

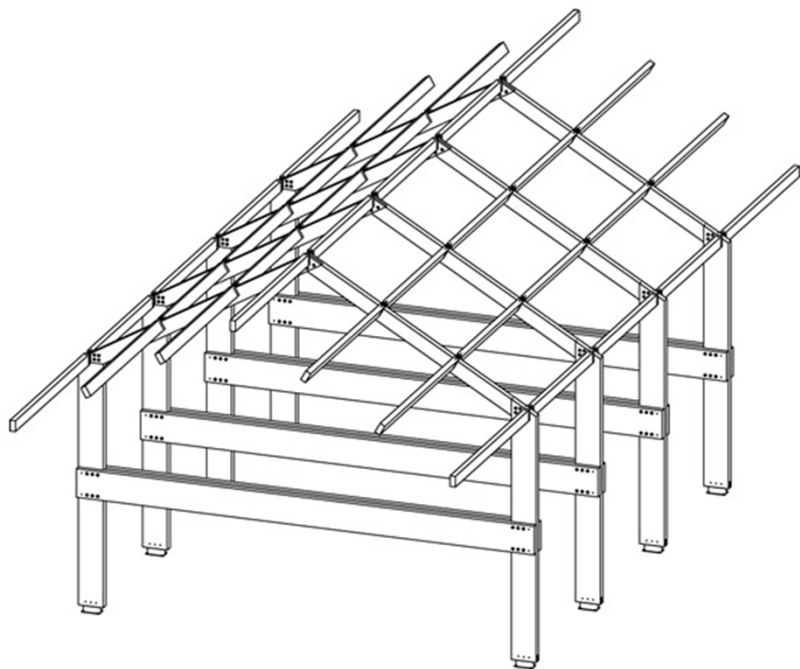


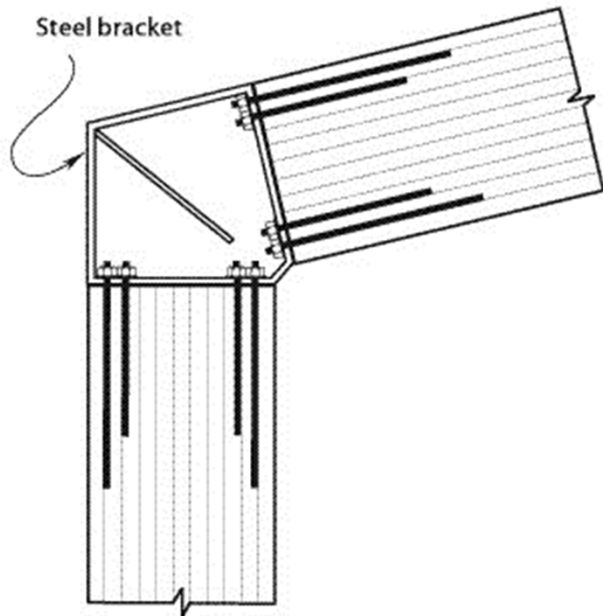
Ductility requirements for moment connections

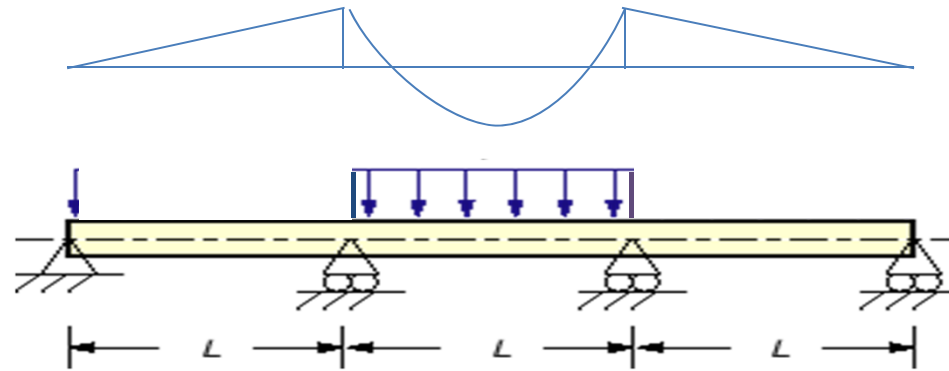
in statically indeterminate timber structures

by

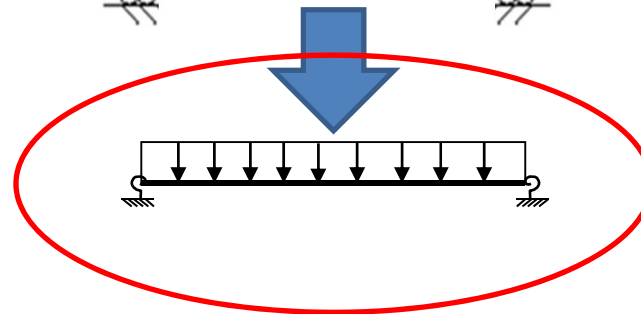
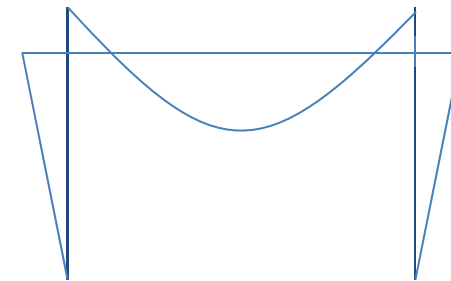
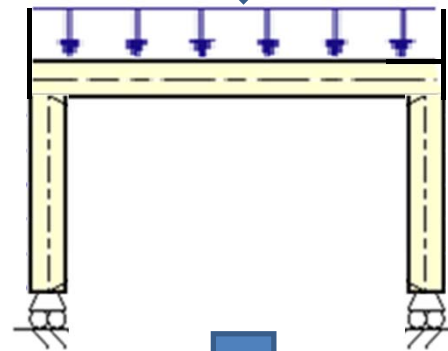
Ad. J.M. Leijten
TU/ Eindhoven
The Netherlands



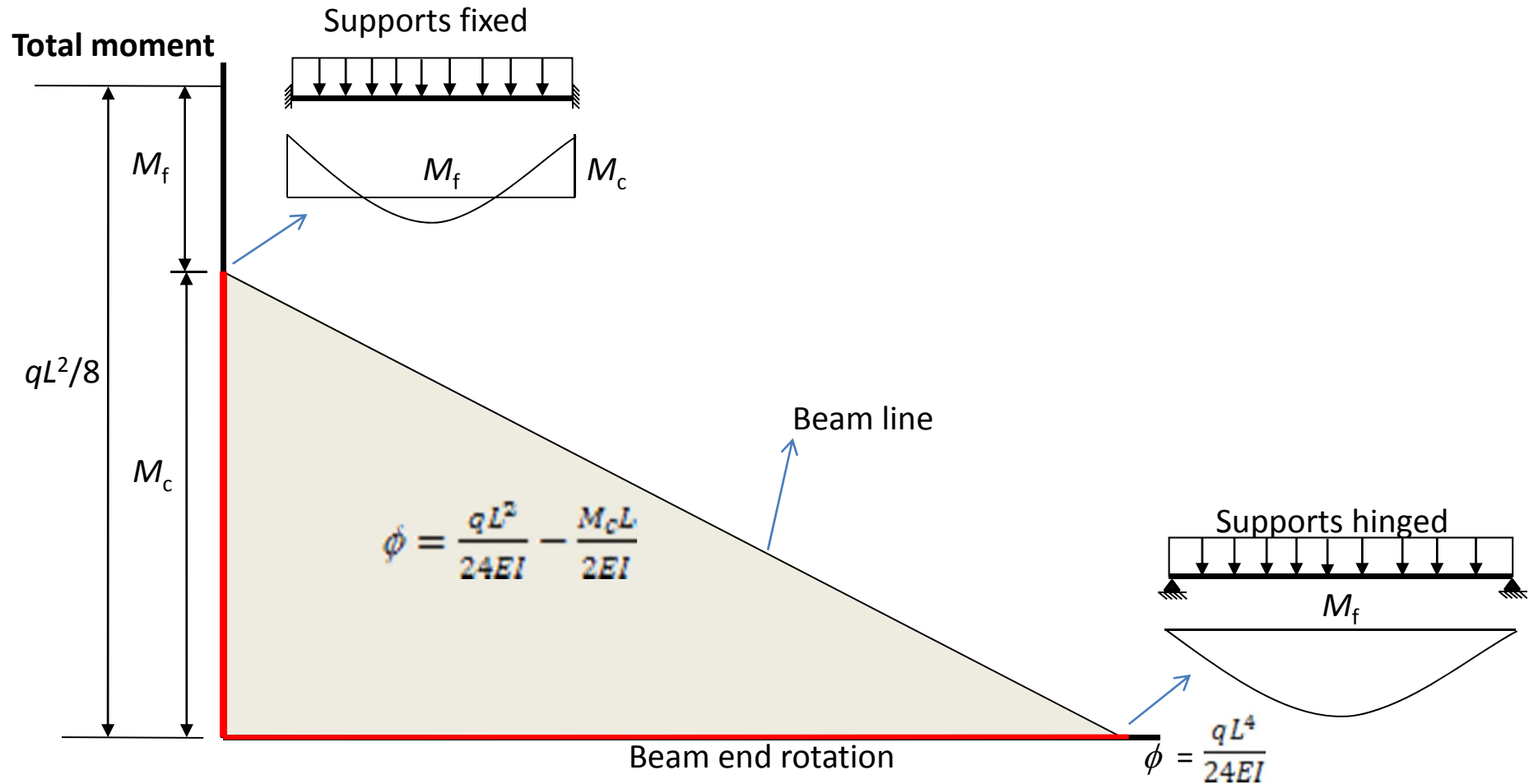




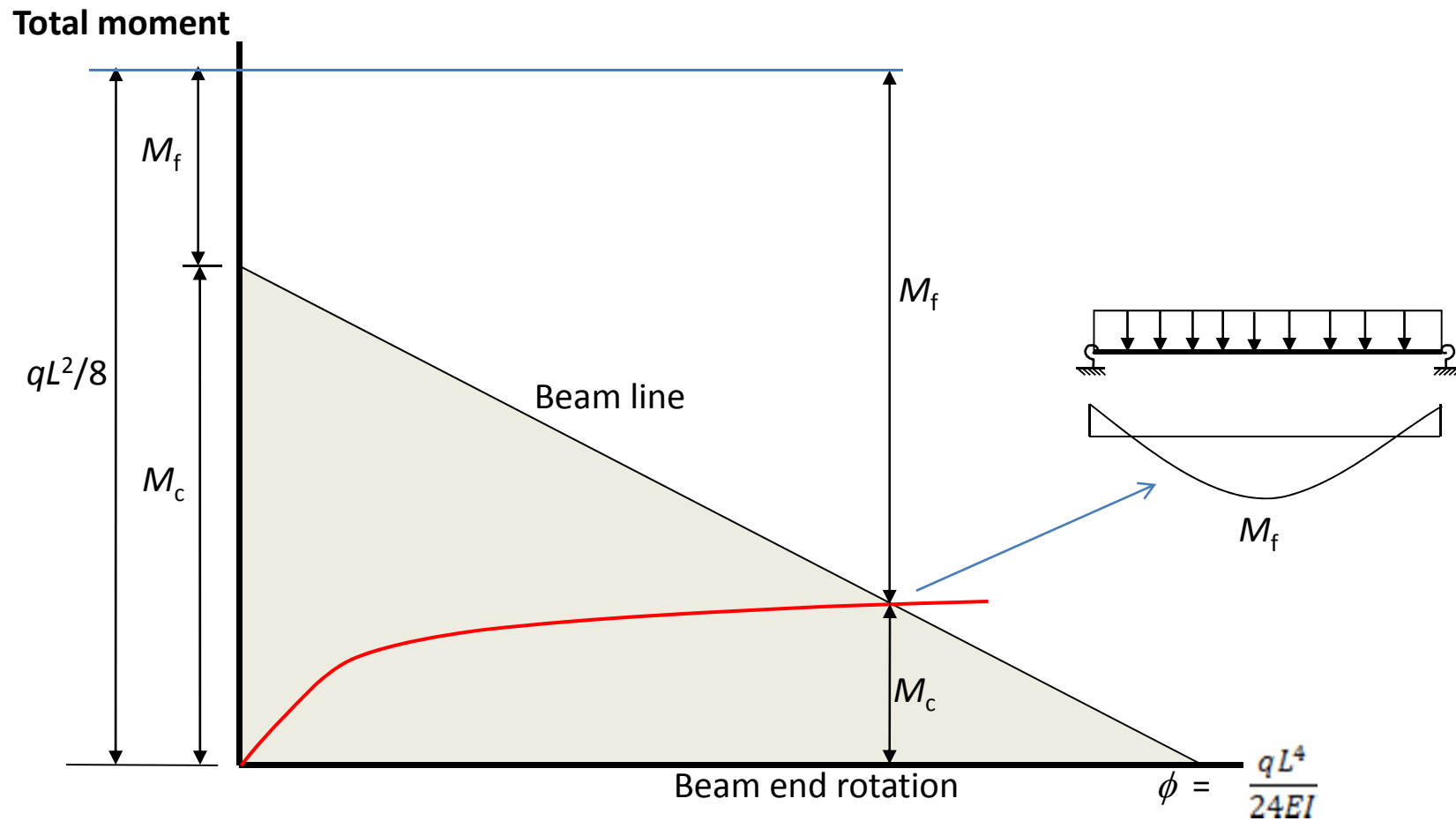
Evaluation using
beam-line
method



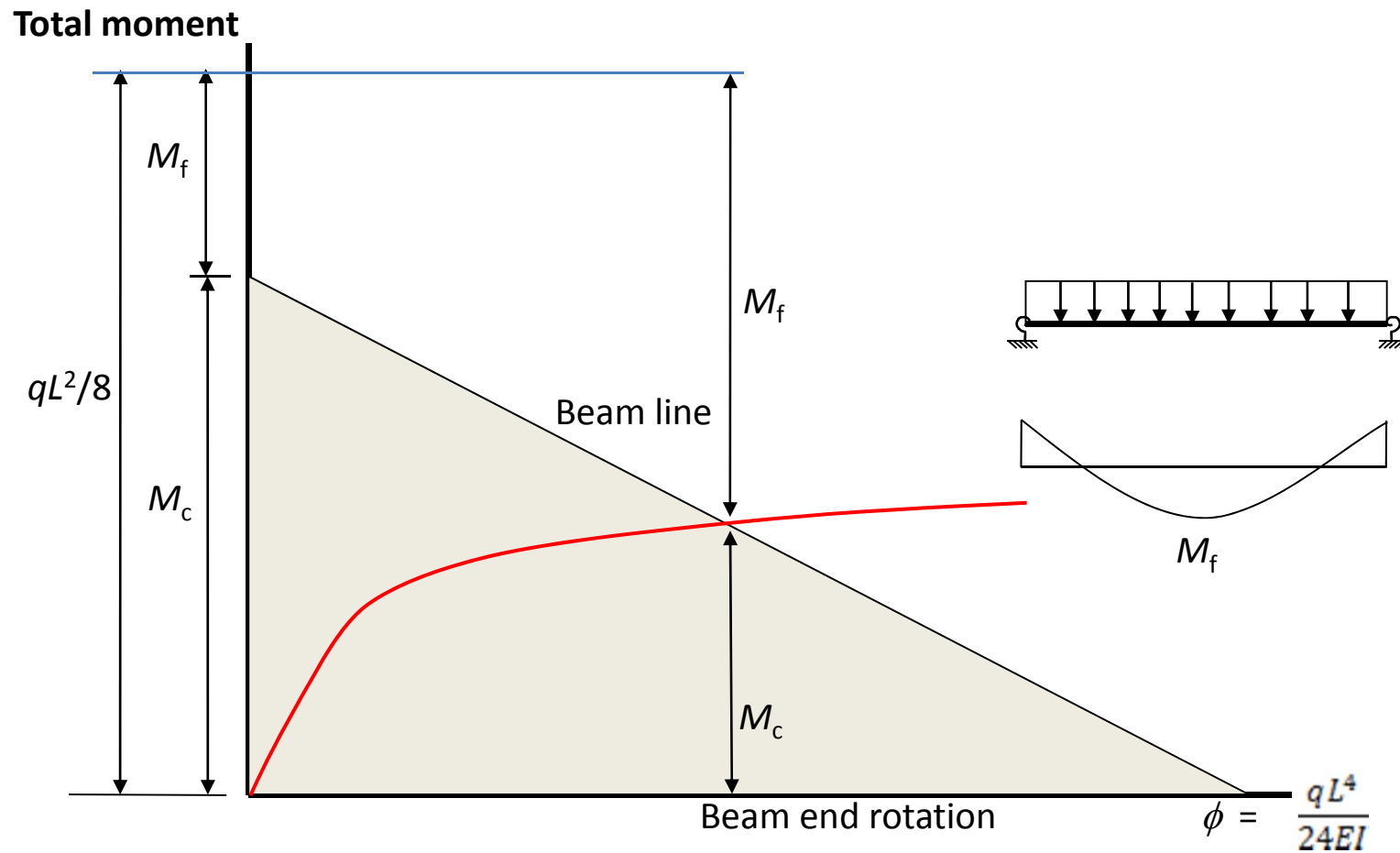
MOMENT ROTATION REQUIREMENTS



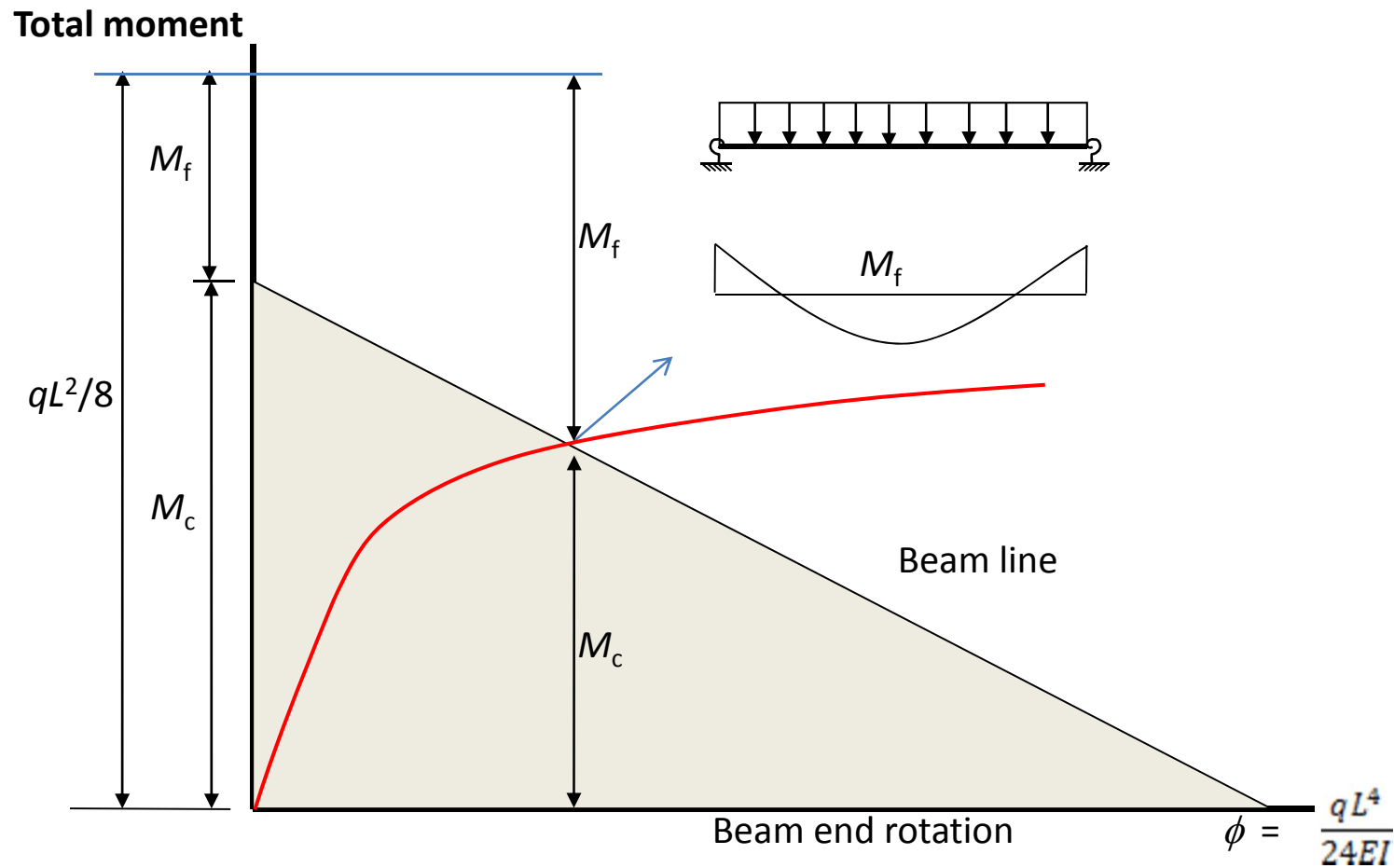
MOMENT ROTATION REQUIREMENTS



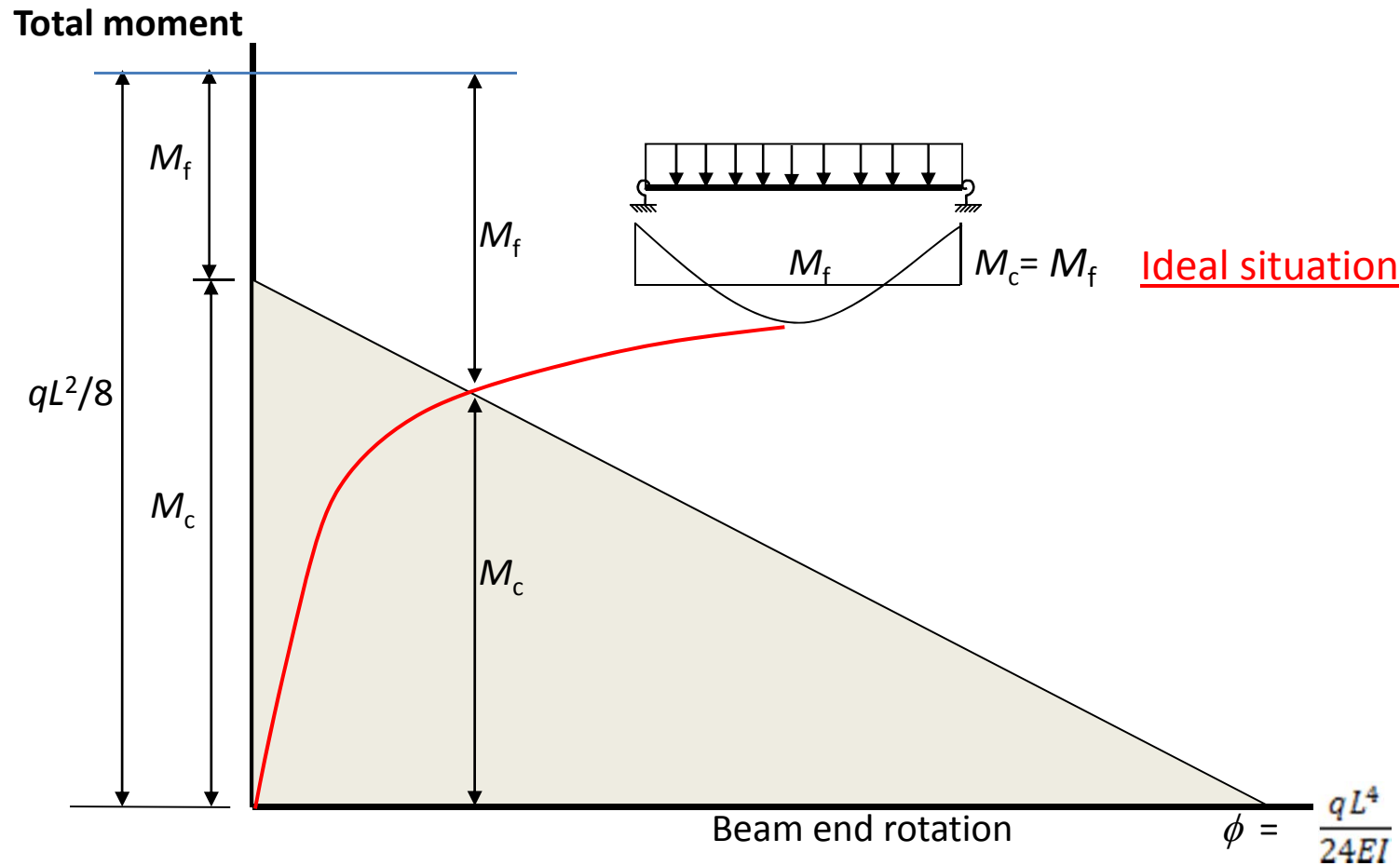
MOMENT ROTATION REQUIREMENTS



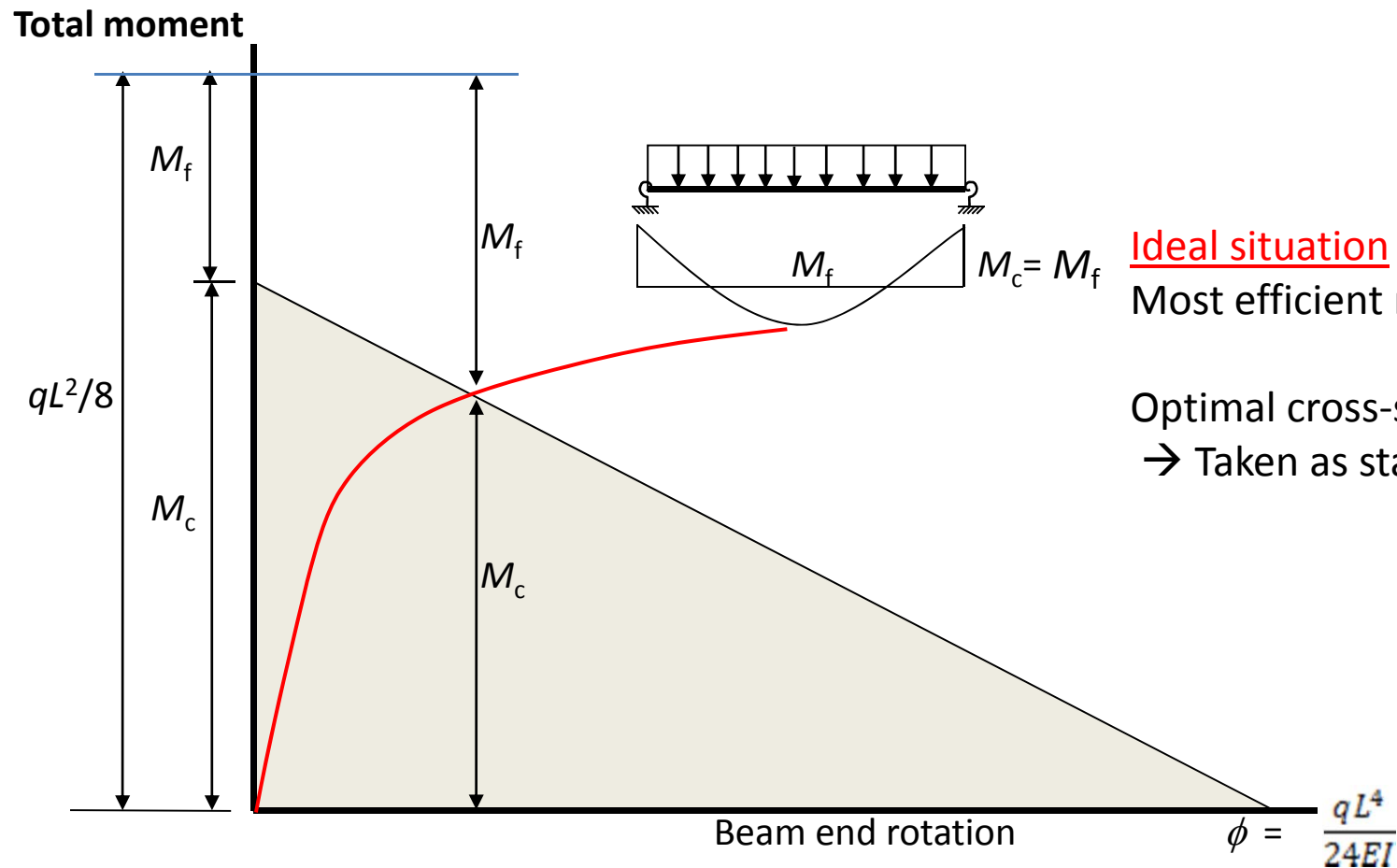
MOMENT ROTATION REQUIREMENTS



MOMENT ROTATION REQUIREMENTS

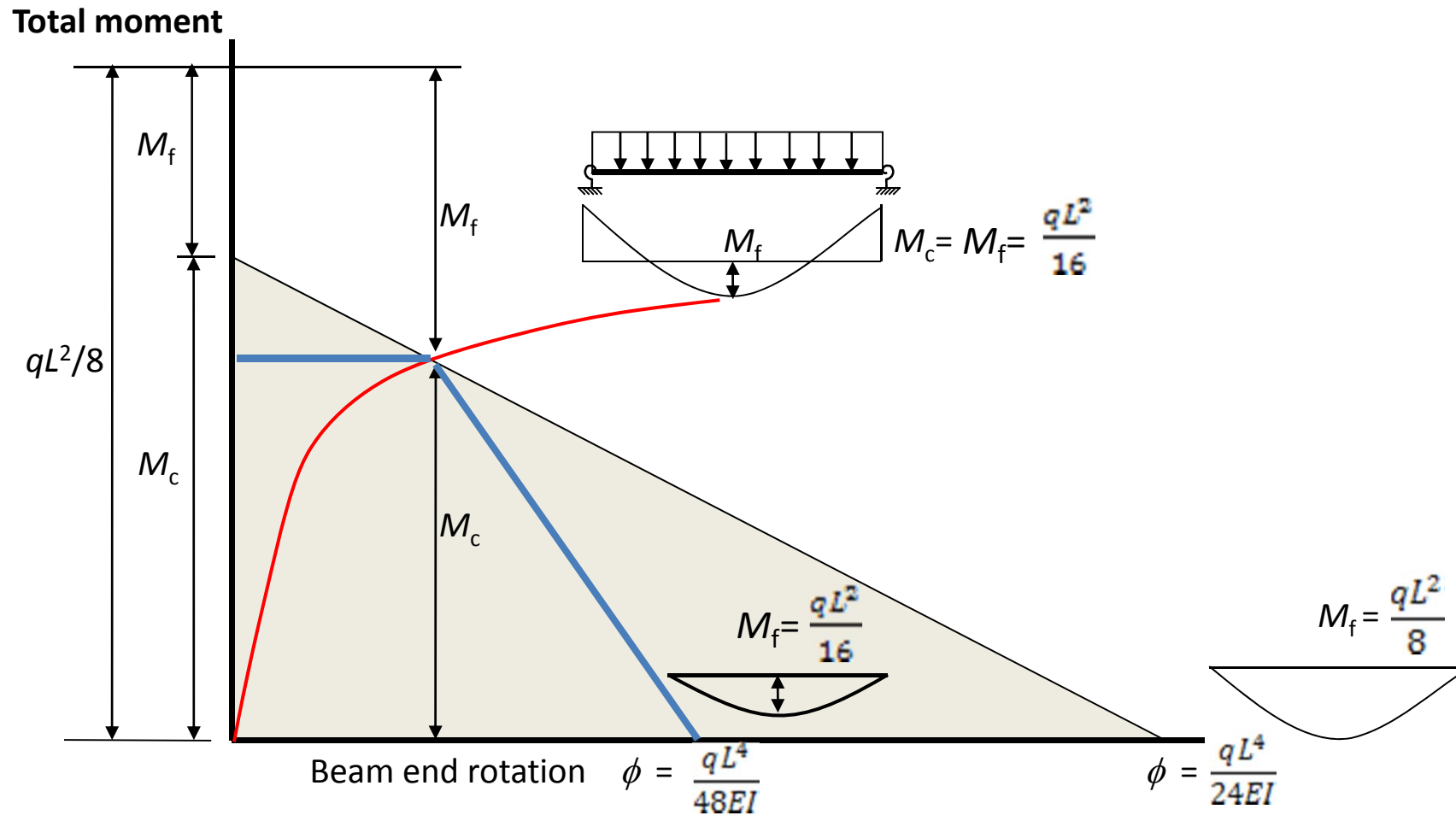


MOMENT ROTATION REQUIREMENTS

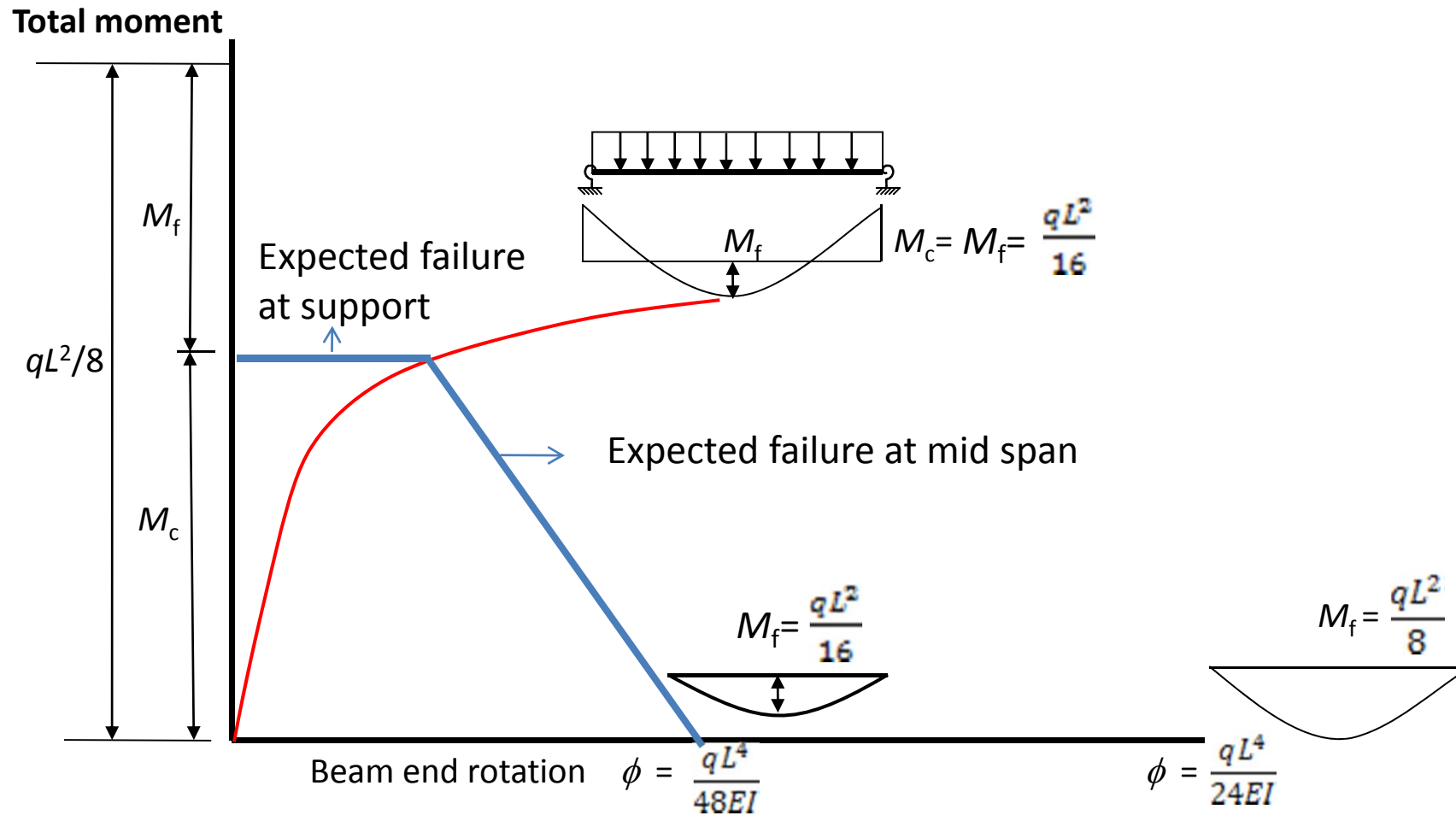


Ideal situation
 Most efficient material use
 Optimal cross-section
 → Taken as starting point

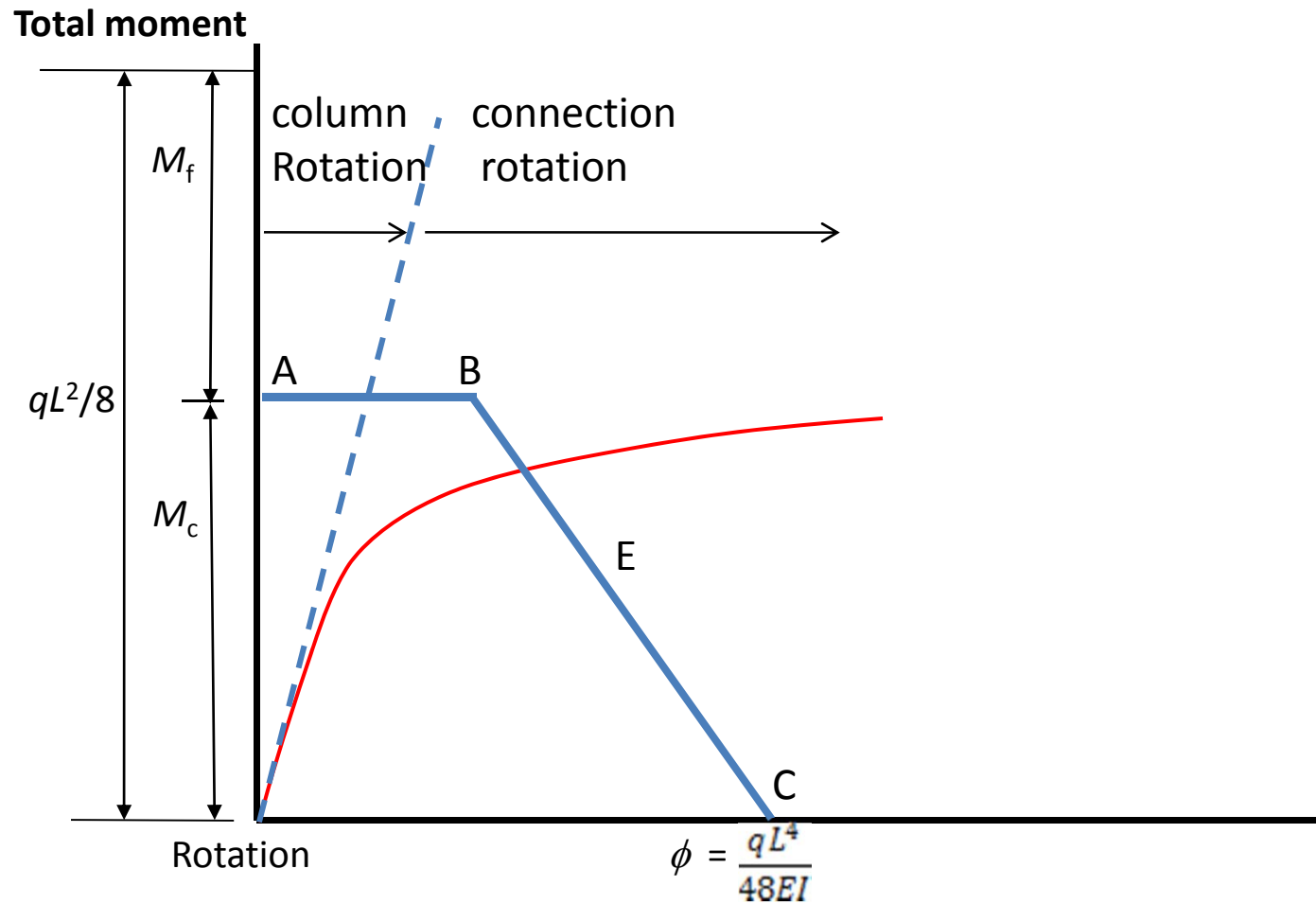
MOMENT ROTATION REQUIREMENTS



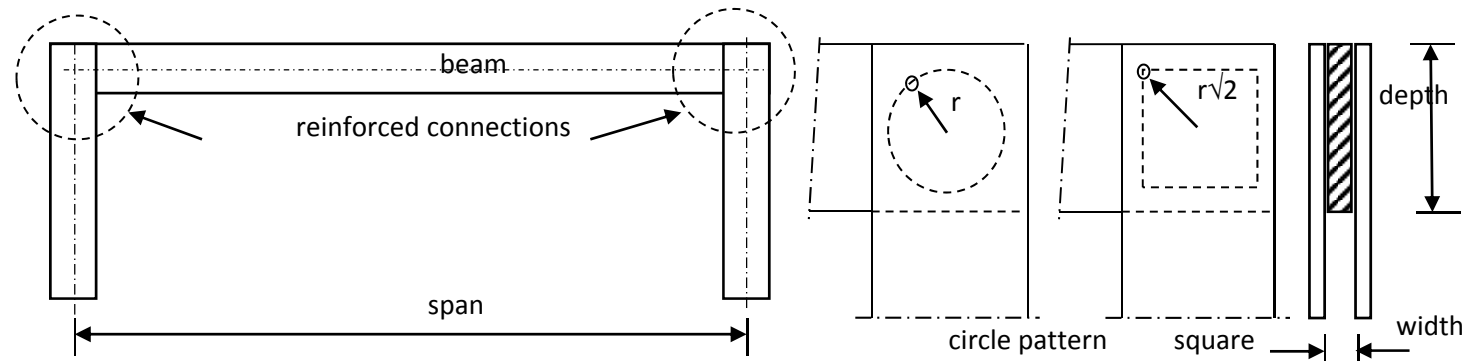
MOMENT ROTATION REQUIREMENTS



MOMENT ROTATION REQUIREMENTS



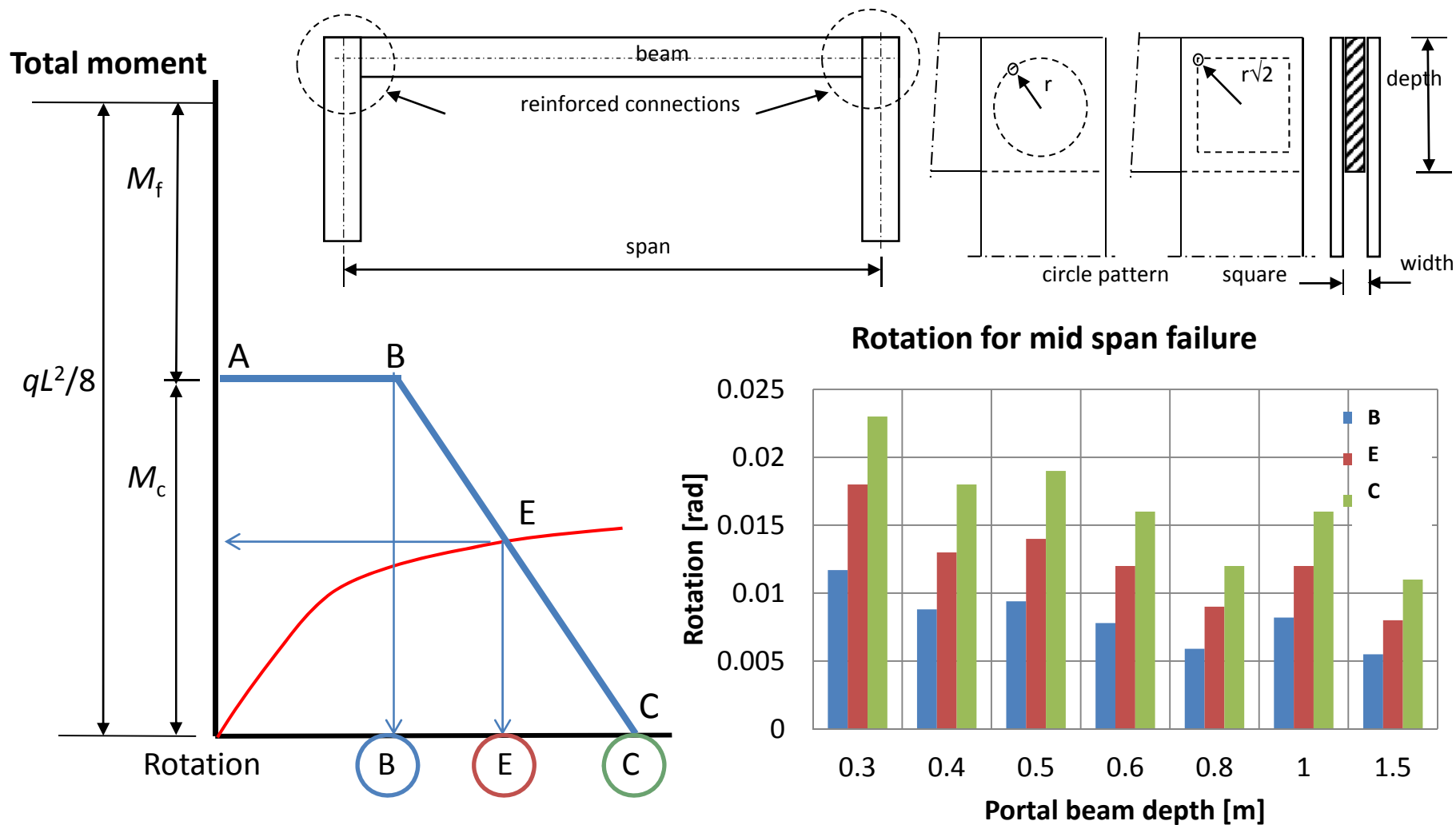
MOMENT ROTATION REQUIREMENTS



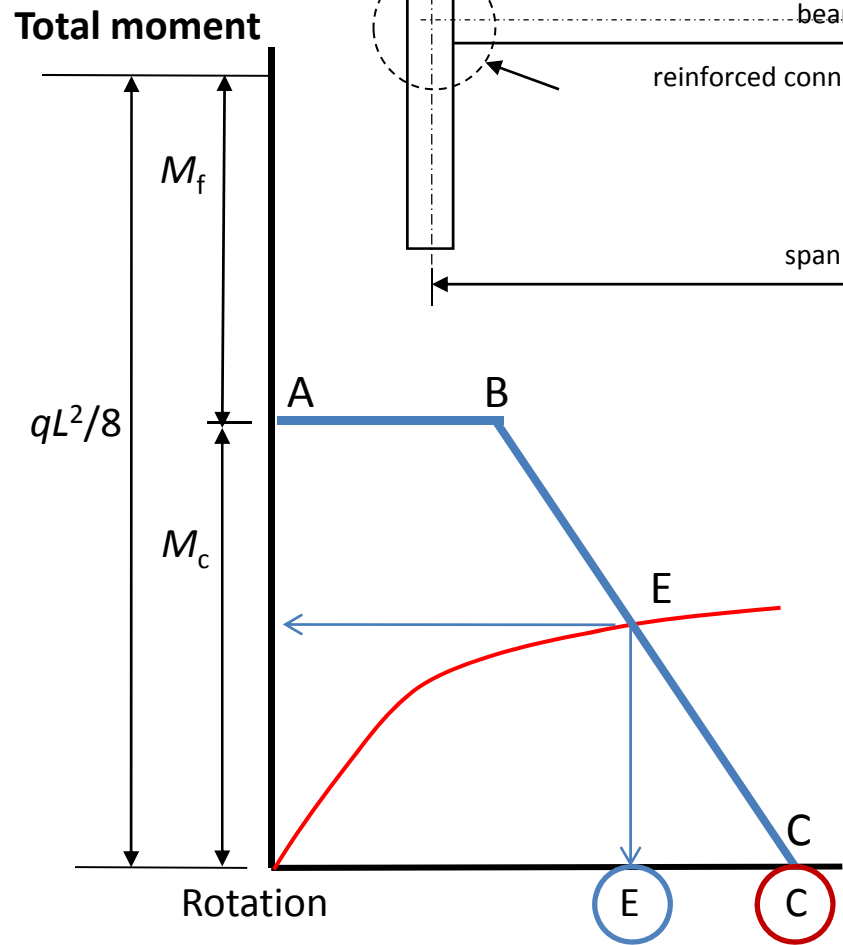
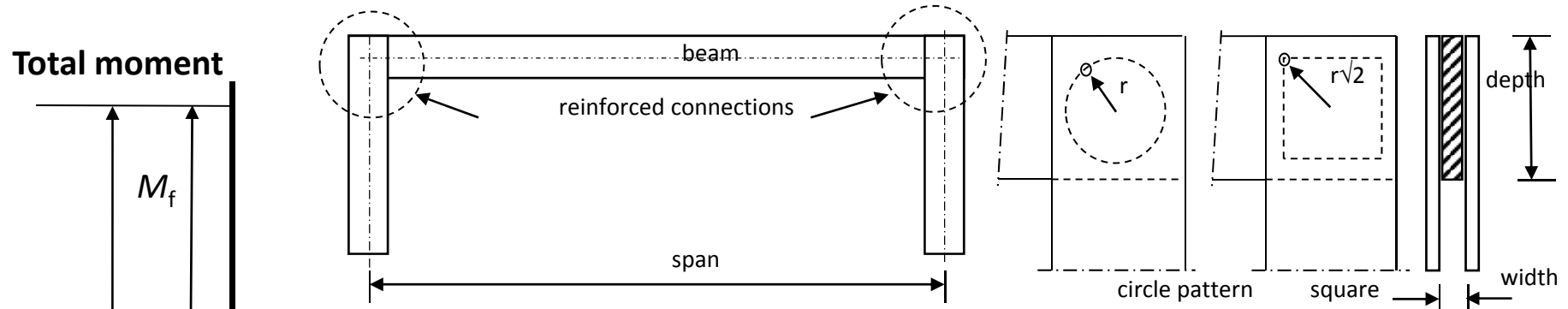
Starting points
 Depth = Span/20
 Width = Depth/8
 UDL= 1,76 kN/m²

Span	Depth	Width	Centre to centre	Load
[m]	[m]	[m]	[m]	[kN/m ¹]
6	0,3	0,04	3	5,28
8	0,4	0,05	3	5,28
10	0,5	0,06	4	7,04
12	0,6	0,08	4	7,04
16	0,8	0,1	4	7,04
20	1	0,13	7	12,32
30	1,5	0,19	7	12,32

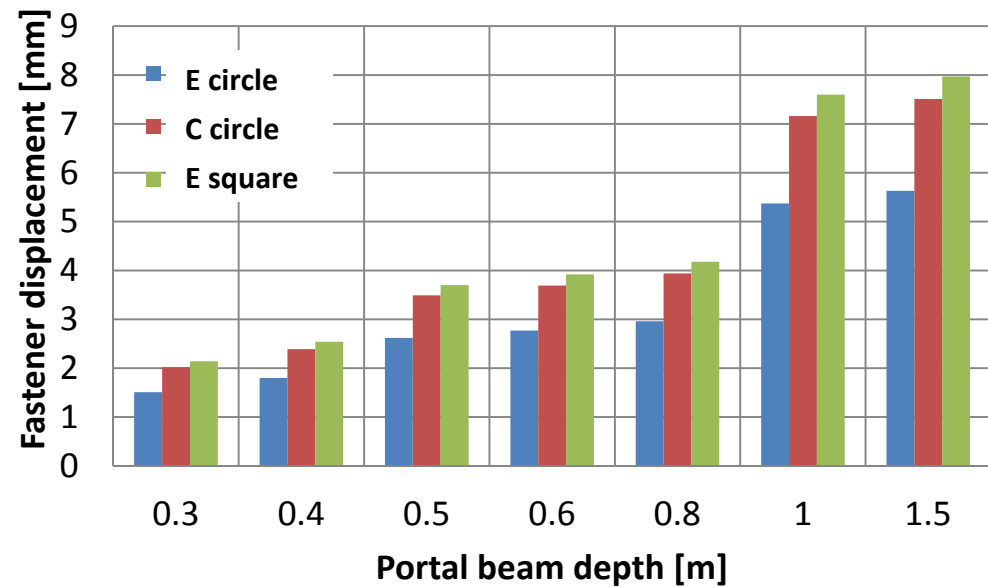
MOMENT ROTATION REQUIREMENTS



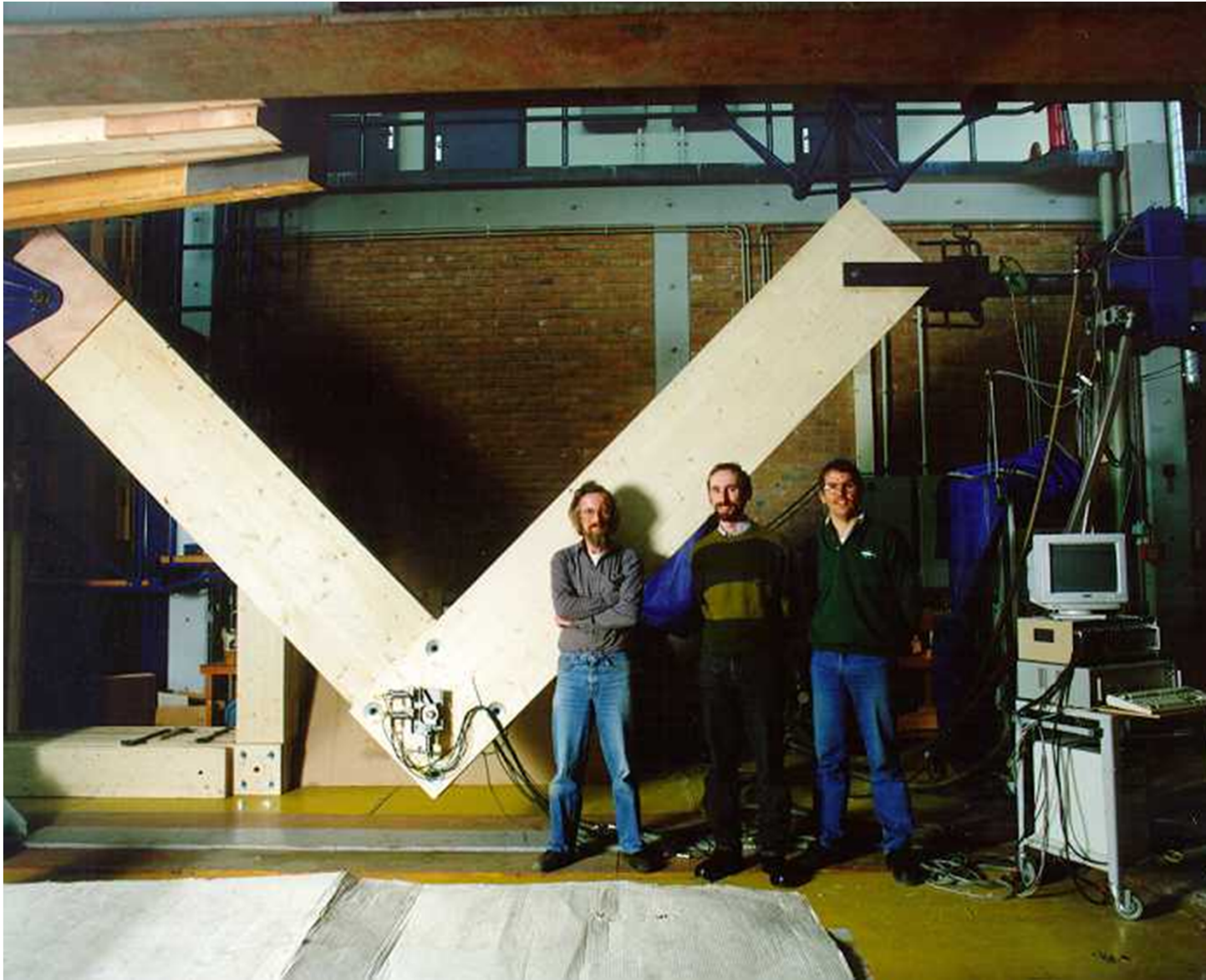
MOMENT ROTATION REQUIREMENTS



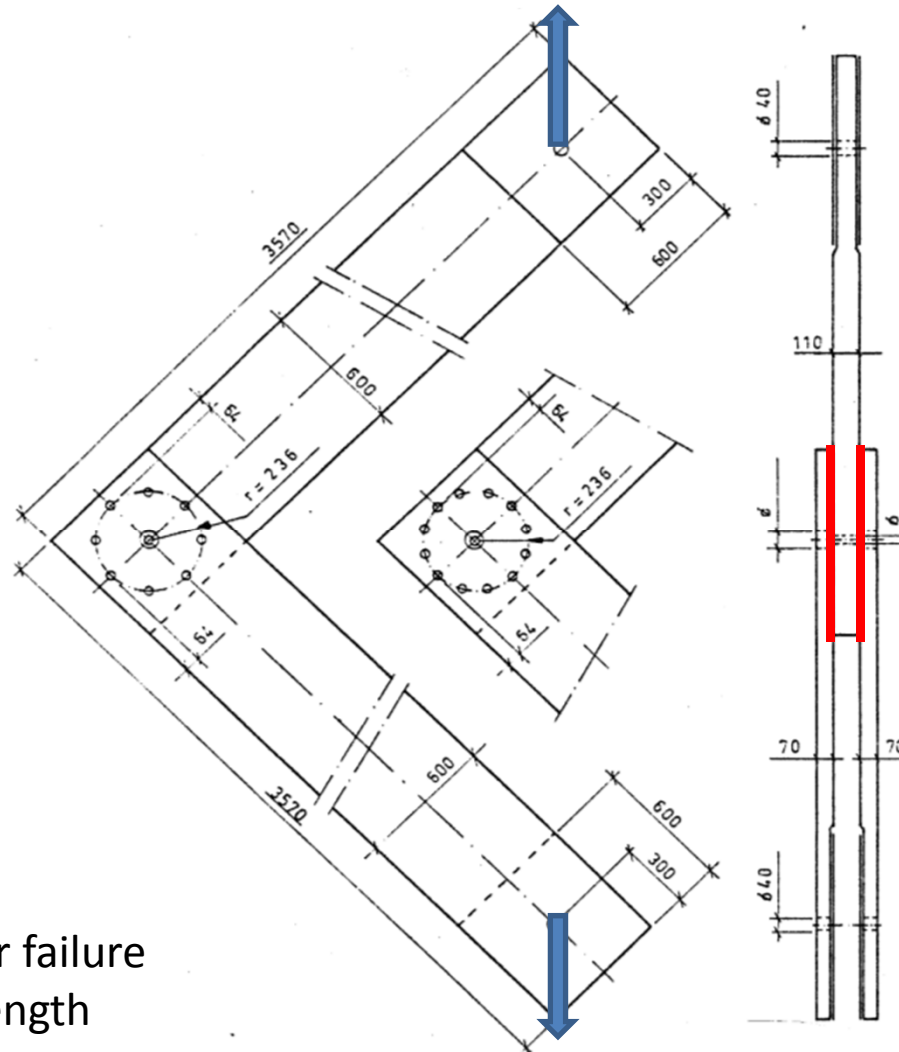
Fastener displacement for mid span failure



What can we achieve with and without reinforcement



What can we achieve with and without reinforcement

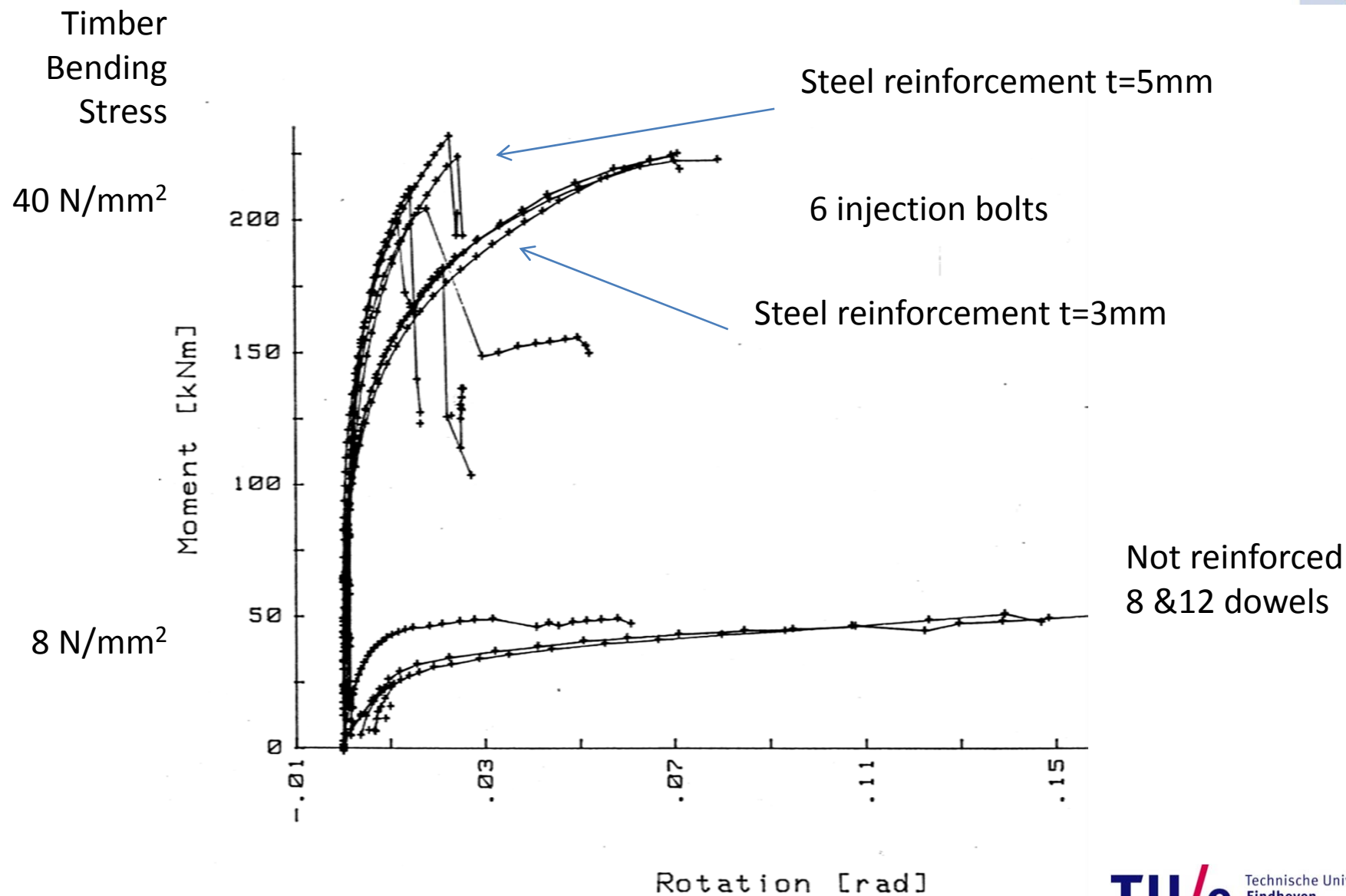


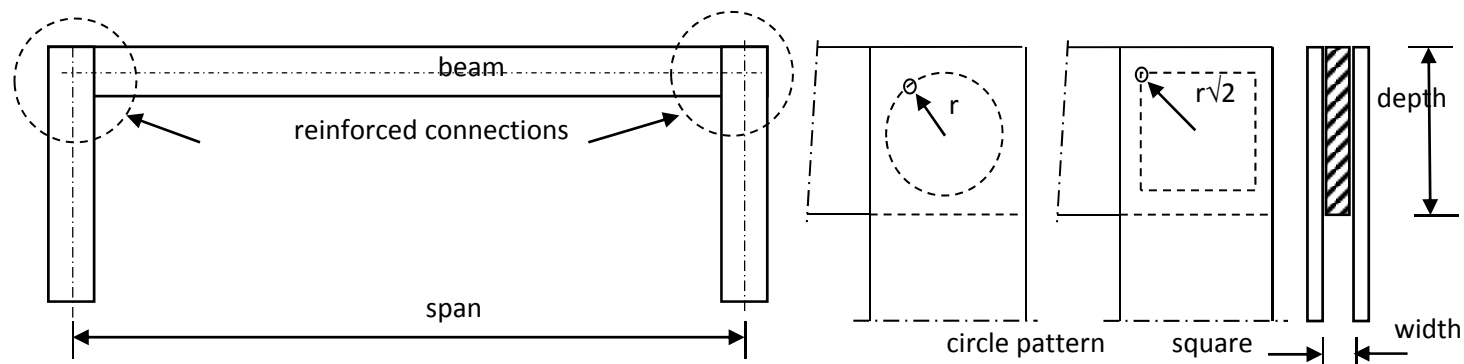
Reinforcement to:

- prevent premature timber failure
- enhance embedment strength

Influence reinforcement 600 mm deep beams

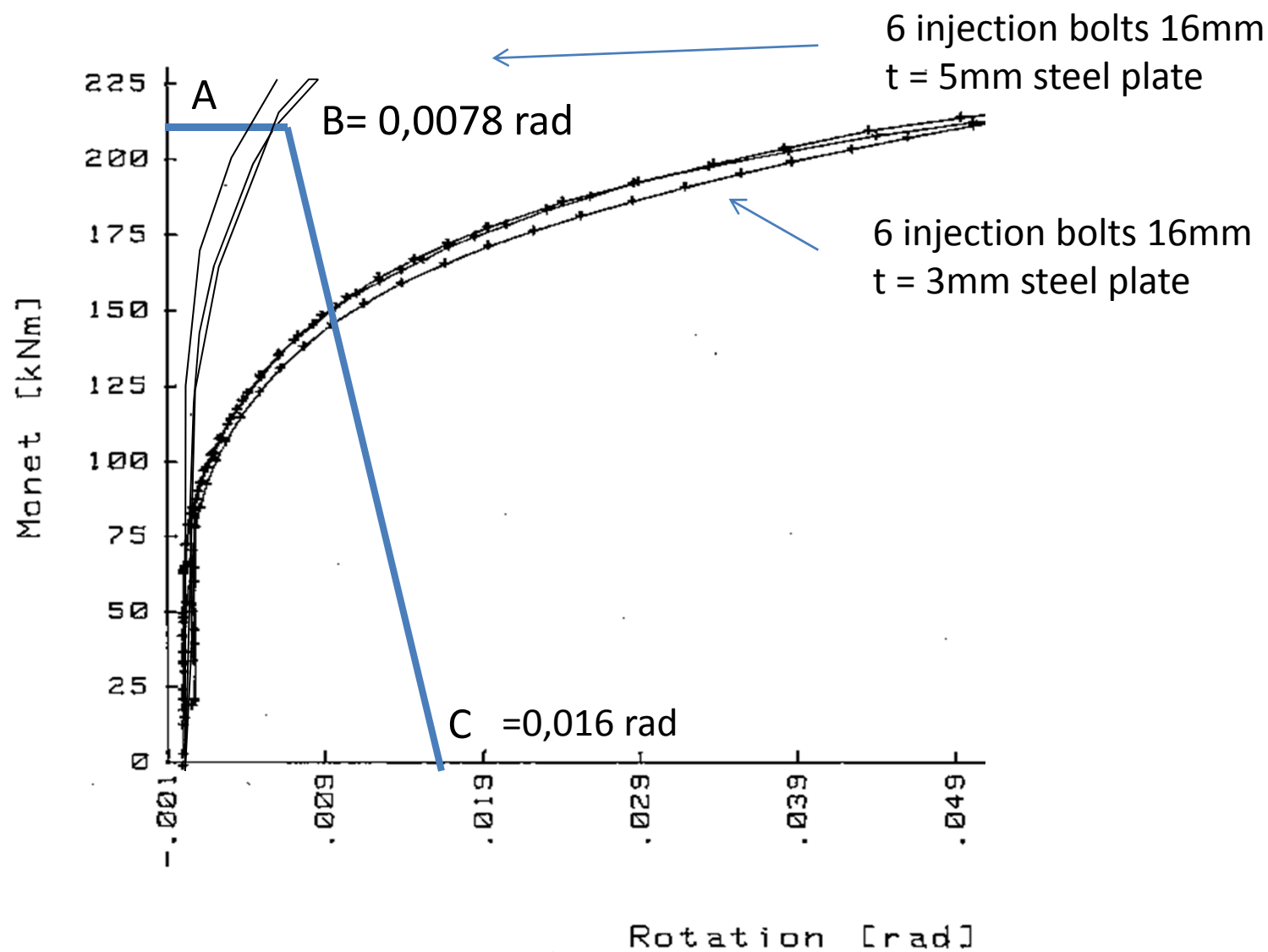
Dowels/injection bolts 16mm diameter

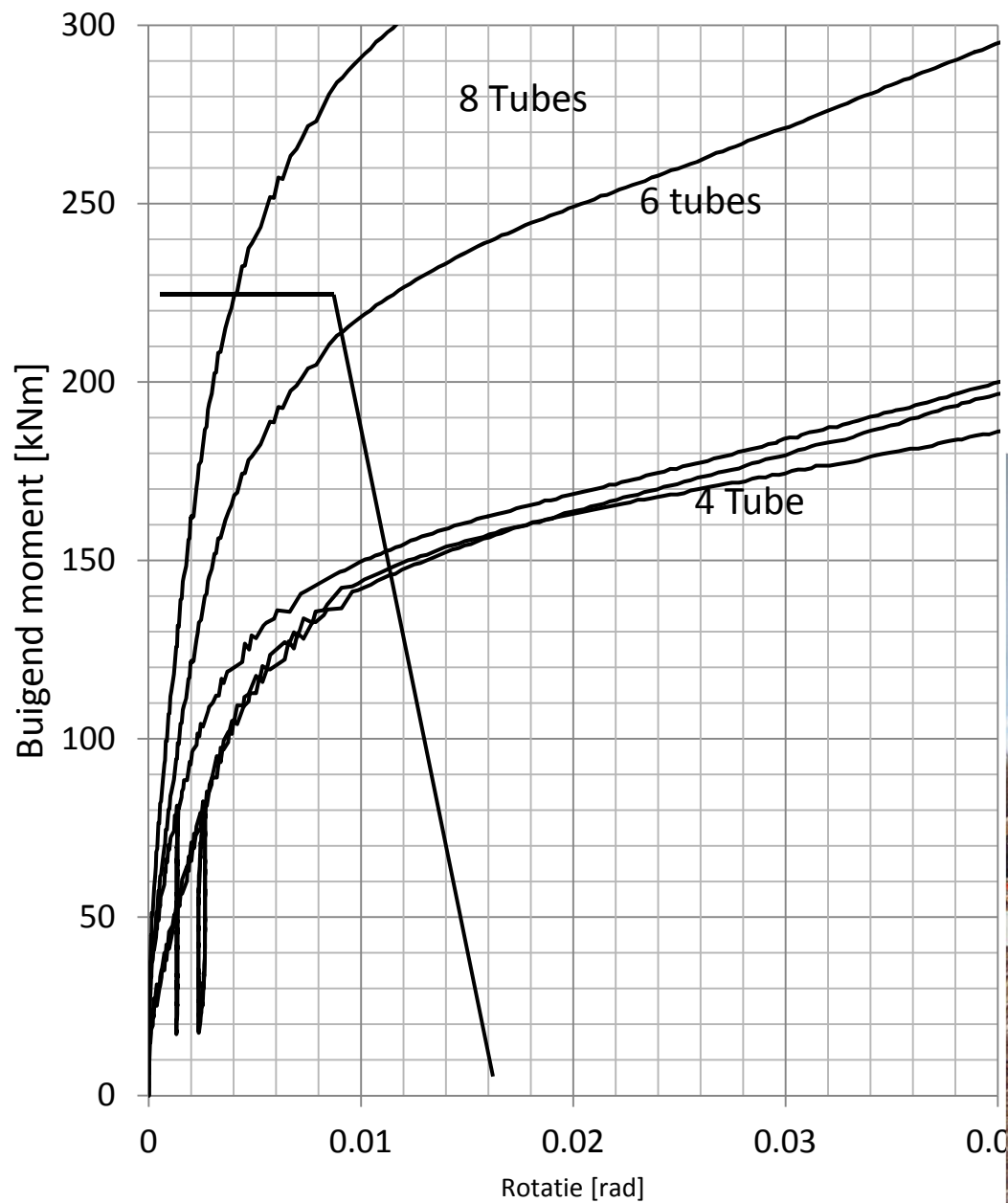




Span	depth	width	centre	load
[m]	[m]	[m]	[m]	[kN/m ¹]
6	0,3	0,04	3	5,28
8	0,4	0,05	3	5,28
10	0,5	0,06	4	7,04
12	0,6	0,08	4	7,04
16	0,8	0,1	4	7,04
20	1	0,13	7	12,32
30	1,5	0,19	7	12,32

Influence reinforcement 600 mm deep beams





Conclusions

- Beam-line method – easy assessment of effectiveness
- Ductility usually adequate
(depends on failure mode)
- High demands on rotational stiffness
- Immediate load take up required
- Connections with dowel type fasteners need very effective type of reinforcement

Thank you for your attention

