Strain associated with FRCM bond failure: $\varepsilon_{fb} = 0.009741$
Ultimate tensile strain of the textile: $\varepsilon_{tk} = 0.01635$

Loading conditions
Weight of the wall (characteristic value): $G_{k1} = \rho \cdot g \cdot L \cdot t \cdot H = 51.8$ kN (11,645.1 lbf)
Roof live load (characteristic value): $G_{k2} = 59.1$ kN (13,286.2 lbf)
Mass proportional seismic load: $E = 6.7$ kN/m (459.1 lbf/ft)
Resultant axial load (design value): $N_{Ed} = (G_{k1}/2) + G_{k2} = 85$ kN (19,108.76 lbf)
Bending moment (design value): $M_{Ed} = E \cdot (H^2/8) = 16.21$ kN·m (11,959 lbf·ft)
Shear (design value): $V_{Ed} = E \cdot (H/2) = 14.74$ kN (3313.68 lbf)

Other data
Safety factor: $\gamma_k = 0.85$

PROCEDURE	CALCULATION IN SI UNITS
STEP 1: Compute the existing strength	
Calculate the existing neutral axis depth c_{urm}, as: $$c_{urm} = \begin{vmatrix} \dfrac{N_{Ed}}{L \cdot \gamma \cdot f_{mu} \cdot \beta} \text{ if } \dfrac{N_{Ed}}{L \cdot \gamma \cdot f_{mu} \cdot \beta} \leq t \\ \text{masonry failure otherwise} \end{vmatrix}$$	$$c_{urm} = \frac{85{,}000 \text{ N}}{2500 \text{ mm} \cdot 0.85 \cdot 1.8 \text{ MPa} \cdot 0.8} = 28 \text{ mm}$$
Calculate the existing nominal flexural strength M_{nURM} as: $$M_{nURM} = N_{Ed} \cdot \left(\frac{t}{2} - \beta \cdot \frac{c_{urm}}{2} \right)$$	$$M_{nURM} = 85 \text{ kN} \cdot \left(\frac{0.4}{2} \text{m} - 0.8 \cdot \frac{0.028}{2} \text{m} \right) = 16 \text{ kN·m (11,801 lbf·ft)}$$ $$\text{Check URM} = \begin{Vmatrix} \textbf{OK} \text{ if } M_{nURM} \geq M_{Ed} \\ \textbf{N.G.} \text{ otherwise} \end{Vmatrix}$$ Check URM = **N.G.** The URM wall does not have adequate flexural strength to resist the seismic action and requires strengthening. Design the FRCM flexural strengthening. The selected FRCM system consists of an aramid-glass (AG) fiber within a lime mortar layer. The AG textile is made of alkali-resistant glass fibers in weft direction (spacing 18 mm), and glass and aramid fibers in warp direction (spacing 15 mm). Mechanical end anchors are also used in the strengthening intervention.
STEP 2: Compute the FRCM design strain	
Using the coefficients α_1 and α_2 equal to 1.5 and 1, respectively, from Section 7.1.2, the FRCM design tensile strain can be determined from Eq. (5.2.b6), as: $$\varepsilon_{fd} = \min\left(\frac{\alpha_1 \cdot \varepsilon_{fb}}{\gamma_M}, \frac{\varepsilon_{tk}}{\alpha_2 \cdot \gamma_M} \right)$$ where the partial safety factor γ_M is equal to 1.5 (Section 5.2).	$$\varepsilon_{fd} = \min\left(\frac{1.5 \cdot 0.009741}{1.5}, \frac{0.01635}{1 \cdot 1.5} \text{m} \right) = 0.009741$$

STEP 3: Select the layout of FRCM reinforcement	
Using a single-textile-layer FRCM system, uniformly applied to the surface of the wall (width of the single strip of textile w_{fl} and spacing between strips s_f, both equal to the length of the wall L), the area of the reinforcement can determined as: Total width of the FRCM strips: $w_f = L$ Area of FRCM reinforcement: $A_f = t_f \cdot w_f$	$A_f = 0.03\text{ mm} \cdot 2500\text{ mm} = 75\text{ mm}^2$
STEP 4: Compute the new flexural capacity of the wall	
Identify the failure mode. Given that no steel reinforcement is present in the wall, in accordance with Section 7.1.2, the two possible out-of-plane failure modes are: 1. Failure Mode I—Crushing of the masonry in compression, if $N_{Ed} > F_m' - F_f'$ 2. Failure Mode II—Failure of FRCM in tension, if $N_{Ed} < F_m' - F_f'$ where F_m' and F_f' are evaluated under the preliminary assumption that both the masonry and the FRCM attain their ultimate strain, as: Neutral axis depth $c_u' = t \cdot \frac{\varepsilon_{mu}}{\varepsilon_{fd} + \varepsilon_{mu}}$ (7.1.3b1)	$c_u' = 400\text{ mm} \cdot \frac{0.0035}{0.009741 + 0.0035} = 106\text{ mm}$
Resultant load for the masonry in compression $F_m' = \gamma \cdot f_{mu} \cdot \beta \cdot c_u' \cdot L$ (7.1.3b2)	$F_m' = 0.85 \cdot 0.0018\text{ kN/mm}^2 \cdot 106\text{ mm} \cdot 2500\text{ mm} = 324\text{ kN}$
Resultant load for the FRCM in tension $F_f' = w_f \cdot t_f \cdot \varepsilon_{fd} \cdot E_f$ (7.1.3b3)	$F_f' = 2500\text{ mm} \cdot 0.03\text{ mm} \cdot 0.009741 \cdot 95\text{ kN/mm}^2 = 69.4\text{ kN}$ Check failure mode $\text{Check} = \begin{Vmatrix} \text{Failure Mode I if } F_m' - F_f' < N_{Ed} \\ \text{Failure Mode II otherwise} \end{Vmatrix}$ Check = Failure Mode II (FRCM failure)

Calculate the design flexural strength.	
In accordance with Section 7.1.2, the effective tensile strain level ε_{fe} in the FRCM reinforcement attained at failure can be set equal to the FRCM design tensile strain ε_{fd}.	$\varepsilon_{fe} = \varepsilon_{fd} = 0.00974$
The effective stress level f_{fe} in the FRCM reinforcement attained at failure can be calculated as follows:	
$f_{fe} = E_f \cdot \varepsilon_{fe}$	$f_{fe} = 95{,}000\ \text{MPa} \cdot 0.009741 = 925.39\ \text{MPa}$
The neural axis depth c_u can be therefore calculated by solving Eq. (7.1.3b5), as:	
$c_u = \dfrac{t_f \cdot w_f \cdot f_{fe} + N_{Ed}}{\gamma \cdot f_{mu} \cdot \beta \cdot L}$	$c_u = \dfrac{(0.03\,\text{mm} \cdot 2500\,\text{mm} \cdot 925.39\,\text{MPa} = 85{,}000\,\text{N})}{0.85 \cdot 1.8\,\text{MPa} \cdot 0.8 \cdot 2500\,\text{mm}} = 50.5\ \text{mm}$
The resultant loads for the masonry in compression F_m and for the FRCM in tension F_f, and the nominal flexural strength M_n can be evaluated as follows:	
$F_m = c_u \cdot \gamma \cdot f_{mu} \cdot \beta \cdot L$	$F_m = 0.0505\ \text{m} \cdot 0.85 \cdot 1800\ \text{kN/m}^2 \cdot 0.8 \cdot 2.5\ \text{m} = 154.5\ \text{kN}$
$F_f = f_{fe} \cdot t_f \cdot w_f$	$F_f = 925{,}390\ \text{kN/m}^2 \cdot 0.00003\ \text{m} \cdot 2.5\ \text{m} = 69.4\ \text{kN}$
$M_n = F_m \cdot \left(\dfrac{t}{2} - \dfrac{\beta}{2} c_u\right) + F_f \cdot \dfrac{t}{2}$ (7.1.3.b6)	$M_n = 154.5\ \text{kN} \cdot \left(\dfrac{0.4}{2}\,\text{m} - \dfrac{0.8}{2} \cdot 0.0505\,\text{m}\right) + 69.4\ \text{kN} \cdot \dfrac{0.4}{2}\,\text{m}$ $M_n = 41.66\ \text{kN·m}\ (30{,}712\ \text{lbf·ft})$
The design value of the flexural strength, according to Eq. (7.1.3.b7), is	
$M_{Rd} = M_{nURM} + \gamma_k \cdot (M_n - M_{nURM})$	$M_{Rd} = 16.05\ \text{kN·m} + 0.5 \cdot (41.66\ \text{kN·m} - 16.05\ \text{kN·m})$ $M_{Rd} = 28.86\ \text{kN·m}\ (21{,}271\ \text{lbf·ft})$
	Check flexural strength Check FS = **OK** if $M_{Rd} \geq M_{Ed}$; **N.G.** otherwise Check FS = **OK**
Verify that the compressive strain in the masonry does not exceed ε_{mu}	Check strain = **OK** if $\varepsilon_{fd} \cdot \left(\dfrac{c_u}{t - c_u}\right) \leq \varepsilon_{mu}$; **N.G.** otherwise Check strain = **OK**

STEP 5: Compute the shear strength of the wall	
Compute the shear strength of unreinforced masonry, in accordance with Eurocode 6. Because the higher value of shear loads is experienced by the wall close to its top, the design average vertical stress over the compressed part of the wall (σ_d) can be evaluated by dividing the superimposed load (G_{k2}) by the cross section of the wall itself (which in this case is totally compressed).	
$\sigma_d = \frac{G_{k2}}{t \cdot L}$	$\sigma_d = \frac{59{,}100\,\text{N}}{400\,\text{mm} \cdot 2500\,\text{mm}} = 0.059\ \text{MPa}$
The design value of the shear strength of masonry is evaluated as	
$f_{vd} = \left(\frac{f_{vk0} + 0.4\sigma_d}{\gamma_m}\right)$	$f_{vd} = \left(\frac{0.2\,\text{MPa} + 0.4 \cdot 0.059\,\text{MPa}}{2}\right) = 0.1118\ \text{MPa}$
The design shear strength under out-of-plane loads (V_{RdOP}) is calculated in accordance with Eq. (7.1.b8), where c_u, in this case, is equal to the thickness t of the wall	
$V_{RdOP} = t \cdot L \cdot f_{vd}$	V_{RdOP} = 400 mm · 2500 mm · 0.0001118 kN/mm^2 = 112 kN (25,179 lbf) Check shear strength Check ShS = $\begin{cases} \textbf{OK} \text{ if } V_{RdOP} \geq V_{ED} \\ \textbf{N.G.} \text{ otherwise} \end{cases}$ Check ShS = **OK**

12.2.1 *Strengthening of masonry crowning-beams with FRCM/SRG systems (ACI approach)*—The following example explains how to calculate the tensile strength, the design resistant bending moment, and the flexural stiffness of a FRCM/SRG reinforced masonry crowning-beam subjected to bending load acting both parallel and perpendicular to the mortar bed joints.

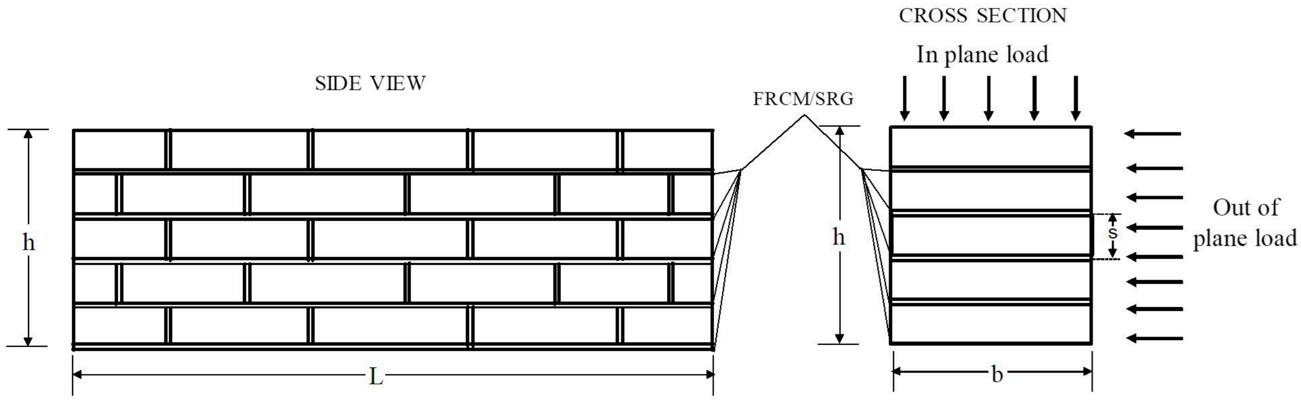

Fig. 12.2.1—FRCM/SRG reinforced masonry crowning-beam: geometrical properties and load patterns.

Masonry crowning beam geometrical and mechanical properties

Height of the crowning beam:	h = 10.24 in. (260 mm)
Width of the crowning beam:	b = 9.843 in. (250 mm)
Masonry compressive strength:	f_{mu} = 1160.3 psi (8 MPa)
Compressive ultimate strain:	ε_{mu} = 0.0035
Masonry elastic modulus:	E_m = 290.08 ksi (2000 MPa)
Stress-block parameters (in case of FRCM failure):	
Masonry strength parameter:	γ = 0.7
Neutral axis depth parameter:	β = 0.7

FRCM system properties

The selected FRCM system consists of an aramid-glass (AG) fiber within a lime mortar layer. The AG textile is made of alkali-resistant glass fibers in weft direction (spacing 0.71 in.), and glass and aramid fibers in warp direction (spacing 0.59 in.).

Ultimate tensile strain of the fabric:	ε_{fu} = 0.0267
Stiffness:	E_f = 4496.17 ksi (31 GPa)
Design tensile strain:	ε_{fd} = min(ε_{fu}, 0.012) = 0.012
Design thickness of composite strips:	t_f = 0.0012 in. (0.03 mm)
Number of FRCM plies:	n_f = 5
Spacing between FRCM layers:	s = 2.047 in. (52 mm)
Width of the FRCM strip.	$w_f = b$ = 9.84 in. (250 mm)

PROCEDURE	CALCULATION IN in.-lb
STEP 1: Compute the tensile strength	
Compute the tensile strength N_n, according to Eq. (7.2a17). $N_n = b \cdot n_f \cdot t_f \cdot \varepsilon_{fd} \cdot E_f$	N_n = 9.843 in.·5·0.0021 in.·0.012·4,496,170 psi = 3186 lbf (14.2 kN)
The design tensile strength of the crowning-beam N_{Rd} is therefore calculated as follows: Reduction factor ϕ_m = 0.6 $\phi N_n = \phi_m \cdot N_n$ (7.2a18)	ϕN_n = 0.6 · 3186 lbf = 1912 lbf (8.5 kN)

STEP 2: Compute the out of plane flexural strength	
Identify the failure mode. In accordance with Section 7.2.3, the two possible out-of-plane failure modes are: 1. Failure Mode I—Crushing of the masonry in compression, if $F_m' < F_f'$ 2. Failure Mode II—Failure of FRCM in tension, if $F_m' > F_f'$ where F_m' and F_f' are evaluated under the preliminary assumption that both the masonry and the FRCM attain their ultimate strain, as: Neutral axis depth	
$c_u' = b\dfrac{\varepsilon_{mu}}{\varepsilon_{fd}+\varepsilon_{mu}}$ (7.2a1)	$c_u' = 9.843\text{ in.}\cdot\dfrac{0.0035}{0.012+0.0035} = 2.223\text{ in.}$
Resultant load for the masonry in compression $F_m' = \gamma \cdot f_{mu} \cdot \beta \cdot c_u' \cdot h$ (7.2a2)	$F_m' = 0.7 \cdot 1160.3\text{ psi} \cdot 0.7 \cdot 2.223\text{ in.} \cdot 10.236\text{ in.} = 12{,}937\text{ lbf}$
Resultant load for the FRCM in tension $F_f' := \dfrac{1}{2} n_f \cdot t_f \cdot \varepsilon_{fd} \cdot E_f \cdot (b - c_u')$ (7.2a3)	$F_f' := \dfrac{1}{2}\cdot 5 \cdot 0.0012\text{ in.}\cdot 0.012 \cdot 4{,}496{,}170\text{ psi}\cdot(9.843\text{ in.} - 2.223\text{ in.}) = 1233.9\text{ lbf}$ Check failure mode $\text{Check} = \begin{vmatrix}\text{Failure Mode I if } F_m' < F_f' \\ \text{Failure Mode II otherwise}\end{vmatrix}$
Calculate the design flexural strength.	Check = Failure Mode II (FRCM failure)
In accordance with Section 7.2.3, the effective tensile strain level ε_{fe} in the FRCM reinforcement attained t failure can be set equal to the FRCM design tensile strain ε_{fd}.	$\varepsilon_{fe} = \varepsilon_{fd} = 0.0120$
The effective stress level f_{fe} in the FRCM reinforcement attained at failure can be calculated as follows:	
$f_{fe} = E_f \cdot \varepsilon_{fe}$	$f_{fe} = 4{,}496{,}170\text{ psi} \cdot 0.012 = 53{,}954\text{ psi}$
The neural axis depth c_u can be therefore calculated by solving Eq. (7.2a4), as: $c_u = \dfrac{\left(\dfrac{1}{2} f_{fe} \cdot b \cdot n_f \cdot t_f\right)}{\gamma \cdot f_{mu} \cdot \beta \cdot h + \dfrac{1}{2} \cdot f_{fe} \cdot n_f \cdot t_f}$	$c_{u.} := \dfrac{\dfrac{1}{2}\cdot 53{,}954\text{ psi}\cdot 9.843\text{ in.}\cdot 5 \cdot 0.0012\text{ in.}}{0.7 \cdot 1160.3\text{ psi}\cdot 0.7 \cdot 10.236\text{ in.} + \dfrac{1}{2} 53{,}954\text{ psi}\cdot 5 \cdot 0.0012\text{ in.}} = 0.2664\text{ in.}$

The nominal flexural strength M_n can be evaluated, in accordance with Eq. (7.2a5), as $M_n = f_{fe} \cdot \frac{(b-c_u)}{2} \cdot n_f \cdot t_f \cdot \left(\frac{2}{3}b + \frac{1}{3}c_u - \frac{1}{2}\cdot\beta\cdot c_u\right)$	$\frac{2}{3}b + \frac{1}{3}c_u - \frac{1}{2}\cdot\beta\cdot c_u = \frac{2}{3}\cdot 9.843\text{ in.} + \frac{1}{3}\cdot 0.2664\text{ in.}\cdot\left(1-\frac{3}{2}\cdot 0.7\right) = 6.56\text{ in.}$ $M_n = 53{,}954\text{ psi}\cdot\frac{(9.843\text{ in.} - 0.2664\text{ in.})}{2}\cdot 5\cdot 0.0012\text{ in.}\cdot 6.56\text{ in.} = 10{,}168.57\text{ lbf}\cdot\text{in.}$ (847.37 lbf·in.=1.1kN·m)
The design value of the flexural strength is therefore: $\phi_m = 0.6$ $\phi M_n = \phi_m \cdot M_n$ (7.2a6) Verify that the compressive strain in the masonry does not exceed ε_{mu}	Check strain = **OK** if $\varepsilon_{fd}\left(\frac{c_u}{b-c_u}\right) \le \varepsilon_{mu}$; **N.G.** otherwise Check strain = **OK**
STEP 3: Compute the in plane flexural strength	
Identify the failure mode. In accordance with Section 7.2.4, the two possible out-of-plane failure modes are: 1. Failure Mode I—Crushing of the masonry in compression, if $F_m' < F_f'$ 2. Failure Mode II—Failure of FRCM in tension, if $F_m' > F_f'$ where F_m' and F_f' are evaluated under the preliminary assumption that both the masonry and the FRCM attain their ultimate strain, as:	
Neutral axis depth $c_u' = h\cdot\frac{\varepsilon_{mu}}{\varepsilon_{fd} + \varepsilon_{mu}}$	$c_u' = 10.236\text{ in.}\cdot\frac{0.0035}{0.012 + 0.0035} = 2.311\text{ in.}$
Resultant load for the masonry in compression $F_m' = \gamma \cdot f_{mu} \cdot \beta \cdot c_u' \cdot b$ (7.2a8)	$F_m' = 0.7 \cdot 1160.3\text{ psi} \cdot 0.7 \cdot 2.311\text{ in.} \cdot 9.843\text{ in.} = 12{,}933\text{ lbf}$
Resultant load for the FRCM in tension $F_f' = 2 \cdot \varepsilon_{fd} \cdot E_f \cdot b \cdot t_f$ (7.2a9)	$F_f' = 2 \cdot 0.012 \cdot 4{,}496{,}170\text{ psi} \cdot 9.843\text{ in.} \cdot 0.0012\text{ in.} = 1274.6\text{ lbf}$ Check failure mode Check := Failure Mode I if $F_m' < F_f'$; Failure Mode II otherwise Check = Failure Mode II (Failure of FRCM)

Calculate the design flexural strength. In accordance with Section 7.2.4, the effective tensile strain level ε_{fe} in the FRCM reinforcement attained at failure can be set equal to the FRCM design tensile strain ε_{fd}.	$\varepsilon_{fe} = \varepsilon_{fd} = 0.012$
The effective stress level f_{fe} in the FRCM reinforcement attained at failure is the same of that computed in Step 2.	$f_{fe} = 53{,}954$ psi
The neural axis depth c_u can be therefore calculated by solving Eq. (7.2.a10), as:	
$A = \gamma \cdot f_{mu} \cdot \beta \cdot b$	$A = 5596$ lbf/in.
$B = 2t_f \cdot b \cdot \varepsilon_{fe} \cdot E_f + b \cdot \beta \cdot \gamma \cdot f_{mu} \cdot h$	$B = 58{,}580$ lbf
$C = E_f \cdot \varepsilon_{fe} \cdot b \cdot t_f \cdot (2 \cdot h - s)$	$C = 11{,}747$ lbf in.
$\mathrm{c1} := \dfrac{B + (B^2 - 4 \cdot A \cdot C)^{0.5}}{2A}$ $\mathrm{c2} = \dfrac{B - (B^2 - 4 \cdot A \cdot C)^{0.5}}{2A}$	
The real value of neutral axis depth is therefore: $c_u := \begin{cases} c1 \text{ if } (\lvert c1 \rvert \le h) \wedge (c1 > 0) \\ c2 \text{ otherwise} \end{cases}$	$c_u = 0.205$ in.
The nominal flexural strength M_n can be evaluated, in accordance with Eq. (7.2a11), as: $\mathrm{d} = \dfrac{(h - c_u)^2 + (h - c_u - s)^2}{2 \cdot h - 2c_u - s}$	$\mathrm{d} = \dfrac{(10.236\text{ in.} - 0.205\text{ in.})^2 + (10.236\text{ in.} - 2.05\text{ in.} - 2.05\text{ in.})^2}{2 \cdot 10.236\text{ in.} - 2 \cdot 0.205\text{ in.} - 2.05\text{ in.}} = 9.123\text{ in.}$
$\mathrm{d1} = c_u \cdot (1 - 0.5 \cdot \beta) + d$	$\mathrm{d1} = 0.205\text{ in.} \cdot (1 - 0.5 \cdot 0.7) + 9.123\text{ in.} = 9.256\text{ in.}$
$M_n = b \cdot t_f \cdot \varepsilon_{fe} \cdot \left(1 + \dfrac{h - c_u - s}{h - c_u}\right) \cdot \mathrm{d1}$	$1 + \dfrac{h - c_u - s}{h - c_u} = 1 + \dfrac{10.236\text{ in.} - 0.205\text{ in.} - 2.05\text{ in.}}{10.236\text{ in.} - 0.205\text{ in.}} = 1.80$ $M_n = 9.843\text{ in.} \cdot 0.0012\text{ in.} \cdot 0.012 \cdot 4{,}496{,}170\text{ psi} \cdot 1.8 \cdot 9.123\text{ in.} =$ $= 10{,}465.09\text{ lbf} \cdot \text{in.}$
The design value of the flexural strength is therefore: $\phi M_n = \phi_m \cdot M_n$ (7.2a12)	$\phi M_n = 0.6 \cdot 872.09\text{ lbf}\cdot\text{ft} = 523.25\text{ lbf}\cdot\text{ft}\ (0.71\text{ kN}\cdot\text{m})$
Verify that the compressive strain in the masonry does not exceed ε_{mu}	Check strain = $\begin{cases} \textbf{OK} \text{ if } \varepsilon_{fd} \cdot \left(\dfrac{c_u}{h - c_u}\right) \le \varepsilon_{mu} \\ \textbf{N.G.} \text{ otherwise} \end{cases}$ Check strain = **OK**

STEP 4: Compute the out of plane flexural stiffness	
Compute the neutral axis depth of the homogenized cross section in accordance with Eq. (7.2a13)	
$A1 = \frac{h}{2} - \frac{3}{4}\frac{E_f}{E_m} \cdot n_f \cdot t_f$	A1 = 5.05 in.
$B1 = \frac{E_f}{E_m} \cdot n_f \cdot t_f \cdot b$	B1 = 0.92 in.^{2}
$C1 = \frac{E_f}{E_m} \cdot n_f \cdot t_f \cdot b^2$	C1 = 9.01 in.^{3}
$c1 := \frac{-B1 + (B1^2 + A1 \cdot C1)^{0.5}}{2 \cdot A1}$	
$c2 := \frac{-B1 - (B1^2 + A1 \cdot C1)^{0.5}}{2 \cdot A1}$	
The real value of neutral axis depth is therefore:	
$c_u = \max(c1, c2)$	$c_u = 0.58$ in.
The moment of inertia can be obtained, in accordance with Eq. (7.2.a14), as	
$I = h \cdot \frac{c_u{}^3}{3} + \frac{E_f}{E_m} \cdot n_f \cdot t_f \cdot \frac{(b - c_u{}^3)}{3}$	$I = 10.236\,\text{in.} \cdot \frac{(0.58\text{ in.})^3}{3} + \frac{4496.17\text{ ksi}}{290.08\text{ ksi}} \cdot 5 \cdot 0.0012\text{ in.} \cdot \frac{(9.26\text{ in.})^3}{3} = 25.28\text{ in.}^4\ (1.1 \times 10^7\ \text{mm}^4)$ (1.1 × 10^7 mm^4)

STEP 5: Compute the in plane flexural stiffness	
Compute the neutral axis depth of the homogenized cross section in accordance with Eq. (7.2a15)	
$A2 = b \cdot \frac{E_f}{E_m} \cdot b \cdot t_f$	A2 = 1.80 in.^{3}
$B2 = \frac{E_f}{E_m} \cdot t_f \cdot b$	B2 = 0.18 in.^{2}
$C2 = h - \frac{s}{2}$	C2 = 9.21 in.
$c_{ip1} = \frac{-(B2) + \left[(B2)^2 + A2 \cdot (C2)\right]^{0.5}}{\frac{b}{2}}$	
$c_{ip2} = \frac{-(B2) - \left[(B2)^2 + A2 \cdot (C2)\right]^{0.5}}{\frac{b}{2}}$	
The real value of neutral axis depth is therefore:	
$c_u = \max(c_{ip1}, c_{ip2})$	c_u = 0.79 in.
The moment of inertia can be obtained, in accordance with Eq. (7.2.a16), as follows:	
$I = b \cdot \frac{c_u^3}{3} + \frac{E_f}{E_m} \cdot b \cdot t_f \cdot \left[(h - c_u)^2 + (h - c_u - s)^2\right]$	$I = 9.843 \text{ in.} \cdot \frac{(0.79 \text{ in.})^3}{3} + \frac{4496.17 \text{ ksi}}{290.08 \text{ ksi}} \cdot (9.843 \text{ in.}) \cdot 0.0012 \text{ in.} \cdot 143.9 \text{ in.}^2 =$ 27.9 in.^{4} (1.2×10^7 mm^4)