|  |
| --- |
| Formsteel |
| Structural Report |
| PS1 – Structural calculation and design report |

|  |
| --- |
| Formsteel  4-25-2019 |



Contents

[1. Geometry 2](#_Toc7095148)

[1.1. Basic geometry 2](#_Toc7095149)

[1.2. Structural model in 3D environment 2](#_Toc7095150)

[2. Material properties 3](#_Toc7095151)

[3. Cross-sections 4](#_Toc7095152)

[4. Member types 6](#_Toc7095153)

[5. Load 7](#_Toc7095154)

[5.1. Basic Parameters 7](#_Toc7095155)

[5.2. Dead Load 7](#_Toc7095156)

[5.3. Service load 7](#_Toc7095157)

[5.4. Live / Imposed Load 7](#_Toc7095158)

[5.5. Snow Load 7](#_Toc7095159)

[5.6. Wind Load 7](#_Toc7095160)

[5.7. Seismic Load 8](#_Toc7095161)

[6. Load Cases 10](#_Toc7095162)

[7. Load Combinations 11](#_Toc7095163)

[8. Member design 12](#_Toc7095164)

[8.1. Member type: Main Column 12](#_Toc7095165)

[8.1.1. Member internal forces 12](#_Toc7095166)

[8.1.2. Frame internal forces 13](#_Toc7095167)

[8.1.3. Member design details - ULS 14](#_Toc7095168)

[8.1.4. Member deflections 14](#_Toc7095169)

[8.1.5. Member design details - SLS 14](#_Toc7095170)

[9. Joint Design 15](#_Toc7095171)

[9.1. Member type: Main Column 15](#_Toc7095172)

[10. Footing Design 17](#_Toc7095173)

# Geometry

## Basic geometry

Width B = [GableWidth] m

Length L = [Length] m

Height H1 = [WallHeight] m

~~Height H~~~~2~~ ~~= 4.48 m~~~~2~~

Roof Pitch α = [RoofPitch\_deg] deg

Girt spacing Bg = [GirtDistance] m

Purlin spacing Bp = [PurlinDistance] m

Wind post spacing Bwp = [ColumnDistance] m

Rafter length 9.423 m

Toto by somasidal do tabulky, aby to bolo peknenaformatovane

Pismenkazakladnehofontu by malibyt co najmensie a citatelne “10”???

Pointa je vsetkonahustittak aby smemali co najmenejstran a co najhutnejsie data.

## Structural model in 3D environment

Orezatbieleokrajeobrazka aby bol co najvacsi. Este samusimetroskupohrat s farbami aby to nabielompozadivyzeralolepsie. Asibudemepotrebovat 2 sadyfarieb pre 3D grafikua ine pre export.

[3DModelImage]

# Materialproperties

VUC\_ComponentList, Datagrid\_Componentszistitkolkoroznychmaterialov je zadanychcomponentam, asi to budena 99% G550 pre vsetkykomponenty. Pre kazdy z tychtomaterialovzobrazittabulkuobsahujucuudaje v datagrideDatagrid\_Materials

V kode by bolo dobre mat moznostnastavitktoreriadkytabulkysaexportuju, nepotrebujemevsetky, defaultnevypnut tie ktoresuprazdne.

Ak by to slotak by mohlibyttabulkyajvedlaseba. Usetrimeriadky

[MaterialProperties]

# Cross-sections

VUC\_ComponentList, Datagrid\_Componentszistitkolkoroznychprierezov je zadanychcomponentam. Pre kazdy z tychtoprierezovpodlanazvuprierezuzobrazittabulkuobsahujucuudaje v datagrideDatagrid\_ComponentDetails.

Predtabulkualebovedlatabulkyzobrazitobrazokprierezu (obrazkypripravim). Obrazokprierezu by moholbytvedlatabulky.Usetrili by sariadky.

V kode by bolo dobre mat moznostnastavitktoreriadkytabulkysaexportuju, nepotrebujemevsetky. Defaultnevypnut tie, ktoresuprazdne.

Ak budenastrankemalomiesta, takskocitnadalsiu, najednustranku by samohlizmestit 2 prierezy

Cross-section name: 63020

|  |  |
| --- | --- |
|  |  |

Cross-section name:270115

|  |  |
| --- | --- |
|  |  |

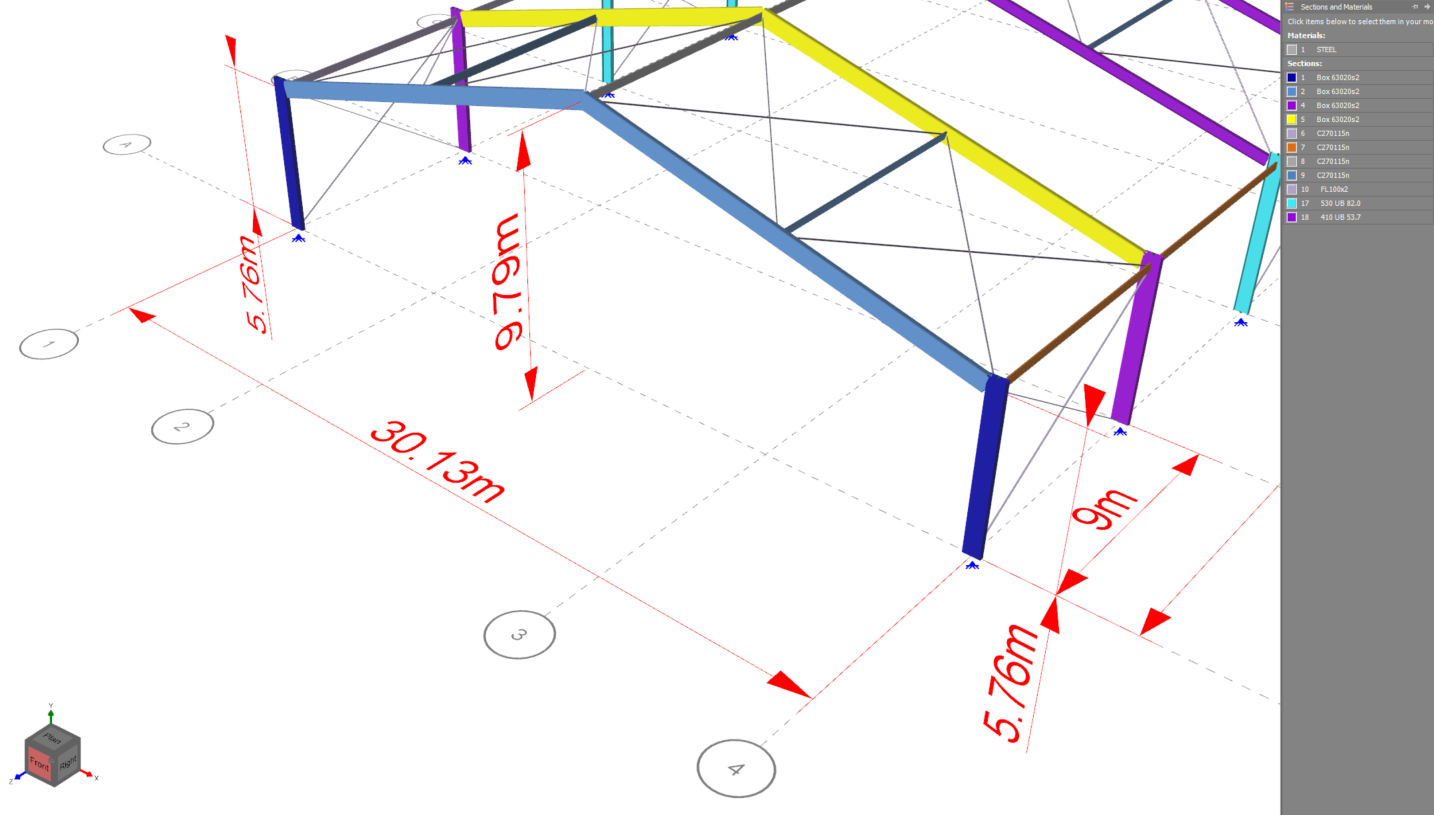
# Member types

ZobrazittabulkuUC\_ComponentList, Datagrid\_Components bez checkboxov.

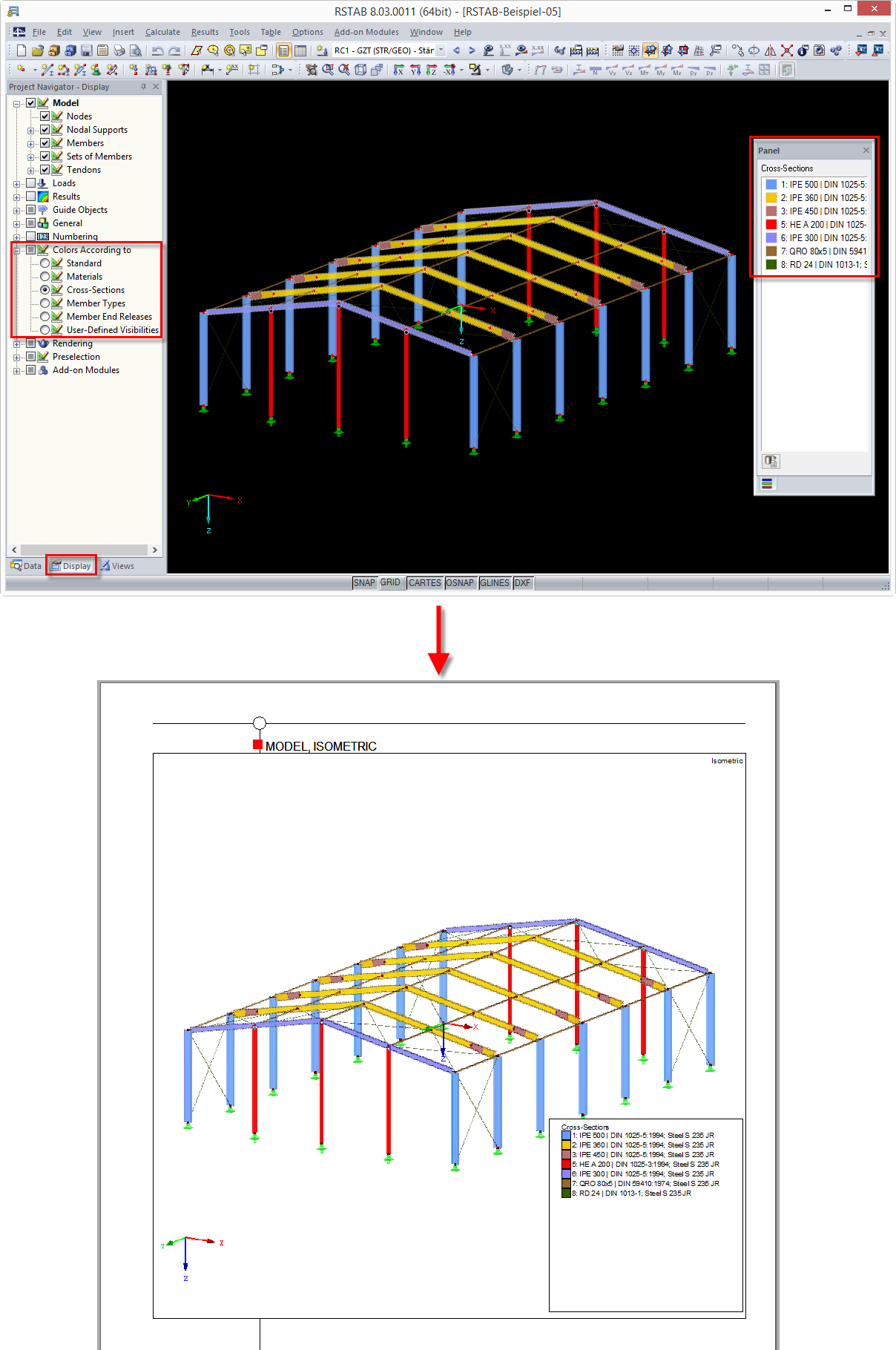
Mozno by bolo dobrepridat do tohodatagriduestejedenstlpec“Color”. Farbujednotlivychkomponent by smepotommohlicez GUI nastavovat. Zarovenbudemoznerychloidentifikovat co je co podlafariebna 3Dobrazku. Niektoreprogramymajufarbupriradenutypomobjektovako je material, cross-section, component type atd a da sa v 3D medzitymifarbamiprepinattakze je lahkoidentifikovatelne co je akyprierez, aky material a podobne (vid obrazok pod tabulkou)



Ukazka zo SPACE GASS – farby v 3D a legendavpravo



Ukazka RSTAB – 3D grafika s legendou a obrazok v protokole



# Load

## Basic Parameters

Location: [Location]

Design life: [DesignLife\_Value] years

Importance level: [ImportanceClass]

Annual probability of exceedance SLS: [AnnualProbabilitySLS]

Return period SLS: RSLS = [R\_SLS] years

Site elevation E = [SiteElevation] m

## Dead Load

TODO – potrebujemespristupnitpremenne v objektecez properties

Wall cladding load g c.w = [CCalcul\_1170\_1.DeadLoad\_Wall] kN/m2

Roof cladding load g c.r = [CCalcul\_1170\_1.DeadLoad\_Roof] kN/m2

Additional wall load g a.w = [AdditionalDeadActionWall] kN/m2

Additional roof load g a.r = [AdditionalDeadActionRoof] kN/m2

Total wall load g t.w = [CCalcul\_1170\_1.DeadLoadTotal\_Wall] kN/m2

Total roof load g t.r = [CCalcul\_1170\_1.DeadLoadTotal\_Roof] kN/m2

## Service load

Todo – if necessary

## Live / Imposed Load

Roof live load q l.r = [ImposedActionRoof] kN/m2

## Snow Load

TODO – potrebujemespristupnitpremenne v objektecez properties

Annual probability of exceedance ULS: [AnnualProbabilityULS\_Snow]

Return period RULS.S = [R\_ULS\_Snow] years

Snow elevation region: [CCalcul\_1170\_3.eSnowElevationRegion]

Ground snow load sg.ULS= [CCalcul\_1170\_3.s\_g\_ULS] kN/m2

Ground snow load sg.SLS= [CCalcul\_1170\_3.s\_g\_SLS] kN/m2

Roof exposure category [ExposureCategory]

Exposure factor Ce = [CCalcul\_1170\_3.C\_e]

Factor μ1 = [CCalcul\_1170\_3.Nu1\_Alpha1]

Factor μ2 = [CCalcul\_1170\_3.Nu2\_Alpha1]

Roof snow load sULS= [CCalcul\_1170\_3.s\_ULS] kN/m2

Roof snow load sSLS= [CCalcul\_1170\_3.s\_SLS] kN/m2

## Wind Load

TODO – potrebujemespristupnitpremenne v objektecez properties

Annual probability of exceedance ULS: [AnnualProbabilityULS\_Wind]

Return period RULS.W = [R\_ULS\_Wind] years

Wind region [EWindRegion]

Terrain category [TerrainCategory]

Reference height z = [CCalcul\_1170\_2.z] m

Average structure height h = [CCalcul\_1170\_2.h] m

Regional 3s gust wind speed VR.ULS = [CCalcul\_1170\_2.V\_R\_ULS] m/s

Regional 3s gust wind speed VR.SLS = [CCalcul\_1170\_2.V\_R\_SLS] m/s

Terrain/height multiplier Mz.cat= [CCalcul\_1170\_2.M\_z\_cat]

Shielding multiplier Ms = [CCalcul\_1170\_2.M\_s]

Topographic multiplier Mt = [CCalcul\_1170\_2.M\_t]

Hodnotysadajupocitatrozne pre smeryvetraN,W,E,S. Zatialbudemezobrazovatlenhodnoty s indexom [0]

Wind direction multiplier Md = [CCalcul\_1170\_2.fM\_D\_array\_values\_9[0]]

Site wind speed Vsit,β.ULS= [CCalcul\_1170\_2.V\_sit\_ULS\_Theta\_9[0]] m/s

Site wind speed Vsit,β.SLS= [CCalcul\_1170\_2.V\_sit\_SLS\_Theta\_9[0]] m/s

Design wind speed Vdes,θ.ULS= [CCalcul\_1170\_2.V\_des\_ULS\_Theta\_4[0]] m/s

Design wind speed Vdes,θ.SLS= [CCalcul\_1170\_2.V\_des\_SLS\_Theta\_4[0]] m/s

Density of air ρair = [CCalcul\_1170\_2.Rho\_air] kg/m3

Dynamic response factor Cdyn = [CCalcul\_1170\_2.C\_dyn]

Basic wind pressure pb.ULS = [CCalcul\_1170\_2.p\_basic\_ULS\_Theta\_4[0]] kN/m2

Basic wind pressure pb.SLS = [CCalcul\_1170\_2.p\_basic\_SLS\_Theta\_4[0]] kN/m2

## Seismic Load

Equivalent static method parameters

Annual probability of exceedance ULS: [AnnualProbabilityULS\_EQ]

Return period RULS.EQ = [R\_ULS\_EQ]

Site subsoil class [ESiteSubSoilClass]

Fault distance Dmin = [FaultDistanceDmin] km

Fault distance Dmax = [FaultDistanceDmax] km

Zone factor Z = [ZoneFactorZ]

Natural period along X-direction Tx = [PeriodAlongYDirectionTx] s

Natural period along Y-direction Ty = [PeriodAlongYDirectionTy] s

Spectral shape factor Ch(Tx) = [SpectralShapeFactorChTx]

Spectral shape factor Ch(Ty) = [SpectralShapeFactorChTy]

ULS

TODO – potrebujemespristupnitpremenne v objektecez properties

Structural ductility factor ULS μ = [CCalcul\_1170\_5.Nu\_ULS]

Structural performance factor ULS Sp = [CCalcul\_1170\_5.S\_p\_ULS\_strength]

Near-fault factor N(Tx,D) =[CCalcul\_1170\_5.N\_TxD\_ULS]

Elastic site hazard spectrum C(Tx) = [CCalcul\_1170\_5.C\_Tx\_ULS]

Factor kμ(Tx) = [CCalcul\_1170\_5.k\_Nu\_Tx\_ULS]

Horizontal design action coefficient Cd (Tx) = [CCalcul\_1170\_5.C\_d\_T1x\_ULS\_strength]

Contributing weight Gtot.x= [CCalcul\_1170\_5.G\_tot\_x] kN

Horizontal static force Vx = [CCalcul\_1170\_5.V\_x\_ULS\_strength] kN

Near-fault factor N(Ty,D) =[CCalcul\_1170\_5.N\_TyD\_ULS]

Elastic site hazard spectrum C(Ty) = [CCalcul\_1170\_5.C\_Ty\_ULS]

Factor kμ(Ty) = [CCalcul\_1170\_5.k\_Nu\_Ty\_ULS]

Horizontal design action coefficient Cd (Ty) = [CCalcul\_1170\_5.C\_d\_T1y\_ULS\_strength]

Contributing weight Gtot.y= [CCalcul\_1170\_5.G\_tot\_y] kN

Horizontal static force Vx = [CCalcul\_1170\_5.V\_y\_ULS\_strength] kN

SLS - TODO

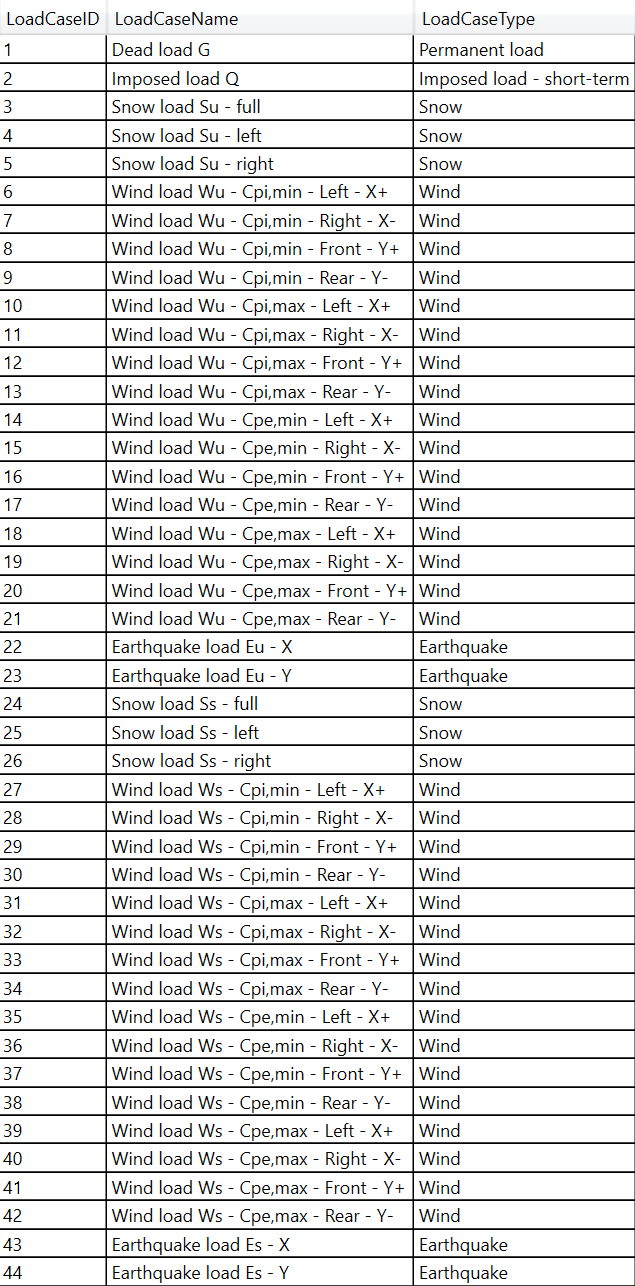
~~Structural ductility factor SLS μ = [CCalcul\_1170\_5.Nu\_SLS]~~

~~Structural performance factor SLS S~~~~p~~ ~~= [CCalcul\_1170\_5.S\_p\_SLS]~~

# Load Cases

Vlozittabulku z UC\_LoadCasesList- datagridDatagrid\_LoadCases.

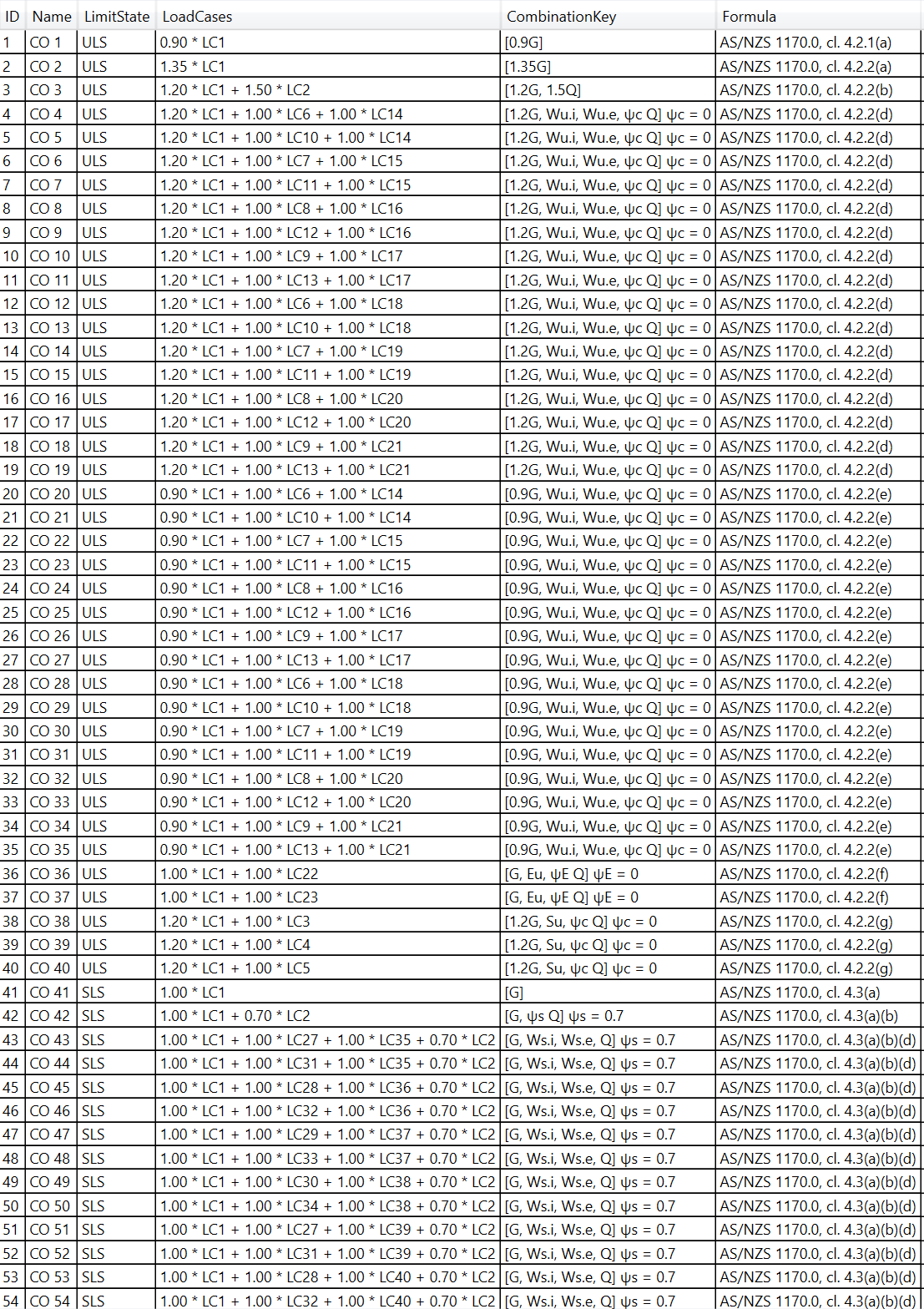
Ak je tabulkadlhsianezjednastranapotrebujemejurozdelit a nakazdustrankuzobrazithlavickutabulky.



# Load Combinations

Vlozittabulku z UC\_LoadCombinationsList - datagridDatagrid\_LoadCombinations.

Ak je tabulkadlhsianezjednastranapotrebujemejurozdelit a nakazdustrankuzobrazithlavickutabulky.



# Member design

Pre kazdytypkomponenty z Tab Members ktora ma zaskrtnuty Design vlozittabulkuvysledkov z Member Design, vlozitobrazky s priebehmivnutornychsil (internal forces) pre danu

komponentu a kombinaciupriktorejvzniklorozhodujuce design ratio.

Pre prutyramovzobrazitajpriebehvnutornychsilnarame.

Kapitola 8.1 by sa mala generovat v cycle (8.1, 8.2. 8.3 … 8. N) pre vsetkycomponenty 1 - N,ktoremajuzaskrtnute Design

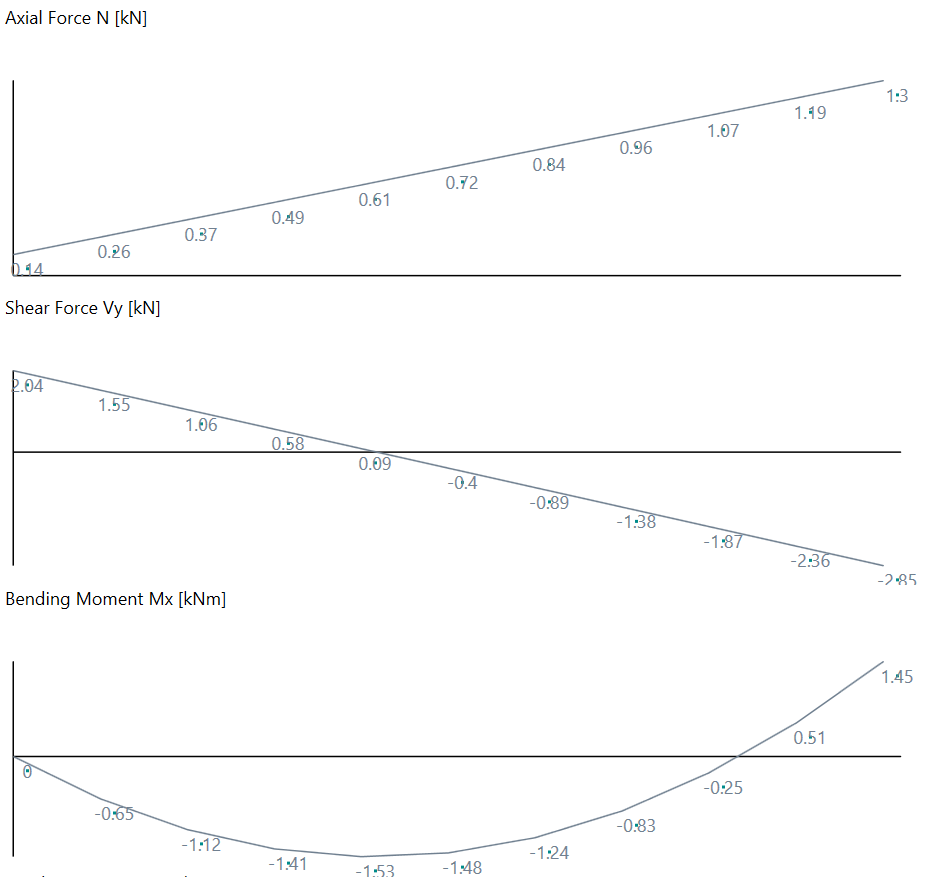
## Member type: Main Column

Governing member ID:xxx

Governing load combination ID: xxx

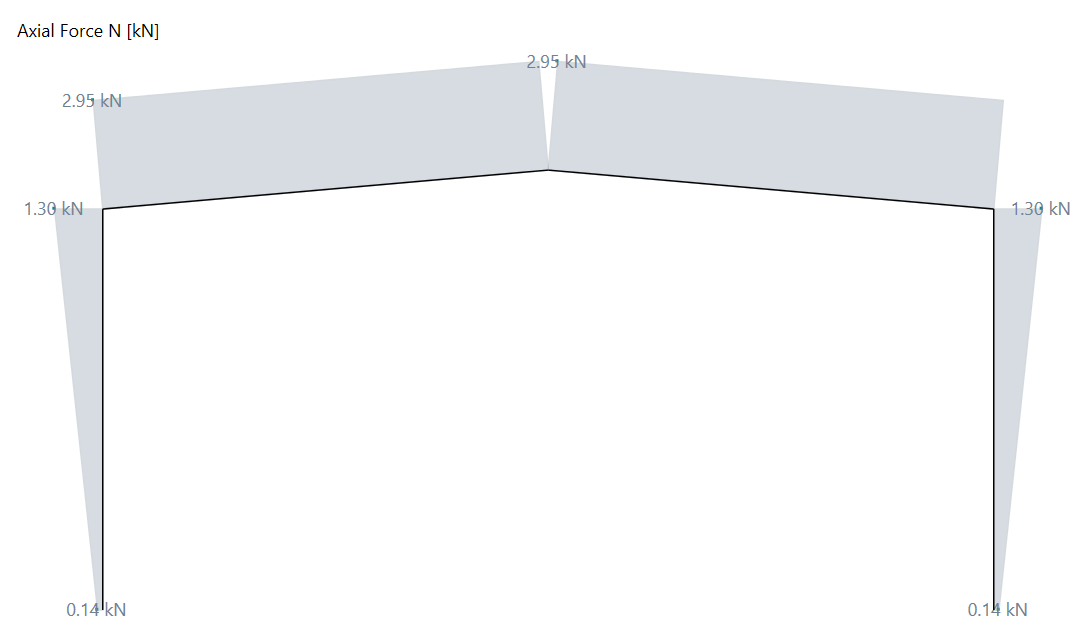
### Member internal forces

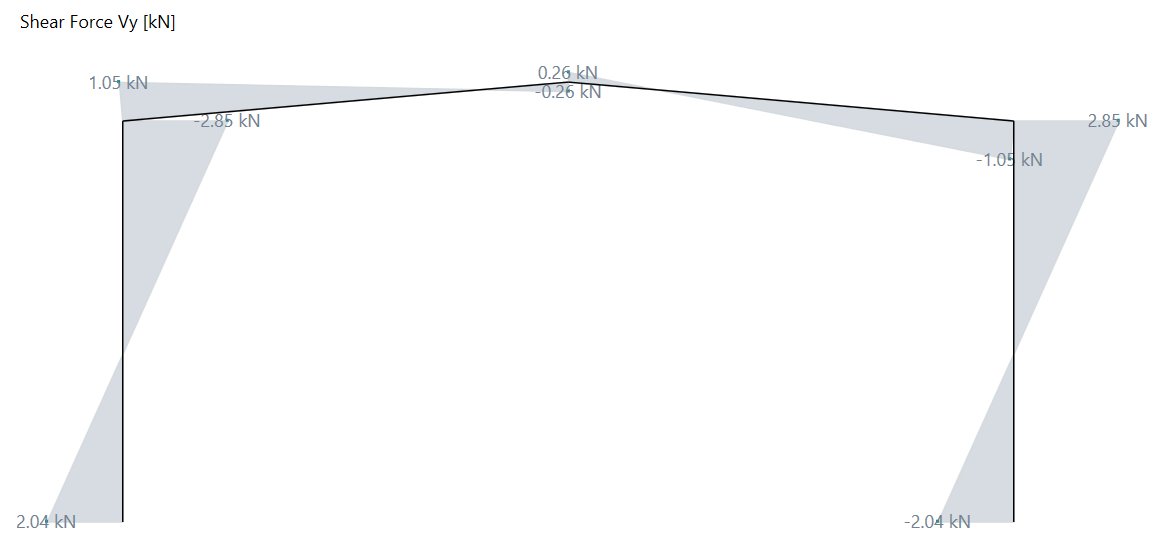
Obrazky y UC\_InternalForces, jeden canvas – jedenobrazok. Canvas, ktoremajuvsetky values 0 neexportovat.

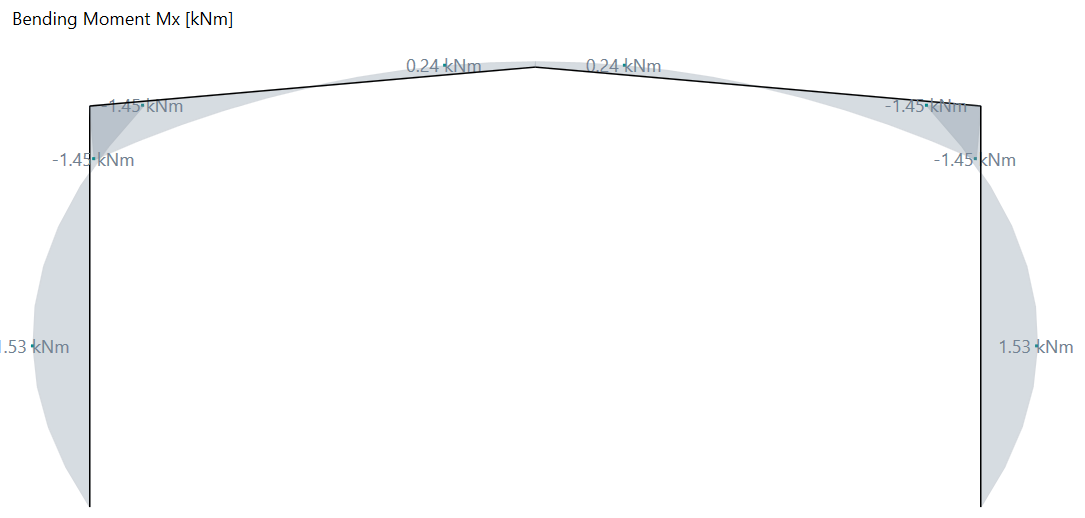


Ak je pruttypu EC, ER, MC alebo MR zobrazitajvnutornesilynarame, do ktorehoposudzovanyprutpatri – dialog FrameInternalForces\_2D. Nulovepriebehyvynechat.

### Frame internal forces







### Member design details - ULS

Zobrazitdetaily z UC\_MemberDesign

Zobrazitdetailypre rozhodujucukombinaciu zo skupinyULS



### Member deflections

TODO ObrazkyzUC\_Deflection, jeden canvas – jedenobrazok. Canvas, ktoremajuvsetky values 0 neexportovat.

Toto estepotrebujemedopracovat.

### Member design details - SLS

Zobrazitdetailypre rozhodujucukombinaciu zo skupiny SLS



# Joint Design

Podobnevlozit pre kazdukomponentutabulkyvysledkovspojov z Joint Design pre rozhodujucekombinacievnutornychsil (max design ratio).

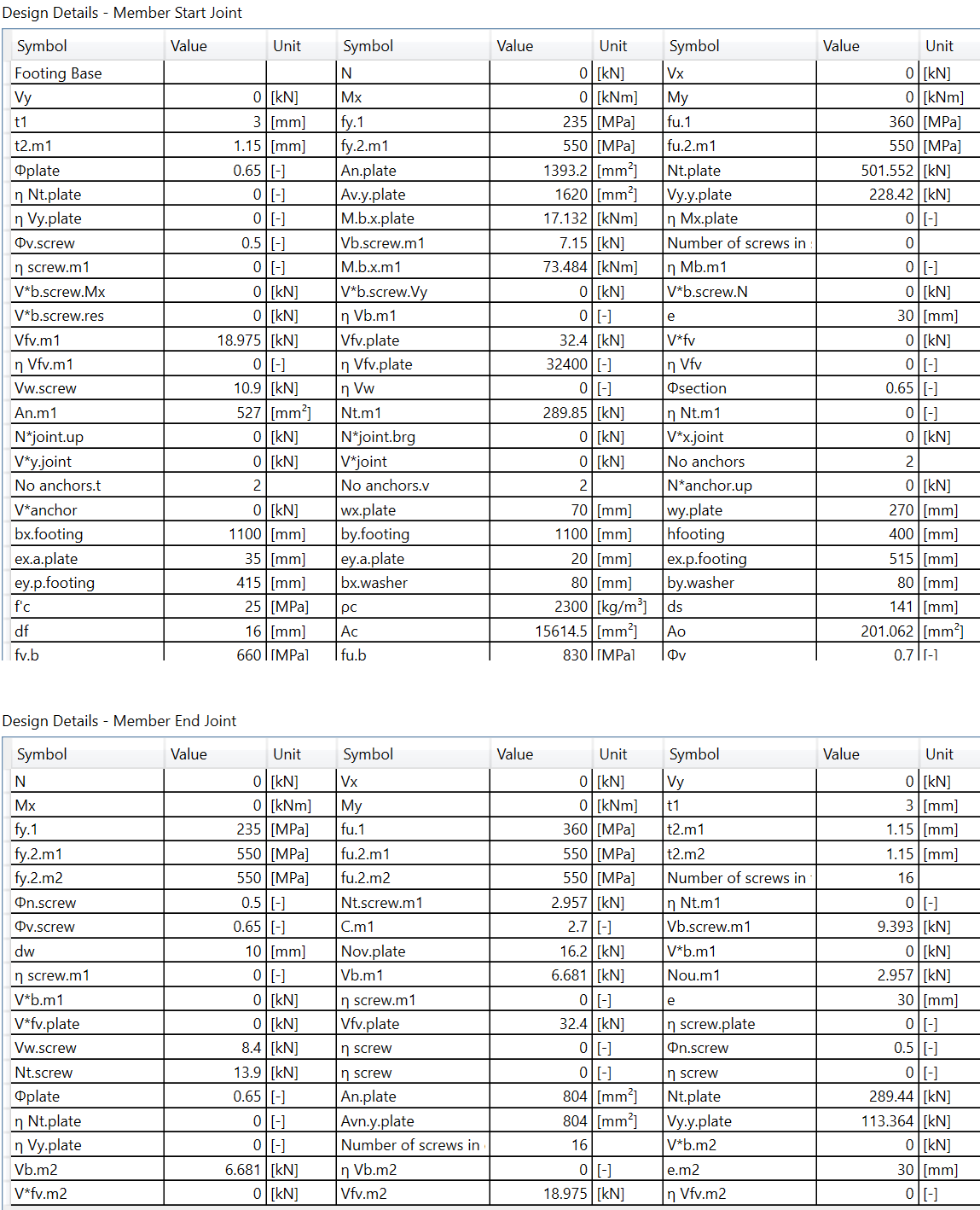
## Member type: Main Column

Zobrazit pre kazdytypcombponenty so zaskrtnutym Design detailyposudkuspojov z UC\_JointDesign

TODO - Potrebovali by smetuvlozitobrazokspojanazaciatku a nakoncipruta v 3D alebo 2D.

Pre 2D by smemohlipouzit to canvas zo System Component Viewer





# Footing Design

TODO (oddelitvysledky od joint design)

**Po ukoncenigenerovania report potrebujemeupdatovatObsah (update field Ctrl + A and F9)**