Venymän laskenta integroimalla normaalivoiman funktio

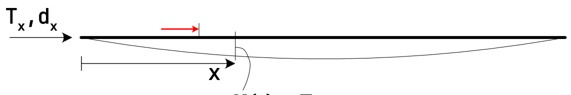
Ville Pekkala, 25.2.2025

Venymän arvo pisteessä x

$EI*v'(x) = N(x)$

$EI*v = \int M(x)dx$ (C_1 = siirtymä d_x*EA)

Pistekuorma

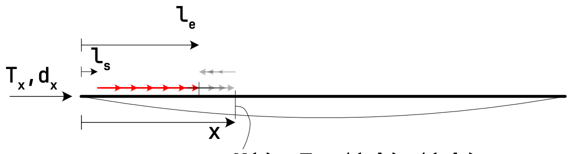


$N(x) = T_x - q$

$EA*v = \int N(x)dx$

$\int M(x)dx = T_x x - qx$

Viivakuorma



$N(x) = T_x - q*(x-ls)-q*(x-le)$

$EA*v = \int N(x)dx$

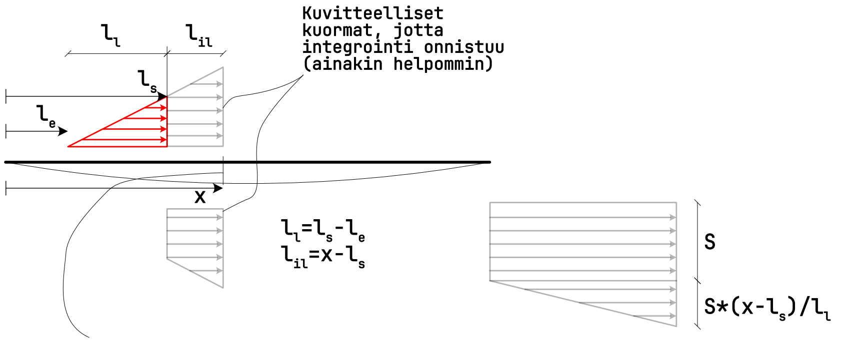
$\int N(x)dx = T_x x - q*(x-ls)^2/2 + q*(x-le)^2/2$

Kolmiokuorma, kuorma kasvaa x-suuntaan

$$
\begin{aligned}
N(x) = T_x &- \\
&S/l_l(x-l_e)*(x-l_e)*1/2 + \\
&S*(x-l_s) + \\
&S/l_l*(x-l_s)*(x-l_s)*1/2
\end{aligned}
$$

$EI*v = \int N(x)dx$

$$
\begin{aligned}
\int N(x)dx = T_x x &- \\
&S/l_l(x-l_e)^3*1/6 + \\
&S*(x-l_s)^2/2 + \\
&S/l_l*(x-l_s)^3*1/6
\end{aligned}
$$



Kolmiokuorma, kuorma pienenee x-suuntaan

Kuorma, joka loppuu ennen pistettä x

$$
\begin{aligned}
N(x) = T_x &- \\
&S/l_l*(x-l_s)*(x-l_s)*1/2 - \\
&S/l_l*(x-l_e)*(x-l_e)*1/2 + \\
&S*(x-l_s) - S/l_l*(x-l_s)*(x-l_s)
\end{aligned}
$$

$EI*v = \int N(x)dx$

$$
\begin{aligned}
\int N(x)dx = T_x x &- \\
&S/l_l*(x-l_s)^3*1/6 - \\
&S/l_l*(x-l_e)^3*1/6 + \\
&S*(x-l_s)^2/2 - \\
&S/l_l*(x-l_s)^3/3
\end{aligned}
$$

$$
\begin{aligned}
N(x) = T_x &- \\
&S/l_l*(x-l_s)*(x-l_s)*1/2 - \\
&S*(x-l_s) - \\
&S/l_l*(x-l_s)*(x-l_s)
\end{aligned}
$$

$EI*v = \int N(x)dx$

$$
\begin{aligned}
\int N(x)dx = T_x x &- \\
&S/l_l*(x-l_s)^3*1/6 + \\
&S*(x-l_s)^2/2 - \\
&S/l_l*(x-l_s)^3/3
\end{aligned}
$$