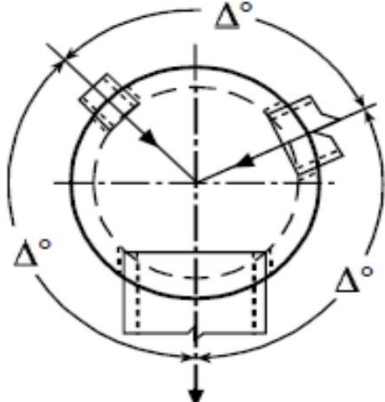


Allowable Angles in Round Manholes for Ductile Iron Pipe using ASTM C923 Connectors

MH Dia	Allowable Angle								
	Pipe ID (inches)	6	8	10	12	14	18	20	24
48	Opening	12	12	16	16	20	24	24	28
	6	12	39						
	8	12	39	39					
	10	16	49	49	54				
	12	16	49	49	54	54			
	14	20	54	54	59	59	64		
	18	24	59	59	64	64	69	75	
	20	24	59	59	64	64	69	75	75
	24	28	70	70	75	75	80	85	85

MH Dia	Allowable Angle									
	Pipe ID (inches)	6	8	10	12	14	18	20	24	30
60	Opening	12	12	16	16	20	24	24	28	34
	6	12	31							
	8	12	31	31						
	10	16	39	39	43					
	12	16	39	39	43	43				
	14	20	43	43	47	47	51			
	18	24	47	47	51	51	55	59		
	20	24	47	47	51	51	55	59	59	
	24	28	55	55	59	59	63	67	67	71
	30	34	62	62	66	66	70	74	74	78



Equations:

$A_o = \text{asin} (O_{po} / ID_m)$
 $A_i = \text{asin} (O_{pi} / ID_m)$
 $A_c = \text{Clear Cir} / ID_m / \pi \times 360$
 $\text{MinAng} = A_o + A_i + A_c$

Notes:

Allowable angles shown based upon Ductile Iron Pipe in ASTM C923 Flexible Pipe Connectors with 4" minimum clear for 48" - 72" manholes and 8" clear for 84" - 126" manholes with matching centerlines. Vertical separation may allow smaller angles. Local jurisdictions may require larger angles between pipe openings or larger manholes than shown.

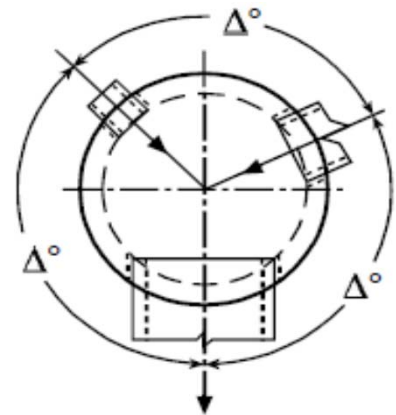
Allowable Angles in Round Manholes for Ductile Iron Pipe using ASTM C923 Connectors

MH Dia	Allowable Angle											
	Pipe ID (inches)	6	8	10	12	14	18	20	24	30	36	
72	Opening	12	12	16	16	20	24	24	28	34	42	
	6	12	26									
	8	12	26	26								
	10	16	32	32	36							
	12	16	32	32	36	36						
	14	20	36	36	39	39	42					
	18	24	39	39	42	42	46	49				
	20	24	39	39	42	42	46	49	49			
	24	28	46	46	49	49	52	56	56	59		
	30	34	51	51	54	54	58	61	61	64	70	
	36	42	59	59	62	62	65	68	68	72	77	85

MH Dia	Allowable Angle												
	Pipe ID (inches)	6 - 8	10 - 12	14	18	20	24	30	36	42	48	54	
84	Opening	12	16	20	24	24	28	34	42	48	54	60	
	6 or 8	12	28										
	10 or 12	16	31	33									
	14	20	33	36	39								
	18	24	36	39	42	45							
	20	24	36	39	42	45	45						
	24	28	39	42	45	47	47	50					
	30	34	44	46	49	52	52	55	59				
	36	42	50	52	55	58	58	61	65	71			
	42	48	54	57	60	63	63	66	70	76	81		
	48	54	60	62	65	68	68	71	75	81	86	91	
	54	60	65	68	71	74	74	76	81	87	92	97	103

Equations:

$A_o = \text{asin} (O_{po} / ID_m)$
 $A_i = \text{asin} (O_{pi} / ID_m)$
 $A_c = \text{Clear Cir} / ID_m / \pi \times 360$
 $\text{MinAng} = A_o + A_i + A_c$



Notes:

Allowable angles shown based upon Ductile Iron Pipe in ASTM C923 Flexible Pipe Connectors with 4" minimum clear for 48" - 72" manholes and 8" clear for 84" - 126" manholes with matching centerlines. Vertical separation may allow smaller angles. Local jurisdictions may require larger angles between pipe openings or larger manholes than shown.

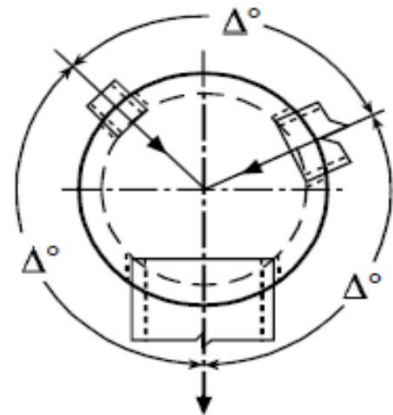
Allowable Angles in Round Manholes for Ductile Iron Pipe using ASTM C923 Connectors

MH Dia	Allowable Angle													
	Pipe ID (inches)	6 - 8	10	12	14	18	20	24	30	36	42	48	54	
96	Opening	12	16	16	20	24	24	28	34	42	48	54	60	
	6 or 8	12	24											
	10	16	27	29										
	12	16	27	29	29									
	14	20	29	32	32	34								
	18	24	32	34	34	37	39							
	20	24	32	34	34	37	39	39						
	24	28	34	37	37	39	41	41	44					
	30	34	38	40	40	43	45	45	48	52				
	36	42	43	46	46	48	50	50	53	57	62			
	42	48	47	50	50	52	55	55	57	61	66	70		
	48	54	51	54	54	56	59	59	61	65	70	74	79	
	54	60	56	58	58	61	63	63	66	69	75	79	83	87

MH Dia	Allowable Angle													
	Pipe ID (inches)	6 - 8	10	12	14	18	20	24	30	36	42	48	54	
108	Opening	12	16	16	20	24	24	28	34	42	48	54	60	
	6 or 8	12	22											
	10	16	24	26										
	12	16	24	26	26									
	14	20	26	28	28	30								
	18	24	28	30	30	32	35							
	20	24	28	30	30	32	35	35						
	24	28	30	33	33	35	37	37	39					
	30	34	34	36	36	38	40	40	42	46				
	36	42	38	40	40	43	45	45	47	50	55			
	42	48	42	44	44	46	48	48	50	54	58	62		
	48	54	45	48	48	50	52	52	54	57	62	65	69	
	54	60	49	51	51	53	56	56	58	61	66	69	73	76

Equations:

$A_o = \text{asin} (O_{po} / ID_m)$
 $A_i = \text{asin} (O_{pi} / ID_m)$
 $A_c = \text{Clear Cir} / ID_m / \text{PI} \times 360$
 $\text{MinAng} = A_o + A_i + A_c$



Notes:

Allowable angles shown based upon Ductile Iron Pipe in ASTM C923 Flexible Pipe Connectors with 4" minimum clear for 48" - 72" manholes and 8" clear for 84" - 126" manholes with matching centerlines. Vertical separation may allow smaller angles. Local jurisdictions may require larger angles between pipe openings or larger manholes than shown.

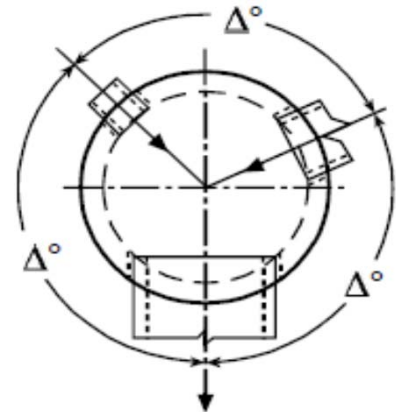
Allowable Angles in Round Manholes for Ductile Iron Pipe using ASTM C923 Connectors

MH Dia	Allowable Angle												
	Pipe ID (inches)	6 - 8	10	12	14	18	20	24	30	36	42	48	54
120	Opening	12	16	16	20	24	24	28	34	42	48	54	60
	6 or 8	12	20										
	10	16	22	23									
	12	16	22	23	23								
	14	20	23	25	25	27							
	18	24	25	27	27	29	31						
	20	24	25	27	27	29	31	31					
	24	28	27	29	29	31	33	33	35				
	30	34	30	32	32	34	36	36	38	41			
	36	42	34	36	36	38	40	40	42	45	49		
	42	48	37	39	39	41	43	43	45	48	52	55	
	48	54	41	43	43	44	46	46	48	51	55	58	62
	54	60	44	46	46	48	50	50	52	55	59	62	65

MH Dia	Allowable Angle												
	Pipe ID (inches)	6 - 8	10	12	14	18	20	24	30	36	42	48	54
126	Opening	12	16	16	20	24	24	28	34	42	48	54	60
	6 or 8	12	19										
	10	16	21	22									
	12	16	21	22	22								
	14	20	22	24	24	26							
	18	24	24	26	26	28	30						
	20	24	24	26	26	28	30	30					
	24	28	26	28	28	30	32	32	33				
	30	34	29	31	31	33	34	34	36	39			
	36	42	33	35	35	36	38	38	40	43	47		
	42	48	36	37	37	39	41	41	43	46	50	53	
	48	54	39	40	40	42	44	44	46	49	53	56	59
	54	60	42	44	44	45	47	47	49	52	56	59	62

Equations:

$A_o = \text{asin} (O_{po} / ID_m)$
 $A_i = \text{asin} (O_{pi} / ID_m)$
 $A_c = \text{Clear Cir} / ID_m / \pi \times 360$
 $\text{MinAng} = A_o + A_i + A_c$



Notes:

Allowable angles shown based upon Ductile Iron Pipe in ASTM C923 Flexible Pipe Connectors with 4" minimum clear for 48" - 72" manholes and 8" clear for 84" - 126" manholes with matching centerlines. Vertical separation may allow smaller angles. Local jurisdictions may require larger angles between pipe openings or larger manholes than shown.