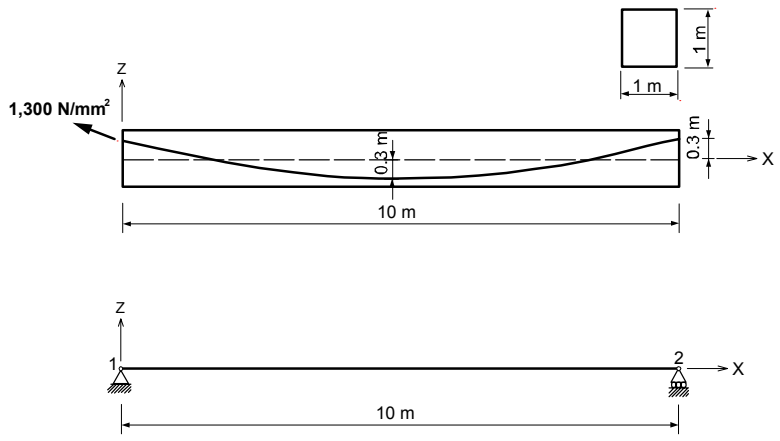
TDM-1

Title

Tendon prestressing loss by friction, slip and relaxation

Description

Determine the tendon prestressing loss by friction, slip and relaxation.



Structural analysis model

Model

Analysis Type

2-D static analysis (X-Z Plane)

Unit System

mm, N

Dimension

Length 10 m

Element

Beam element

Material

Concrete Modulus of elasticity	$E = 30{,}000\ N/mm^2$
Steel Modulus of elasticity	$E = 200{,}000\ N/m^2$
Area of tendon	$A_{st} = 1184.52\ mm^2$
Allowable stress of steel	$fy = 1570\ N/mm^2$
Anchorage slip	$l_{slip} = 6\ mm$
Relaxaion coefficient	$C_{relax} = 45$
Curvature friction factor	$u = 0.3$
Wobble friction factor	$k = 6.6 \times 10^{-6}/m$
Duct diameter	$d_{duct} = 63\ mm$

Section Property

Area	$A = 1 \times 10^6\ mm^2$
Moment of inertia	$Iyy = 8.3333 \times 10^{10}\ mm^4$

Boundary Condition

Node 1 ; Constrain D_X, D_Y and D_Z

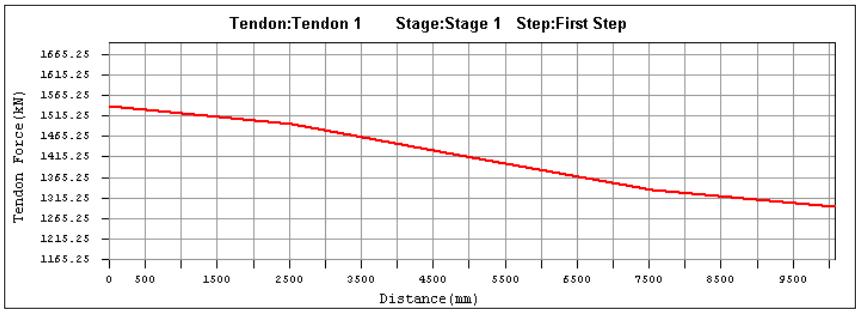
Node 2 ; Constrain D_Y and D_Z

Load Case

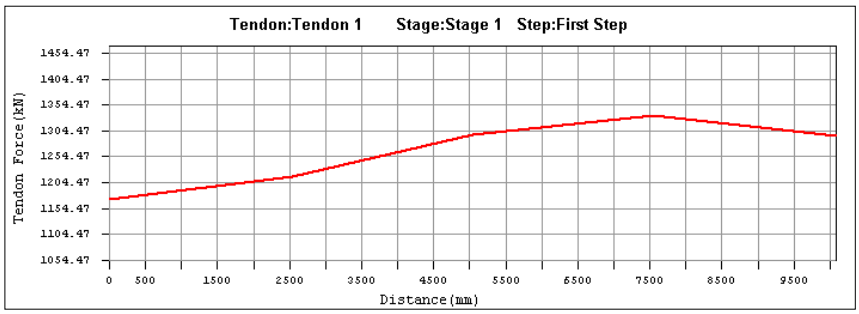
A tendon prestress load, 1,300 N/mm^2 is applied at the beginning point.

Results

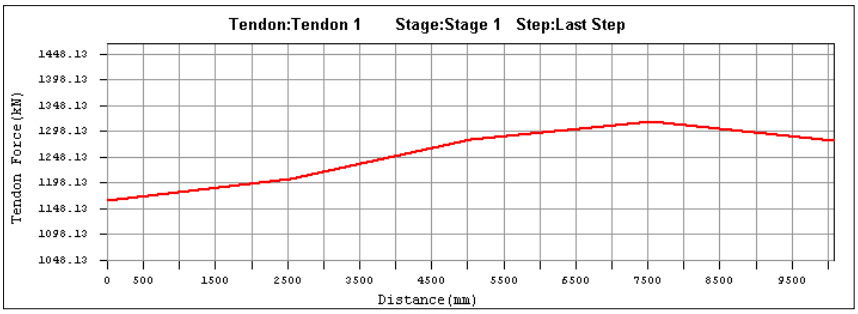
Tendon prestress loss by friction



Tendon prestress loss by anchorage slip



Tendon prestress loss by relaxtion



Comparison of Results

Unit : kN

Case		Output location				
		i	L/4	L/2	3L/4	j
Friction loss	Theoretical	1539.876	1495.331	1413.500	1334.705	1294.733
	MIDAS	1539.876	1495.314	1413.502	1334.718	1294.719
Anchorage slip	Theoretical	1171.642	1216.187	1298.018	1334.705	1294.733
	MIDAS	1171.635	1216.197	1298.009	1334.718	1294.719
Relaxaion	Theoretical	1164.599	1206.688	1283.590	1317.891	1280.514
	MIDAS	1164.593	1206.698	1283.582	1317.904	1280.500

Reference

Young-Jin Kang, “Nonlinear Geometric, Material and Time dependent Analysis of Reinforced and Prestressed Concrete Frames,” thesis presented to University of California, Berkeley, in partial fulfillment of the requirement for the degree of Doctor of Philosophy, 1977

P. Zia, H.K. Preston, N.L. Scott and E.B. Workman, “Estimating Prestress Losses,” Concrete International, Vol. 1, No. 6, June 1979, pp. 32-38

Recommendations for Estimating Prestress Losses, reported by PCI Committee on Prestress Losses, Journal PCI, Vol. 20, No. 4, July-August 1975, pp. 43-75