DMP - Drainage Mesh Pipe Underground Drainage Design & Installation Guide Manual

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ECO-MESH

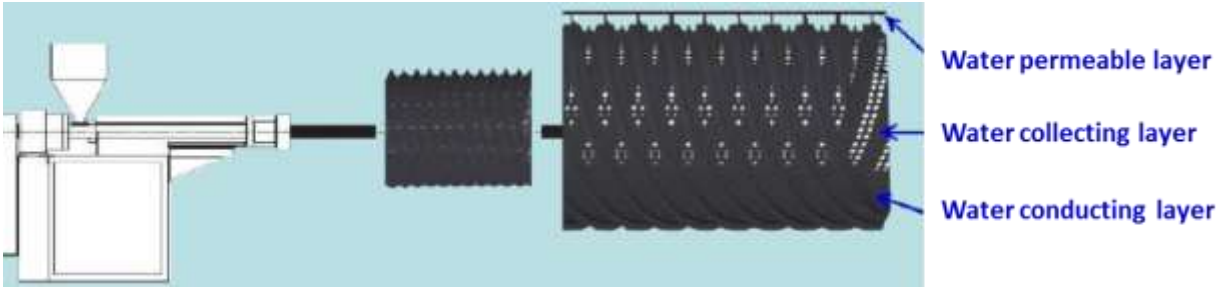
DMP - Drainage Mesh Pipe Design & Install Guidance Manual

A. DMP - Drainage Mesh Pipe Description

A-1. What is the DMP - Drainage Mesh Pipe

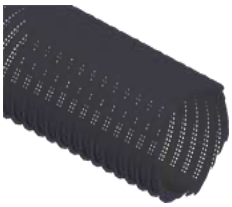
DMP-Drainage Mesh Pipe is made of high-density polyethylene (HDPE), and the three-dimensional thread is surrounded by a mesh structure, which is continuously extruded. The water collecting area of the catchment layer is more than 80%, and the water collecting space is increased, and the mesh pipe is not easy to block. The high-density mesh is distributed throughout the permeable layer and has excellent water permeability.

The three-dimensional spiral mesh structure of the pipe body has the advantages of high pressure resistance, light weight, toughness, acid and alkali resistance, corrosion resistance and non-breaking. It is a low-cost, easy-to-construct, high-efficiency and high-valued permeable material.



A-2. DMP - Drainage Mesh Pipe Structure

The three-dimensional stiffening thread is surrounded by a mesh structure, and the bottom part integrally extrudes the impervious layer of the formed portion, thereby achieving the functions of water collecting, drainage and water guiding.

				
Full permeable (MSO)	**Full permeable (WSO)**	**Full permeable (NSO)**	**2/3 permeable (NSD)**	**1/2 permeable (NSH)**

A-3. DMP - Drainage Mesh Pipe Feature

High pressure resistance.
The three-dimensional stiffening thread surrounds the mesh structure and has high pressure resistance.

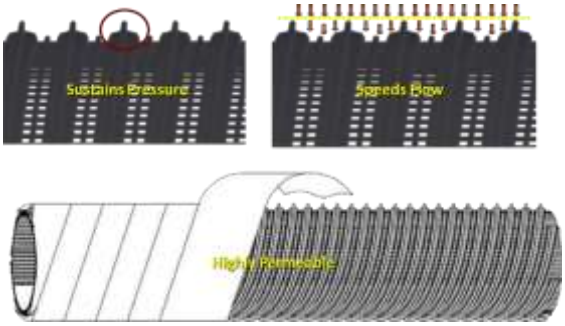
High permeable area, high water collection, not easy to block.
The three-dimensional stiffening thread surrounds, and the water permeable area is over 80%, which is not easy to block.

The drainage effect is particularly good.
The high-density three-dimensional mesh is distributed throughout the water collecting layer and has high water collection capacity, which can reduce the density of the permeable network pipe and reduce the cost.

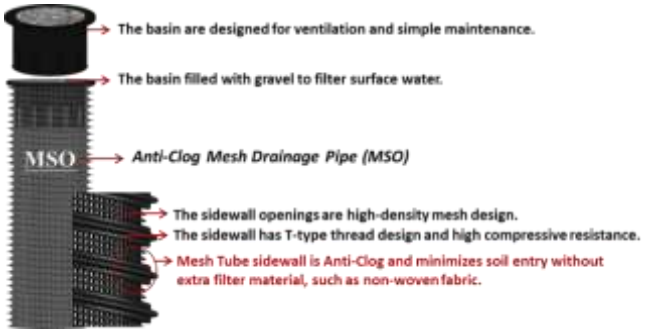
Light weight and easy to construct.
High-density polyethylene raw materials, light weight, tough, acid and alkali resistant, non-corrosive, non-toxic, soil and water quality are completely free from pollution.

Easy to construct.
The Drainage Mesh Pipe is fully sized and comes with standard fittings for easy construction.

Long service life.
Drainage Mesh Pipe is made of high density polyethylene and has a life span of more than 50 years.



A-4. Anti-Clog DMW - Drainage Mesh Wells Feature



DMW - Drainage Mesh Wells–Unique Characteristics

The sidewall openings are high-density mesh design.

The sidewall has T-type thread design and high compressive resistance.

DMW - Drainage Mesh Well sidewall is Anti-Clog and minimizes soil entry without extra filter material, such as non-woven fabric.

A-5. DMP - Drainage Mesh Pipe Specifications

DMP - Drainage Mesh Pipe Specifications

NSO
Full permeable

NSD
2/3 permeable

NSH
1/2 permeable

Drainage Mesh Pipe straight connector specifications

Drainage Mesh Pipe		ID*OD	Pitch	Length
Size	Code	±3.0%mm	±3.0%	m
1½"	NSO-40A NSD-40A	37*48	11.0mm	4m
2"	NSO-50A NSD-50A NSH-50A	48.5*61	11.5mm	4m
2½"	NSO-65A NSD-65A	62*76	12.5mm	4m
3"	NSO-75A NSD-75A NSH-75A	77*89	12.5mm	4m
3½"	NSO-90A NSD-90A	85*100	12.5mm	4m
4"	NSO-100A NSD-100A NSH-100A	98*114	12.5mm	4m
5"	NSO-125A NSD-125A	123*140	14.0mm	5m
6"	NSO-150A NSD-150A NSH-150A	148*165	14.0mm	5m
8"	NSO-200A NSD-200A NSH-200A	195*216	14.5mm	5m
10"	NSO-250A NSD-250A NSH-250A	239*267	14.5mm	5m
12"	NSO-300A NSD-300A	290*318	15.0mm	5m
16"	NSO-400A	390*420	15.5mm	5m

Connector		ID*OD	Pitch	Length
Size	Code	±3.0%mm	±3.0%	cm
1½"F	NSF-40A	48.5*61.0	11.5mm	12cm
2"F	NSF-50A	62.0*76.0	12.5mm	12cm
2½"F	NSF-65A	77.0*89.0	12.5mm	12cm
3"F	NSF-75A	90.0*105.0	12.5mm	15cm
3½"F	NSF-90A	101.0*115.0	12.5mm	15cm
4"F	NSF-100A	115.0*130.0	12.5mm	20cm
5"F	NSF-125A	141.0*160.0	14.0mm	20cm
6"F	NSF-150A	166.0*183.0	14.5mm	25cm
8"F	NSF-200A	217.0*240.0	14.5mm	30cm
10"F	NSF-250A	268.0*290.0	14.5mm	35cm
12"F	NSF-300A	320.0*342.0	15.0mm	40cm
16"F	NSF-400A	422.0*452.0	15.5mm	45cm

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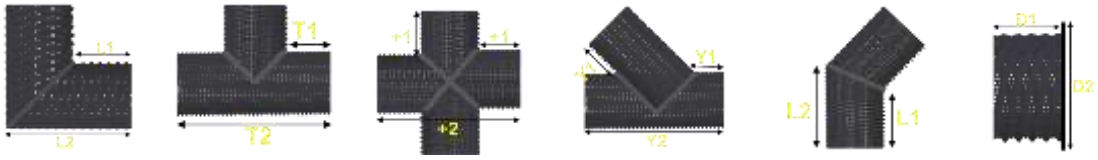
DMP - Drainage Mesh Pipe Profiled joints Specifications



L-connector T-connector +-connector Y-connector L45^0-connector D-plug

Size		ID*OD	Pitch	L1 T1 +1	L2	T2	+2	Y2	L45^{0}2	D2
Diameter	Code	±3.0%mm	±3.0%	Y1 L45^{0}1 D1	mm	mm	mm	mm	mm	mm
1½"F	NSF-40	48.5*60.0	11.5mm	80**mm**	140	220	220	245	105	110
2"F	NSF-50	60.5*76.0	12.5mm	80**mm**	156	236	236	267	111	126
2½"F	NSF-65	76.8*90.0	12.5mm	80**mm**	170	250	250	287	117	140
3"F	NSF-75	90.5*105.0	12.5mm	100**mm**	205	305	305	348	143	155
3½"F	NSF-90	101.0*115*0	12.5mm	100**mm**	215	315	315	363	148	165
4"F	NSF-100	115.0*130.0	12.5mm	133**mm**	263	397	397	450	187	180
5"F	NSF-125	141.0*160.0	14.0mm	133**mm**	293	427	427	493	200	210
6"F	NSF-150	166.0*183.0	14.0mm	167**mm**	350	516	516	592	242	233
8"F	NSF-200	217.0*240.0	14.5mm	200**mm**	440	640	640	739	299	290
10"F	NSF-250	268.0*290.0	14.5mm	233**mm**	523	757	757	877	353	340
12"F	NSF-300	320.0*342.0	15.0mm	267**mm**	609	875	875	1017	408	392
16"F	NSF-400	422.0*452.0	15.5mm	300**mm**	752	1052	1052	1239	487	502

A-6. DMP - Drainage Mesh Pipe Physical Properties

Drainage Mesh Pipe is made of high-density polyethylene (HDPE). It is light, tough, acid and alkali resistant, non-corrosive, non-toxic, and soil and water are completely free from pollution. It is the best permeable material for underground drainage.

Physical properties	Chemical properties
High-density polyethylene (HDPE) integrated extrusion molding Light weight: (specific gravity 0.936 ~ 0.965) Operating temperature range: -30 ° C ~ 80 ° C Impact resistance Durability Shockproof	Good resistance: In general soils, polyethylene is completely free of chemicals. Non-toxic: Polyethylene plastic (PE) is environmentally friendly and the land and water quality are completely free from pollution.

A-7. DMP - Drainage Mesh Pipe Physical Property Specifications

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

B. DMP - Drainage Mesh Pipe Underground drainage design

B-1. DMP - Drainage Mesh Pipe Water Permeability

DMP - Drainage Mesh Pipe Permeability coefficient standard setting : 0.95

Drainage Mesh Pipe Water permeability coefficient:

The conditions of surface state, slope, soil quality, rainfall duration, etc. in the drainage area, plus the permeability coefficient of the water pipe layer material and the surface permeability area of the mesh pipe, the higher the water permeability coefficient, the better the drainage rate. The drainage capacity of the mesh pipe is determined by the pipe diameter and the water permeable surface area. If the displacement is large, the water must be discharged smoothly through the mesh pipe. Drainage Mesh Pipe has a T-shaped thread surrounded by a mesh structure. The water-permeable surface area ratio is over 80%. The high-density mesh is distributed throughout the water collecting layer. The drainage effect is excellent, and it can meet the drainage function more than other permeable pipes.

Mesh Pipe surface permeability layer

Drainage Mesh Pipe has a surface area of more than 80% and has a large effective permeable area. It can use a smaller diameter drain pipe to reduce material cost, reduce construction cost, and has a large effective permeable area, which is equivalent to high anti-blocking rate and high drainage efficiency.

B-2. DMP - Drainage Mesh Pipe Drainage Capacity

Drainage Mesh Pipe Theoretical Drainage Capacity

Calculation formula	
Flow rate $V=\frac{1}{n}\cdot R^{2/3}\cdot S^{1/2}$	V (m/sec) : Flow rate Q (m^3/sec) : Flow volume D (m) : Pipe diameter n : Pipe friction=0.011 R (m) : Hydraulic radius S : Hydraulic slope
Flow volume $Q=\frac{\pi}{4}D^2\cdot\frac{1}{n}(R)^{2/3}(S^{1/2})$ (=A x V)	

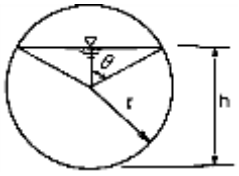
Reference data

Mesh pipe flow rate calculation table (non-full flow h)

Q= Flow rate (m^3/sec) $Q=\frac{1}{n}\times R^{2/3}\times S^{1/2}\times A=\frac{1}{n}\times D^{8/3}\times S^{1/2}\times\alpha$ $\alpha=\frac{AR^{2/3}}{D^{8/3}}=f(\frac{h}{D})$

V= Flow volume (m/sec) $V=\frac{1}{n}\times R^{2/3}\times S^{1/2}=\frac{1}{n}\times D^{8/3}\times S^{1/2}\times\beta$ $\beta=\frac{R^{2/3}}{D^{8/3}}=f(\frac{h}{D})$

h/D	α	β	Remark
0.50	0.15584	0.0992	Q= Flow volume (m^3/sec) D= Pipe diameter (m) *n*= Roughness coefficient *S*= Hydraulic slope V= Flow rate (m/sec)
0.55	0.18256	0.1031	
0.60	0.20904	0.1062	
0.65	0.23576	0.1091	
0.70	0.26095	0.1111	
0.75	0.28422	0.1125	
0.80	0.30466	0.1130	
0.85	0.32117	0.0757	
0.90	0.33219	0.1115	
0.95	0.33491	0.1086	
1.00	0.31169	0.0992	



Theoretical displacement calculation results (generally h/D=0.8 design)

Horizontal pipe displacement (*S*=1)

Size	ID (mm)	Horizontal displacement (m^3/s)
1½"	35	0.003366
2"	47	0.00738
2½"	61	0.01481
3"	74	0.0248
4"	98	0.0524
5"	123	0.0961
6"	148	0.1574
8"	197	0.3195
10"	239	0.5650
12"	290	0.9463
16"	390	2.0851

Hydraulic slope ($S \rightarrow S^{1/2}$)

Water flow slope	Water gradient
1/50	0.1414
1/100	0.1000
1/200	0.0707
1/250	0.0632
1/300	0.0577
1/400	0.0500
1/500	0.0447
1/600	0.0408
1/800	0.0354
1/900	0.0333
1/1000	0.0316

Drainage Mesh Pipe Flow Rate and Flow volume. Water Circulation Water Break Area / Tube Inner Diameter Area, Non-full flow (generally 0.8 design)

ID	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
1½"	Flow rate m/sec	0.567	0.401	0.283	0.254	0.231	0.200	0.179	0.164	0.152	0.142	0.134	0.127
35mm	Flow volume L/sec	0.436	0.309	0.218	0.195	0.178	0.154	0.138	0.126	0.117	0.109	0.103	0.098
2"	Flow rate m/sec	0.690	0.488	0.345	0.309	0.282	0.244	0.218	0.199	0.184	0.173	0.163	0.154
47mm	Flow volume L/sec	0.958	0.677	0.479	0.428	0.391	0.339	0.303	0.276	0.256	0.239	0.226	0.214
2½"	Flow rate m/sec	0.821	0.581	0.411	0.367	0.335	0.290	0.260	0.237	0.219	0.205	0.194	0.184
61mm	Flow volume L/sec	1.920	1.357	0.960	0.859	0.784	0.679	0.607	0.554	0.513	0.480	0.452	0.429
3"	Flow rate m/sec	0.934	0.660	0.467	0.418	0.381	0.330	0.295	0.270	0.250	0.233	0.220	0.209
74mm	Flow volume L/sec	3.213	2.272	1.607	1.437	1.312	1.136	1.016	0.928	0.859	0.803	0.757	0.719
4"	Flow rate m/sec	1.126	0.796	0.563	0.504	0.460	0.398	0.356	0.325	0.301	0.282	0.265	0.252
98mm	Flow volume L/sec	6.797	4.806	3.398	3.039	2.775	2.403	2.149	1.962	1.816	1.699	1.602	1.520
5"	Flow rate m/sec	1.311	0.927	0.655	0.586	0.535	0.463	0.414	0.378	0.350	0.328	0.309	0.293
123mm	Flow volume L/sec	12.457	8.809	6.229	5.571	5.086	4.404	3.939	3.596	3.329	3.114	2.936	2.786
6"	Flow rate m/sec	1.483	1.048	0.741	0.663	0.605	0.524	0.469	0.428	0.396	0.371	0.349	0.332
148mm	Flow volume L/sec	20.404	14.428	10.202	9.125	8.330	7.214	6.452	5.890	5.453	5.101	4.809	4.562
8"	Flow rate m/sec	1.770	1.251	0.885	0.791	0.722	0.626	0.560	0.511	0.473	0.442	0.417	0.396
193mm	Flow volume L/sec	41.416	29.286	20.708	18.522	16.908	14.643	13.097	11.956	11.069	10.354	9.762	9.261
10"	Flow rate m/sec	2.041	1.443	1.020	0.913	0.833	0.721	0.645	0.589	0.545	0.510	0.481	0.456
239mm	Flow volume L/sec	73.239	51.788	36.620	32.754	29.900	25.894	23.160	21.142	19.574	18.310	17.263	16.377
12"	Flow rate m/sec	2.322	1.642	1.161	1.038	0.948	0.821	0.734	0.670	0.620	0.580	0.547	0.519
290mm	Flow volume L/sec	122.672	86.742	61.336	54.860	50.081	43.371	38.792	35.412	32.785	30.668	28.914	27.430
16"	Flow rate m/sec	2.828	2.000	1.414	1.265	1.155	1.000	0.894	0.816	0.756	0.707	0.667	0.632
390mm	Flow volume L/sec	270.306	191.135	135.153	120.884	110.352	95.568	85.478	78.031	72.242	67.576	63.712	60.442

B-3. DMP - Drainage Mesh Pipe Compressive strength

Compressive strength : Buried trench Drainage Mesh Pipe，In addition to the vertical direction of force, it also resists the lateral Soil pressure.

Soil pressure calculation and compressive strength

1. Soil pressure **$P_1(t/m^2)$**

Vertical Soil pressure (H=2m 以下) $P_1=rH$

Vertical Soil pressure and lateral pressure (H=2m 以上) $P_1=C_d*r*B$

Soil pressure coefficient in trench type $C_d=\frac{1}{2K\tan\phi}(1-e^{-2K\tan\phi\frac{H}{B}})$

2. Load **$P_2(t/m^2)$**

$P_2=\alpha\cdot q\ (1+i)$

3. Total pressure **$P(t/m^2)$** **$P=P_1+P_2$**

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 e=2.71818

α : No load groove factor

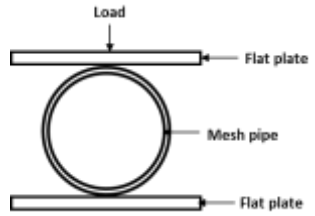
I : Wheel pressure shock rate

q (t) : Wheel to ground load

B (m) : Ditch bottom width

H (m) : Backfill depth

DMP - Drainage Mesh Pipe vertical compression test method



Test method:

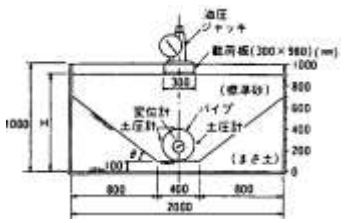
Place the Pipe between two plates and compress it at a constant speed.

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



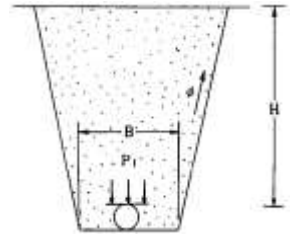
Pipe outer diameter deformation rate ε

$$\varepsilon = \frac{(D - D')}{D} X100$$

D (mm) : Standard caliber

D' (mm) : Pipe deformation caliber

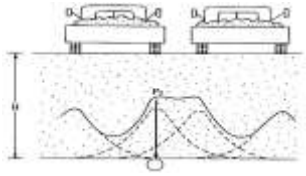
Pipe buried backfill high Soil pressure wheel pressure reference table



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	Drainage 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. DMP - Drainage 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.

DMP - Drainage Mesh Pipe 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).
Drainage 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

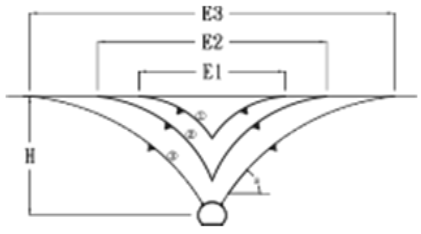
$Qt=\frac{1}{360}$ x(1-C)xIxAxFs	Q_t(m²/sec)：Design displacement F_s(-) ：Design safety rate I(mm/hr) ：Rainfall intensity C(-) ：Runoff coefficient A(ha) ：Drainage area

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. DMP - Drainage 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

DMP - Drainage 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

DMP - Drainage 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

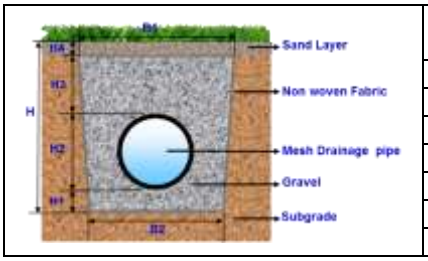
Generally, the buried pipe spacing is 10 to 15 times the depth of the buried pipe.

DMP - Drainage 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.

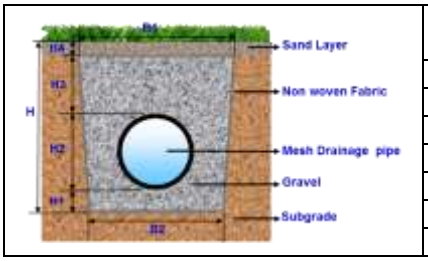
B-6. DMP - Drainage Mesh Pipe Design Reference Data

DMP - Drainage Mesh Pipe Design Reference**-** Pedestrian lane



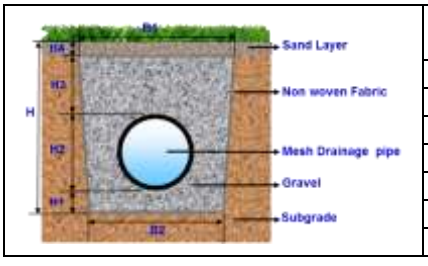
Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	43	5	8	25	5
4"	25	30	44	5	9	25	5
6"	30	35	52	5	17	25	5
8"	37	42	67	5	22	35	5
10"	45	50	72	5	27	35	5
12"	50	55	77	5	32	35	5

DMP - Drainage 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	72	5	17	45	5
8"	37	42	77	5	22	45	5
10"	45	50	92	5	27	55	5
12"	50	55	97	5	32	55	5

DMP - Drainage 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	51	5	6	35	5
3"	25	30	63	5	8	45	5
4"	25	30	74	5	9	55	5
6"	30	35	92	5	17	65	5
8"	37	42	107	5	22	75	5
10"	45	50	122	5	27	85	5
12"	50	55	137	5	32	95	5

B-7. DMP - Drainage Mesh Pipe Installation specification

DMP - Drainage Mesh Pipe Installation specification

I. DMP - Drainage Mesh Pipe Characteristics

Drainage 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 surrounded by a mesh structure and is not easy to block. The high-density mesh is spread throughout the pipe. Excellent, spiral mesh structure, light weight, toughness, acid and alkali resistance, non-corrosive, not easy to break, etc., and integrally formed at the bottom to form a 1/3 or 1/2 impervious layer to achieve water permeability and The function of drainage is a low-cost, easy-to-construct, high-efficiency, high-economic value of permeable and drainage materials.

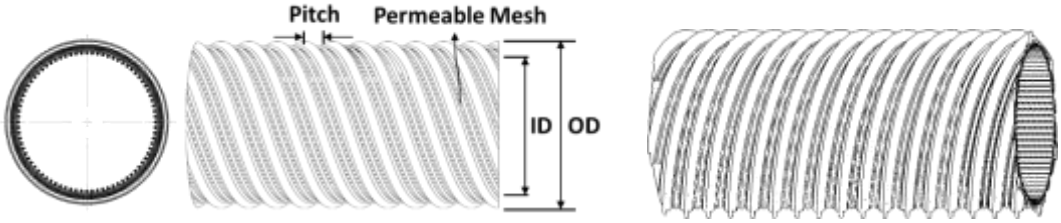
2. DMP- Drainage Mesh Pipe Materials：

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

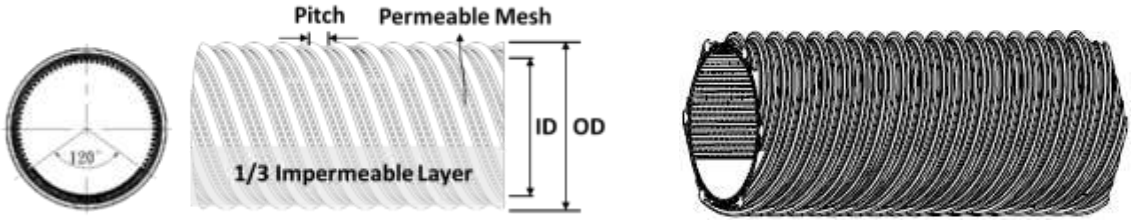
Inspection project	unit	Test method	Standard
Density	g/cm^3	ASTM 0792-13	> 0.940
Elongation	%	ASTM D638-14	> 300
Tensile strength	Kgf/cm^2	ASTM D638-14	> 180

3. DMP - Drainage Mesh Pipe Structure :

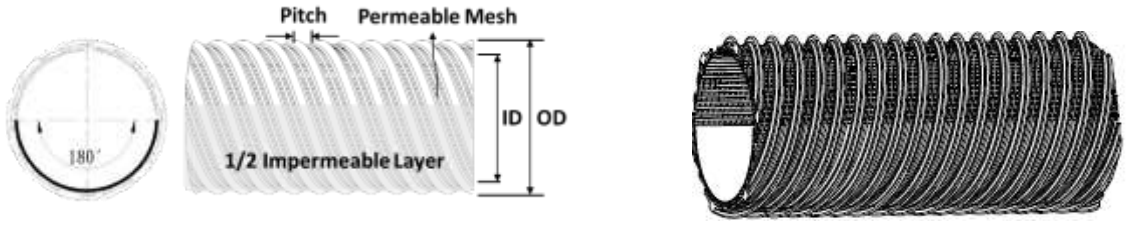
Drainage Mesh Pipe adopts a three-dimensional T-shaped thread to be integrally extruded, and the thread is surrounded by a mesh structure, and the Full permeable type or 1/3 or 1/2 of the impervious layer is integrally extruded at the bottom to achieve the function of water permeability and drainage.



Drainage Mesh Pipe – Full permeable Layer (NSO)



Drainage Mesh Pipe - 2/3 permeable Layer (NSD)



Drainage Mesh Pipe - 1/2 permeable Layer (NSH)

4. DMP - Drainage Mesh Pipe Specifications：

DMP - Drainage Mesh Pipe Specifications

NSO
Full permeable

NSD
2/3 permeable

NSH
1/2 permeable

Drainage Mesh Pipe straight connector specifications

Drainage Mesh Pipe		ID*OD	Pitch	Length
Size	Code	±3.0%mm	±3.0%	m
1½"	NSO-40A NSD-40A	37*48	11.0mm	4m
2"	NSO-50A NSD-50A NSH-50A	48.5*61	11.5mm	4m
2½"	NSO-65A NSD-65A	62*76	12.5mm	4m
3"	NSO-75A NSD-75A NSH-75A	77*89	12.5mm	4m
3½"	NSO-90A NSD-90A	85*100	12.5mm	4m
4"	NSO-100A NSD-100A NSH-100A	98*114	12.5mm	4m
5"	NSO-125A NSD-125A	123*140	14.0mm	5m
6"	NSO-150A NSD-150A NSH-150A	148*165	14.0mm	5m
8"	NSO-200A NSD-200A NSH-200A	195*216	14.5mm	5m
10"	NSO-250A NSD-250A NSH-250A	239*267	14.5mm	5m
12"	NSO-300A NSD-300A	290*318	15.0mm	5m
16"	NSO-400A	390*420	15.5mm	5m

Connector		ID*OD	Pitch	Length
Size	Code	±3.0%mm	±3.0%	cm
1½"F	NSF-40A	48.5*61.0	11.5mm	12cm
2"F	NSF-50A	62.0*76.0	12.5mm	12cm
2½"F	NSF-65A	77.0*89.0	12.5mm	12cm
3"F	NSF-75A	90.0*105.0	12.5mm	15cm
3½"F	NSF-90A	101.0*115.0	12.5mm	15cm
4"F	NSF-100A	115.0*130.0	12.5mm	20cm
5"F	NSF-125A	141.0*160.0	14.0mm	20cm
6"F	NSF-150A	166.0*183.0	14.5mm	25cm
8"F	NSF-200A	217.0*240.0	14.5mm	30cm
10"F	NSF-250A	268.0*290.0	14.5mm	35cm
12"F	NSF-300A	320.0*342.0	15.0mm	40cm
16"F	NSF-400A	422.0*452.0	15.5mm	45cm

5. DMP - Drainage Mesh Pipe Connect：

Drainage Mesh Pipe with standard fittings, construction faster and easier.

6. Pre-construction instructions:

1. Construction drawing: including construction plan and section detail drawing and material specifications.
2. Samples: The contractor must provide instructions as directed by the architect or owner.
3. Type: As shown in the figure. In addition to the material and size, the appearance is not limited.
4. Documentation:

I. The contractor shall submit the selected materials and samples to the architect or the owner for review before the construction, and shall submit the supporting documents to the materials provided in accordance with the prescribed standards. After the architect's review or the owner's approval, the materials shall be Can enter.

II. Before the construction of the architect or the owner, if there is any doubt about the quality, the architect or the owner will sample and send the inspection on site, and the construction will be completed after passing the inspection. (The inspection materials must meet the ASTM series inspection certificate)

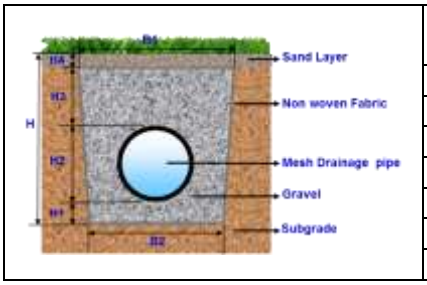
III. After the completion of this project, the original manufacturer's factory certificate shall be issued by the contractor to be submitted to the architect or engineering consultant for verification.

6. 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 Drainage 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.

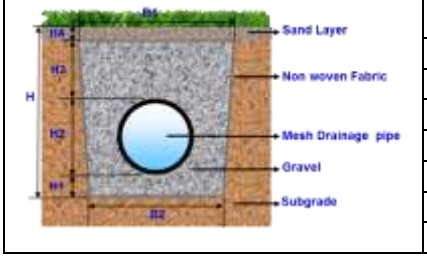
7. DMP - Drainage Mesh Pipe Design and Installation Reference

DMP - Drainage Mesh Pipe Design Reference- Pedestrian lane



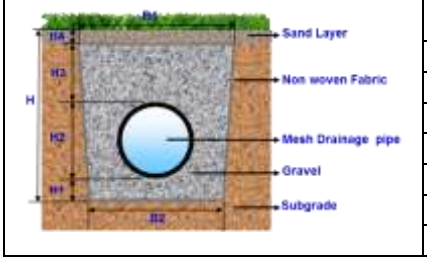
Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	43	5	8	25	5
4"	25	30	44	5	9	25	5
6"	30	35	52	5	17	25	5
8"	37	42	67	5	22	35	5
10"	45	50	72	5	27	35	5
12"	50	55	77	5	32	35	5

DMP - Drainage Mesh Pipe Design Reference- Light load lane (T-20*1)



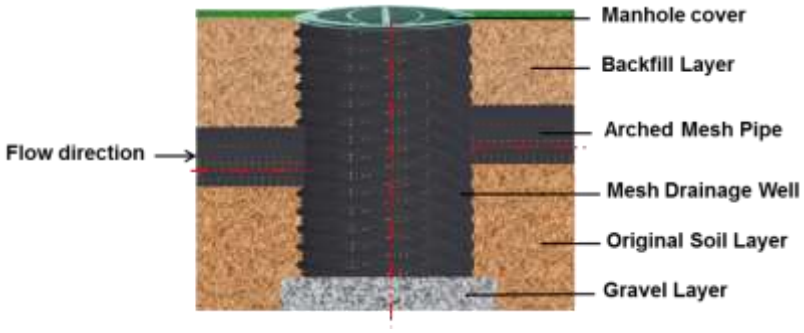
Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	41	5	6	25	5
3"	25	30	53	5	8	35	5
4"	25	30	54	5	9	35	5
6"	30	35	72	5	17	45	5
8"	37	42	77	5	22	45	5
10"	45	50	92	5	27	55	5
12"	50	55	97	5	32	55	5

DMP - Drainage Mesh Pipe Design Reference- Heavy load lane (T-20*2)

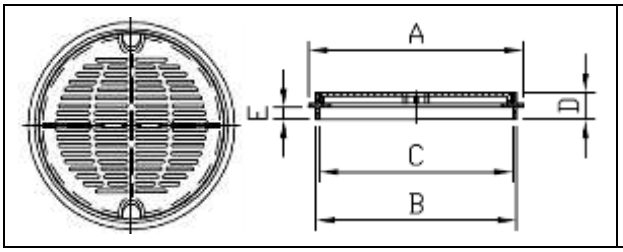


Size	B (cm)	B1 (cm)	H (cm)	H1 (cm)	H2 (cm)	H3 (cm)	H4 (cm)
2"	25	30	51	5	6	35	5
3"	25	30	63	5	8	45	5
4"	25	30	74	5	9	55	5
6"	30	35	92	5	17	65	5
8"	37	42	107	5	22	75	5
10"	45	50	122	5	27	85	5
12"	50	55	137	5	32	95	5

DMW - Drainage Mesh Well schematic diagram

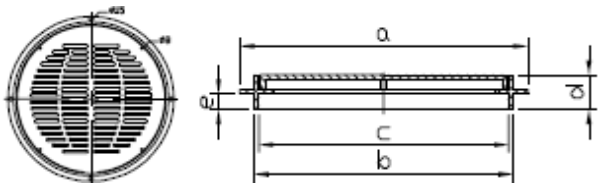


Cast iron manhole cover reference data



manhole cover	A	B	C	D	F
10"	323	293	277	60	26
12"	374	344	328	60	26
16"	476	446	434	60	26

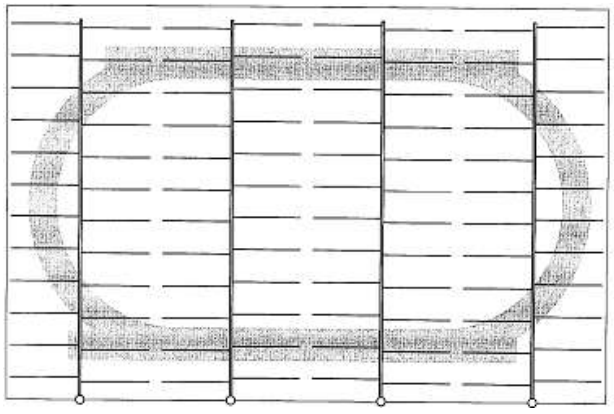
Plastic manhole cover reference data



manhole cover	A	B	C	D	F
12"(318)	390	342	323	60	26
16"(420)	494	446	426	60	26

B-8. DMP - Drainage Mesh Pipe-Case Study

B-8-1. Case Study-Drainage Mesh Pipe Sportfield drainage Design



Design conditions
Drainage area :
A=186X120=22.320M²
Drain outlet : 4
Daily rainfall : R=100mm
Permeability coefficient : C=0.25
Design exclusion time : T=12hr
Water flow slope : I=1/300
Design safety rate : Fs=1.5
Load: One 14-ton car

Design displacement

Q_1(m³/sec) Calculation

Q_t= $\frac{1}{360}$ x(1-C)xIxAxF_s

Q_t(m²/sec) : Design displacement
Fs(-) : Computing design safety rate
I(mm/hr) : Water permeability
C(-) : Runoff coefficient
A(ha) : Drainage area

Design displacement calculation result

$$\mathbf{Q_t}=\frac{1}{360}\times(1\text{-}0.25)\times\frac{100}{12}\times\frac{22320}{10000}\times1.5=5.812\times10^{-2}\ (m^3/sec)$$

Displacement of each drain

$Q_{t'}=5.812\times10^{-2}\div4=1.453\times10^{-2}$ (m³/sec)

Runoff coefficient (c) Standard quality setting: Surface condition, slope, soil quality, rainfall duration, etc. in the drainage area

Park, Plaza: 0.1~0.3
Greenland Farm : 0.05~0.25
Sports ground Golf course : 0.3~0.6

DMP - Drainage Mesh Pipe main pipe and branch pipe displacement

Theoretical displacement of the mesh pipe Q_n(m³/sec)

Q_n= $\frac{1}{n}$ x$D^{8/3}$x$S^{1/2}$xα	Q_n (m³/sec) : Theoretical displacement of the mesh pipe D (m) : Pipe diameter (ID) n : Friction n=0.011 *S* : Hydraulic slope

DMP - Drainage Mesh Pipe Flow volume

Size	ID (mm)	Theoretical displacement (m^3/s)	Piping slope
2"	47	5×10^{-4}	1/300
3"	74	1.6×10^{-3}	1/300
4"	98	3.3×10^{-3}	1/300
5"	123	6.1×10^{-3}	1/300
6"	148	0.01	1/300
8"	197	0.0215	1/300

Main pipe 197ø displacement

$Q_n(=0.0215)>Q_t(=0.01453)$ Can fully drain

Branch pipe displacement design

74mmø, pipe inclination 1/300, branch pipe Space width 10m

L_{max}= $\frac{Qm\times A}{Qt\times E}$	Q_m (m³/sec) : Branch management displacement A (m²) : Drainage area of each drain Q_t (m³/sec) : Design displacement for each drain E (m) : Buried pipe spacing	Branch pipe can be matched with the length of the main pip $L_{max}=\frac{1.117\times10^{-3}\times(22{,}320\div4)}{1.453\times10^{-2}\times10}$ =61m

Mesh pipe compression selection

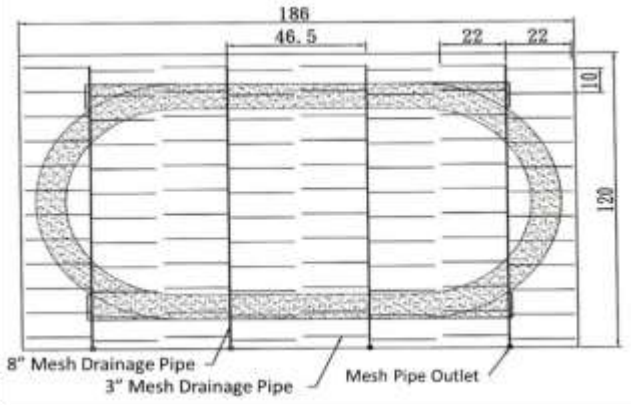
Backfill height = 0.4m, 14 tons of truck walking conditions,

Mesh pipe compression selection

P=0.72(Soil pressure)+10.98(Wheel pressure)=11.70t

P=11.70t/m^3 Mesh pipe diameter change

Size	Drainage Mesh Pipe
74	6.1%
198	8.3%



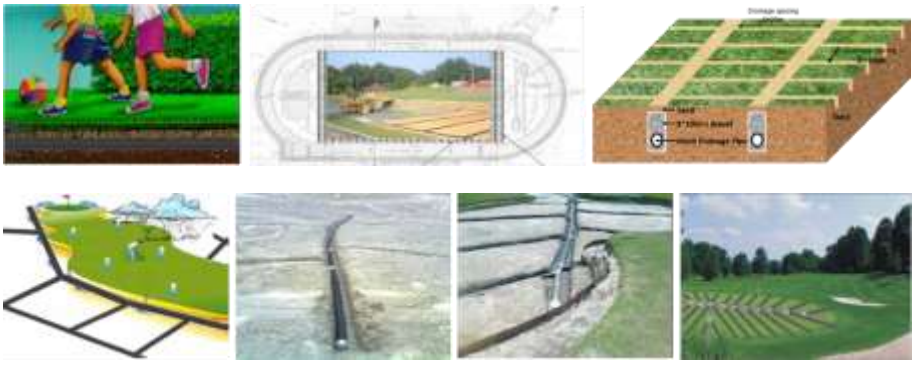
Sports field construction plan

C. DMP - Drainage Mesh Pipe Applications

C-1. Retaining Wall Drainage

C-2. Road & Paved Area Drainage

C-3. Sports Field Drainage

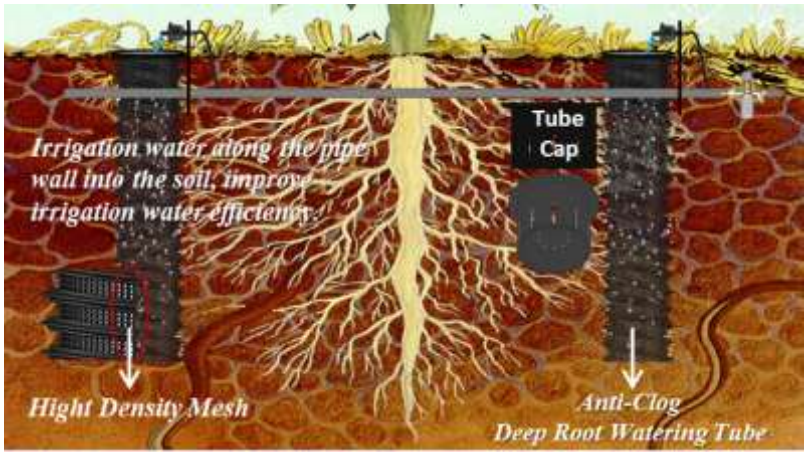


C-4. Park & Open Area Drainage

C-5. Transverse Drainage

D. DMW - Drainage Mesh Wells Applications

D-1. DRWT - Deep Root Watering Mesh Tube



D-2. ASR-Aquifer Recharge Aquifer Storage and Recovery