# 7.1 Multi-linear Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresis01.gts |

Figure 7.1.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of multi-linear model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

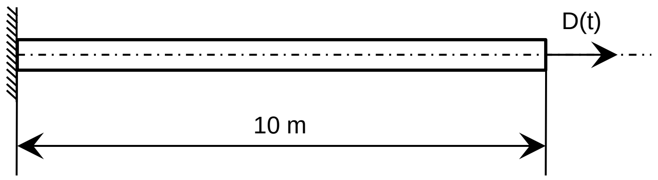



Figure 7.1.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness | $K = 4.0 \times 10^9\ N$ |
| **Section property** | Cross-sectional area | $A = 1\ m^2$ |
| **Loading** | Prescribed displacement | Figure 7.1.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5\ N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5\ N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Lumped plasticity | End node |

Figure 7.1.2
Prescribed displacement
at right end node

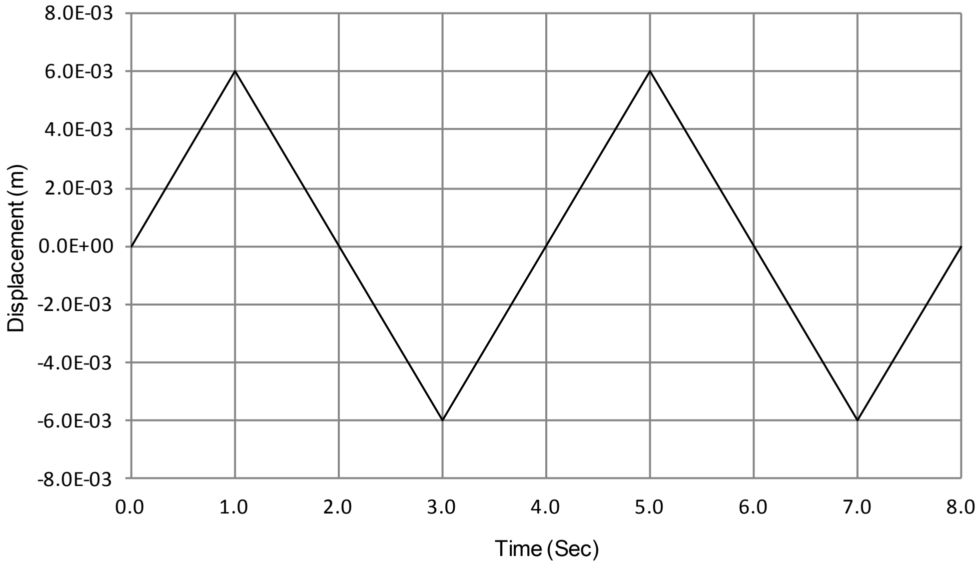



Figure 7.1.3
Force-displacement curve

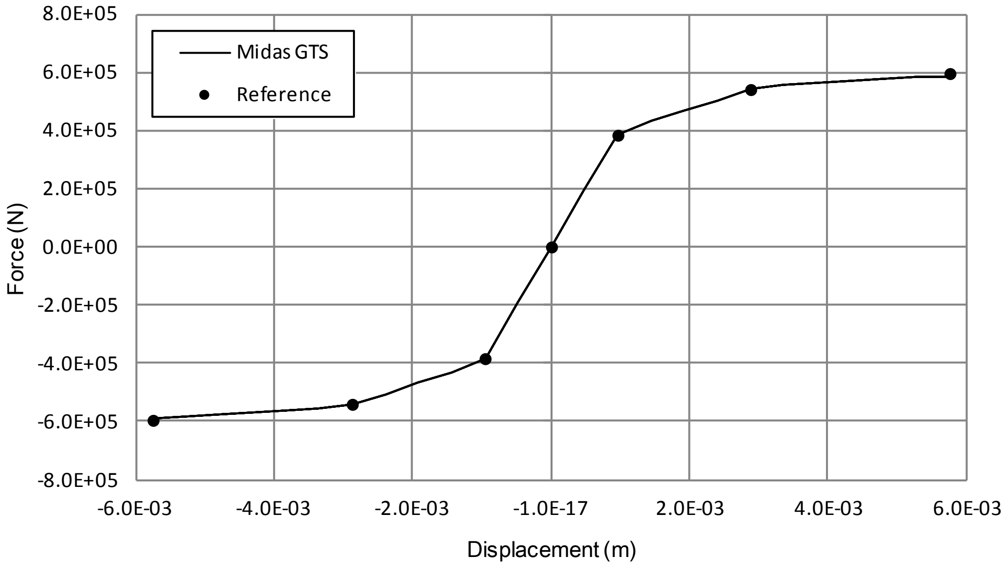


*Table 7.1.1 Partial results of force-displacement relationship*

| | Force | |
|---|---|---|
| Displacement | Midas GTS | Reference |
| *-5.76E-03* | *-5.96E+05* | *-5.96E+05* |
| *-2.88E-03* | *-5.41E+05* | *-5.41E+05* |
| *-9.60E-04* | *-3.84E+05* | *-3.84E+05* |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *9.60E-04* | *3.84E+05* | *3.84E+05* |
| *2.88E-03* | *5.41E+05* | *5.41E+05* |
| *5.76E-03* | *5.96E+05* | *5.96E+05* |

# 7.2 Kinematic hardening Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresis02.gts |

Figure 7.2.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of kinematic hardening model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

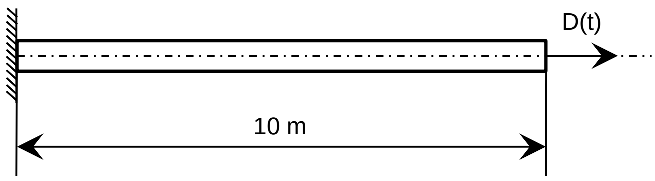



Figure 7.2.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness | $K = 4.0 \times 10^9$ N |
| **Section property** | Cross-sectional area | $A = 1$ $m^2$ |
| **Loading** | Prescribed displacement | Figure 7.2.2 |
| **Skeleton curve data** | 1st Yield point | Force : $4.0 \times 10^5$ N<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5$ N<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.2.2
Prescribed displacement
at right end node

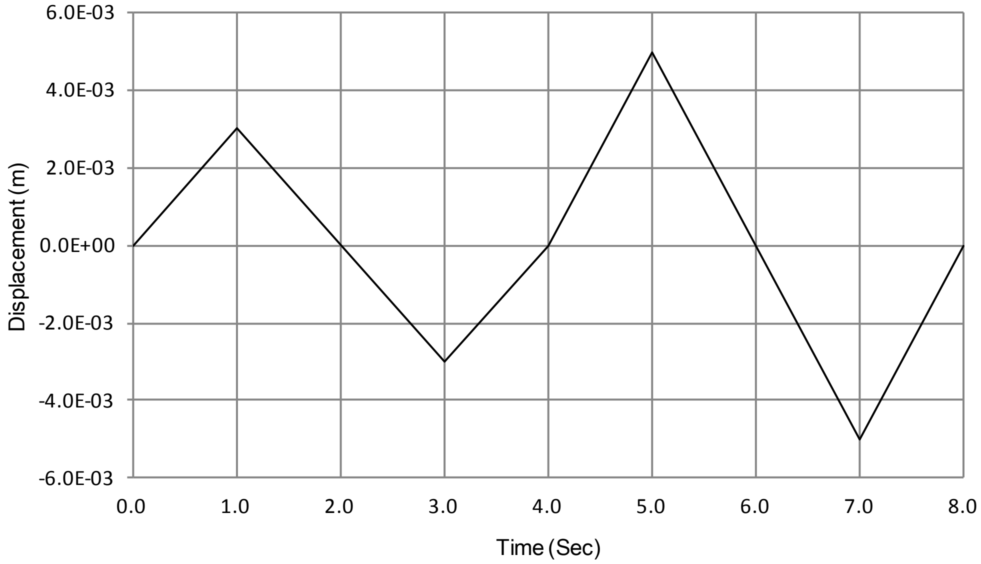



Figure 7.2.3
Force-displacement curve

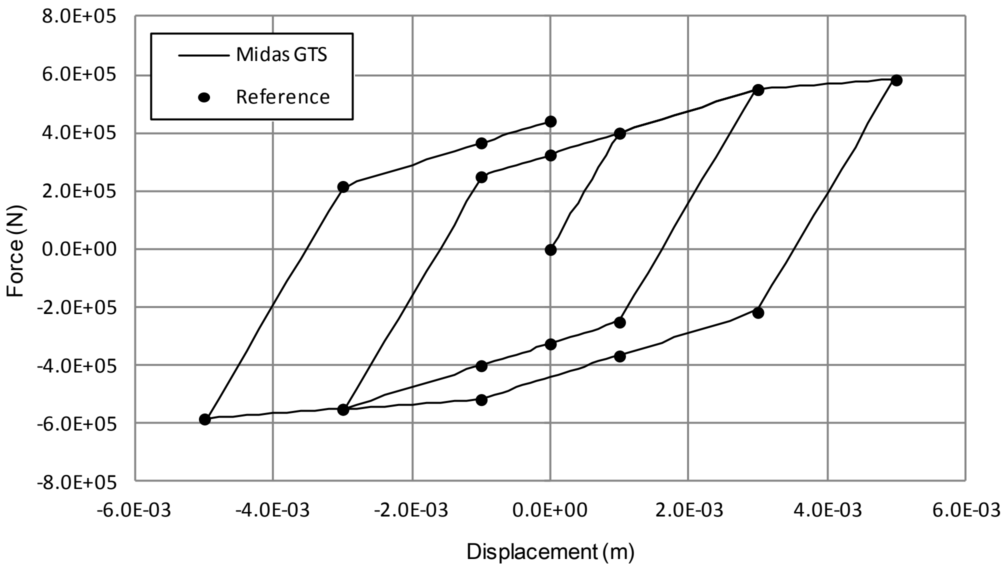


*Table 7.2.1 Partial results of force-displacement relationship*

| | Force | |
|---|---|---|
| Displacement | Midas GTS | Reference |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *1.00E-03* | *4.00E+05* | *4.00E+05* |
| *3.00E-03* | *5.50E+05* | *5.50E+05* |
| *1.00E-03* | *-2.50E+05* | *-2.50E+05* |
| *0.00E+00* | *-3.25E+05* | *-3.25E+05* |
| *-1.00E-03* | *-4.00E+05* | *-4.00E+05* |
| *-3.00E-03* | *-5.50E+05* | *-5.50E+05* |
| *-1.00E-03* | *2.50E+05* | *2.50E+05* |
| *0.00E+00* | *3.25E+05* | *3.25E+05* |
| *1.00E-03* | *4.00E+05* | *4.00E+05* |
| *3.00E-03* | *5.50E+05* | *5.50E+05* |
| *5.00E-03* | *5.83E+05* | *5.83E+05* |
| *3.00E-03* | *-2.17E+05* | *-2.17E+05* |
| *1.00E-03* | *-3.67E+05* | *-3.67E+05* |

# 7.3 Peak-Oriented model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys03.gts |

Figure 7.3.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of peak-oriented model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

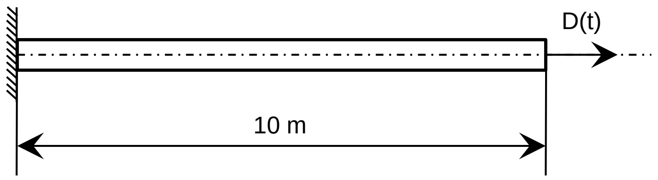



Figure 7.3.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness | $K = 4.0 \times 10^9$ N |
| **Section property** | Cross-sectional area | $A = 1$ $m^2$ |
| **Loading** | Prescribed displacement | Figure 7.3.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5$ N<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5$ N<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

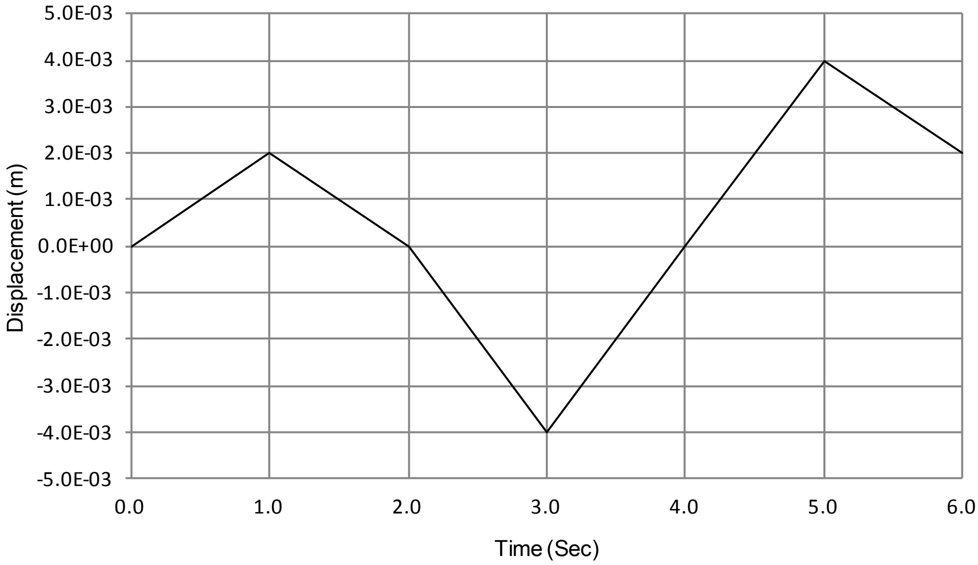



Figure 7.3.2
Prescribed displacement
at right end node

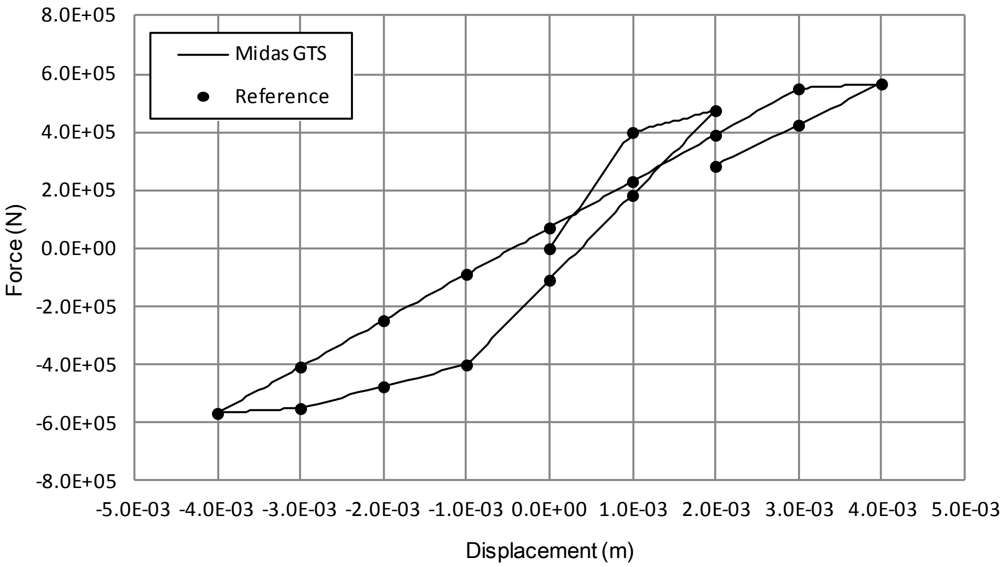



Figure 7.3.3
Force-displacement curve

*Table 7.3.1 Partial results of force-displacement relationship*

| | Force | |
|---|---|---|
| Displacement | Midas GTS | Reference |
| 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 1.00E-03 | 4.00E+05 | 4.00E+05 |
| 2.00E-03 | 4.75E+05 | 4.75E+05 |
| 1.00E-03 | 1.83E+05 | 1.83E+05 |
| 0.00E+00 | -1.08E+05 | -1.08E+05 |
| -1.00E-03 | -4.00E+05 | -4.00E+05 |
| -2.00E-03 | -4.75E+05 | -4.75E+05 |
| -3.00E-03 | -5.50E+05 | -5.50E+05 |
| -4.00E-03 | -5.67E+05 | -5.67E+05 |
| -3.00E-03 | -4.07E+05 | -4.07E+05 |
| -2.00E-03 | -2.48E+05 | -2.48E+05 |
| -1.00E-03 | -8.81E+04 | -8.81E+04 |
| 0.00E+00 | 7.14E+04 | 7.14E+04 |
| 1.00E-03 | 2.31E+05 | 2.31E+05 |

# 7.4 Origin-Oriented model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys04.gts |

Figure 7.4.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of origin-oriented model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

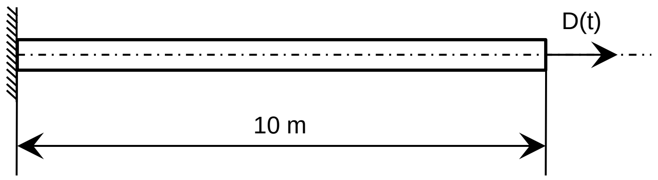



Figure 7.4.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness | $K = 4.0 \times 10^9\ N$ |
| **Section property** | Cross-sectional area | $A = 1\ m^2$ |
| **Loading** | Prescribed displacement | Figure 7.4.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5\ N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5\ N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.4.2
Prescribed displacement at right end node

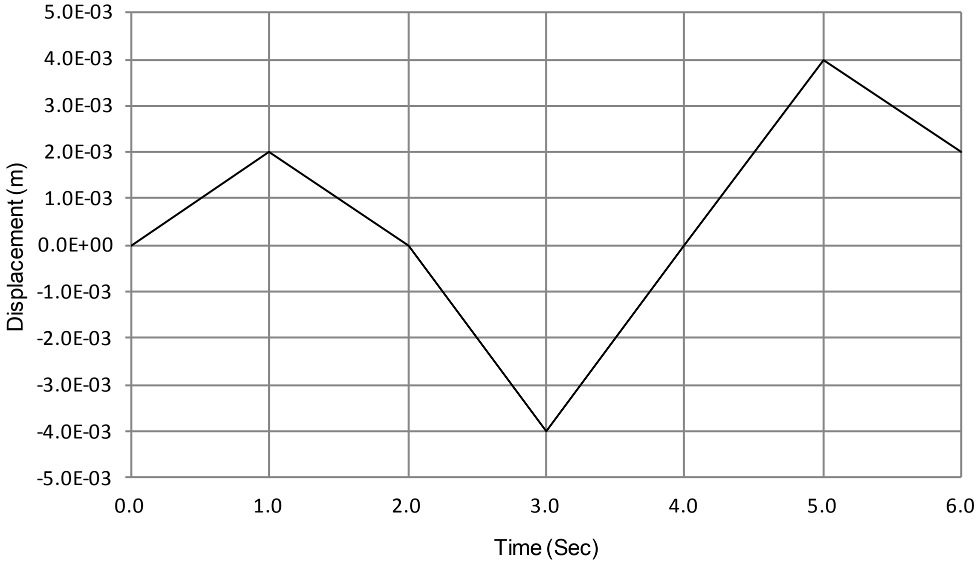



Figure 7.4.3
Force-displacement curve

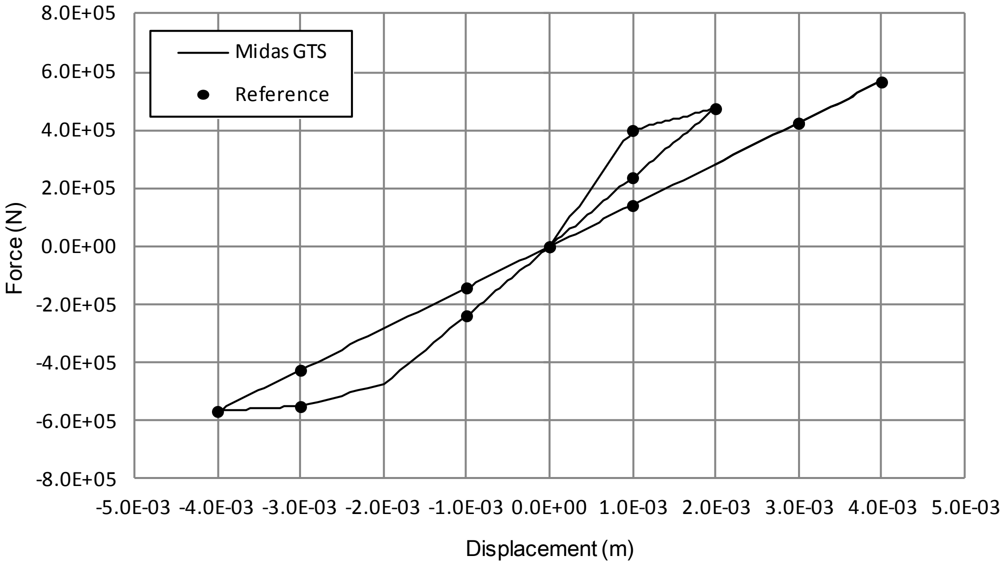


*Table 7.4.1 Partial results of force-displacement relationship*

| Displacement | Force | |
|---|---|---|
| | Midas GTS | Reference |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *1.00E-03* | *4.00E+05* | *4.00E+05* |
| *2.00E-03* | *4.75E+05* | *4.75E+05* |
| *1.00E-03* | *2.38E+05* | *2.38E+05* |
| *0.00E+00* | *1.65E-09* | *1.65E-09* |
| *-1.00E-03* | *-2.38E+05* | *-2.38E+05* |
| *-3.00E-03* | *-5.50E+05* | *-5.50E+05* |
| *-4.00E-03* | *-5.67E+05* | *-5.67E+05* |
| *-3.00E-03* | *-4.25E+05* | *-4.25E+05* |
| *-1.00E-03* | *-1.42E+05* | *-1.42E+05* |
| *0.00E+00* | *-4.15E-09* | *-4.15E-09* |
| *1.00E-03* | *1.42E+05* | *1.42E+05* |
| *3.00E-03* | *4.25E+05* | *4.25E+05* |
| *4.00E-03* | *5.67E+05* | *5.67E+05* |

# 7.5 Clough Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys05.gts |

Figure 7.5.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of clough model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

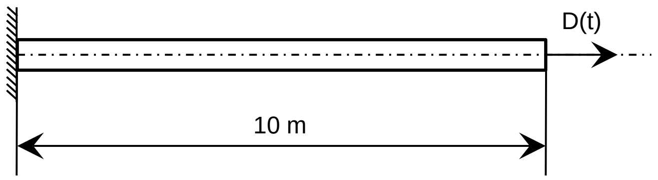



Figure 7.5.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness<br>Unloading parameter | $K = 4.0 \times 10^9\ N$<br>$\beta=0.2$ |
| **Section property** | Cross-sectional area | $A = 1\ m^2$ |
| **Loading** | Prescribed displacement | Figure 7.5.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5\ N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5\ N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.5.2
Prescribed displacement at right end node

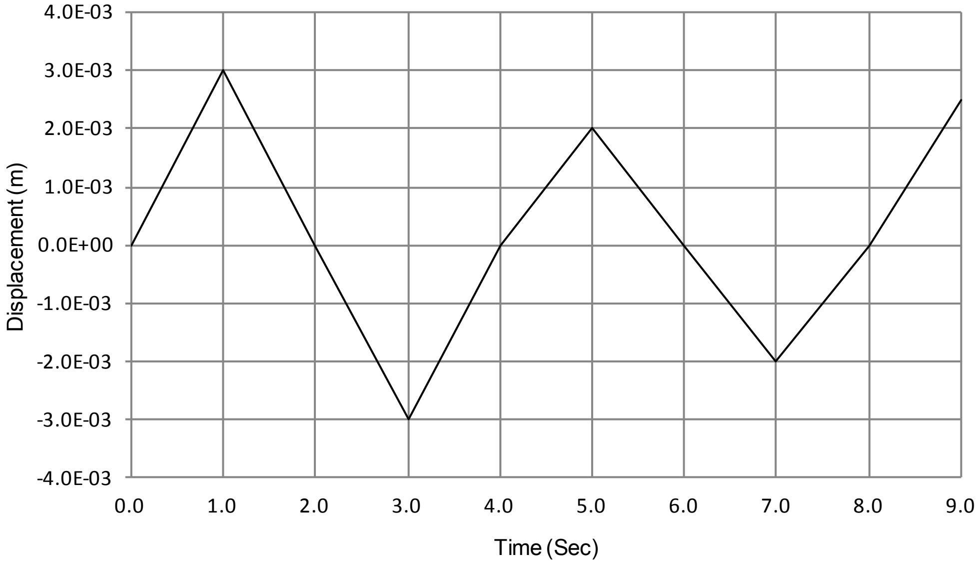



Figure 7.5.3
Force-displacement curve

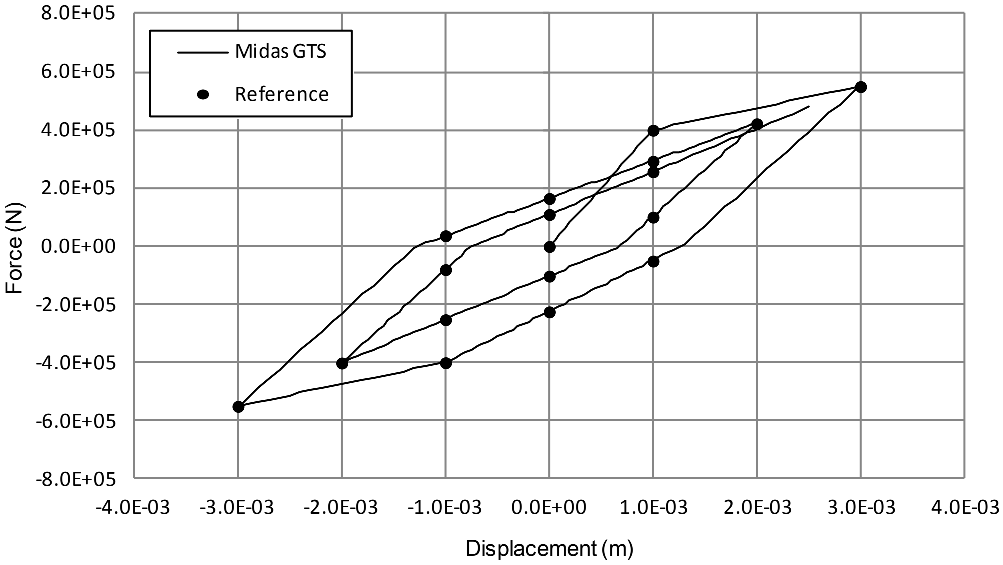


*Table 7.5.1 Partial results of force-displacement*

| | Force | |
|---|---|---|
| Displacement | Midas GTS | Reference |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *1.00E-03* | *4.00E+05* | *4.00E+05* |
| *3.00E-03* | *5.50E+05* | *5.50E+05* |
| *1.00E-03* | *-5.02E+04* | *-5.02E+04* |
| *0.00E+00* | *-2.25E+05* | *-2.25E+05* |
| *-1.00E-03* | *-4.00E+05* | *-4.00E+05* |
| *-3.00E-03* | *-5.50E+05* | *-5.50E+05* |
| *-1.00E-03* | *3.68E+04* | *3.68E+04* |
| *0.00E+00* | *1.65E+05* | *1.65E+05* |
| *1.00E-03* | *2.93E+05* | *2.93E+05* |
| *2.00E-03* | *4.22E+05* | *4.22E+05* |
| *1.00E-03* | *1.01E+05* | *1.01E+05* |
| *0.00E+00* | *-1.02E+05* | *-1.02E+05* |
| *-1.00E-03* | *-2.52E+05* | *-2.52E+05* |

# 7.6 Degrading Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys06.gts |

Figure 7.6.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of degrading model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

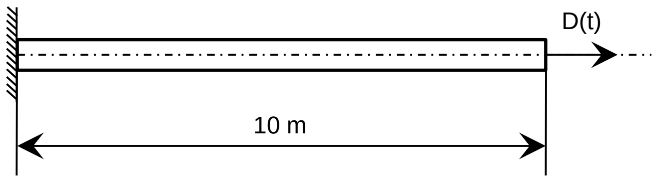



Figure 7.6.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness | $K = 4.0 \times 10^9\ N$ |
| **Section property** | Cross-sectional area | $A = 1\ m^2$ |
| **Loading** | Prescribed displacement | Figure 7.6.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5\ N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5\ N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.6.2
Prescribed displacement
at right end node

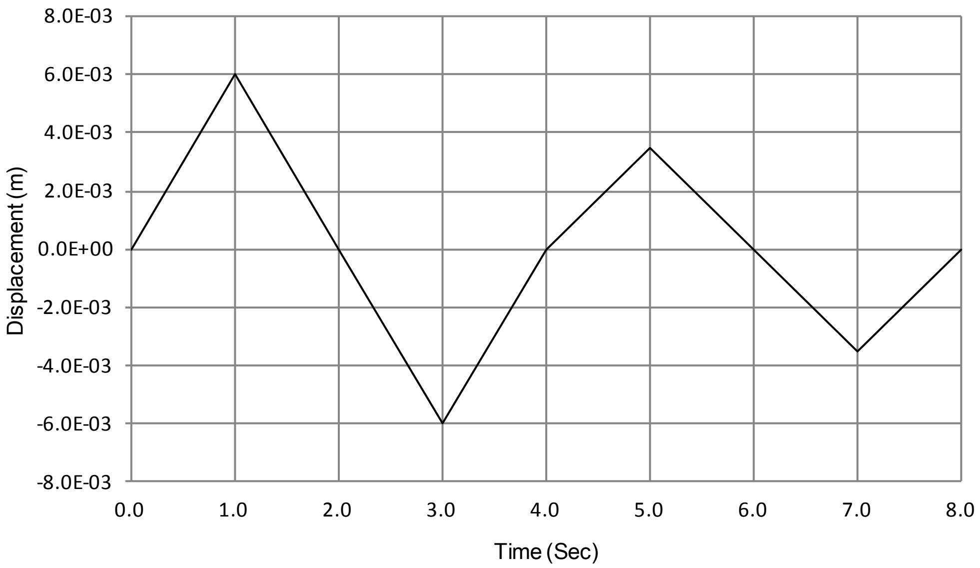



Figure 7.6.3
Force-displacement curve

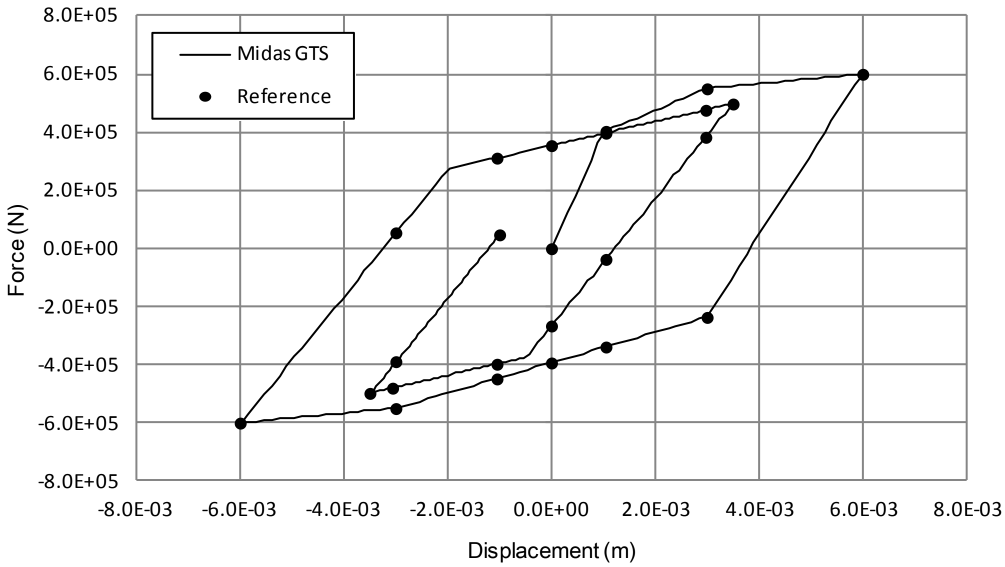


*Table 7.6.1 Partial results of force-displacement*

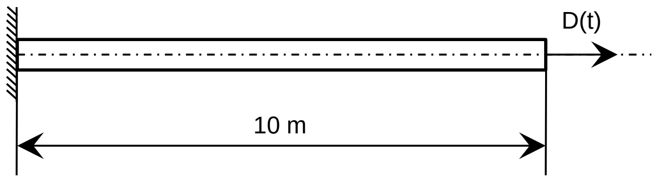
| Displacement | Force | |
|---|---|---|
| | MIDAS GTS | Reference |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *1.05E-03* | *4.04E+05* | *4.04E+05* |
| *3.00E-03* | *5.50E+05* | *5.50E+05* |
| *6.00E-03* | *6.00E+05* | *6.00E+05* |
| *3.00E-03* | *-2.36E+05* | *-2.36E+05* |
| *1.05E-03* | *-3.38E+05* | *-3.38E+05* |
| *0.00E+00* | *-3.93E+05* | *-3.93E+05* |
| *-1.05E-03* | *-4.48E+05* | *-4.48E+05* |
| *-3.00E-03* | *-5.50E+05* | *-5.50E+05* |
| *-6.00E-03* | *-6.00E+05* | *-6.00E+05* |
| *-3.00E-03* | *5.45E+04* | *5.45E+04* |
| *-1.05E-03* | *3.12E+05* | *3.12E+05* |
| *0.00E+00* | *3.55E+05* | *3.55E+05* |
| *1.05E-03* | *3.98E+05* | *3.98E+05* |

# 7.7 Takeda Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys07A.gts<br>Hysteresys07B.gts |

Figure 7.7.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of Takeda model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

Figure 7.7.1
bar element model




| | | |
|---|---|---|
| **Material data** | Initial stiffness<br>Unloading parameter<br>Inner loop parameter | $K = 4.0 \times 10^9\ N$<br>$\beta$=0.4<br>$\alpha$=0.85 |
| **Section property** | Cross-sectional area | $A = 1\ m^2$ |
| **Loading** | Prescribed displacement | Figure 7.7.2<br>Figure 7.7.3 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5\ N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5\ N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.7.2
Prescribed displacement
at right end node (case A)

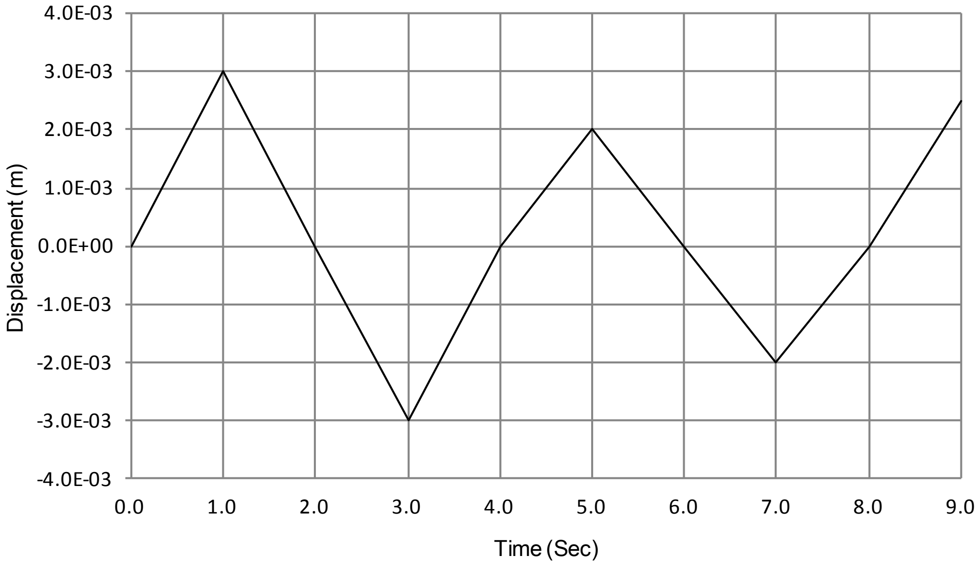



Figure 7.7.3
Prescribed displacement
at right end node (case B)

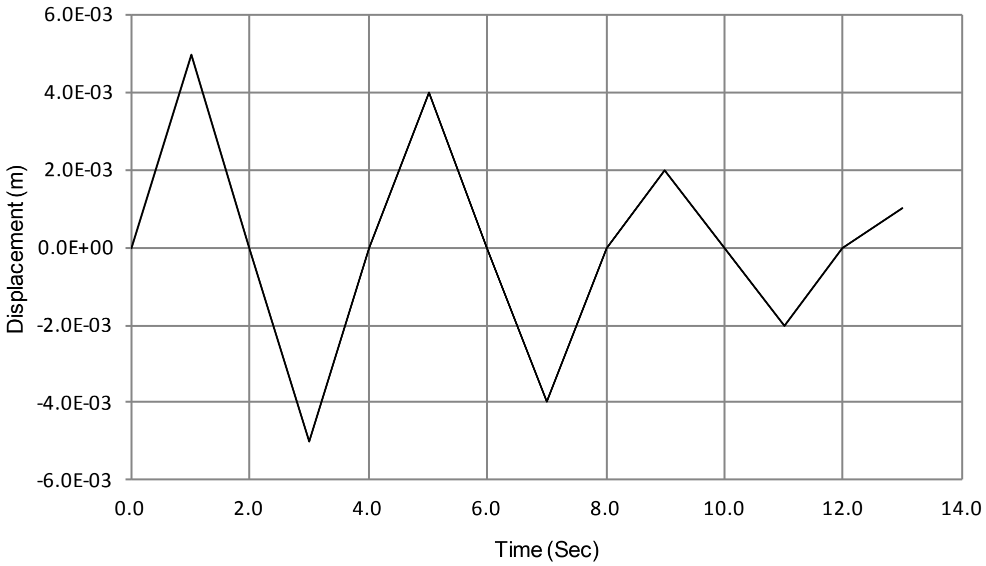


Figure 7.7.4
Force-displacement curve (case A)

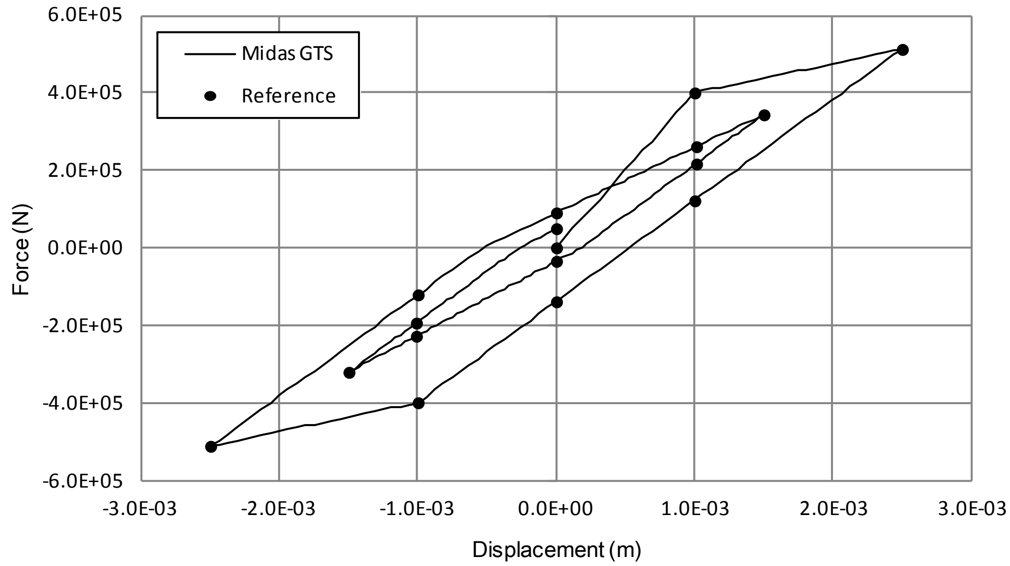



Figure 7.7.5
Force-displacement curve (case B)

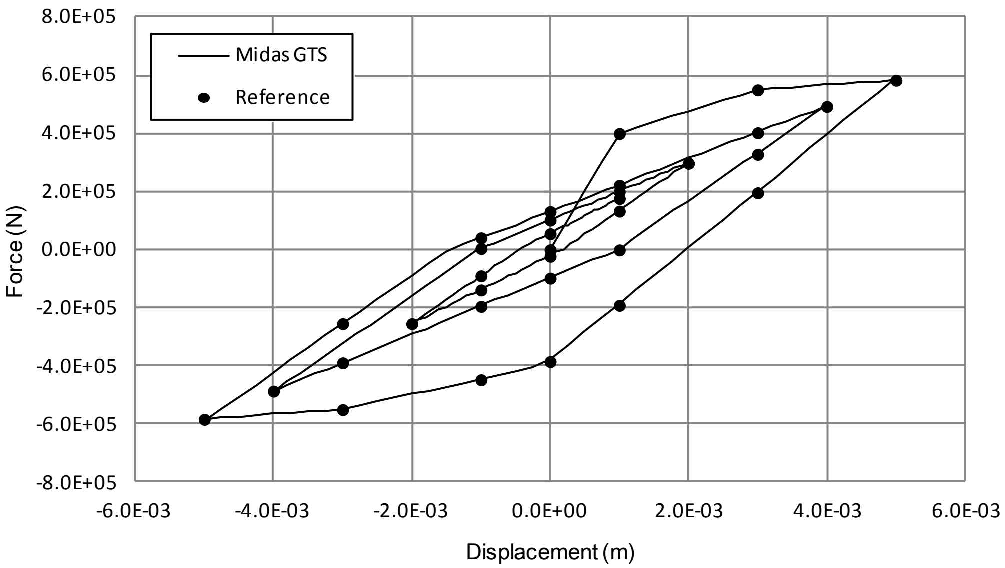


*Table 7.7.1 Partial results of force-displacement (case A)*

| | Force | |
|---|---|---|
| Displacement | MIDAS GTS | Reference |
| 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 1.00E-03 | 4.00E+05 | 4.00E+05 |
| 2.50E-03 | 5.13E+05 | 5.13E+05 |
| 1.00E-03 | 1.21E+05 | 1.21E+05 |
| 0.00E+00 | -1.39E+05 | -1.39E+05 |
| -1.00E-03 | -4.00E+05 | -4.00E+05 |
| -2.50E-03 | -5.13E+05 | -5.13E+05 |
| -1.00E-03 | -1.21E+05 | -1.21E+05 |
| 0.00E+00 | 9.02E+04 | 9.02E+04 |
| 1.01E-03 | 2.61E+05 | 2.61E+05 |
| 1.50E-03 | 3.44E+05 | 3.44E+05 |
| 1.01E-03 | 2.16E+05 | 2.16E+05 |
| 0.00E+00 | -3.48E+04 | -3.48E+04 |
| -1.01E-03 | -2.28E+05 | -2.28E+05 |
| -1.50E-03 | -3.21E+05 | -3.21E+05 |

*Table 7.7.2 Partial results of force-displacement (case B)*

| | Force | |
|---|---|---|
| Displacement | MIDAS GTS | Reference |
| 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 1.00E-03 | 4.00E+05 | 4.00E+05 |
| 3.00E-03 | 5.50E+05 | 5.50E+05 |
| 5.00E-03 | 5.83E+05 | 5.83E+05 |
| 3.00E-03 | 1.96E+05 | 1.96E+05 |
| 1.00E-03 | -1.91E+05 | -1.91E+05 |
| 0.00E+00 | -3.85E+05 | -3.85E+05 |
| -1.00E-03 | -4.47E+05 | -4.47E+05 |
| -3.00E-03 | -5.50E+05 | -5.50E+05 |
| -5.00E-03 | -5.83E+05 | -5.83E+05 |
| -3.00E-03 | -2.54E+05 | -2.54E+05 |
| -1.00E-03 | 4.11E+04 | 4.11E+04 |
| 0.00E+00 | 1.32E+05 | 1.32E+05 |
| 1.00E-03 | 2.22E+05 | 2.22E+05 |
| 3.00E-03 | 4.03E+05 | 4.03E+05 |

# 7.8 Modified Takeda Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys08.gts |

Figure 7.8.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of modified Takeda model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

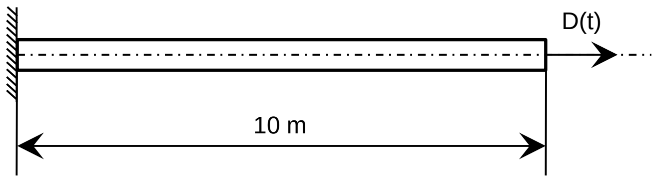



Figure 7.8.1
bar element model

| | | |
|---|---|---|
| **Material data** | Initial stiffness<br>Unloading parameter<br>Inner loop parameter | $K = 4.0 \times 10^9$ $N$<br>$\beta$=0.4<br>$\alpha$=0.85 |
| **Section property** | Cross-sectional area | $A = 1$ $m^2$ |
| **Loading** | Prescribed displacement | Figure 7.8.2 |
| **Force-Stiffness reduction factor** | 1st Yield point | Force : $4.0 \times 10^5$ $N$<br>Stiffness reduction : 0.1875 |
| | 2nd Yield point | Force : $5.5 \times 10^5$ $N$<br>Stiffness reduction : 0.041667 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.8.2
Prescribed displacement
at right end node

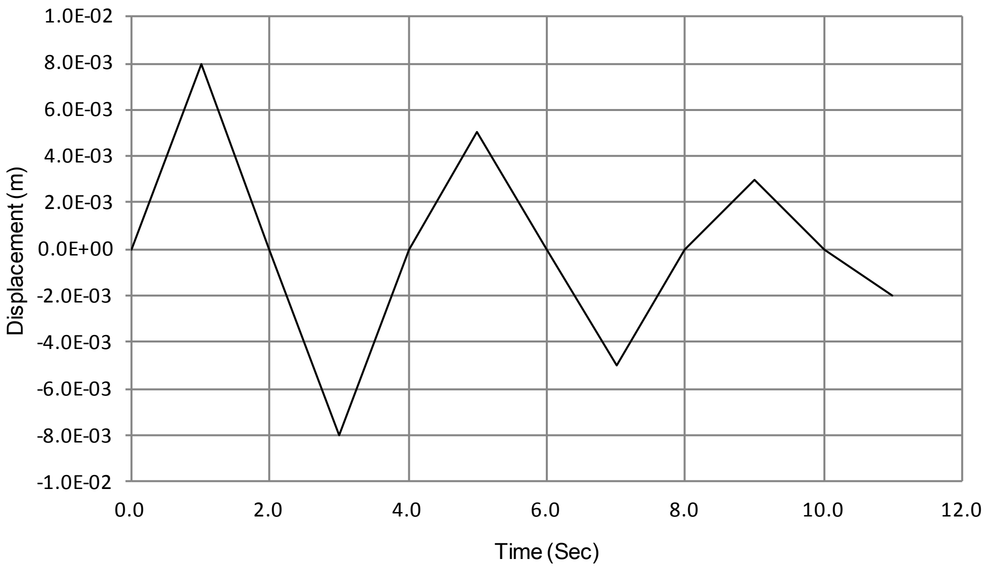



Figure 7.8.3
Force-displacement curve

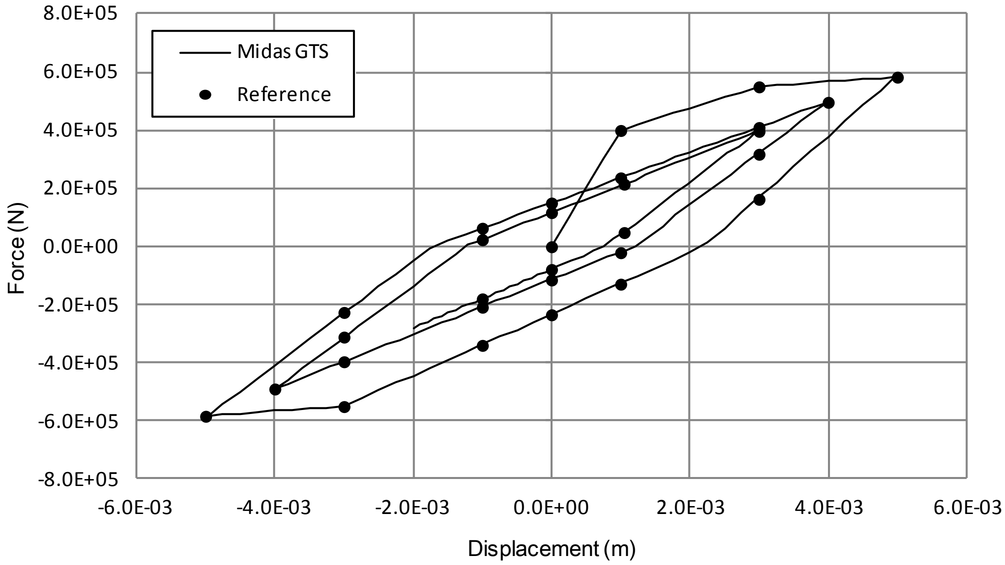


*Table 7.8.1 Partial results of force-displacement*

| | Force | |
|---|---|---|
| Displacement | Midas GTS | Reference |
| 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 1.00E-03 | 4.00E+05 | 4.00E+05 |
| 3.00E-03 | 5.50E+05 | 5.50E+05 |
| 5.00E-03 | 5.83E+05 | 5.83E+05 |
| 3.00E-03 | 1.63E+05 | 1.63E+05 |
| 1.00E-03 | -1.29E+05 | -1.29E+05 |
| 0.00E+00 | -2.34E+05 | -2.34E+05 |
| -1.00E-03 | -3.39E+05 | -3.39E+05 |
| -3.00E-03 | -5.50E+05 | -5.50E+05 |
| -5.00E-03 | -5.83E+05 | -5.83E+05 |
| -3.00E-03 | -2.26E+05 | -2.26E+05 |
| -1.00E-03 | 6.36E+04 | 6.36E+04 |
| 0.00E+00 | 1.50E+05 | 1.50E+05 |
| 1.00E-03 | 2.37E+05 | 2.37E+05 |
| 3.00E-03 | 4.10E+05 | 4.10E+05 |

# 7.9 Ramberg Osgood Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys09.gts |

Figure 7.9.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of Ramberg Osgood model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

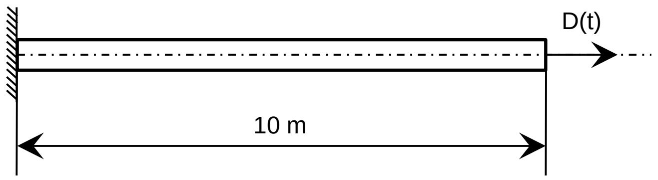



Figure 7.9.1
bar element model

| | | |
|---|---|---|
| **Material data** | Elastic modulus<br>Critical displacement<br>Maximum damping | $E = 210.0 \times 10^9$ $N/m^2$<br>$\delta_r = 1.90476 \times 10^{-8}$ $m$<br>$h_{max}$=0.12732 |
| **Section property** | Cross-sectional area | $A = 1$ $m^2$ |
| **Loading** | Prescribed displacement | Figure 7.9.2 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.8.2
Prescribed displacement
at right end node

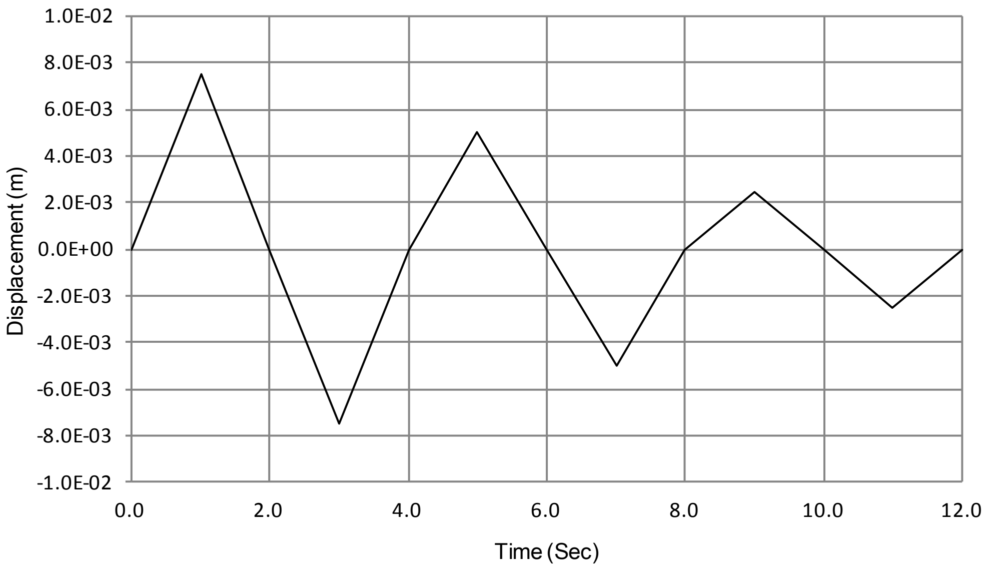



Figure 7.8.3
Force-displacement curve

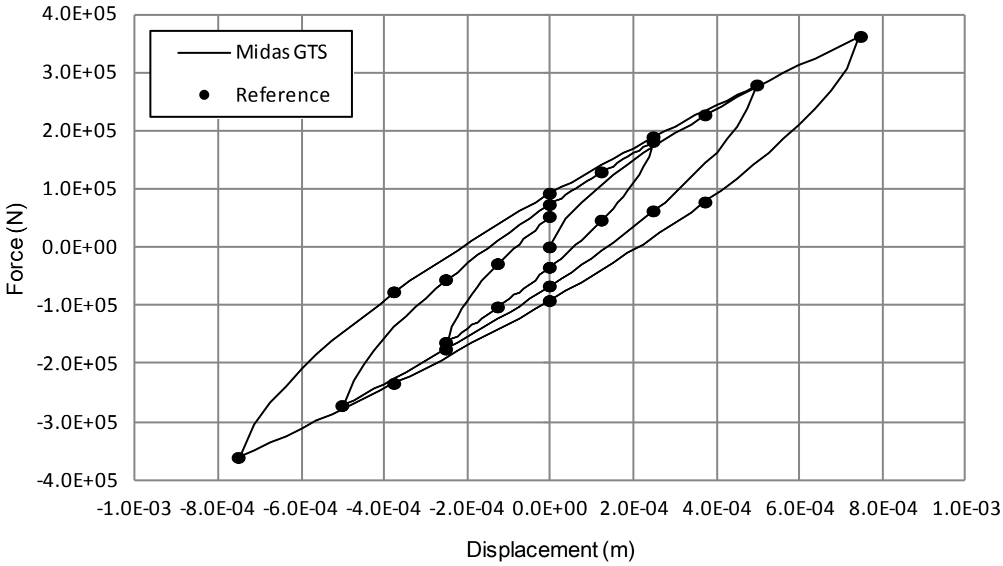


*Table 7.9.1 Partial results of force-displacement*

| | Force | |
|---|---|---|
| Displacement | MIDAS GTS | Reference |
| *0.00E+00* | *0.00E+00* | *0.00E+00* |
| *3.75E-04* | *2.27E+05* | *2.27E+05* |
| *7.50E-04* | *3.62E+05* | *3.62E+05* |
| *3.75E-04* | *7.72E+04* | *7.72E+04* |
| *0.00E+00* | *-9.22E+04* | *-9.22E+04* |
| *-3.75E-04* | *-2.35E+05* | *-2.35E+05* |
| *-7.50E-04* | *-3.62E+05* | *-3.62E+05* |
| *-3.75E-04* | *-7.72E+04* | *-7.72E+04* |
| *0.00E+00* | *9.22E+04* | *9.22E+04* |
| *2.50E-04* | *1.89E+05* | *1.89E+05* |
| *5.00E-04* | *2.78E+05* | *2.78E+05* |
| *2.50E-04* | *6.20E+04* | *6.20E+04* |
| *0.00E+00* | *-6.71E+04* | *-6.71E+04* |
| *-2.50E-04* | *-1.76E+05* | *-1.76E+05* |
| *-5.00E-04* | *-2.73E+05* | *-2.73E+05* |

# 7.10 Hardin Drnevich Model

| | |
|---|---|
| **REFERENCE** | Analytical solution |
| **ELEMENT** | Bar element |
| **MODEL FILENAME** | Hysteresys10.gts |

Figure 7.10.1 shows a various Bar element model subjected to axial displacement dependent on time. The fixed boundary condition is assigned to the left end. In case of Hardin Drnevich model, hinge is considered in order to evaluate relationship between force and stiffness reduction factor at the hinge location.

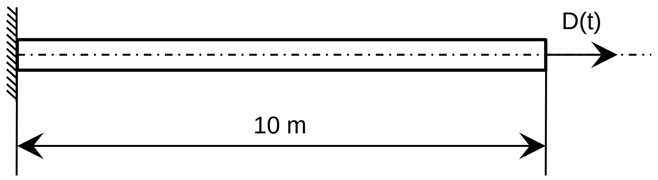



Figure 7.10.1
bar element model

| | | |
|---|---|---|
| **Material data** | Elastic modulus<br>Critical displacement | $E = 210.0 \times 10^{9}\ N/m^{2}$<br>$\delta_r = 9.5238 \times 10^{-4}\ m$ |
| **Section property** | Cross-sectional area | $A = 1\ m^{2}$ |
| **Loading** | Prescribed displacement | Figure 7.10.2 |
| **Hinge location** | Distributed plasticity | Gauss-Lobatto integration point |

Figure 7.10.2
Prescribed displacement
at right end node

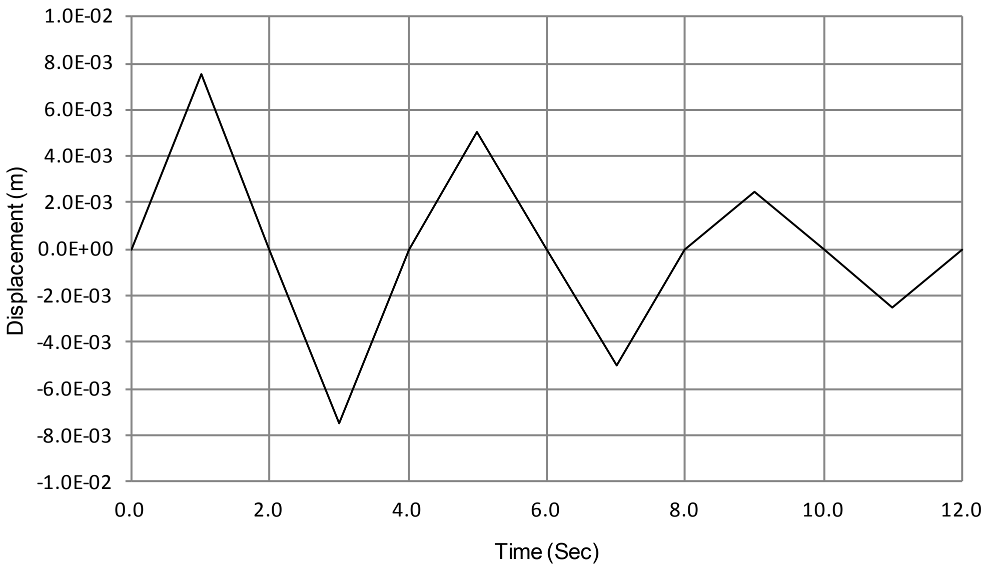



Figure 7.10.3
Force-displacement curve

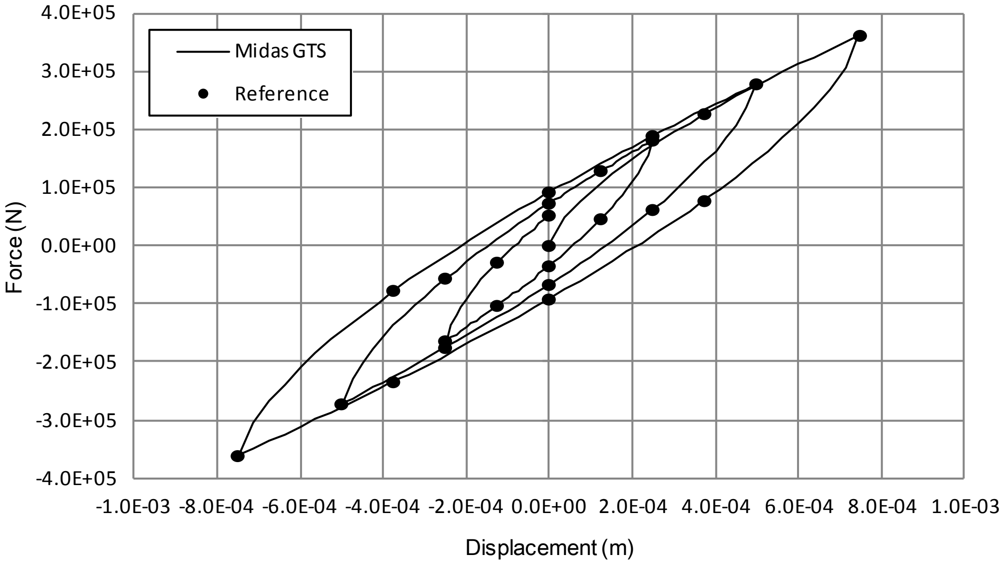


*Table 7.10.1 Partial results of force-displacement*

| | Force | |
|---|---|---|
| Displacement | MIDAS GTS | Reference |
| 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 3.75E-04 | 5.65E+06 | 5.65E+06 |
| 7.50E-04 | 8.81E+06 | 8.81E+06 |
| 3.75E-04 | 2.23E+06 | 2.23E+06 |
| 0.00E+00 | -2.49E+06 | -2.49E+06 |
| -3.75E-04 | -6.04E+06 | -6.04E+06 |
| -7.50E-04 | -8.81E+06 | -8.81E+06 |
| -3.75E-04 | -2.23E+06 | -2.23E+06 |
| 0.00E+00 | 2.49E+06 | 2.49E+06 |
| 2.50E-04 | 4.96E+06 | 4.96E+06 |
| 5.00E-04 | 7.04E+06 | 7.04E+06 |
| 2.50E-04 | 2.40E+06 | 2.40E+06 |
| 0.00E+00 | -1.28E+06 | -1.28E+06 |
| -2.50E-04 | -4.26E+06 | -4.26E+06 |
| -5.00E-04 | -6.73E+06 | -6.73E+06 |