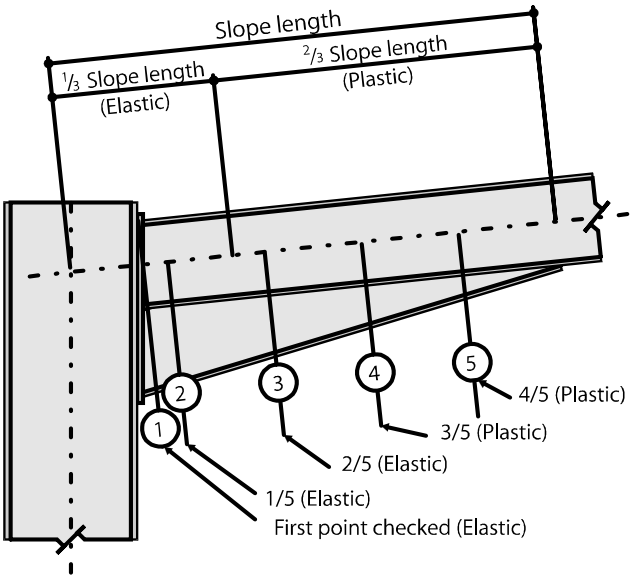
1 Design

1.1 Haunch Strength checks

For haunches, the initial haunch lengths and depths are set using default preferences, the haunches are **NOT** automatically re-sized by Tekla Portal Frame Designer. The capacity of haunched members is checked at sections 1 to 5 inclusive as shown below and at other points of interest. The checks are similar to those for the rafters and columns but differ in detail because of the approach to classification.



1.1.1 Restraint Type Summary

Type	Comment
Outer Flange	Used as an end restraint for the elastic checks when the outside flange is in compression and as an intermediate restraint for Elastic App C (SCI P399) and Plastic Annex BB.3 Ls.
Inner Flange	Used as an end restraint for the elastic checks when the inside flange is in compression and as an intermediate restraint for Elastic App C (SCI P399) and Plastic Annex BB.3 Ls.
Torsional	Used as an end restraint for all checks and as an intermediate restraint for Elastic App C (SCI P399) and Plastic Annex BB.3 Ls.
Contraflexure	The point of contra-flexure can be used in the same way as a torsional restraint.

1.1.2 Stability Check Summary

Check	Restraint	Comment	Formula
Elastic Tapered	Compression Flange (Or Torsional)	Tapered and Uniform Sections	$N_{Ed}/N_{c,Rd} + M_{Ed}/M_{b,Rd} \leq 1$
Elastic Eq. 6.62	Compression Flange (Or Torsional)	Uniform Section	$N_{Ed}/N_{b,z,Rd} + M_{Ed}/M_{b,Rd} \leq 1$
Elastic App. C SCI P399	Torsional with 1 intermediate restraint	Requires at least 1 intermediate restraint and must be in elastic zone only	$N_{Ed}/N_{b,z,Rd} + M_{y,i}/M_{b,Rd,i} \leq 1$
Plastic Annex BB.3 Lm	Between two torsional, or one torsional and one compression if the entire length is in compression requires at least one intermediate restraints	Generally used for short and stable lengths.	Length ≤ Lm $L_m = \frac{38 i_z}{\sqrt{\frac{1}{57,4}\left(\frac{N_{Ed}}{A}\right) + \frac{1}{756\,C_1^2}\left(\frac{W_{pl,y}^2}{A I_T}\right)\left(\frac{f_y}{235}\right)^2}}$
Plastic Annex BB.3 Ls	Between torsional, compression and requires at least one intermediate restraint	Generally used for short and stable lengths. Allowed in both elastic and plastic zone. At least one tension flange restraint is required.	Length ≤ Ls $L_s = \sqrt{C_m}\, L_k \left(\frac{M_{pl,y,Rk}}{M_{N,y,Rk} + aN_{Ed}}\right)$

1.2 Design Combinations

The design combinations we will consider critical for this design are as follows:

1. 01 Gravity — Self-weight + Dead + Imposed + Imperfections
2. 02 Valley Snow — Self-weight + Dead + Snow Drift + Imperfections
3. 03 Side Wind — Self-weight + Dead + (Side Wind +Cpe -0.3Cpi)
4. 04 Side Uplift — Self-weight + Dead + (Side Wind, -Cpe 0.2Cpi)
5. 05 Gable Uplift — Self-weight + Dead + (Gable Wind 0.2Cpi)

A thorough examination of the results obtained from running the various conditions of Side & Gable Wind, Positive & Negative Cpi, Positive & Negative Roof Cpe with the just the Self-Weight + Dead or with the Self-Weight + Dead + Service + Imposed has shown that the following combinations usually are critical for the given conditions:

Design Condition	Location	Notes	Load Combination
Member Strength		Min Lambda_p	01 Gravity + Imperfections
Connection Forces	External Eaves	Max Moment	01 Gravity + Imperfections
		Min Moment	03 Side Wind
	Internal Eaves	Max Moment	05 Gable Wind
		Min Moment	01 Gravity + Imperfections
	Apex	Max Moment	01 Gravity + Imperfections
		Min Moment	05 Gable Wind
Deflections	External Eaves	Max Horizontal	04 Side Uplift
		Min Horizontal	01 Gravity + Imperfections
	Internal Eaves	Max Horizontal	04 Side Uplift
		Min Horizontal	01 Gravity + Imperfections
	Apex	Max Vertical	04 Side Uplift
		Min Vertical	05 Gable Wind
Base Loads	External Base	Max Vertical Load	01 Gravity + Imperfections
		Min Vertical Load	03 Side Wind
	Internal Base	Max Vertical Load	01 Gravity + Imperfections
		Min Vertical Load	05 Gable Wind