AMP-Arched Mesh Pipe- Underground Drainage

Design and Installation Technical Information

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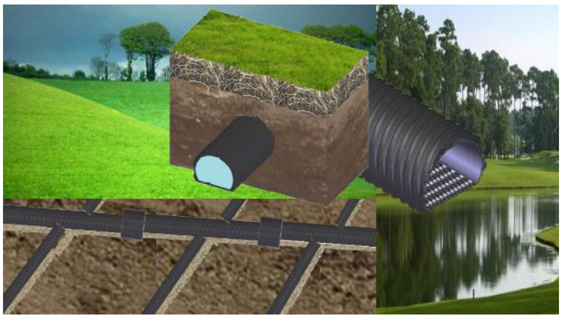


ECO-MESH
Water Solution

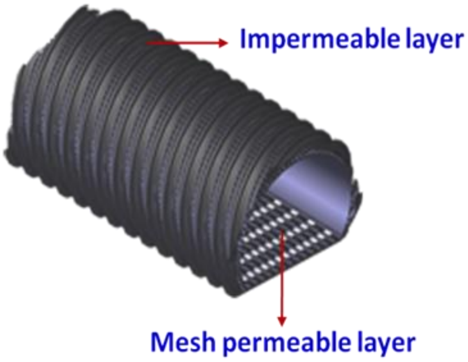
A. AMP-Arched Mesh Pipe Description

A-1. What Is the AMP-Arched Mesh Pipe ?

Subsoil drainage pipe is used to remove excess ground water.
AMP-Arched Mesh Pipe is a new type of drainage pipe that remains clog free without requiring additional filter material.

AMP-Arched Mesh Pipe Structure

The half-moon type is an impermeable layer, and the flat part is a mesh-permeable layer.



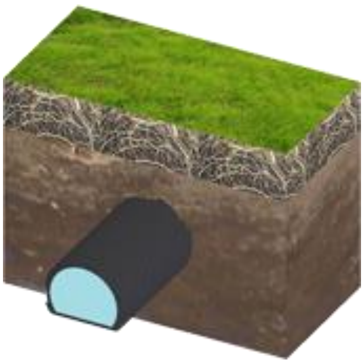
A-2. AMP-Arched Mesh Pip drainage features

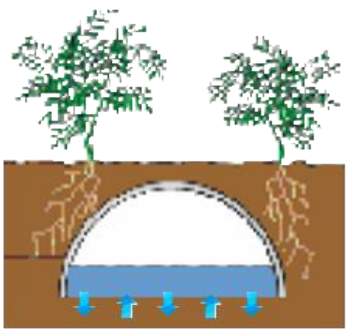
Traditional subsoil drainage pipe installations require additional excavation to surround the pipe with gravel to provide sufficient drainage and the addition of filter material to prevent pipe blockages.

Traditional Underground Drainage Pipe

Traditional Installation Method

"AMP-Arched Mesh Pipe" is impermeable on the upper arched surface and permeable on the lower surface. Soil particles sink through the permeable layer due gravity rather than traveling with the water into the aqueduct.
"AMP-Arched Mesh Pipe" remains clog resistant and prevents drainage pipe blockage without requiring gravel installation or filter coatings.





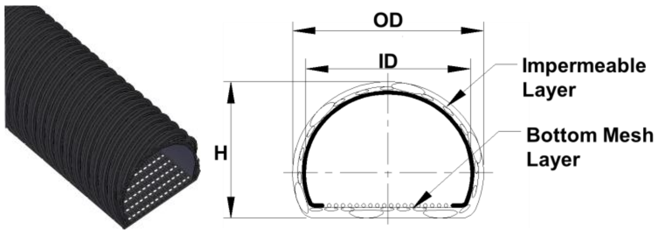
AMP-Arched Mesh Pipe does not need to use filter materials to eliminate saturated water in the soil. Mesh pipe does not block, and ecological engineering construction is the best underground drainage material.

A-3. AMP-Arched Mesh Pipe Physical indicators

Inspection project	unit	Test method	Standard
Density	g/cm^3	ASTM 0792-13	＞ 0.940
Elongation	%	ASTM D638-14	＞ 300
Tensile strength	Kgf/cm^2	ASTM D638-14	＞ 180
Compressive strength (10% deformation)	Kgf/m	ASTM D2412	＞ 180

A-4. AMP-Arched Mesh Pipe Specifications

AMP-Arched Mesh Pipe Specifications



Size		ID*OD*H	Pitch	Length
Diameter	**Code**	**±3.0%mm**	**±3.0%mm**	**m**
2"	HPT-50A	50*62*54	11.5mm	5m
2½"	HPT-65A	63*76*70	12.5mm	5m
3"	HPT-75A	79*92*82	12.5mm	5m
4"	HPT-100A	96*114*94	12.5mm	5m
6"	HPT-150A	149*167*136	14.0mm	5m
8"	HPT-200A	193*216*170	14.5mm	5m
10"	HPT-250A	239*267*197	15.0mm	5m
12"	HPT-300A	290*318*223	15.5mm	5m

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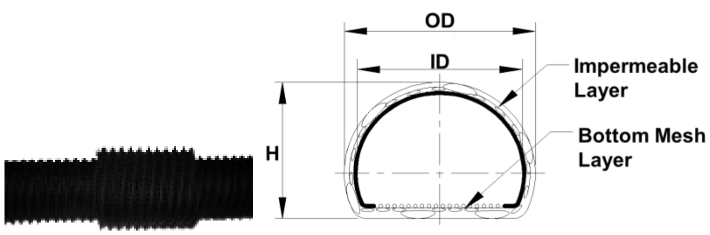
AMP-Arched Mesh Pipe straight connector specifications



Connector		ID*OD*H	Pitch	Length
Diameter	**Code**	**±3.0%mm**	**±3.0%mm**	**cm**
2"F	HPF-50A	63*76*70	12.5mm	12cm
2½"F	HPF-65A	79*92*82	12.5mm	12cm
3"F	HPF-75A	96*114*94	12.5mm	15cm
4"F	HPF-100A	112*128*112	12.5mm	20cm
6"F	HPF-150A	168*188*158	14.5mm	25cm
8"F	HPF-200A	217*240*193	14.5mm	30cm
10"F	HPF-250A	268*290*220	15.0mm	35cm
12"F	HPF-300A	320*344*245	15.5mm	40cm

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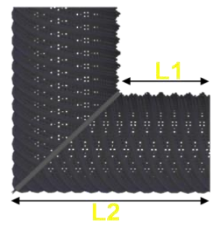
AMP-Arched Mesh Pipe Profiled joints Specifications

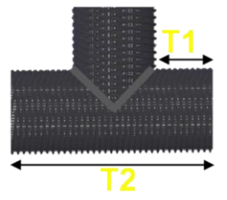
AMP-Arched Mesh Pipe L-connector Specifications

Size		ID*OD*H	Pitch	L1	L2
Diameter	Code	±3.0%mm	±3.0%mm	mm	mm
2"F	HPF-50L	63*76*70	12.5mm	72	148
2½"F	HPF-65L	79*92*82	12.5mm	72	161
3"F	HPF-75L	96*114*94	12.5mm	90	195
4"F	HPF-100L	112*128*112	12.5mm	120	250
6"F	HPF-150L	168*188*158	14.5mm	150	333
8"F	HPF-200L	217*240*193	14.5mm	180	420
10"F	HPF-250L	268*290*220	15.0mm	210	500
12"F	HPF-300L	320*344*245	15.5mm	240	584



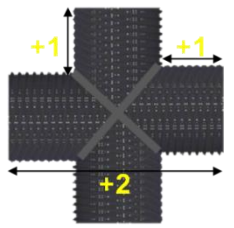
AMP-Arched Mesh Pipe T-connector Specifications

Size		ID*OD*H	Pitch	T1	T2
Diameter	Code	±3.0%mm	±3.0%mm	mm	mm
2"F	HPF-50T	63*76*70	12.5mm	72	220
2½"F	HPF-65T	79*92*82	12.5mm	72	233
3"F	HPF-75T	96*114*94	12.5mm	90	285
4"F	HPF-100T	112*128*112	12.5mm	120	370
6"F	HPF-150T	168*188*158	14.5mm	150	483
8"F	HPF-200T	217*240*193	14.5mm	180	600
10"F	HPF-250T	268*290*220	15.0mm	210	710
12"F	HPF-300T	320*344*245	15.5mm	240	824



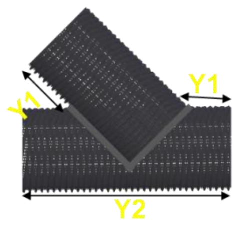
AMP-Arched Mesh Pipe +-connector Specifications

Size		ID*OD*H	Pitch	+1	+2
Diameter	Code	±3.0%mm	±3.0%mm	mm	mm
2"F	HPF-50+	63*76*70	12.5mm	72	220
2½"F	HPF-65+	79*92*82	12.5mm	72	233
3"F	HPF-75+	96*114*94	12.5mm	90	285
4"F	HPF-100+	112*128*112	12.5mm	120	370
6"F	HPF-150+	168*188*158	14.5mm	150	483
8"F	HPF-200+	217*240*193	14.5mm	180	600
10"F	HPF-250+	268*290*220	15.0mm	210	710
12"F	HPF-300+	320*344*245	15.5mm	240	824



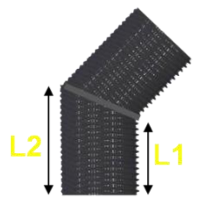
AMP-Arched Mesh Pipe Y-connector Specifications

Size		ID*OD*H	Pitch	Y1	Y2
Diameter	Code	±3.0%mm	±3.0%mm	mm	mm
2"F	HPF-50Y	63*76*70	12.5mm	72	251
2½"F	HPF-65Y	79*92*82	12.5mm	72	270
3"F	HPF-75Y	96*114*94	12.5mm	90	328
4"F	HPF-100Y	112*128*112	12.5mm	120	424
6"F	HPF-150Y	168*188*158	14.5mm	150	559
8"F	HPF-200Y	217*240*193	14.5mm	180	699
10"F	HPF-250Y	268*290*220	15.0mm	210	830
12"F	HPF-300Y	320*344*245	15.5mm	240	966



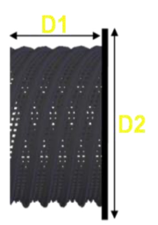
AMP-Arched Mesh Pipe L45^0-connector Specifications

Size		ID*OD*H	Pitch	L45-1	L45-2
Diameter	Code	±3.0%mm	±3.0%mm	mm	mm
2"F	HPF-50L45	63*76*70	12.5mm	72	103
2½"F	HPF-65L45	79*92*82	12.5mm	72	109
3"F	HPF-75L45	96*114*94	12.5mm	90	133
4"F	HPF-100L45	112*128*112	12.5mm	120	174
6"F	HPF-150L45	168*188*158	14.5mm	150	226
8"F	HPF-200L45	217*240*193	14.5mm	180	279
10"F	HPF-250L45	268*290*220	15.0mm	210	330
12"F	HPF-300L45	320*344*245	15.5mm	240	382



AMP-Arched Mesh Pipe D-plug Specifications

Size		ID*OD*H	Pitch	D1
Diameter	Code	±3.0%mm	±3.0%mm	mm
2"F	HPF-50D	63*76*70	12.5mm	72
2½"F	HPF-65D	79*92*82	12.5mm	72
3"F	HPF-75D	96*114*94	12.5mm	90
4"F	HPF-100D	112*128*112	12.5mm	120
6"F	HPF-150D	168*188*158	14.5mm	150
8"F	HPF-200D	217*240*193	14.5mm	180
10"F	HPF-250D	268*290*220	15.0mm	210
12"F	HPF-300D	320*344*245	15.5mm	240



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B. AMP-Arched Mesh Pipe Underground Penetration & Drainage Design Guide

B-1. AMP-Arched Mesh Pipe Drainage Capacity

AMP-Arched Mesh Pipe Theoretical Drainage Capacity

Flow rate $V = \frac{1}{n} R^{2/3} S^{1/2}$ Flow volume $Q = A \frac{1}{n} R^{2/3} S^{1/2}$ (=A x V)	V : Flow rate (m/sec) Q : Flow volume (m^3/sec) D : Pipe diameter (m) n : Roughness coefficient R : Hydraulic radius (m) *S* : Hydraulic slope (%) A : Sectional area of the flow (m^2)

AMP-Arched Mesh Pipe flow rate calculation table (non-full flow d)

Flow volume (m^3/sec) $$Q = \frac{1}{n} \times R^{\frac{2}{3}} \times S^{\frac{1}{2}} \times A = \frac{1}{n} \times r^{\frac{8}{3}} \times S^{\frac{1}{2}} \times \alpha$$

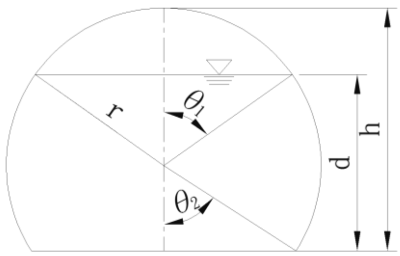
Flow rate (m/sec) $$V = \frac{1}{n} \times R^{\frac{2}{3}} \times S^{\frac{1}{2}} = \frac{1}{n} \times r^{\frac{2}{3}} \times S^{\frac{1}{2}} \times \beta$$

其中 $$\alpha = \frac{(\pi-\theta_1-\theta_2+\sin\theta_1\cos\theta_1+\sin\theta_2\cos\theta_2)^{\frac{5}{3}}}{(2(\pi-\theta_1-\theta_2+\sin\theta_2))^{\frac{2}{3}}} \quad \beta =$$

$$\frac{(\pi-\theta_1-\theta_2+\sin\theta_1\cos\theta_1+\sin\theta_2\cos\theta_2)^{\frac{2}{3}}}{(2(\pi-\theta_1-\theta_2+\sin\theta_2))^{\frac{2}{3}}}$$

AMP-Arched Mesh Pipe αβ comparison table of different water depth ratios

d/h	2"		3"		4"		6"		8"	
	α	β	α	β	α	β	α	β	α	β
0.50	0.958	0.611	0.904	0.597	0.896	0.594	0.932	0.604	0.836	0.579
0.55	1.095	0.631	1.029	0.616	1.019	0.614	1.062	0.624	0.949	0.597
0.60	1.229	0.648	1.151	0.632	1.139	0.630	1.190	0.640	1.058	0.613
0.65	1.358	0.662	1.268	0.645	1.255	0.642	1.313	0.653	1.163	0.625
0.70	1.479	0.672	1.378	0.654	1.363	0.652	1.429	0.663	1.261	0.634
0.75	1.589	0.678	1.477	0.660	1.461	0.658	1.533	0.669	1.349	0.639
0.80	1.684	0.680	1.562	0.662	1.545	0.660	1.623	0.671	1.424	0.641
0.85	1.759	0.678	1.629	0.660	1.610	0.657	1.694	0.669	1.483	0.639
0.90	1.807	0.669	1.670	0.651	1.651	0.649	1.738	0.660	1.519	0.631
0.95	1.814	0.652	1.676	0.635	1.656	0.632	1.744	0.644	1.523	0.615
1	1.691	0.598	1.563	0.583	1.546	0.581	1.627	0.591	1.422	0.566



Q= Flow volume (m^3/sec)

r=Pipe radius (m)

n= Roughness coefficient

S= Hydraulic slope

V= Flow rate (m/sec)

a AMP-Arched Mesh Pipe theory (maximum) displacement (S=1) (d/h=0.95)		
Pipe diameter	ID (mm)	Theoretical displacement (m^3/sec)
2"	47	0.0064
3"	74	0.0158
4"	98	0.0327
6"	148	0.1038
8"	197	0.1916

b Hydraulic slope comparison table Hydraulic slope (S→S1/2)			
S	$S^{1/2}$	*S*	$S^{1/2}$
1/50	0.1414	1/500	0.0447
1/100	0.1000	1/600	0.0408
1/200	0.0707	1/800	0.0354
1/250	0.0632	1/900	0.0333
1/300	0.0577	1/1000	0.0316
1/400	0.0500		

Maximum displacement =(a) Theoretical displacement x (b) $S^{1/}$

AMP-Arched Mesh Pipe Flow Rate and Flow Volume

AMP-Arched Mesh Pipe Flow Rate & Flow Volume (water depth d / Pipe diameter high h = 0.6 non-full flow) roughness coefficient n = 0.015

Size	Slope	1/50	1/100	1/200	1/250	1/300	1/400	1/500	1/600	1/700	1/800	1/900	1/1000
2"	Flow rate m/sec	0.52	0.37	0.26	0.23	0.21	0.18	0.16	0.15	0.14	0.13	0.12	0.12
	Flow Volume L/sec	0.61	0.43	0.31	0.27	0.25	0.22	0.19	0.18	0.16	0.15	0.14	0.14
3"	Flow rate m/sec	0.65	0.46	0.32	0.29	0.27	0.23	0.21	0.19	0.17	0.16	0.15	0.15
	Flow Volume L/sec	1.53	1.08	0.77	0.69	0.63	0.54	0.48	0.44	0.41	0.38	0.36	0.34
4"	Flow rate m/sec	0.78	0.55	0.39	0.35	0.32	0.28	0.25	0.22	0.21	0.19	0.18	0.17
	Flow Volume L/sec	3.18	2.25	1.59	1.42	1.30	1.12	1.01	0.92	0.85	0.79	0.75	0.71
6"	Flow rate m/sec	1.04	0.74	0.52	0.47	0.43	0.37	0.33	0.30	0.28	0.26	0.25	0.23
	Flow Volume L/sec	10.01	7.08	5.01	4.48	4.09	3.54	3.17	2.89	2.68	2.50	2.36	2.24
8"	Flow rate m/sec	1.20	0.85	0.60	0.54	0.49	0.43	0.38	0.35	0.32	0.30	0.28	0.27
	Flow Volume L/sec	18.83	13.31	9.41	8.42	7.69	6.66	5.95	5.44	5.03	4.71	4.44	4.21
10"	Flow rate m/sec	1.36	0.96	0.68	0.61	0.56	0.48	0.43	0.39	0.36	0.34	0.32	0.30
	Flow Volume L/sec	32.02	22.64	16.01	14.32	13.07	11.32	10.13	9.24	8.56	8.01	7.55	7.16
12"	Flow rate m/sec	1.50	1.06	0.75	0.67	0.61	0.53	0.47	0.43	0.40	0.37	0.35	0.33
	Flow Volume L/sec	47.97	33.92	23.99	21.45	19.58	16.96	15.17	13.85	12.82	11.99	11.31	10.73

AMP-Arched Mesh Pipe Flow Rate & Flow Volume (water depth d / Pipe diameter high h = 0.75 non-full flow) roughness coefficient n = 0.015

Size	Slope	1/50	1/100	1/200	1/250	1/300	1/400	1/500	1/600	1/700	1/800	1/900	1/1000
2"	Flow rate m/sec	0.54	0.39	0.27	0.24	0.22	0.19	0.17	0.16	0.15	0.14	0.13	0.12
	Flow Volume L/sec	0.79	0.56	0.40	0.35	0.32	0.28	0.25	0.23	0.21	0.20	0.19	0.18
3"	Flow rate m/sec	0.68	0.48	0.34	0.30	0.28	0.24	0.21	0.20	0.18	0.17	0.16	0.15
	Flow Volume L/sec	1.97	1.39	0.98	0.88	0.80	0.70	0.62	0.57	0.53	0.49	0.46	0.44
4"	Flow rate m/sec	0.81	0.57	0.41	0.36	0.33	0.29	0.26	0.23	0.22	0.20	0.19	0.18
	Flow Volume L/sec	4.08	2.88	2.04	1.82	1.66	1.44	1.29	1.18	1.09	1.02	0.96	0.91
6"	Flow rate m/sec	1.09	0.77	0.55	0.49	0.45	0.39	0.34	0.31	0.29	0.27	0.26	0.24
	Flow Volume L/sec	12.90	9.12	6.45	5.77	5.27	4.56	4.08	3.72	3.45	3.22	3.04	2.88
8"	Flow rate m/sec	1.26	0.89	0.63	0.56	0.51	0.44	0.40	0.36	0.34	0.31	0.30	0.28
	Flow Volume L/sec	23.99	16.97	12.00	10.73	9.80	8.48	7.59	6.93	6.41	6.00	5.66	5.37
10"	Flow rate m/sec	1.42	1.01	0.71	0.64	0.58	0.50	0.45	0.41	0.38	0.36	0.34	0.32
	Flow Volume L/sec	40.62	28.72	20.31	18.17	16.58	14.36	12.85	11.73	10.86	10.16	9.57	9.08
12"	Flow rate m/sec	1.56	1.10	0.78	0.70	0.64	0.55	0.49	0.45	0.42	0.39	0.37	0.35
	Flow Volume L/sec	60.61	42.86	30.30	27.10	24.74	21.43	19.17	17.50	16.20	15.15	14.29	13.55

AMP-Arched Mesh Pipe Flow Rate & Flow Volume (water depth d / Pipe diameter high h = 0.8 non-full flow) roughness coefficient n = 0.015

Size	Slope	1/50	1/100	1/200	1/250	1/300	1/400	1/500	1/600	1/700	1/800	1/900	1/1000
2"	Flow rate m/sec	0.55	0.39	0.27	0.24	0.22	0.19	0.17	0.16	0.15	0.14	0.13	0.12
	Flow Volume L/sec	0.84	0.59	0.42	0.38	0.34	0.30	0.27	0.24	0.22	0.21	0.20	0.19
3"	Flow rate m/sec	0.68	0.48	0.34	0.30	0.28	0.24	0.22	0.20	0.18	0.17	0.16	0.15
	Flow Volume L/sec	2.08	1.47	1.04	0.93	0.85	0.74	0.66	0.60	0.56	0.52	0.49	0.47
4"	Flow rate m/sec	0.82	0.58	0.41	0.36	0.33	0.29	0.26	0.24	0.22	0.20	0.19	0.18
	Flow Volume L/sec	4.31	3.05	2.15	1.93	1.76	1.52	1.36	1.24	1.15	1.08	1.02	0.96
6"	Flow rate m/sec	1.09	0.77	0.55	0.49	0.45	0.39	0.35	0.32	0.29	0.27	0.26	0.24
	Flow Volume L/sec	13.65	9.65	6.83	6.11	5.57	4.83	4.32	3.94	3.65	3.41	3.22	3.05
8"	Flow rate m/sec	1.26	0.89	0.63	0.56	0.51	0.45	0.40	0.36	0.34	0.31	0.30	0.28
	Flow Volume L/sec	25.33	17.91	12.67	11.33	10.34	8.96	8.01	7.31	6.77	6.33	5.97	5.66
10"	Flow rate m/sec	1.43	1.01	0.71	0.64	0.58	0.50	0.45	0.41	0.38	0.36	0.34	0.32
	Flow Volume L/sec	42.83	30.29	21.42	19.16	17.49	15.14	13.55	12.37	11.45	10.71	10.10	9.58
12"	Flow rate m/sec	1.56	1.11	0.78	0.70	0.64	0.55	0.49	0.45	0.42	0.39	0.37	0.35
	Flow Volume L/sec	63.85	45.15	31.92	28.55	26.07	22.57	20.19	18.43	17.06	15.96	15.05	14.28

AMP-Arched Mesh Pipe Flow Rate & Flow Volume (water depth d / Pipe diameter high h = 1 full flow) roughness coefficient n = 0.015

Size	Slope	1/50	1/100	1/200	1/250	1/300	1/400	1/500	1/600	1/700	1/800	1/900	1/1000
2"	Flow rate m/sec	0.48	0.34	0.24	0.22	0.20	0.17	0.15	0.14	0.13	0.12	0.11	0.11
	Flow Volume L/sec	0.84	0.60	0.42	0.38	0.34	0.30	0.27	0.24	0.23	0.21	0.20	0.19
3"	Flow rate m/sec	0.60	0.42	0.30	0.27	0.24	0.21	0.19	0.17	0.16	0.15	0.14	0.13
	Flow Volume L/sec	2.08	1.47	1.04	0.93	0.85	0.74	0.66	0.60	0.56	0.52	0.49	0.47
4"	Flow rate m/sec	0.72	0.51	0.36	0.32	0.29	0.25	0.23	0.21	0.19	0.18	0.17	0.16
	Flow Volume L/sec	4.31	3.05	2.16	1.93	1.76	1.52	1.36	1.24	1.15	1.08	1.02	0.96
6"	Flow rate m/sec	0.96	0.68	0.48	0.43	0.39	0.34	0.30	0.28	0.26	0.24	0.23	0.22
	Flow Volume L/sec	13.69	9.68	6.84	6.12	5.59	4.84	4.33	3.95	3.66	3.42	3.23	3.06
8"	Flow rate m/sec	1.11	0.79	0.56	0.50	0.45	0.39	0.35	0.32	0.30	0.28	0.26	0.25
	Flow Volume L/sec	25.29	17.89	12.65	11.31	10.33	8.94	8.00	7.30	6.76	6.32	5.96	5.66
10"	Flow rate m/sec	1.26	0.89	0.63	0.56	0.51	0.45	0.40	0.36	0.34	0.31	0.30	0.28
	Flow Volume L/sec	42.70	30.19	21.35	19.09	17.43	15.10	13.50	12.33	11.41	10.67	10.06	9.55
12"	Flow rate m/sec	1.38	0.98	0.69	0.62	0.56	0.49	0.44	0.40	0.37	0.35	0.33	0.31
	Flow Volume L/sec	63.55	44.94	31.78	28.42	25.94	22.47	20.10	18.35	16.98	15.89	14.98	14.21

B-2. AMP-Arched Mesh Pipe Permeability

Water retention ability to penetrate the base configuration design value calculation

AMP-Arched Mesh Pipe theoretical water permeability

$Q_{hp} = A_{id} x k \ x \ t$

Q_{hp}：AMP-Arched Mesh Pipe theoretical water permeability

A_{id} ：AMP-Arched Mesh Pipe area

K：Soil permeability coefficient or final infiltration rate

t ：Rainfall delay reference value (s)

Soil permeability coefficient k_{Soil}

k：The soil permeability coefficient (m/s) is determined by the soil within 2 m of the surface layer. Drilling investigation should be carried out first, and the "uniform classification" of the soil within 2 m of the surface of the drilling result should be substituted into Table 13 to obtain the k value; if the drilling survey is not met without the need of drilling survey, the topsoil can be judged by experience. Possible soil quality, and substituted into Table 14 to obtain the k value.

Base final infiltration rate f

f：The final infiltration rate (m/s) of the base, the final infiltration rate refers to the value when the rainwater is absorbed by the soil at the time of rainfall. It should be infiltrated in the field or determined by the soil within 2m of the surface. . Drilling investigation should be carried out first, and the "uniform classification" of the soil within 2 m of the surface of the drilling results should be substituted into Table 13 to obtain the f value; if the drilling survey is not required according to law, the surface soil may be judged by experience. Soil quality, and substituted into Table 14 to obtain the f value.

Unified soil classification and soil final infiltration rate f and permeability coefficient k comparison table

Soil classification	Particle size D10 (mm)	Unified soil classification	Final infiltration rate*f*(m/s)	Soil permeability coefficient*k* (m/s)
Bad grade gravel	0.4	GP	10^{-3}	10^{-3}
Good grade gravel		GW	10^{-4}	10^{-4}
Mud gravel		GM		
Clay gravel		GC		
Bad grade sand		SP	10^{-5}	10^{-5}
Good grade sand	0.1	SW		
Muddy sand	0.01	SM	10^{-6}	10^{-7}
Clay sand		SC		
Mud clay	0.005	ML	10^{-7}	10^{-8}
clay	0.001	CL		10^{-9}
High plastic clay	0.00001	CH		10^{-11}

Note: Different soils belonging to the same soil uniform classification will have errors due to the tightness and composition.
This table is based on the objective of the assessment, but its minimum value, which makes the assessment results more conservative and credible.

Soil final infiltration rate f and permeability coefficient k simple comparison table

Soil quality	sandy soil	Silt Soil	Clay Soil	High plastic clay
Final infiltration ratef (m/s)	10^{-5}	10^{-6}	10^{-7}	10^{-7}
Soil permeability coefficientK(m/s)	10^{-5}	10^{-7}	10^{-9}	10^{-11}

AMP-Arched Mesh Pipe each meter of water permeate theory

Coefficient k	Size	The bottom is not covered with sand	Laying sand on the bottom (Increase in area 20cm)
Final infiltration rate (10^{-6} m/s)	2"	0.1793 L/hr·m	0.8993 L/hr·m
	3"	0.2592 L/hr·m	0.9792 L/hr·m
	4"	0.3420 L/hr·m	1.0620 L/hr·m
	6"	0.5173 L/hr·m	1.2373 L/hr·m
	8"	0.6851 L/hr·m	1.4051 L/hr·m
Soil permeability coefficient (10^{-7} m/s)	2"	0.0179 L/hr·m	0.0899 L/hr·m
	3"	0.0259 L/hr·m	0.0979 L/hr·m
	4"	0.0342 L/hr·m	0.1062 L/hr·m
	6"	0.0517 L/hr·m	0.1237 L/hr·m
	8"	0.0685 L/hr·m	0.1405 L/hr·m

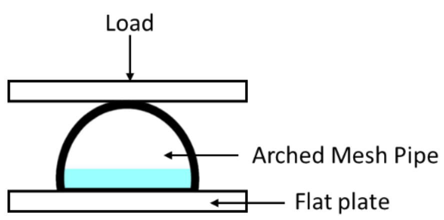
B-3. AMP-Arched Mesh Pipe Compressive strength

Compressive strength : Buried trench AMP-Arched Mesh Pipe, in addition to the vertical direction external force, but also to resist the soil pressure side

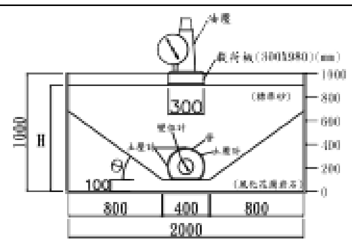
Soil pressure calculation and compressive strength

1. Soil pressure **P_1(t/m²)** Vertical Soil pressure (H=2m or less) P_1=rH Vertical Soil pressure and lateral pressure (H=2m or more) P_1=C_d*r*B Soil pressure coefficient in trench type $C_d=\frac{1}{2K\tan\phi}\left(1-e^{-2K\tan\O\frac{H}{B}}\right)$ **2.** Load **P_2(t/m²)** **P_2=α·q (1+i)** **3.** Total pressure **P(t/m²)** **P=P_1+P_2**	r (t/m3) : Soil unit volume weight Ø : Internal friction angle buried in soil K : Soil pressure coefficient K=(1-sinØ)/(1±sinØ) C_d : groove coefficient e : Natural logarithme=2.71818 α : No load groove factor I : Wheel pressure shock rate q (t) : Wheel to ground load B (m) : Ditch bottom width H (m) : Backfill depth

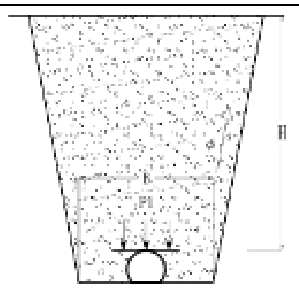
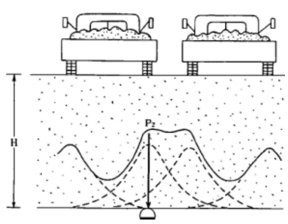
AMP-Arched Mesh Pipe vertical compression test method

	Test method: Place the Pipe between two plates and compress it at a constant speed. Pipe inner diameter reduced by 10% 20% load Compressive strength = load / bore diameter difference Standard Test for Tube Compressive Strength to ASTM D2412-02。

Compressive deformation rate test

	Pipe outer diameter deformation rate ε $\varepsilon = \frac{(D-D')}{D} X100$ D (mm) : Standard caliber D' (mm) : Pipe deformation caliber

Pipe buried backfill high Soil pressure wheel pressure reference table

	**P_1** **:** Soil pressure **ø** **:** The greater the angle of the ditch side, the greater the downward force of the Soil pressure **B** **:** The smaller the bottom area of the trench, the greater the pressure on the tube
	**H :** The deeper the depth of the buried pipe, the smaller the load on the pipe

Backfill soil pressure wheel pressure height reference table

pressure	Soil pressure P_1 (t/m³)					Wheel pressure P_2 (t/m³)				Mobile Impact P		
condition	Groove width B (m)					T-14		T-20		I	α	
Backfill H	B=0.5	B=0.8	B=1	B=1.25	B=1.5	1car	2 car	1 car	2 car	No load	1 car	2 car
0.3	0.54	B=0.5m H<2.0m， Soil pressure is only affected by soil depth				15.68	15.68	22.04	22.04	0.4	2.0	2.0
0.4	0.72					10.98	11.52	15.68	16.46		1.4	1.47
0.5	0.90					8.23	9.41	11.76	13.44		1.05	1.20
0.6	1.08					6.66	7.68	9.52	10.98		0.85	0.98
0.8	1.44					4.39	5.72	6.27	8.18		0.56	0.73
1.0	1.8					3.14	4.47	4.48	6.38		0.40	0.57
1.2	2.16					2.20	3.53	3.14	5.04		0.28	0.45
1.5	2.7					1.80	2.67	2.58	3.81		0.23	0.34
2.0	3.6					1.16	1.67	1.66	2.40	0.3	0.16	0.23
2.5	2.00	2.62	2.89	3.14	3.32	0.87	1.24	1.25	1.77		0.12	0.17
3.0	2.11	2.86	3.20	3.14	3.76	0.60	0.87	0.86	1.25	0.2	0.09	0.13

The minimum backfill height

Minimum backfill height when tube deformation rate is less than 10%

Size	AMP-Arched Mesh Pipe			
Load	T-14*2	T-20*2	T-14*1	T-20*1
2"	0.3m	0.4m		
3"	0.4m	0.5m	0.3m	0.4m
4"	0.5m	0.6m	0.3m	0.5m
6"	0.6m	0.7m	0.4m	0.5m
8"	0.7m	0.8m	0.4m	0.5m

B-4. AMP-Arched Mesh Pipe diameter and pipe inclination angle

Slope determination

The pipe inclination (water flow direction) is determined by the topography and the mesh pipe flow rate, and the slope of the pipe is designed according to the terrain condition and the slope of the surface.

Mesh pipe water flow speed range: The mesh pipe flow rate (0.2m/sec) or more can remove the deposits in the pipe, and the mesh pipe flow rate (1.0m/sec) or more may cause vibration.

AMP-Arched Mesh Pipe Piping slope requirement：

Diameter	50	65	100	150	200
Minimum piping inclination **0.2m/sec**	**1/600**	**1/850**	**1/1510**	**1/2470**	**1/3630**
Minimum pipe inclination **1.0m/sec**	**1/25**	**1/35**	**1/60**	**1/100**	**1/145**

Pipe diameter decision (main pipe)

The design of the displacement of the pipe diameter is (inlet water * safety rate).

AMP-Arched Mesh Pipe water input calculation, including rainfall, water permeability, surface drainage area of the mesh pipe, time and range of water accumulation.

Discharge calculation formula

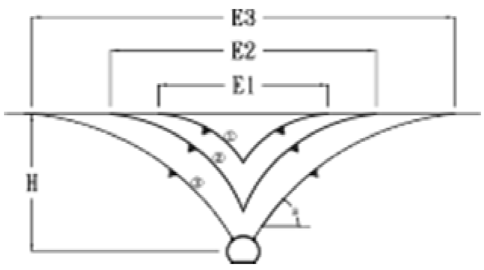
$Qt=\frac{1}{360}x(1-C)xIxAxFs$	Q_t(m²/sec) : Design displacement F_s(-) : Design safety rate I(mm/hr) : Rainfall intensity C(-) : Runoff coefficient A(ha) : Drainage area

Pipe diameter and drainage calculation

Qn=A·V $=\frac{1}{n}$ xD8/3xS1/2xα $\alpha=\frac{AR^{2/3}}{D^{8/3}}=f(\frac{h}{D})$	V(m/sec): Water flow rate inside the mesh pipe R(m) : Mesh pipe length (=D/4) *S*(-) : Hydraulic slope Q_n(m³/sec)：Flow Volume A(m²) : Sectional area of the mesh pipe D(m) : Pipe diameter (ID)

B-5. AMP-Arched Mesh Pipe Buried depth and spacing

Time variation of groundwater drainage



Groundwater surface 1 2 3 change and time relationship
Drainage pipe influence range E1 E2 E3
H : Mesh Pipe buried depth
B : Groundwater surface angle

AMP-Arched Mesh Pipe Buried depth and spacing (General design)

Soil quality	Particle size below 0.02mm weight ratio %	Mesh pipe buried depth and spacing (m)			
		0.8	1.0	1.2	1.4
Heavy clay	100~75	6.0~8.0	6.5~8.5	7.0~9.0	7.5~9.5
Ordinary clay	75~60	8.0~9.0	8.5~10.0	9.0~11.0	9.5~11.5
Clay loam	60~50	9.0~10.0	10.0~11.5	11.0~12.5	11.5~13.5
Common loam	50~40	10.0~12.5	11.5~13.0	12.5~14.5	13.5~16.0
Sandy loam	40~25	11.5~14.5	13.0~17.0	14.5~19.5	16.0~22.0
Loamy sand	25~10	14.5~18.0	17.0~22.0	19.5~26.0	22.0~30.0
Sand Soil	<10	>18.0	>22.0	>26.0	>30.0

The annual average rainfall is calculated from 600~650mm

AMP-Arched Mesh Pipe Buried depth and spacing (Purpose design)

Purpose	Soil	Depth (m)	Spacing (m)
Sportfield track	Material such as slag	0.4	3
Sportfield	Sandy soil structure	0.4	5~10
School Sportfield	Ordinary soil	0.5~1.0	8~20
Golf Course (Green)	Ordinary soil	0.4~0.8	5~15
Golf Course (Fairway)	Ordinary soil	0.5~1.2	2~20
football field	Sandy loam	0.4~1.2	3~10
Baseball field	Ordinary soil	0.5~1.0	8~20
Park square	Ordinary soil	0.5~1.0	8~20
Material yard	Ordinary soil	0.5~1.0	5~15
Courtyard	Ordinary soil	0.2~0.5	3~8

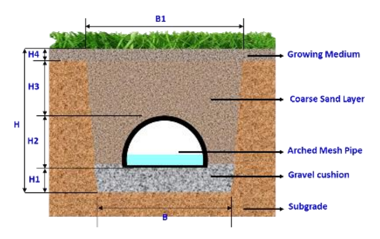
Generally, the buried pipe spacing is 10 to 15 times the depth of the buried pipe.

AMP-Arched Mesh Pipe buried depth and spacing considerations

1. The depth of the mesh pipe must be shallower than the average depth of the water table.
2. The depth of the mesh pipe must be deeper than the root depth of the plant (avoiding the net tube below the large plant).
3. In areas where water is easy to accumulate, the interval between the mesh pipe should be tighter.
4. The dry place must be kept quickly. The depth of the mesh pipe must be shallow and the interval should be dense.
5. When the permeable layer material has good water permeability, the interval between the mesh pipes can be larger.

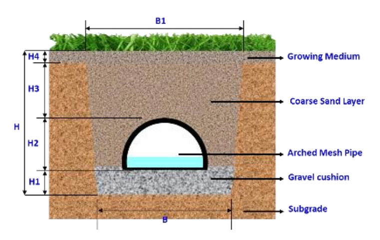
B-6. AMP-Arched Mesh Pipe Design Reference

AMP-Arched Mesh Pipe Design Reference**-** Pedestrian lane



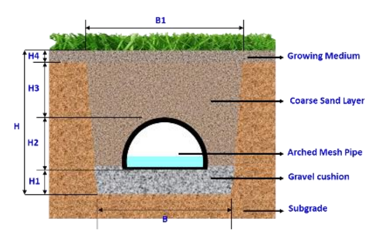
Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	43	5	8	25	5
4"	25	30	44	5	9	25	5
6"	30	35	49	5	14	25	5
8"	37	42	62	5	17	35	5
10"	45	50	65	5	20	35	5
12"	50	55	68	5	23	35	5

AMP-Arched Mesh Pipe Design Reference**-** Light load lane **(**T-20*1)



Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	53	5	8	35	5
4"	25	30	54	5	9	35	5
6"	30	35	69	5	14	45	5
8"	37	42	72	5	17	45	5
10"	45	50	85	5	20	55	5
12"	50	55	88	5	23	55	5

AMP-Arched Mesh Pipe Design Reference**-** Heavy load lane **(**T-20*2)



Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	49	5	4	35	5
3"	25	30	63	5	8	45	5
4"	25	30	74	5	9	55	5
6"	30	35	89	5	14	65	5
8"	37	42	102	5	17	75	5
10"	45	50	115	5	20	85	5
12"	50	55	128	5	23	95	5

B-7. AMP-Arched Mesh Pipe Installation specification

<u>AMP-Arched Mesh Pipe Installation specification</u>

A. AMP-Arched Mesh Pipe Characteristics

The AMP-Arched Mesh Pipe adopts a half-moon design. The half-moon type is impervious. The flat part is a mesh-shaped permeable layer. When the burial, the mesh-like permeable layer is downward, and the water flows from bottom to top into the water conduit to remove saturated rainwater from the soil. In this way, the soil particles sink the temple due to gravity, so that they do not flow into the water conduit along with the water, and at the same time, they will not cause siltation in the water conduit, and the mesh-permeable layer facing downward can both enter the water and also disperse the water. When moisture enters, the pressure difference phenomenon naturally produces a pumping effect on the moisture in the soil, and is discharged outward by gravity flow, further generating a negative pressure inside the soil, greatly increasing the drainage efficiency, and when the soil moisture is insufficient, the water can penetrate. The soil reaches the effect of water retention irrigation.

AMP-Arched Mesh Pipe is made of high-density polyethylene (HDPE), which is formed by three-dimensional threading. It has high pressure resistance and is not easy to slide. The thread is not easy to block around the mesh structure. The spiral mesh structure is light, tough and resistant. Excellent characteristics such as acid and alkali, non-corrosive, and not easy to break. AMP-Arched Mesh Pipe has no filtered water layer to hinder the drainage and drainage system. The drainage system is not blocked, saving construction costs and filter material costs. It is the best material for water retention and drainage.

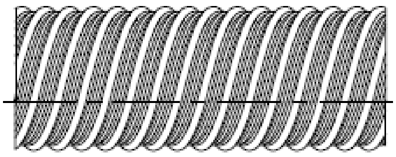
B. AMP-Arched Mesh Pipe Material：

Made of high-density polyethylene (HDPE) material, the material is tough and not easy to break, and the physical properties are as follows:

Inspection project	unit	Test method	Standard
Density	g/cm^3	ASTM 0792-13	＞ 0.940
Elongation	%	ASTM D638-14	＞ 300
Tensile strength	Kgf/cm^2	ASTM D638-14	＞ 180
Compressive strength (10% deformation)	Kgf/m	ASTM D2412	＞ 180

D. AMP-Arched Mesh Pipe Structure：

The AMP-Arched Mesh Pipe extrusion molding has a three-dimensional thread around the Pipe, and the spiral is surrounded by a mesh structure. The half-moon type is an impermeable layer, and the flat part is a mesh-shaped water-permeable layer. When the burial, the mesh-like permeable layer is downward, and the water flows from bottom to top. The water conduit, so that the soil particles do not accumulate in the water conduit.

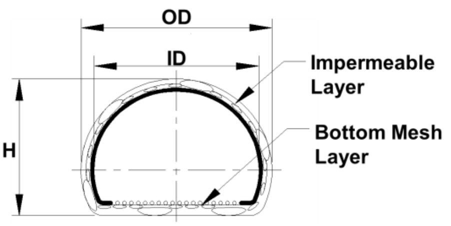


AMP-Arched Mesh Pipe FIG perspective

E. AMP-Arched Mesh Pipe Specifications :

AMP-Arched Mesh Pipe Specifications

Size	Code	ID*OD*H ±3.0%mm	Pitch ±3.0%mm	Length m
2"	HPT-50A	50*62*54	11.5mm	5m
2½"	HPT-65A	63*76*70	12.5mm	5m
3"	HPT-75A	79*92*82	12.5mm	5m
4"	HPT-100A	96*114*94	12.5mm	5m
6"	HPT-150A	149*167*136	14.0mm	5m
8"	HPT-200A	193*216*170	14.5mm	5m
10"	HPT-250A	239*267*197	15.0mm	5m
12"	HPT-300A	290*318*223	15.5mm	5m



F. AMP-Arched Mesh Pipe Connect：

AMP-Arched Mesh Pipe with standard fittings, construction faster and easier.

G. General provisions：

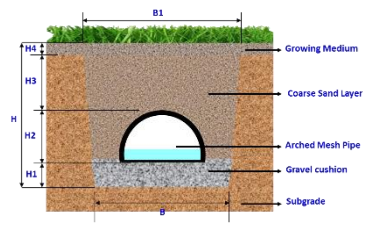
1. Before the construction, the contractor shall prepare the samples and the original catalogue together with the project plan submitted to the architect or engineering consultant for approval before construction.
2. After the completion of this project, the original manufacturer's factory certificate shall be issued by the contractor to be submitted to the architect or engineering consultant for verification.

H. Installation Steps：

1. Site preparation: Mark the construction scope clearly and properly level. The height is based on the drawing and is compacted.
2. Stakeout: Measure the exact location of the site and mark it according to the piping plan.
3. Mechanical trenching:
   - I. First excavate the position of the main pipe according to the set slope.
   - II. Re-excavate the branch pipe position and the pipe end depth is based on the dry pipe depth.
   - III. When digging trenches, if there are any debris in the square or the trench, it must be removed by manual excavation.
4. Gravel laying: After the trenching project is completed, the 5cm~10cm clear gravel is evenly laid on the bottom of the ditch. The thickness is subject to the illustration.
5. Buried permeable AMP-Arched Mesh Pipe and shallow well construction:
   - I. Firstly, the main pipe is buried in the ditch and fixed by gravel. During the construction, the pipe will be laid flat, the halfmoon type will be upward, and the plane part will be downward.
   - II. The intersection of the main pipe and the branch pipe are connected by two-way, three-way and four-way joints respectively.
   - III. When constructing the well, please make a reserved hole so that the main pipe can be inserted into the well, and then the surrounding space will be sealed with cement mortar.
6. Backfilling: The overall configuration of the main pipe and the branch pipe is completed, and the backfill is layered and is compacted.

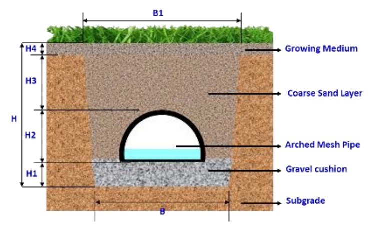
7. **AMP-Arched Mesh Pipe Design and Installation Reference**

AMP-Arched Mesh Pipe Design Reference- Pedestrian lane



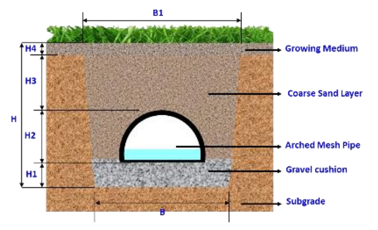
Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	43	5	8	25	5
4"	25	30	44	5	9	25	5
6"	30	35	49	5	14	25	5
8"	37	42	62	5	17	35	5
10"	45	50	65	5	20	35	5
12"	50	55	68	5	23	35	5

AMP-Arched Mesh Pipe Design Reference- Light load lane (T-20*1)



Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	53	5	8	35	5
4"	25	30	54	5	9	35	5
6"	30	35	69	5	14	45	5
8"	37	42	72	5	17	45	5
10"	45	50	85	5	20	55	5
12"	50	55	88	5	23	55	5

AMP-Arched Mesh Pipe Design Reference- Heavy load lane (T-20*2)



Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	49	5	4	35	5
3"	25	30	63	5	8	45	5
4"	25	30	74	5	9	55	5
6"	30	35	89	5	14	65	5
8"	37	42	102	5	17	75	5
10"	45	50	115	5	20	85	5
12"	50	55	128	5	23	95	5

B-9. AMP-Arched Mesh Pipe Drainage Case Study

B-9-1. Case Study: Park drainage

AMP-Arched Mesh Pipe Underground Drainage Design (promote rainwater infiltration, Groundwater recharge)
Using the AMP-Arched Mesh Pipe for expected rainfall, the rainwater can be quickly infiltrated into the ground to reduce surface runoff.

Underground drainage design condition calculation
Expected rainfall calculation formula

$Q_f = C \text{ x } I \text{ x } A$

Q_f : Expected rainfall（m^3/hr）

C ：Outflow coefficient

I ：Rainfall intensity〈mm/hr〉

A ：Base area〈m^2〉

AMP-Arched Mesh Pipe Permeability

$Q_{hp} : A_{hp} x k \text{ x } t$

Q_{hp}: AMP-Arched Mesh Pipe Permeability (m^3/hr)

A_{hp} ：AMP-Arched Mesh Pipe Water permeable area（m^2）

k ：Base soil saturated and permeability coefficient (cm/s)

t ：Rainfall delay reference value (s)。

Soil saturation coefficient k value simple comparison table

Soil quality	Sand	Loam	Clay	High plastic clay
Soil permeability coefficient K(cm/s)	10^{-3}(cm/s)	10^{-5}(cm/s)	10^{-7}(cm/s)	10^{-9}(cm/s)

"**AMP-Arched Mesh Pipe Design water permeability**" Based on the amount of penetration, plus the following various infiltration capabilities

Q_{hp} ：Arched Mesh Pip theoretical water permeability〈m^3/hr〉

α：Various influence factors〈defined as 0.864〉

α calculation method: calculated by various influence factors

$\alpha = \alpha_1 X \alpha_2 X \alpha_3 X \alpha_4$

α_1= Groundwater level〈defined as 0.9〉

α_2= Mesh blocking〈defined as 0.96〉

α_3= Water temperature of water injection〈defined as 1〉

α_4= Previous rainfall〈defined as 1〉

Case Study : Park AMP-Arched Mesh Pipe Underground Drainage

Name：OO Park

Land area：10000m^2

1. Land permeability coefficient k judgment

   There is no drilling investigation report in this case. Referring to the data of the neighboring points of the geological database, the soil layer distribution is between the poor grade sand and the argillaceous sand, and the permeability coefficient k is 10^{-5}cm/s.

2. The base rainfall assessment

   $\boldsymbol{Q_f = C \times I \times A}$

   Q_f：Expected rainfall（m^3/hr）

   C：Outflow coefficient

   I：Rainfall intensity〈50mm/hr〉

   A：Base area〈10000m^2〉

   $Q_f = 0.9 \times (50/1000)*10000 = \mathbf{450.0}$**m^3/hr**

3. Base Drainage AMP-Arched Mesh Pipe Configuration Design Value Calculation

   AMP-Arched Mesh Pipe Water permeability (m)

   $Q_{hp} = A_{id} x k \times t$

   Q_{hp}：AMP-Arched Mesh Pipe theoretical water permeability

   A_{id}：AMP-Arched Mesh Pipe ID

   k : Soil permeability coefficient k

   t : Rainfall delay reference value (s)

AMP-Arched Mesh Pipe theoretical water permeability (m)

Pipe Size	ID mm	Soil permeability coefficient K		
		10^{-3}cm/s Sand	10^{-5}cm/s Loam	10^{-7}cm/s Clay
4"	96	12.442 m^3/hr	0.1244 m^3/hr	0.001244 m^3/hr
6"	146	18.922 m^3/hr	0.1892 m^3/hr	0.001892 m^3/hr

AMP-Arched Mesh PipeActual water permeabilityα：Various influence factors〈defined as 0.864〉

Pipe Size	ID mm	Soil permeability coefficient K		
		10^{-3}cm/s Sand	10^{-5}cm/s Loam	10^{-7}cm/s Clay
4"	96	10.75m^3/hr	0.1075m^3/hr	0.001075m^3/hr
6"	146	16.35 m^3/hr	0.1635 m^3/hr	0.001635 m^3/hr

AMP-Arched Mesh Pipe design water permeability : 4" x 4000m

$Q_{hp} = A_{id} x k \times t$

Q_{hp}=(0.1075m^3/hr) *4300m=462.25m^3/hr

4. AMP-Arched Mesh Pipe design water permeability：

$Q_s = \Sigma Q_s = Q_{hp} x$ (m)

$Q_s = \Sigma Q_s$=462.25(m^3/hr)

5. Evaluation basis

The designed treatment capacity is 462.25 (m^3/hr) greater than the expected amount of rainwater 450.0m^3/hr.

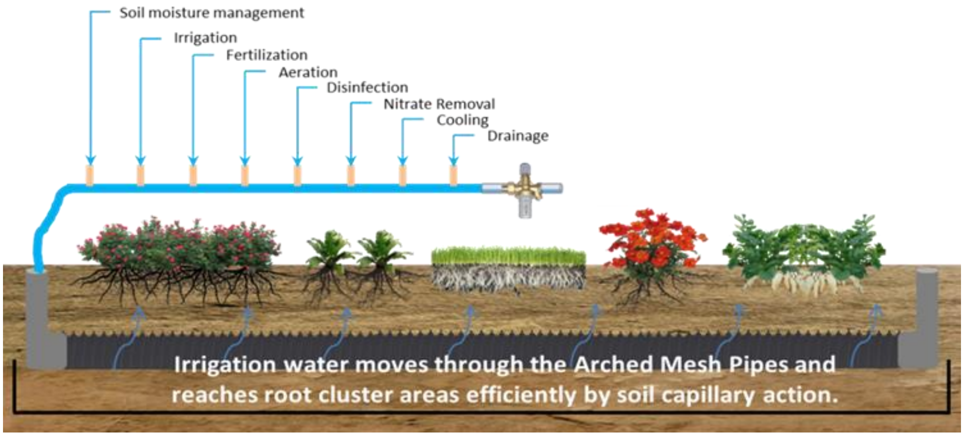
Please confirm that the result of the design process is greater than the sum of the expected rainfall Q_f=C X I X A. If it is small, the scale of the facility must be treated.

C. AMP-Arched Mesh Pipe Underground Drainage and Irrigation Application

C-1. Create a comfortable environment for the growth of plants

During a rain shower or irrigation application, the soil pores will fill with water, soil moisture content 20~30% in volume. Irrigation water moves through the AMP-Arched Mesh Pipes and reaches root cluster areas efficiently by soil capillary action. Irrigation water requirements and irrigation manpower are reduced, Plant growth increase are equivalent to reduce in fertilizer.

AMP-Arched Mesh Pipe provides soil moisture management, drainage, irrigation, fertilization, temperature control, disinfection and other functions.

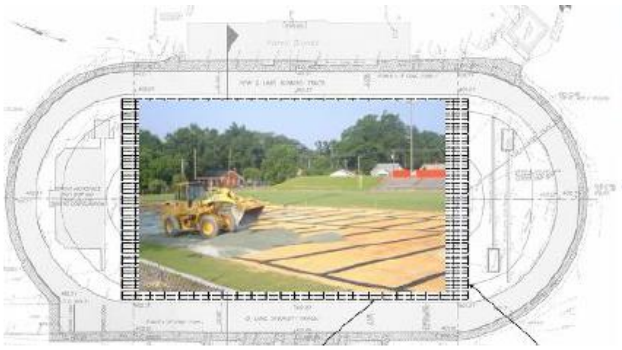


C-2. Sports field drainage & irrigation

AMP-Arched Mesh Pipe is buried directly, there is no waste soil removal problem, Drainage system does not block, save construction costs and filter costs, It is the best material for water retention and drainage in the sports field.

AMP-Arched Mesh Pipe, Permeable layer down when buried, the water flows from bottom to top into the water conduit, and the gravity phenomenon is directly used to generate the soil water separation effect. Thus, the soil particles naturally sink the temple due to gravity, and will not block the drainage layer. It will not block and lose drainage.

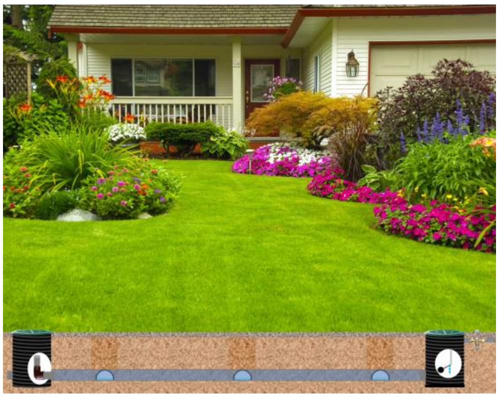
The Sportfield area is large, the watering system is difficult to set up, and the AMP-Arched Mesh Pipe can be used as a sports field irrigation system.





C-3. Landscaping drainage & irrigation

AMP-Arched Mesh Pipe combines efficient irrigation and drainage systems using non-pressurized, gravity driven, capillary physics of the growing medium via the direct interface of the AMPS subsurface irrigation pipe that remains clog resistant and material free.

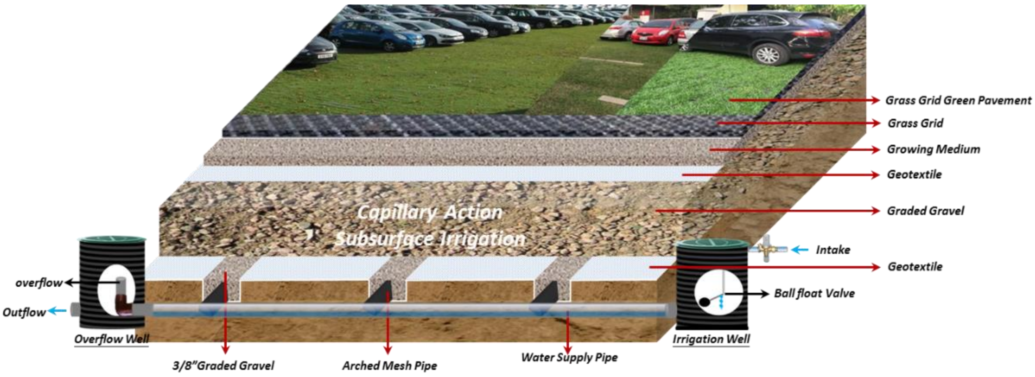


- **Save 50~80% irrigation water**
- **Fertilizer effect increase 40 %**
- **Reduction in irrigation manpower 60%**
- **Soil breathable**
- **Efficient use of irrigation water**
- **Create a comfortable environment for the growth of plants**

C-4. Parking Lot and Driveway drainage & irrigation

AMP-Arched Mesh Pipe System Water Solutions are water management solutions specializing in water conservation and provide efficient drainage and subsurface wicking irrigation.

AMP-Arched Mesh Pipe System provides these benefits using clog free subsurface pipe that does not require additional filter material but absorbs and distributes water to the growing medium using non-pressurized, gravity driven, capillary physics.



C-5. Roof Garden drainage & irrigation

Green roofs are made up of a top vegetative layer that grows in an engineered soil, which sits on top of a drainage layer. A green roof can be intensive, with thicker soils that support a wide variety of plants, or extensive, covered in only a light layer of soil and minimal vegetation.