

( ) , ( )

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( // : // : )

ANSYS

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(Kulkarni et al., 1983)

(Baley, 2002)

(Elenga et al., 2009)

(Asasutjarit et al., 2009;

Khanbashi & Al-Kaabi, 2005; Liu et al., 2009)

(d'Almeida et al., 2006)

( )

( )

(Kaddami et al., 2006)

(Alwar et al., 2009; Zare et al., 2009 )

(Beg et al., 2008)

, ( )

(PVA)

(Alix et al., 2009; Ghali et

.(Zare, 2010)

.al.,2009)

. (Jacob et al., 2004)

( ( ) )  
( )



.(Zare, 2010)

$$v = -\frac{\epsilon_r}{\epsilon_l} \quad ( )$$

(GM1) (GM2)

$\varepsilon_r$

$\varepsilon_t$

( )

( ) ( )

$$\varepsilon_t = \frac{L' - L}{L} \quad ( )$$

$$\varepsilon_r = \frac{D' - D}{D} \quad ( )$$

)

$L'$

$L ( ) ( )$

(

$D'$

$D$

( )

(RMSE)

(Ressing et al., 2007)

$$\int_v \delta \varepsilon^T D \varepsilon dv = \int_v \delta u^T f_b dv + \int_s \delta u^T f_s ds \quad ( )$$

( )

$f_b$

$y \ x$

$f_s$

$\delta \varepsilon$

$D$

$\delta u$

( )

$v$

$E$

( )

( )

$$\sum K_{st}^e U = \sum F^e \quad ( ) \quad (discrete) \quad ( )$$

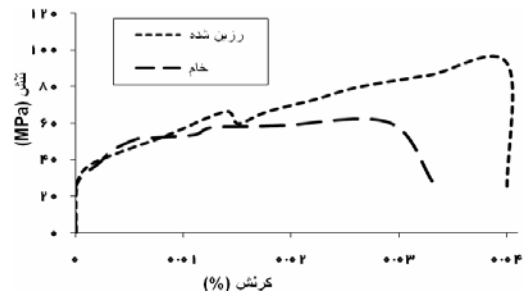
$F^e \ K_{st}^e$

( )

$U$

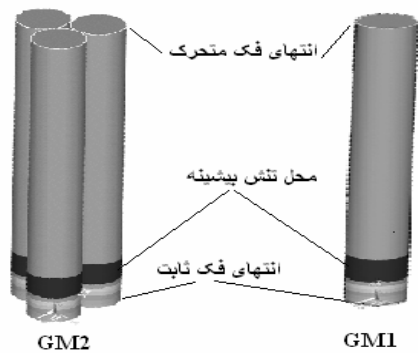
( )

( )



(mm)	(N)	(MPa)	(%)	(MPa)
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/

( ) ( )



( )

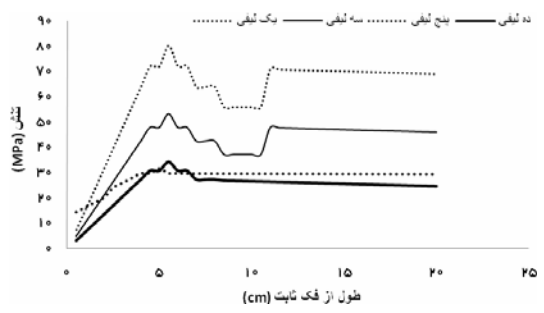
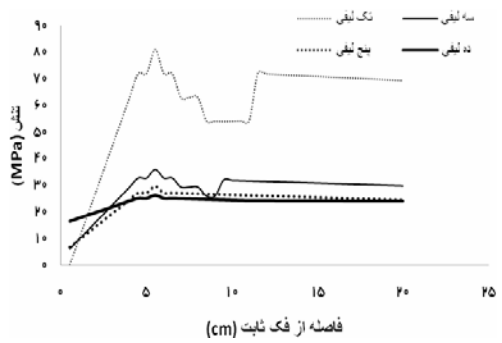
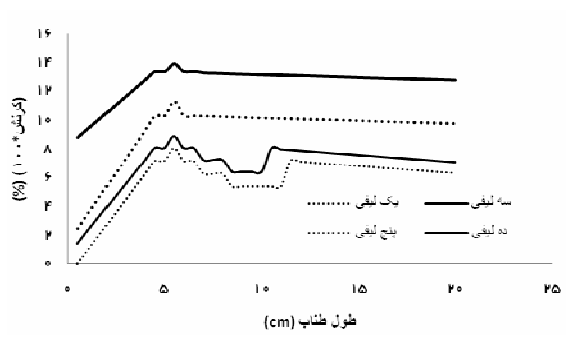
( ) ( )

( )

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( )

(G'Sell et al., 1992)



( ) ( )

( )

(RMSE)

(MPa)			(%)		
GM2	GM1		GM2	GM1	
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/		/	/	RMSE
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/		/	/	RMSE

$$\frac{1}{r}$$

(GM2)

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