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maghsoudi.a.a@mail.uk.ac.ir :

rahgozar@mail.uk.ac.ir :

hamidhashemi55@yahoo.com :

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$0.2\rho_b$

$0.4\rho_b$

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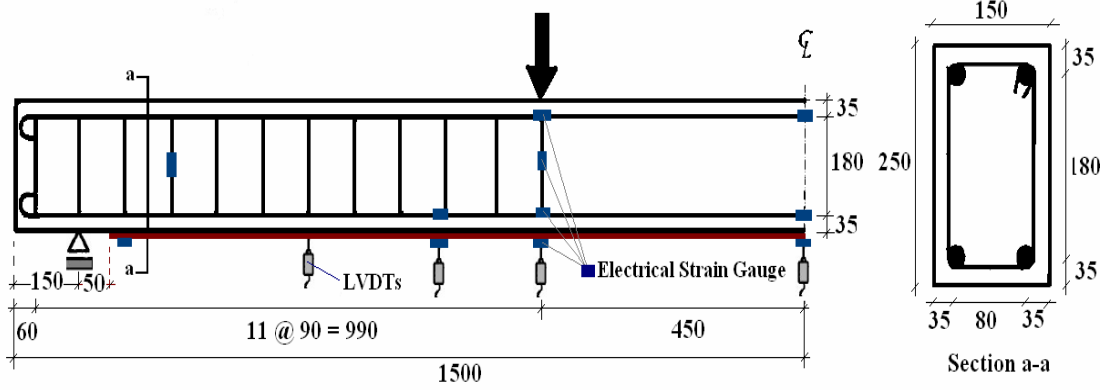
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Series	Test beam	A_s	A'_s	A_{sv}	A_{CFRP} (mm ²)	CFRP layers
A	AH0	2Φ16	2Φ10	Φ10@9cm	0	0
	AH1	2Φ16	2Φ10	Φ10@9cm	6.75	1
	AH4	2Φ16	2Φ10	Φ10@9cm	27	4
B	BH0	2Φ22	2Φ10	Φ10@9cm	0	0
	BH1	2Φ22	2Φ10	Φ10@9cm	6.75	1
	BH4	2Φ22	2Φ10	Φ10@9cm	27	4

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EP-TX (FRP)

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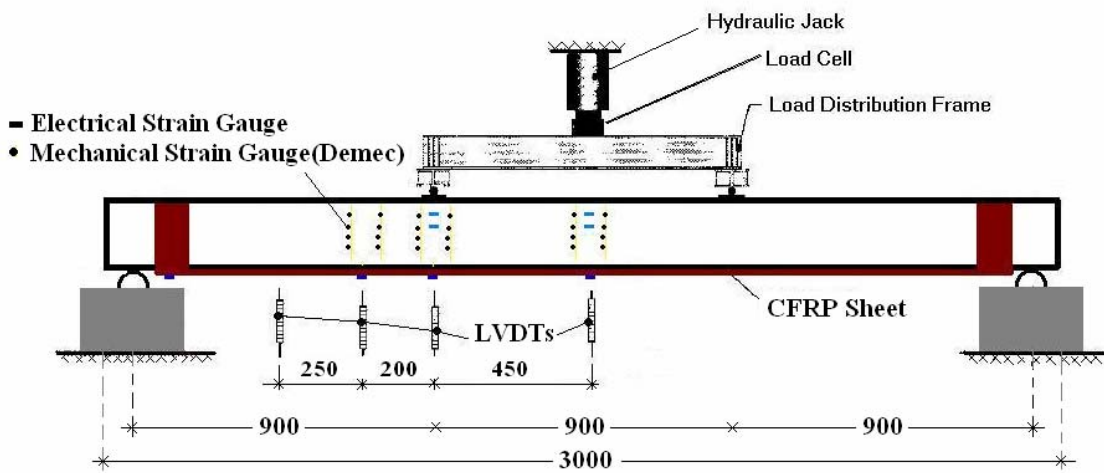
EP-IN

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(°C)			(MPa)		(MPa)		
+		/	>	>	>	>	EP-TX
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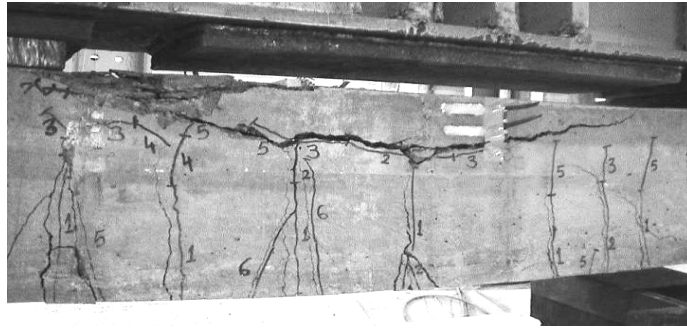
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AH0



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BH4 AH4



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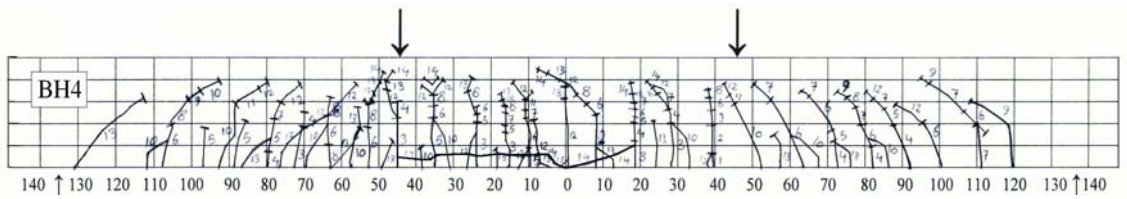
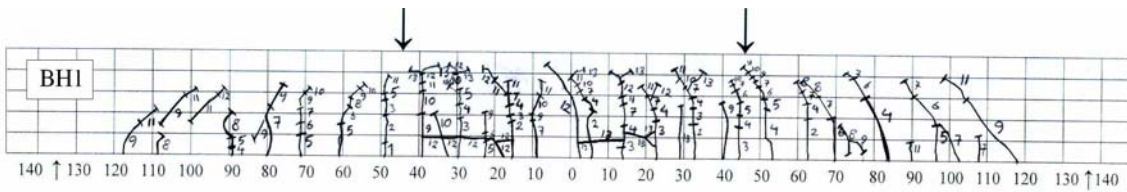
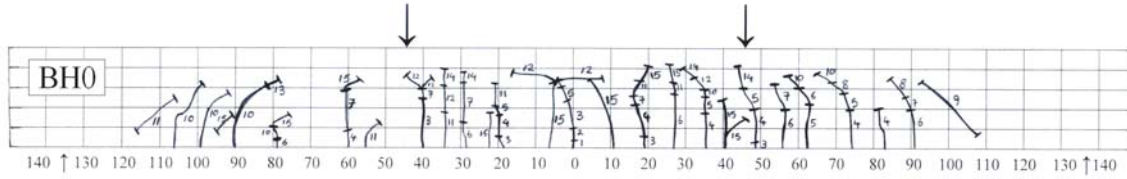
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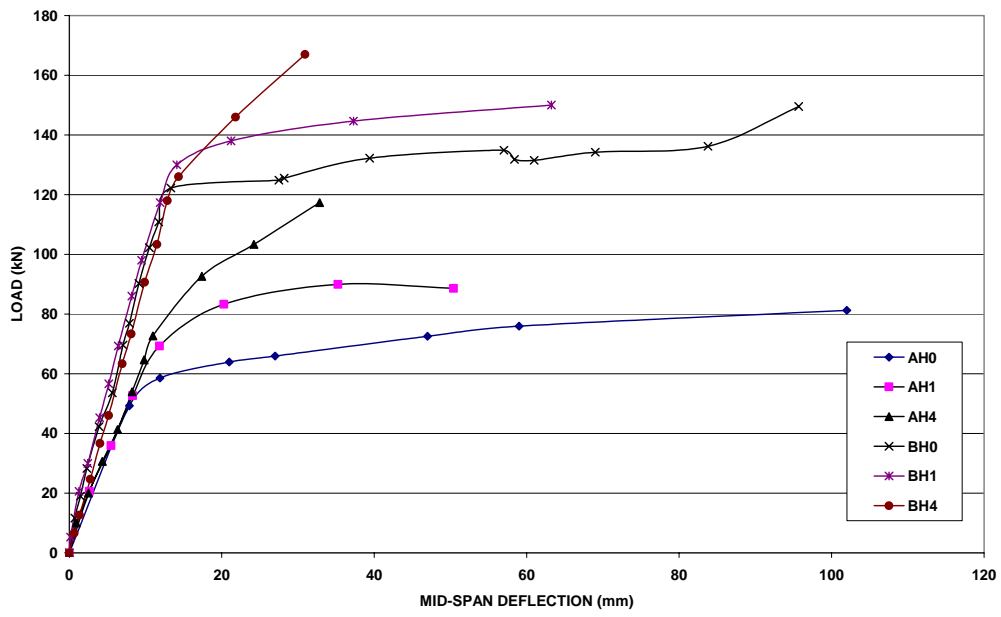
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Series	Test Beam	Failure mode	Peak load P_{ult} (kN)	Ratio to unstrengthened beam	P_{ult}				
					Displacement (mm)	Strain (micron)			
						CFRP	Tensile rebar	Stirrup	Concrete
A	AH0		81.25	1	102	-	2316	48	3600
	AH1	FRP	89.96	1.11	50.42	844	3341	441	2500
	AH4	FRP	117.33	1.44	32.85	2581	9557	954	2100
B	BH0		149.52	1	95.7	-	17843	644	4200
	BH1	FRP	150	1.01	63.24	1066	17330	790	2600
	BH4	FRP	167	1.12	30.92	3367	4512	-	2700



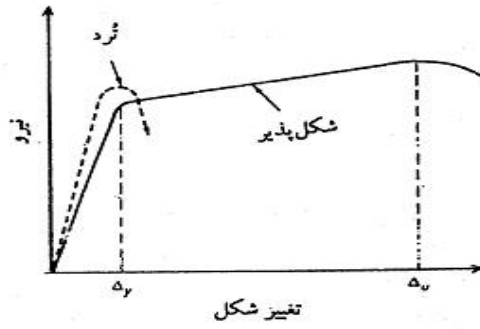
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Δ_y

Δ_U

$$\mu = \frac{\Delta_U}{\Delta_Y}$$

$$\left(\frac{\phi_u}{\phi_y} \right)$$

$$\frac{\theta_u}{\theta_y}$$

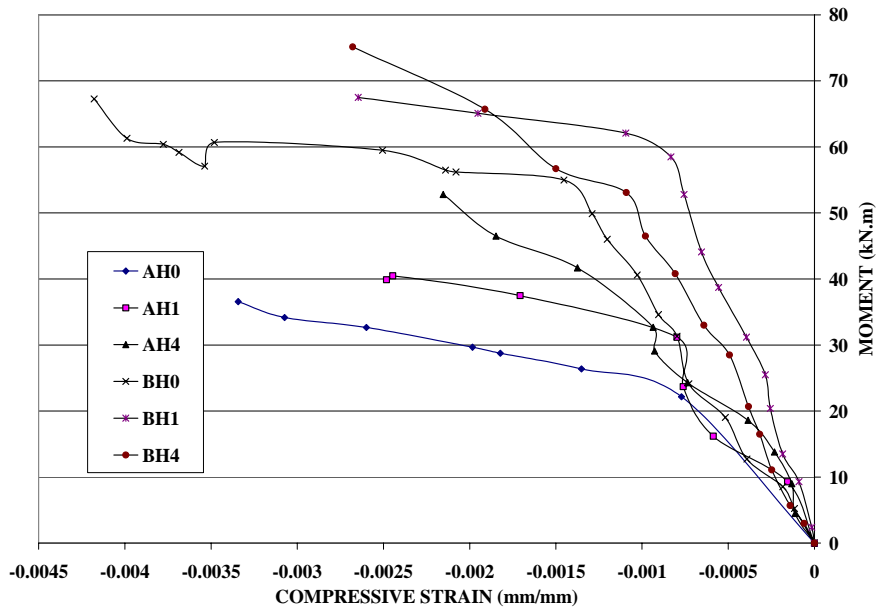
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Series	Test beam	Yield stage				Ultimate stage			
		Load $P_y(kN)$	Increase over control (%)	$\delta_y(mm)$	Decrease over control (%)	Load $P_u(kN)$	Increase over control (%)	$\delta_u(mm)$	Decrease over control (%)
A	AH0	63.93	---	21	---	81.25	---	102	---
	AH1	69.5	8.7	13	38	89.9	11	50.42	30
	AH4	64.7	1.2	9.83	46.8	117.3	44.4	32.85	54.5
B	BH0	122.2	---	13.325	---	149.52	---	95.7	---
	BH1	130	6.4	14.11	-5.9	150	0.5	63.24	33.9
	BH4	118	-3.4	12.86	3.6	167	11.7	30.92	67.7

Series	Test beam	Deflection ductility ratio $\left(\mu_\delta = \frac{\delta_u}{\delta_y}\right)$	Decrease over control beam (%)	Curvature ductility ratio $\left(\mu_\phi = \frac{\phi_u}{\phi_y}\right)$	$\frac{\mu_\delta}{\mu_\phi}$
A	AH0	4.86	----	6.37	0.76
	AH1	3.87	20.4	----	----
	AH4	3.34	31.3	3.91	0.86
B	BH0	7.19	----	6.2	1.16
	BH1	4.48	37.7	----	----
	BH4	2.4	66.6	2.37	1.01

BH4

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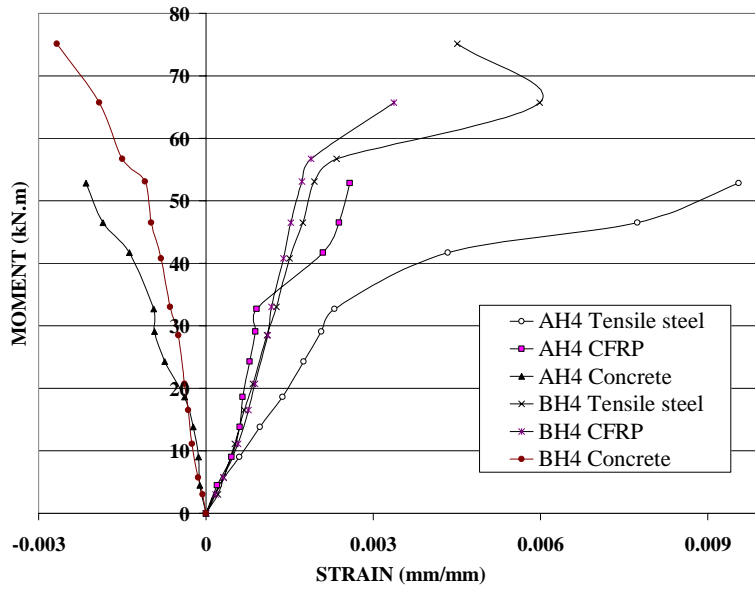
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