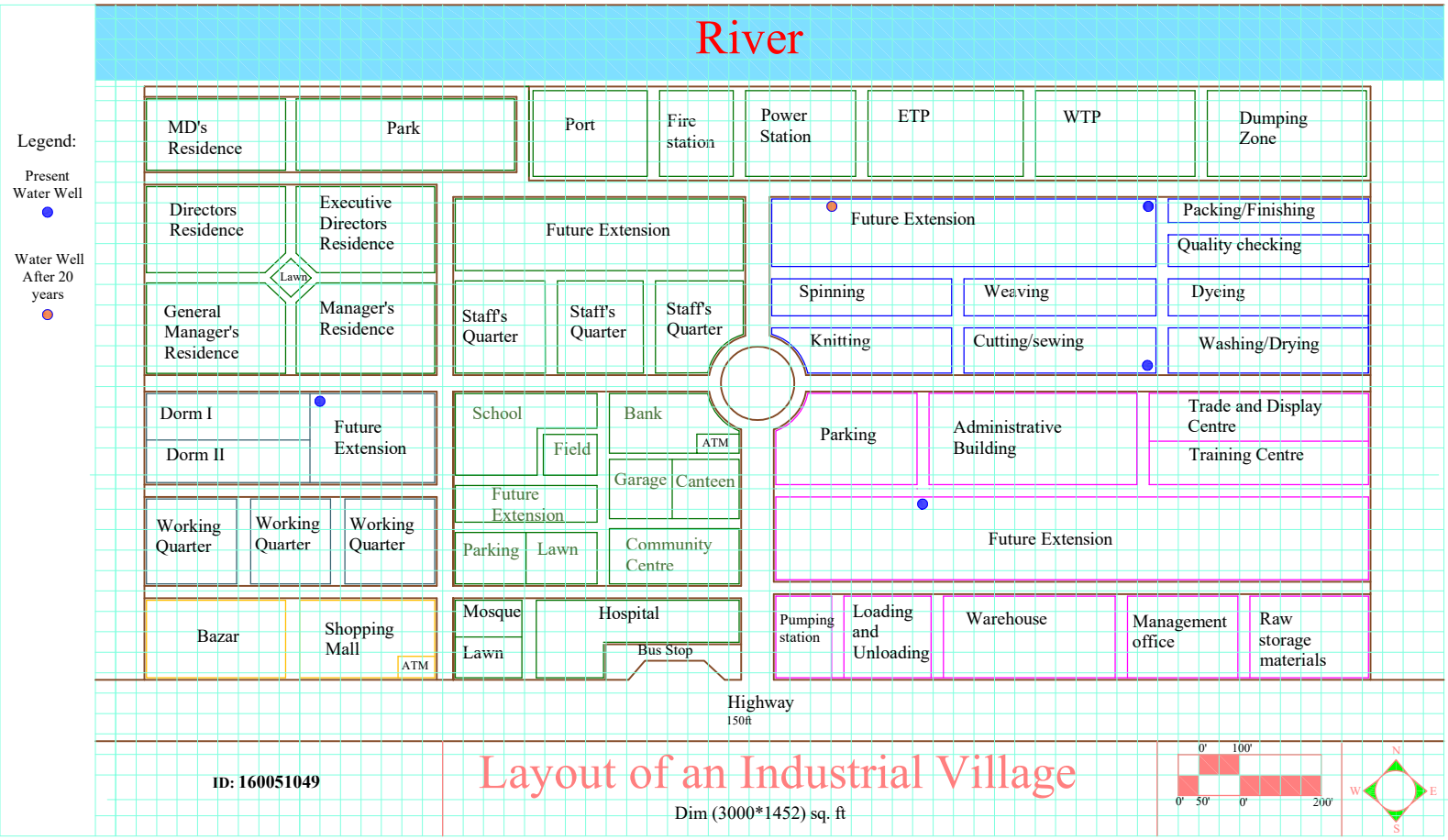
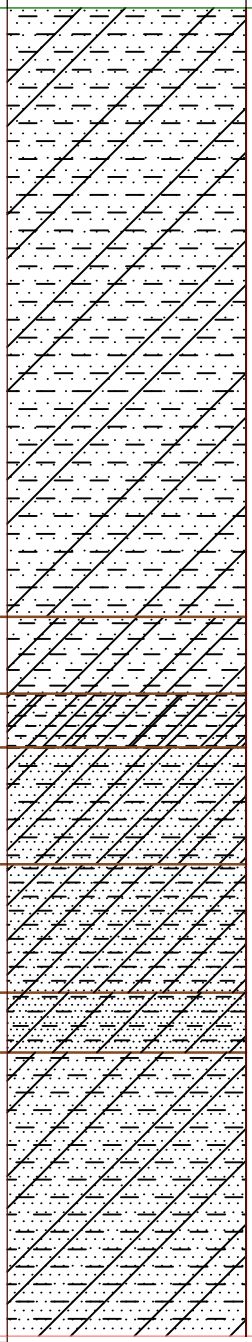
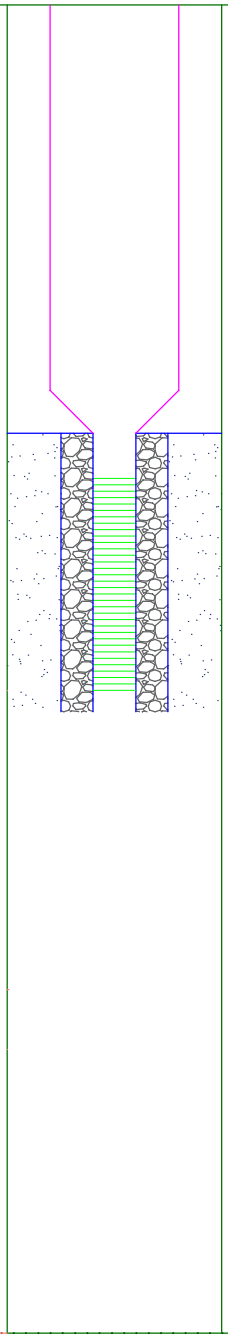
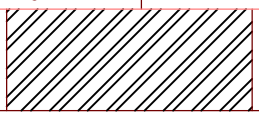
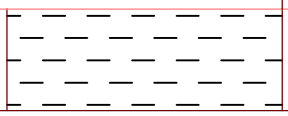
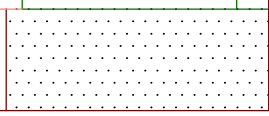

River
Legend:
Present Water Well
Water Well After 20 years
MD's Residence
Park
Port
Fire station
Power Station
ETP
WTP
Dumping Zone
Directors Residence
Executive Directors Residence
Lawn
General Manager's Residence
Manager's Residence
Future Extension
Staff's Quarter
Staff's Quarter
Staff's Quarter
Future Extension
Packing/Finishing
Quality checking
Spinning
Weaving
Dyeing
Knitting
Cutting/sewing
Washing/Drying
Dorm I
Dorm II
Future Extension
School
Field
Bank
ATM
Garage
Canteen
Future Extension
Parking
Lawn
Community Centre
Parking
Administrative Building
Trade and Display Centre
Training Centre
Future Extension
Working Quarter
Working Quarter
Working Quarter
Bazar
Shopping Mall
ATM
Mosque
Lawn
Hospital
Bus Stop
Pumping station
Loading and Unloading
Warehouse
Management office
Raw storage materials
Highway
150ft
ID: 160051049
Layout of an Industrial Village
Dim (3000*1452) sq. ft
0' 100'
0' 50' 0' 200'
N
W
E
S

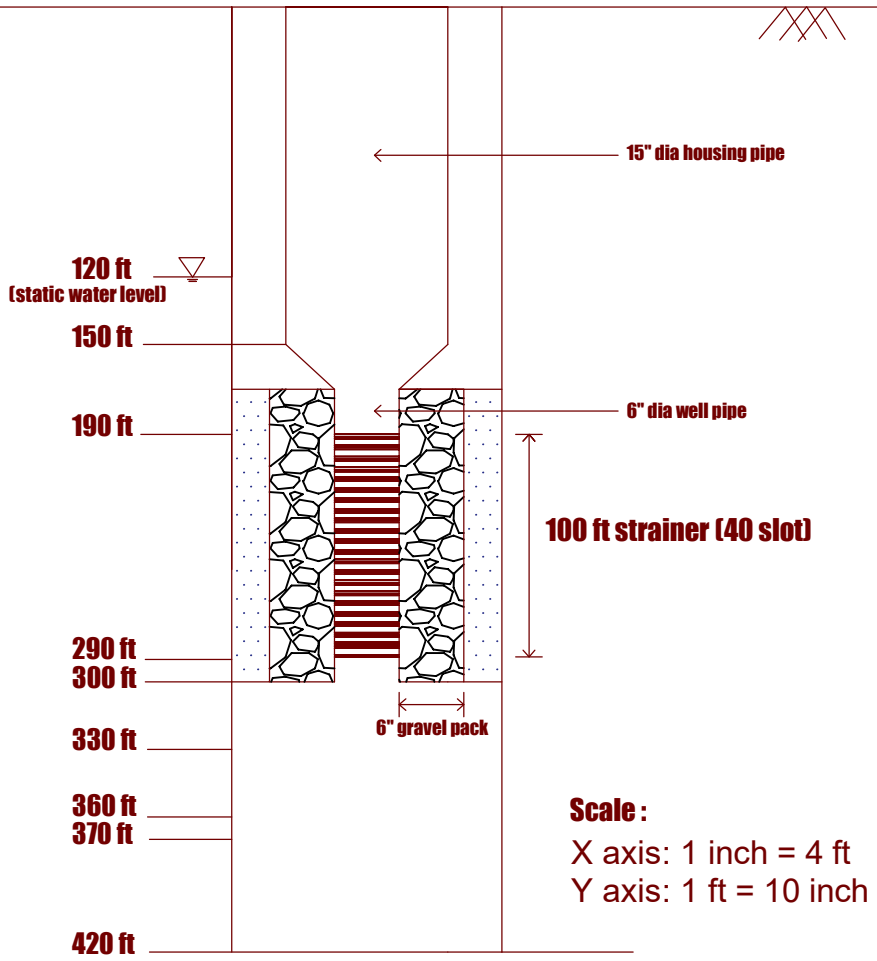
Water Demand Calculation for Residential Area

Type of Building	Per caapita water consumption (lpcd)	Duration (Hr)	Time Factor	Peak Factor	Present				After 10 Years				After 20 years			
					Population	Average consumptions	Peak water demand (lpd)	Present water demand (lpd)	Population	Average consumptions	Peak water demand (lpd)	Present water demand (lpd)	Population	Average consumptions	Peak water demand (lpd)	Present water demand (lpd)
Bungalow	135	24	1	2.5	14	1890	4750	4750	14	1890	4750	4750	20	2700	6750	6750
Flats & Apartments	135	24	1	2.5	280	37800	94500	94500	364	49140	122850	122850	420	56700	141750	141750
Officer's and Staff's Quarter	70	24	1	2.5	276	19320	48300	48300	360	25200	63000	63000	414	28980	72450	72450
Worker's Quarter	70	24	1	2.5	240	16800	42000	42000	312	21840	54600	54600	360	25200	63000	63000
Dormitory	70	24	1	2.5	1050	73500	183750	183750	1050	95550	238875	238875	1050	110250	275625	275625
	Total							373300				484075				559575

Water Demand For Industrial Productions														
Type of Zone	Industrial Unit	Water Consumption (L/Kg of Fabric	Duration (hr)	Time Factor	Peak Factor	Present			after 10 years			after 20 years		
						Amount of Product (kg/day)	Peak Water Demand (lpcd)	Present Water Demant (lpcd)	Amount of Product (kg/day)	Peak Water Demand (lpcd)	Present Water Demand (lpcd)	Amount of Product (kg/day)	Peak Water Demand (lpcd)	Present Water Demant (lpcd)
Industrial Zone	Weaving Unit	35	24	1	1.5	10000	525000	525000	13500	708750	708750	15500	813750	813750
	Knitting Unit	25	24	1	1.5	10000	375000	375000	13500	506250	506250	15500	581250	581250
	Spinning Unit	25	24	1	1.5	10000	375000	375000	13500	506250	506250	15500	581250	581250
	Cutting,Finishing and Packaging Unit	55	24	1	1	10000	550000	550000	13500	742500	742500	15500	852500	852500
	Washing Unit	70	12	1	1.5	10000	1050000	1050000	13500	1417500	1417500	15500	1627500	1627500
	Dying Unit	45	24	1	1.5	10000	675000	675000	13500	911250	911250	15500	1046250	1046250
	Quality Control Unit	20	8	1	1	10000	200000	200000	13500	270000	270000	15500	310000	310000
	Total (Production) (kg/day)								94500					

Ground Water Table	Depth (ft)	Thickness (ft)	Description of Materials	Bore Log	Well Log
120 ft ▽	260 ft	260 ft	Medium to Fine sand, trace Coarse sand		
	290 ft	30 ft	Mostly Medium sand with little Coarse and fine sand		
	300 ft	10 ft	Mostly Medium sand with little Fine sand, trace Coarse sand		
	330 ft	30 ft	Medium to Fine sand, with little Coarse sand		
	360 ft	30 ft	Medium to fine sand with little amount of coarse sand		
	370 ft	10 ft	Medium to fine sand and trace of coarse sand		
	420 ft	50 ft	Medium to fine sand with little Coarse sand		

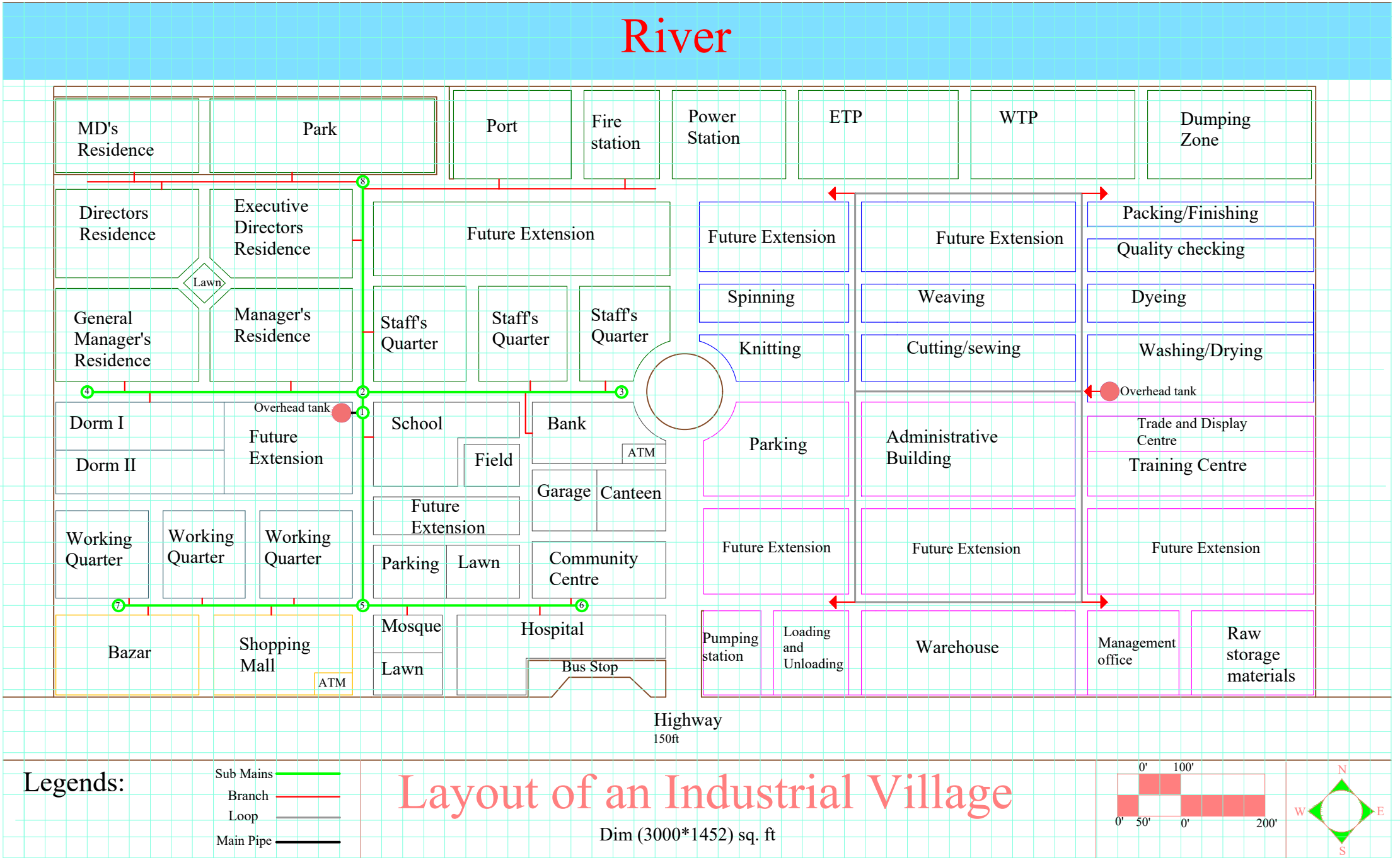
Coarse sand  Medium sand  Fine sand 



Scale :

X axis: 1 inch = 4 ft

Y axis: 1 ft = 10 inch


River
MD's Residence
Park
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Fire station
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ETP
WTP
Dumping Zone
Directors Residence
Executive Directors Residence
Future Extension
Lawn
General Manager's Residence
Manager's Residence
Staff's Quarter
Staff's Quarter
Staff's Quarter
Future Extension
Future Extension
Packing/Finishing
Quality checking
Spinning
Weaving
Dyeing
Knitting
Cutting/sewing
Washing/Drying
Overhead tank
Overhead tank
Dorm I
Dorm II
Future Extension
School
Field
Bank
ATM
Parking
Administrative Building
Trade and Display Centre
Training Centre
Garage
Canteen
Future Extension
Working Quarter
Working Quarter
Working Quarter
Parking
Lawn
Community Centre
Future Extension
Future Extension
Future Extension
Bazar
Shopping Mall
ATM
Mosque
Lawn
Hospital
Bus Stop
Pumping station
Loading and Unloading
Warehouse
Management office
Raw storage materials
Highway
150ft
Legends:
Sub Mains
Branch
Loop
Main Pipe
Layout of an Industrial Village
Dim (3000*1452) sq. ft
0'
100'
0'
50'
0'
200'
N
W
E
S

Water Distribution Network Design

Design of Branch Network for Residential & Common Facilities:

Assumptions: Quantity of water flowing in each section of the network was taken from the peak daily demand previously calculated.

The water distribution system was designed to maintain operating pressures within the system between 40 and 75 psi.

Sample Calculation for pipe section of node 1-2:

Determination of Pipe Diameter:

Supply of Water: 0.2453 cusec

Length of Pipe: 60 ft

Area of the pipe: Q = AV, Where, Q = Supply (cusec)

A = area of the pipe

V = Velocity = 3 fps

A = Q/V = (0.2453/3)*144 = 11.776 sq. in

=> Dreq = 3.872 in

D(provided) = 4 in

Calculation for Frictional head loss:

For path 1: Node 1-2, 2-3, 3-4

Head loss: hf = 4fLv^2/2gD, Where, f = friction factor,

L = Length of pipe

v = velocity = 3 fps,

g = acceleration of gravity = 32 fps^2

D = Diameter provided

So, hf = 1.013 ft

=> head loss in psi = hf*62.4/144 = 0.439 psi (for node 1-2)

Total head loss in node (psi) 1-2, 2-3, 2-4, 2-8 = 0.439 + 3.364 + 6.338 + 7.605 = 17.745 psi

Available pressure = 75 – 17.745 = 5.255

Node	Supply (lpd)	Supply (ft^3/sec)	Length (ft)	Area of Pipe Required(inch^2)	Diameter of Pipe Required (inch)	Diameter of provided pipe(inch)
1,2	600668	0.2453	60	11.776	3.872	4
2,3	163620	0.0668	345	3.208	2.021	3
2,4	329075	0.1344	650	6.451	2.866	3
2,8	106975	0.0437	520	2.097	1.634	2
1,5	77230	0.0315	425	1.514	1.388	2
5,7	50600	0.0207	575	0.992	1.124	2
5,6	23030	0.0094	525	0.451	0.758	1

Node	Length (ft)	Diameter of provided pipe(ft)	Head Loss (ft)	Head Loss (psi)	Total head loss (psi)	Available Pressure (psi)	Comment
1,2	60	0.333	1.013	0.439	17.745	57.255	OK
2,3	345	0.250	7.763	3.364			
2,4	650	0.250	14.625	6.338			
2,8	520	0.167	17.550	7.605			
1,5	425	0.167	14.344	6.216	29.981	45.019	OK
5,7	575	0.167	19.406	8.409			
5,6	525	0.083	35.438	15.356			

Calculation of Branch Network for Residential Zone & Common Facilities

Node	Supply (lpd)	Supply (ft^3/sec)	Length (ft)	Area of Pipe Required(inch^2)	Diameter of Pipe Required (inch)	Diameter of provided pipe(inch)
1,2	928585	0.379	385	18.2042	4.8144	5
2,3	100823	0.041	345	1.9766	1.5864	2
3,4	67163	0.027	390	1.3167	1.2948	2
1,5	1891719	0.773	190	37.0856	6.8716	7
5,6	943794	0.385	600	18.5023	4.8536	5
5,7	444060	0.181	240	8.7054	3.3293	4
7,8	186060	0.076	240	3.6476	2.1550	3

Path	Node	Length (ft)	Diameter of provided pipe(ft)	Head Loss (ft)	Head Loss (psi)	Total head loss (psi)	Available Pressure (psi)	Comment
Path I	1,2	385	0.417	5.198	2.252	13.002	61.998	OK
	2,3	345	0.167	11.644	5.046			
	3,4	390	0.167	13.163	5.704			
Path II	1,5	190	0.583	1.832	0.794	4.304	70.696	OK
	5,6	600	0.417	8.100	3.510			
Path III	1,5	190	0.583	1.832	0.794	4.889	70.111	OK
	5,7	240	0.333	4.050	1.755			
	7,8	240	0.250	5.400	2.340			

Calculation of Loop Network for Industrial & Administrative Zone

Trial 1		length (ft)	length (m)	k	Q_o (lps)	Q_o (m^3/s)	$Q_{o(abs)}$(m^3/s)	Ho (abs) = k*Qo^1.85 (m)	Ho (m)	H0/Qo	Δ (m3/s)	Corrected Q_o (m^3/s)
Loop 1	AB	810	246.95	1	2.90	0.0029	0.0029	2.0204E-05	2.0204E-05	0.006966879	0.008582925	0.0115
	BC	435	132.62	1	2.89	0.0029	0.0029	2.00753E-05	2.00753E-05	0.006946454	0.008582925	0.0115
	DA	435	132.62	1	3.00	0.0030	0.0030	2.15117E-05	2.15117E-05	0.00717056	0.008582925	0.0116
	DC	810	246.95	1	-25.00	-0.0250	0.0250	0.001086899	-0.001086899	0.043475943	0.008582925	-0.0067
Sum									-0.001025108	0.064559836		
Trial 1		**length (ft)**	**length (m)**	**k**	**Qo (lps)**	**Qo (m3/s)**	**Qo(abs)(m3/s)**	**Ho (abs) (m)**	**Ho (m)**	**H0/Qo**	**Δ (m3/s)**	**Corrected Q_o (m^3/s)**
Loop 2	DC	810	246.95	1	25.00	0.0250	0.0250	0.001086899	0.001086899	0.043475943	-0.009760961	0.0067
	FC	435	132.62	1	-1.96	-0.0020	0.0020	9.78754E-06	-9.79E-06	0.004993645	-0.009760961	-0.0117
	DE	435	132.62	1	-2.00	-0.0020	0.0020	1.01603E-05	-1.01603E-05	0.005080138	-0.009760961	-0.0118
	EF	810	246.95	1	-1.96	-0.0020	0.0020	9.78754E-06	-9.79E-06	0.004993645	-0.009760961	-0.0117
Sum									0.001057163	0.05854337		

Trial 2		length (ft)	length (m)	k	Qo (lps)	Qo (m3/s)	Qo(abs)(m3/s)	Ho (abs) (m)	Ho (m)	H0/Qo	Δ (m3/s)	Corrected Q_o (m^3/s)
Loop 1	AB	810	246.95	1	11.48	0.0115	0.0115	0.00025769	0.00025769	0.022441127	-0.004524012	0.0070
	BC	435	132.62	1	11.47	0.0115	0.0115	0.000257275	0.000257275	0.022424514	-0.004524012	0.0069
	DA	435	132.62	1	11.58	0.0116	0.0116	0.000261857	0.000261857	0.022607135	-0.004524012	0.0071
	DC	810	246.95	1	-6.66	-0.0067	0.0067	9.39633E-05	-9.39633E-05	0.014116843	-0.004524012	-0.0158
Sum									0.000682858	0.08158962		
Trial 2		**length (ft)**	**length (m)**	**k**	**Qo (lps)**	**Qo (m3/s)**	**Qo(abs)(m3/s)**	**Ho (abs) (m)**	**Ho (m)**	**H0/Qo**	**Δ (m3/s)**	**Corrected Q_o (m^3/s)**
Loop 2	DC	810	246.95	1	6.66	0.0067	0.0067	9.39633E-05	9.39633E-05	0.014116843	0.004645804	0.0158
	FC	435	132.62	1	-11.72	-0.0117	0.0117	0.000267659	-0.000267659	0.022835932	0.004645804	-0.0071
	DE	435	132.62	1	-11.76	-0.0118	0.0118	0.000269351	-0.000269351	0.022902157	0.004645804	-0.0071
	EF	810	246.95	1	-11.72	-0.0117	0.0117	0.000267659	-2.68E-04	0.022835932	0.004645804	-0.0071
Sum									-0.000710706	0.082690865		

Trial 3		length (ft)	length (m)	k	Qo (lps)	Qo (m3/s)	Qo(abs)(m3/s)	Ho (abs) (m)	Ho (m)	H0/Qo	Δ (m3/s)	Corrected Q_o (m^3/s)
Loop 1	AB	810	246.95	1	6.96	0.0070	0.0070	0.000102024	0.000102024	0.014660886	0.001159734	0.0081
	BC	435	132.62	1	6.95	0.0069	0.0069	0.000101753	0.000101753	0.014642976	0.001159734	0.0081
	DA	435	132.62	1	7.06	0.0071	0.0071	0.000104753	0.000104753	0.01483977	0.001159734	0.0082
	DC	810	246.95	1	-15.83	-0.0158	0.0158	0.00046648	-0.00046648	0.02947568	0.001159734	-0.0136
Sum									-0.000157951	0.073619312		
Trial 3		**length (ft)**	**length (m)**	**k**	**Qo (lps)**	**Qo (m3/s)**	**Qo(abs)(m3/s)**	**Ho (abs) (m)**	**Ho (m)**	**H0/Qo**	**Δ (m3/s)**	**Corrected Q_o (m^3/s)**
Loop 2	DC	810	246.95	1	15.83	0.0158	0.0158	0.00046648	0.00046648	0.02947568	-0.001091818	0.0136
	FC	435	132.62	1	-7.08	-0.0071	0.0071	0.000105199	-0.000105199	0.014868792	-0.001091818	-0.0082
	DE	435	132.62	1	-7.12	-0.0071	0.0071	0.000106302	-0.000106302	0.014940215	-0.001091818	-0.0082
	EF	810	246.95	1	-7.08	-0.0071	0.0071	0.000105199	-1.05E-04	0.014868792	-0.001091818	-0.0082
Sum									0.00014978	0.07415348		

Trial 4		length (ft)	length (m)	k	Qo (lps)	Qo (m3/s)	Qo(abs)(m3/s)	Ho (abs) (m)	Ho (m)	H0/Qo	Δ (m3/s)	Corrected Q_o (m^3/s)
Loop 1	AB	810	246.95	1	8.12	0.0081	0.0081	0.000135689	0.000135689	0.016713258	-0.000416466	0.0077
	BC	435	132.62	1	8.11	0.0081	0.0081	0.00013538	0.00013538	0.016695758	-0.000416466	0.0077
	DA	435	132.62	1	8.22	0.0082	0.0082	0.000138797	0.000138797	0.01688808	-0.000416466	0.0078
	DC	810	246.95	1	-13.57	-0.0136	0.0136	0.000351182	-0.000351182	0.025870923	-0.000416466	-0.0144
Sum									5.86845E-05	0.076168018		
Trial 4		**length (ft)**	**length (m)**	**k**	**Qo (lps)**	**Qo (m3/s)**	**Qo(abs)(m3/s)**	**Ho (abs) (m)**	**Ho (m)**	**H0/Qo**	**Δ (m3/s)**	**Corrected Q_o (m^3/s)**
Loop 2	DC	810	246.95	1	13.57	0.0136	0.0136	0.000351182	0.000351182	0.025870923	0.000436384	0.0144
	FC	435	132.62	1	-8.17	-0.0082	0.0082	0.000137187	-0.000137187	0.016797788	0.000436384	-0.0077
	DE	435	132.62	1	-8.21	-0.0082	0.0082	0.000138433	-0.000138433	0.016867693	0.000436384	-0.0078
	EF	810	246.95	1	-8.17	-0.0082	0.0082	0.000137187	-1.37E-04	0.016797788	0.000436384	-0.0077
Sum									-6.16253E-05	0.076334191		

		length (ft)	length (m)	Corrected Qo(Lps)	Corrected Qo (m3/s)	Qo(abs)(m3/s)	Ho (abs) (m)	Ho/L (m/m)	Diameter (mm)
Loop 1	AB	810	246.95	7.70	0.0077	0.0077	0.0001	0.0000004984530	350
	BC	435	132.62	7.69	0.0077	0.0077	0.0001	0.0000009259258	350
	DA	435	132.62	7.80	0.0078	0.0078	0.0001	0.0000009505703	350
	DC	810	246.95	-14.43	-0.0144	0.0144	0.0004	0.0000015917582	400
		length (ft)	**length (m)**	**Corrected Qo(Lps)**	**Corrected Qo (m3/s)**	**Qo(abs)(m3/s)**	**Ho (abs) (m)**	**Ho/L (m/m)**	**Diameter (mm)**
Loop 2	DC	810	246.95	14.43	0.0144	0.0144	0.0004	0.0000015917582	400
	FC	435	132.62	-7.73	-0.0077	0.0077	0.0001	0.0000009344976	350
	DE	435	132.62	-7.77	-0.0078	0.0078	0.0001	0.0000009434627	350
	EF	810	246.95	-7.73	-0.0077	0.0077	0.0001	0.0000005018598	350