

HYDRAULIC ENGINEERING

REHABILITATION OF THE SAUDI MATERNITY HOSPITAL

**KASSALA HEALTH CITADEL
SUDAN**

DETAILED DESIGN

STORMWATER CALCULUS

	Drainage Area (Runoff)				Gutter									Discharge								Vertical rainwater pipe					
Ref.	Section			Total	Type of gutter	Dimensions				L	Slope	Verification		Gutter Sole	Discharge Outlet			h	Type de Discharge	Q0 disch.	Verification	Di	Filling degree	Q0 RWP	Verifications		
	r	Horizontal surface	C	Total Flow Q		s / Ø	T	Z	W			QL	Type of sole	Effective Discharge	Material Discharge	DN discharge	Q0 disch.										Verification
	l/(s m²)	m²		l/s		mm	mm	mm	mm	m	%	l/s						Type of outlet	mm	mm	l/s	Q0 ≥ Q	mm	0,20 ≤ f ≤ 0,33	l/s	DiTQ ≥ DiAL	
Channel E1	0.06	156.67	1	9.40	Rectangular	350	350	250	175	4.50	0.50%	13.050	OK	Flat	c) Sharp-edged	PVC	200	117.5	Orifice	12.797	OK	188.2	0.2	25.1	OK	OK	
Channel E2	0.06	91.00	1	5.46	Rectangular	350	300	200	140	9.00	0.50%	9.900	OK	Flat	c) Sharp-edged	PVC	160	96	Orifice	7.407	OK	150.6	0.2	13.85	OK	OK	
Channel J	0.06	87.50	1	5.25	Rectangular	350	350	200	140	4.50	0.50%	9.360	OK	Flat	c) Sharp-edged	PVC	200	94	Weir	11.434	OK	188.2	0.2	25.1	OK	OK	
Channel canopy 1	0.06	73.80	1	4.43	Rectangular	400	400	200	140	9.00	0.50%	10.937	OK	Flat	c) Sharp-edged	PVC	160	94	Orifice	7.329	OK	150.6	0.2	13.85	OK	OK	
Channel canopy 2	0.06	48.50	1	2.91	Rectangular	400	400	200	140	6.00	0.50%	10.723	OK	Flat	c) Sharp-edged	PVC	160	94	Orifice	7.329	OK	150.6	0.2	13.85	OK	OK	
Channel K	0.06	253.00	1	15.18	Rectangular	700	700	230	161	12.00	0.50%	23.953	OK	Flat	c) Sharp-edged	PVC	250	108.1	Weir	17.638	OK	235.4	0.2	45.59	OK	OK	
Channel G1	0.06	105.00	1	6.30	Rectangular	300	300	200	140	23.00	0.50%	8.650	OK	Flat	c) Sharp-edged	PVC	160	94	Orifice	7.329	OK	150.6	0.2	13.85	OK	OK	
Channel G1	0.06	52.50	1	3.15	Rectangular	300	300	200	140	11.50	0.50%	8.250	OK	Flat	c) Sharp-edged	PVC	160	94	Orifice	7.329	OK	150.6	0.2	13.85	OK	OK	
Channel G1	0.06	46.00	1	2.76	Rectangular	200	200	200	140	5.00	0.50%	5.310	OK	Flat	c) Sharp-edged	PVC	125	94	Orifice	4.469	OK	117.6	0.2	7.16	OK	OK	

		Drainage Area (Runoff)						Horizontal Rainwater Pipes					Drainage flow conditions				Max. Drainage flow conditions		
Upstream	Downstream	Section				Total		Material	DN	DI	Slope	L	H/Dn	Pipe Flow Colebrook-White (iterative)	Vel.	Tractive Force	max H/D	Colebrook- White (EN12056-3)	Verifications
		r	Ah	C	Section Flow	Upper Flow	Total Flow											QRWpmax	
		l/(s m²)	m²		l/s	l/s	l/s		mm	mm	%	m		[l/s]	m/s	N/m²		l/s	
CV1	CV6	0.06	253.00	1	15.180	0.000	15.180	PVC	160	150.6	1.00%	27.00	58.3%	15.30	1.42	4.04	0.70	19.84	OK
CV2	CV4	0.06	325.00	1	19.500	0.000	19.500	PVC	200	188.2	1.00%	26.00	47.6%	19.71	1.51	4.47	0.70	35.48	OK
CV4	CV6	0.06	325.00	1	19.500	19.500	39.000	PVC	250	235.4	1.00%	18.00	50.8%	39.38	1.77	5.83	0.70	63.56	OK
CV6	CV9	0.06		1	0.000	54.180	54.180	PVC	250	235.4	1.00%	30.00	62.6%	54.52	1.90	6.54	0.70	63.56	OK
CV8	CV9	0.06	325.00	1	19.500	0.000	19.500	PVC	160	150.6	1.00%	17.00	69.3%	19.58	1.49	4.36	0.70	19.84	OK
CV9	CV11	0.06		1	0.000	73.680	73.680	PVC	250	235.4	2.00%	6.00	58.6%	74.26	2.80	12.67	0.70	95.47	OK
CV10	CV11	0.06	216.00	1	12.960	0.000	12.960	PVC	160	150.6	1.00%	14.00	59.2%	15.66	1.43	4.07	0.70	19.84	OK
CV11	CV15	0.06		1	0.000	86.640	86.640	PVC	250	235.4	2.00%	25.00	65.4%	87.16	2.89	13.34	0.70	95.47	OK
CV13	CV15	0.06	185.00	1	11.100	0.000	11.100	PVC	160	150.6	1.00%	35.20	48.1%	11.21	1.32	3.60	0.70	19.84	OK
CV15	PP	0.06		1	0.000	97.740	97.740	PVC	315	296.6	2.00%	11.00	48.1%	98.57	3.00	14.19	0.70	173.98	OK