

HYDRAULIC ENGINEERING

REHABILITATION OF THE SAUDI MATERNITY HOSPITAL

**KASSALA HEALTH CITADEL
SUDAN**

DETAILED DESIGN

FIREFIGHTING CALCULUS

Input data	
Cold Water temperature =	20 °C
Dynamic Visc.=	1.0040E-06 m²/s
Confort level:	Unitário
Drop Preshure Formula	Hazen-Williams
Pmin	25 mca
Pmáx	50 mca

Firefighting Water Network

Network	Pipe Section			Pipe						Equip	Flow			Drop Pressure				Pressures						
	Upstream node	Downstream node	Floor	Material	ND	φint	Horizontal Length (Lh)	L total (Lh + Gh)	b material	Fire Hoses	ΣFtotal	Ftotal calc	Vel.	k.J.L	Geom. Height (Gh)	Local Drop Press.	Total	Upstream Pressure	Downstream Pressure					
														k=25.0%						m/m	m/m	m/m	m.H2O	m.H2O
				mm	mm	m	m		l/s	l/s	6	m/s	m/m	m/m	m/m	m/m	m.H2O	m.H2O						
RIA	Pumping	NFe0	EXT	PEAD PN10	Ø 110	93.60	11.50	11.5	1.5E+02		34.50	6.00	0.87	0.11		5.00	5.11	39.00	33.89					
RIA	NFe0	NFe1	EXT	PEAD PN10	Ø 110	93.60	17.00	17.00	1.5E+02		12.00	6.00	0.87	0.17			0.17	33.89	33.72					
RIA	NFe1	NFe2	EXT	PEAD PN10	Ø 110	93.60	41.10	41.10	1.5E+02		7.50	6.00	0.87	0.40			0.40	33.72	33.32					
RIA	NFe0	NFe3	EXT	PEAD PN10	Ø 110	93.60	19.60	19.60	1.5E+02		22.50	6.00	0.87	0.19			0.19	33.89	33.70					
RIA	NFe3	NFe4	EXT	PEAD PN10	Ø 110	93.60	5.20	5.20	1.5E+02		21.00	6.00	0.87	0.05			0.05	33.70	33.64					
RIA	NFe4	NFe5	EXT	PEAD PN10	Ø 110	93.60	18.00	18.00	1.5E+02		18.00	6.00	0.87	0.18			0.18	33.64	33.47					
RIA	NFe5	NFe6	EXT	PEAD PN10	Ø 110	93.60	29.30	29.30	1.5E+02		16.50	6.00	0.87	0.29			0.29	33.47	33.18					
RIA	NFe6	NFe8	EXT	PEAD PN10	Ø 110	93.60	38.50	38.50	1.5E+02		15.00	6.00	0.87	0.38			0.38	33.18	32.81					
RIA	NFe8	NFe9	EXT	PEAD PN10	Ø 110	93.60	36.00	36.00	1.5E+02		13.50	6.00	0.87	0.35			0.35	32.81	32.45					
RIA	NFe9	NFe10	EXT	PEAD PN10	Ø 110	93.60	32.90	32.90	1.5E+02		6.00	6.00	0.87	0.32			0.32	32.45	32.13					
RIA	NFe9	NFe11	EXT	PEAD PN10	Ø 110	93.60	13.20	13.20	1.5E+02		7.50	6.00	0.87	0.13			0.13	32.45	32.32					
RIA	NFe11	NFe12	EXT	PEAD PN10	Ø 110	93.60	5.70	5.70	1.5E+02		6.00	6.00	0.87	0.06			0.06	32.32	32.27					
RIA	NFe12	NFe13	EXT	PEAD PN10	Ø 90	76.80	59.90	59.90	1.5E+02		4.50	4.50	0.97	0.90			0.90	32.27	31.37					
RIA	NFe13	NFe14	EXT	PEAD PN10	Ø 75	64.00	5.00	5.00	1.5E+02		3.00	3.00	0.93	0.09			0.09	31.37	31.28					
RIA	NFe1	CM1	EXT	PEAD PN10	Ø 90	76.80	4.60	7.10	1.5E+02		4.50	4.50	0.97	0.11	2.50		2.61	33.72	31.11					
RIA	CM1	FH1	GF	Galvanized Steel	Ø 65	65.00	0.80	0.80	1.0E+02	1	4.50	4.50	1.36	0.06			0.06	31.11	31.06					
RIA	FH1	FH2	GF	Galvanized Steel	Ø 50	50.00	27.00	27.00	1.0E+02	1	3.00	3.00	1.53	3.29			3.29	31.06	27.77					
RIA	FH2	FH3	GF	Galvanized Steel	Ø 50	50.00	21.00	21.00	1.0E+02	1	1.50	1.50	0.76	0.71			0.71	27.77	27.06					
RIA	NFe2	CM2	EXT	PEAD PN10	Ø 90	76.80	5.30	7.80	1.5E+02		6.00	6.00	1.30	0.20	2.50		2.70	33.32	30.62					
RIA	CM2	NFi1	GF	Galvanized Steel	Ø 80	80.00	1.00	1.00	1.0E+02		6.00	6.00	1.19	0.04			0.04	30.62	30.57					
RIA	NFi1	FH4	GF	Galvanized Steel	Ø 50	50.00	1.00	1.00	1.0E+02	1	1.50	1.50	0.76	0.03			0.03	30.57	30.54					
RIA	NFi1	NFi2	GF	Galvanized Steel	Ø 65	65.00	23.00	23.00	1.0E+02		4.50	4.50	1.36	1.65			1.65	30.57	28.92					
RIA	NFi2	FH5	GF	Galvanized Steel	Ø 50	50.00	9.70	9.70	1.0E+02	1	1.50	1.50	0.76	0.33			0.33	28.92	28.60					
RIA	NFi2	NFi3	GF	Galvanized Steel	Ø 50	50.00	9.80	9.80	1.0E+02		3.00	3.00	1.53	1.19			1.19	28.92	27.73					
RIA	NFi3	FH6	GF	Galvanized Steel	Ø 50	50.00	6.20	6.20	1.0E+02	1	1.50	1.50	0.76	0.21			0.21	27.73	27.52					
RIA	NFi3	FH7	GF	Galvanized Steel	Ø 50	50.00	10.50	10.50	1.0E+02	1	1.50	1.50	0.76	0.35			0.35	27.73	27.38					
RIA	NFe2	CM3	EXT	PEAD PN10	Ø 50	42.60	21.00	23.50	1.5E+02		1.50	1.50	1.05	0.82	2.50		3.32	33.32	30.00					
RIA	CM3	FH8	GF	Galvanized Steel	Ø 50	50.00	1.50	1.50	1.0E+02	1	1.50	1.50	0.76	0.05			0.05	30.00	29.95					
RIA	NFe3	CM4	EXT	PEAD PN10	Ø 50	42.60	2.20	4.70	1.5E+02		1.50	1.50	1.05	0.16	2.50		2.66	33.70	31.03					
RIA	CM4	FH9	GF	Galvanized Steel	Ø 50	50.00	1.00	1.00	1.0E+02	1	1.50	1.50	0.76	0.03			0.03	31.03	31.00					
RIA	NFe4	CM5	EXT	PEAD PN10	Ø 75	64.00	9.60	12.10	1.5E+02		3.00	3.00	0.93	0.21	2.50		2.71	33.64	30.94					
RIA	CM5	FH10	GF	Galvanized Steel	Ø 50	50.00	2.80	2.80	1.0E+02	1	3.00	3.00	1.53	0.34			0.34	30.94	30.59					
RIA	FH10	FH11	GF	Galvanized Steel	Ø 50	50.00	34.00	34.00	1.0E+02	1	1.50	1.50	0.76	1.15			1.15	30.59	29.45					
RIA	NFe5	CM6	EXT	PEAD PN10	Ø 50	42.60	3.40	5.90	1.5E+02		1.50	1.50	1.05	0.21	2.50		2.71	33.47	30.76					
RIA	CM6	FH12	GF	Galvanized Steel	Ø 50	50.00	1.00	1.00	1.0E+02	1	1.50	1.50	0.76	0.03			0.03	30.76	30.73					
RIA	NFe6	CM7	EXT	PEAD PN10	Ø 50	42.60	3.30	5.80	1.5E+02		1.50	1.50	1.05	0.20	2.50		2.70	33.18	30.48					
RIA	CM7	FH13	GF	Galvanized Steel	Ø 50	50.00	1.00	1.00	1.0E+02	1	1.50	1.50	0.76	0.03			0.03	30.48	30.45					
RIA	NFe8	CM9	EXT	PEAD PN10	Ø 50	42.60	1.00	3.50	1.5E+02		1.50	1.50	1.05	0.12	2.50		2.62	32.81	30.18					
RIA	CM9	FH15	GF	Galvanized Steel	Ø 50	50.00	4.50	4.50	1.0E+02	1	1.50	1.50	0.76	0.15			0.15	30.18	30.03					
RIA	NFe10	CM10	EXT	PEAD PN10	Ø 75	64.00	1.20	3.70	1.5E+02		3.00	3.00	0.93	0.06	2.50		2.56	32.13	29.57					
RIA	CM10	VP1	GF	Galvanized Steel	Ø 65	65.00	10.00	10.00	1.0E+02		3.00	3.00	0.90	0.34			0.34	29.57	29.23					
RIA	VP1	FH16	GF	Galvanized Steel	Ø 50	50.00	2.20	2.20	1.0E+02	1	1.50	1.50	0.76	0.07			0.07	29.23	29.15					
RIA	VP1	FH17	1F	Galvanized Steel	Ø 50	50.00	1.00	3.00	1.0E+02	1	1.50	1.50	0.76	0.10	2.00		2.10	29.23	27.13					
Servico	NFe10	CM11	EXT	PEAD PN10	Ø 75	64.00	14.00	16.50	1.5E+02		3.00	3.00	0.93	0.29	2.50		2.79	32.13	29.35					
RIA	CM11	VP2	GF	Galvanized Steel	Ø 65	65.00	10.00	10.00	1.0E+02		3.00	3.00	0.90	0.34			0.34	29.35	29.01					
RIA	VP2	FH18	GF	Galvanized Steel	Ø 50	50.00	2.20	2.20	1.0E+02	1	1.50	1.50	0.76	0.07			0.07	29.01	28.93					
RIA	VP2	FH19	1F	Galvanized Steel	Ø 50	50.00	1.00	3.00	1.0E+02	1	1.50	1.50	0.76	0.10	2.00		2.10	29.01	26.91					
RIA	NFe11	CM12	EXT	PEAD PN10	Ø 50	42.60	1.20	3.70	1.5E+02		1.50	1.50	1.05	0.13	2.50		2.63	32.32	29.70					
RIA	CM12	FH18		Galvanized Steel	Ø 50	50.00	2.00	2.00	1.0E+02	1	1.50	1.50	0.76	0.07			0.07	29.70	29.63					
RIA	NFe12	CM13	EXT	PEAD PN10	Ø 50	42.60	1.20	3.70	1.5E+02		1.50	1.50	1.05	0.13	2.50		2.63	32.27	29.64					
RIA	CM13	FH19		Galvanized Steel	Ø 50	50.00	2.20	2.20	1.0E+02	1	1.50	1.50	0.76	0.07			0.07	29.64	29.57					
RIA	NFe13	CM14	EXT	PEAD PN10	Ø 50	42.60	1.20	3.70	1.5E+02		1.50	1.50	1.05	0.13	2.50		2.63	31.37	28.74					
RIA	CM14	FH20		Galvanized Steel	Ø 50	50.00	12.50	12.50	1.0E+02	1	1.50	1.50	0.76	0.42			0.42	28.74	28.32					
RIA	NFe14	CM15	EXT	PEAD PN10	Ø 50	42.60	8.20	10.70	1.5E+02		1.50	1.50	1.05	0.37	2.50		2.87	31.28	28.41					
RIA	CM15	FH21		Galvanized Steel	Ø 50	50.00	12.50	12.50	1.0E+02	1	1.50	1.50	0.76	0.42			0.42	28.41	27.99					
RIA	NFe14	CM16	EXT	PEAD PN10	Ø 50	42.60	65.00	67.50	1.5E+02		1.50	1.50	1											