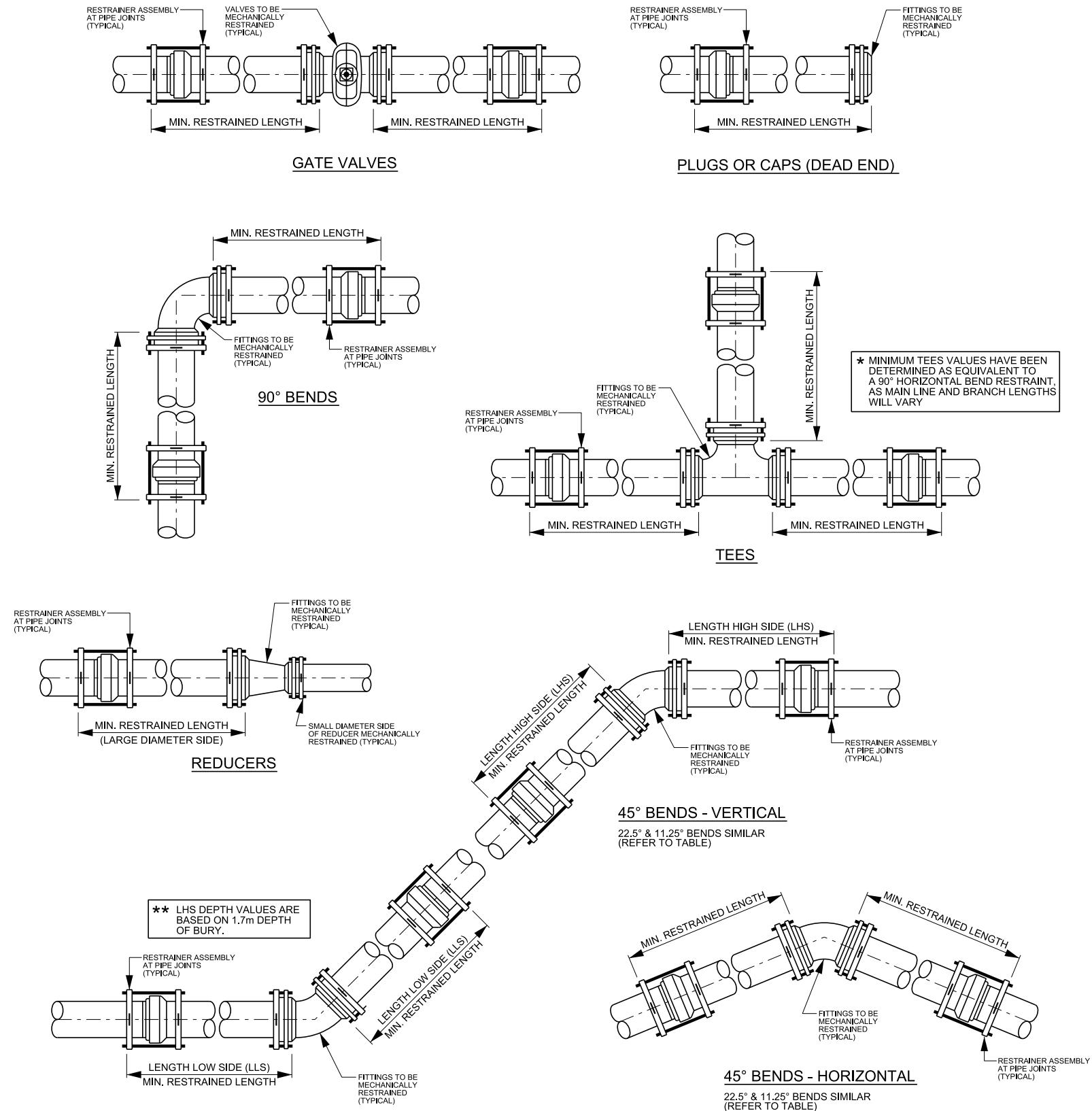
DESCRIPTION	PIPE DIAMETER (mm)					
	100 Ø	150 Ø	200 Ø	250 Ø	300 Ø	400 Ø
<b>VALVES, DEAD ENDS, CAPS, PLUGS</b> Either side of valves and before caps or plugs	7.5	10.5	13.5	16.0	19.0	24.5
<b>TEES *</b> Size on size or reducing tees	3.0	3.5	4.5	5.5	12.5 (a)	12.5 (a)
<b>HORIZONTAL BENDS</b>						
11.25° bends	0.5	0.5	1.0	1.0	1.0	1.0
22.5° bends	1.0	1.0	1.5	1.5	1.5	1.5
45° bends	1.5	1.5	2.0	2.5	3.0	3.5
90° bends	3.0	3.5	4.5	5.5	12.5 (a)	12.5 (a)
<b>45° VERTICAL BENDS **</b>						
Length High Side - LHS (Based on 1.7m cover)	3.5	4.5	6.0	7.0	8.0	10.5
Length Low Side - LLS (Depth greater than or equal to 1.7m)	1.5	1.5	2.0	2.5	3.0	3.5
<b>22.5° &amp; 11.25° VERTICAL BENDS **</b>						
Length High Side - LHS (Based on 1.7m cover)	1.5	2.5	3.0	3.5	4.0	5.0
Length Low Side - LLS (Depth greater than or equal to 1.7m)	1.0	1.0	1.5	1.5	1.5	2.0
<b>REDUCERS</b>						
SMALL DIAMETER SIDE (mm)	LARGE DIAMETER SIDE (mm)					
	100 Ø	150 Ø	200 Ø	250 Ø	300 Ø	400 Ø
100 Ø	n/a	5.5	10.0	13.0	16.5	23.0
150 Ø	n/a	n/a	6.0	10.0	14.0	21.0
200 Ø	n/a	n/a	n/a	5.5	10.5	18.0
250 Ø	n/a	n/a	n/a	n/a	6.0	15.0
300 Ø	n/a	n/a	n/a	n/a	n/a	10.5
400 Ø	n/a	n/a	n/a	n/a	n/a	n/a

TABLE VALUES BASED UPON EBAA 'CL (Granular)' SOIL TYPES (Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays - backfilled with granular material)

(a) 300 Ø AND 400Ø PIPE DIAMETER TABLE VALUES FOR 90° BENDS AND TEES HAVE BEEN INCREASED TO 12.5m MINIMUM LENGTHS.

## NOTE

- BLOCKING IS NOT PERMITTED ON NEW INSTALLATIONS.
- TABLE VALUES ARE BASED UPON PVC PIPE MANUFACTURER'S RECOMMENDED MINIMUM RESTRAINING LENGTHS FOR FITTINGS AND VALVES.
- TABLE CALCULATION PARAMETERS ARE BASED UPON A SAFETY FACTOR OF 1.5 TO 1, WITH A TYPE '5' TRENCH AND A TEST PRESSURE OF 1035kPa (150p.s.i.) AT 1.7m DEPTH OF BURY. INSTALLATION DEPTH LESS THAN 1.7m REQUIRES ADDITIONAL RESTRAINT LENGTH, TO BE DETERMINED BY THE ENGINEER.
- MINIMUM RESTRAINED PIPE LENGTHS LISTED ARE INTENDED TO ADDRESS PVC PIPE INSTALLATIONS UNDER NORMAL CONDITIONS WITH GRANULAR 'D' (LIMESTONE SCREENING, COLOUR TO BE BETWEEN LIGHT GREY TO WHITE) BEDDING MATERIAL WITH A MINIMUM 1.7m DEPTH OF COVER.
- REFER TO PLAN AND PROFILE DESIGN DRAWINGS, WHICH INDICATE PROJECT SPECIFIC MINIMUM RESTRAINED PIPE LENGTHS. THE DESIGN DRAWINGS WILL TAKE PRECEDENCE OVER THIS STANDARD DRAWING IN THE CASE WHERE THE RESTRAINED LENGTHS ARE GREATER THAN THE TABLE VALUES SHOWN.
- SHOP DRAWINGS ARE REQUIRED FOR THE FOLLOWING SOILS CONDITIONS:
  - DEPTH OF BURY LESS THAN 1.7m
  - CRITICAL INSTALLATIONS REQUIRING A HIGHER SAFETY FACTOR THAN 1.5 TO 1
  - SOILS WITH SPT 'N' < 12 OR Su < 70kPa (PER GEOTECHNICAL REPORT)
  - EMBANKMENT CONDITION
  - FILL SOILS AT BASE OF TRENCH
  - ORGANIC SOILS BELOW INVERT
  - TRENCH CONDITIONS REQUIRING ACTIVE DEWATERING
  - ANY OTHER SEVERE SOIL OR PROJECT SPECIFIC CONDITIONS NOT COVERED IN TABLE
- SHOP DRAWINGS ARE REQUIRED FOR ALL INSTALLATIONS WITH PIPE DIAMETER EQUAL TO AND GREATER THAN 400mm (AWWA C905).
- ALL PIPING, FITTINGS, VALVES, APPURTENANCES AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.



**Region of Peel**  
Working for you

**PUBLIC WORKS**  
STANDARD DRAWING

REV. DATE: APRIL 2014

APPROVED BY

A.P.

STD. DWG. NUMBER

**1-5-9**

DRAWN BY

**AINLEY GROUP**

SCALE

**N.T.S.**

**TYPICAL MECHANICAL THRUST RESTRAINT FOR PVC PIPE**