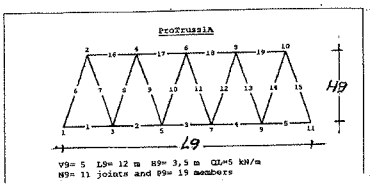
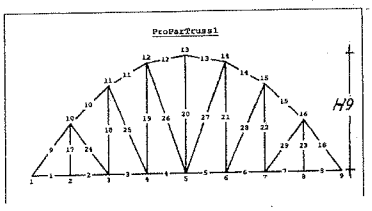
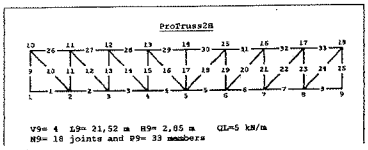
Part 10

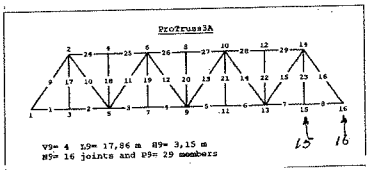
Program **TRUSSPROGRAM4444**

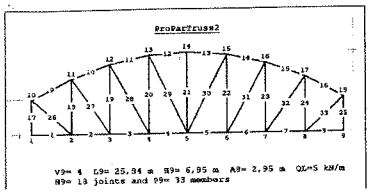
Calculation of member(end) forces and joint displacements of several trusses. 1 - 8

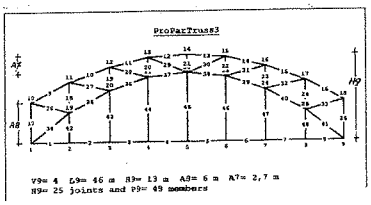








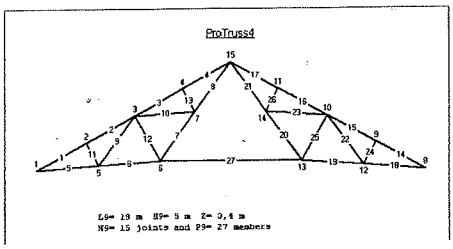


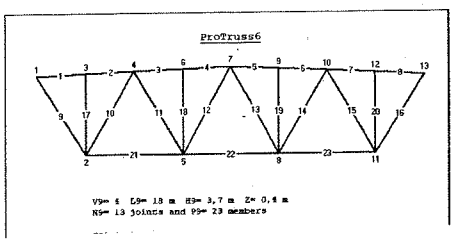


Trusses with movable force systems. 9 -20

Program **TRUSSPROGRAM5555**

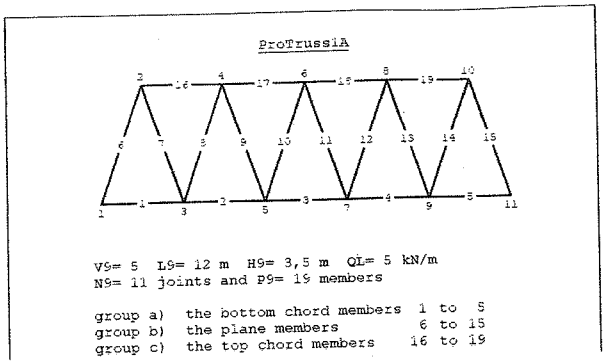
'Roof trusses' 21-30





Program code for the construction data of these 'roof trusses'. 31-41

Own weight, joint loads, wind and snow loads.



STORE NR= GET

Storing following data.
V9,L9,H9,A8,A7,QL,QE,N9,P9,MF,TRU,MF
TRU is truss number.

```
For P=1 To P9
LL(P),HH(P),A11(P),NFH(P),EAA)P),QEE(P)
Next P
For I=1 To N9
FX(I),PH(I),SH(I),X1(I)
FY(I),PV(I),SV(I),Y1(I)
Next I
For I=1 To MF : MFF(I),MA(I) : Next I
```

TNVF, suppose 2 vertical load forces to putin, FY(4)=-12 and FY(6=-15, then type 2 in text box TNVF and in TSTRING 4,-12 Enter and 6,-15 Enter.

Mobile load force system, input variables in TSTRING.
A click on ForceDivision determines all load force cases, a click on

CalculateMobForces calculates the member end forces for all the cases, plus the largest member tension and compression force for each group of members.

For the second form, click go to FDATA, for printing results on the form or printed by the printer. Shown with the examples.

TRUSSPROGRAM444 and form controls.

Preprogrammed data with a click on EX1A to EX3, combined with their prprogammed truss data with ProTruss1A to ProParTruss3.
Click both EX1A and ProTruss1A, and Show shows the data beloging to them.

These data of EX1A can be put in in the text boxes TV9, TL9, TH9, TA8 and TA9.

TQL for the distributed load QL for all bottom chord members. If not given at the start then type in TQL a value and click again the concerning truss, click Show and its there.

TQE for own weight QE for all members.

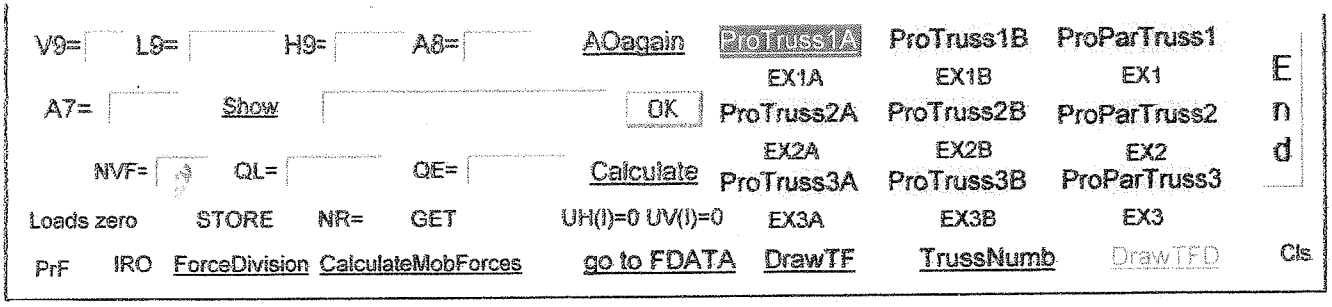
The large text TSTRING.

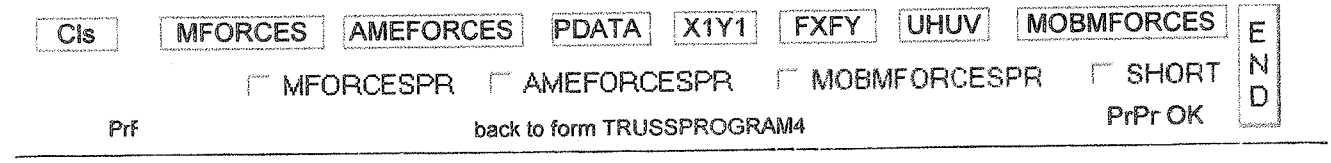
If PV(3)=1 then the vertical displacement of joint 3 is prescribed, start value UV(3)=0.
To give it a value e.g. 7 (/EA) then to type in TSTRING PV(3)=7 Enter.
This way following variables can get a value, displacement values UH(), UV(),
prescribed values PV(), PH(), 1 or 0,
joint load values FX() and FY().
E.g. FY(4)=-12 Enter, FY(6)=-15 Enter.

Strain stiffness of members.
For the trusses all strain stiffnesses at the start are 1*EA. Suppose members 16 to 19 get another value, 1.3*EA.
PEAA,P1,P2,ST,EA To type in TSTRING
PEAA,16,19,1,1.3 Enter.
Numbering step ST=1, 16-17-18-19. In some cases step ST=2.
And for a single member P=17 with
PEAA,17,17,1,1.3 Enter.

Own weight of members.
For the trusses own weight QE=0 at the start.
When typing a value in text box TQE all members get that value.
Suppose members 6 to 15 get another value, QE=0.7 kN/m.
PQEE,P1,P2,ST,QE To type in TSTRING
PQEE,6,15,1,.7 Enter.

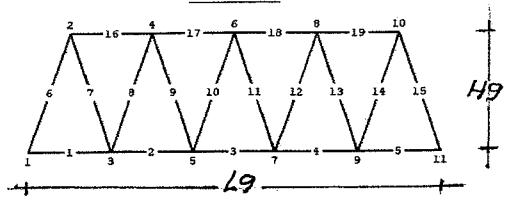
A click on UH(I)=0 UV(I)=0 makes all 'displacements' to be calculated zero again.



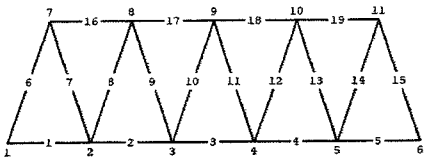


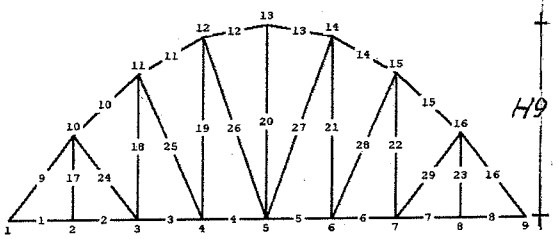
Nine trusses with preprogrammed data.

ProTruss1A Bottom chord with V9=5 spans
Length L9= 12 m Height H9= 3,5 m
For a quick view click EX1A for these data, and
click ProTruss1A, becoming blue,
click DrawTF to draw the truss,
click TrussNumb to number joints and members,
click Calculate and DrawTFD to draw the deformation of the truss.
Protruss1B Like Protruss1A but with differend joint numbering, with EX1B.
ProParTruss1 With EX1.

ProTruss1A


V9= 5 L9= 12 m H9= 3,5 m QL=5 kN/m
N9= 11 joints and P9= 19 members

ProTruss1B

V9= 5 L9= 12 m H9= 3,5 m QL=5 kN/m
N9= 11 joints and P9= 19 members

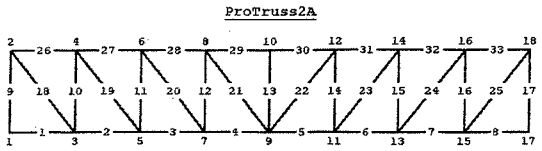
ProParTruss1


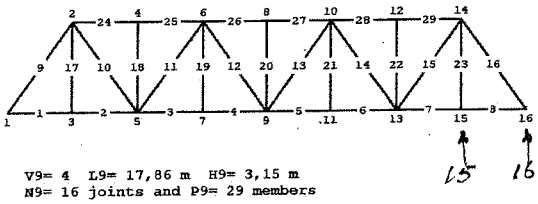
V9= 4 L9= 18 m H9= 6,8 m
N9= 16 joints and P9= 29 members

ProTruss1A	ProTruss1B	ProParTruss1	
EX1A	EX1B	EX1	End
ProTruss2A	ProTruss2B	ProParTruss2	
EX2A	EX2B	EX2	
ProTruss3A	ProTruss3B	ProParTruss3	
EX3A	EX3B	EX3	
DrawTF	TrussNumb	DrawTFD	Cls

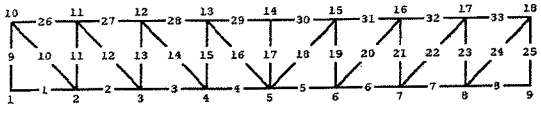
ProTruss2A EX2A and Protruss2B EX2B, same truss but with different joint and member numbering.
ProParTruss2 with EX2.

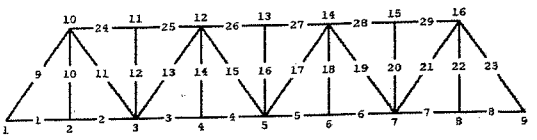
ProTruss3A EX3A with an irregular bottom chord joint numbering, this picture with 1-3-5-7-9-11-13-15-16, no problem, but movable load system cannot be applied; a warning is given when trying it.
ProTruss3B EX3B like truss ProTruss3A but with differend joint and member numbering.
ProParTruss3 with EX3.

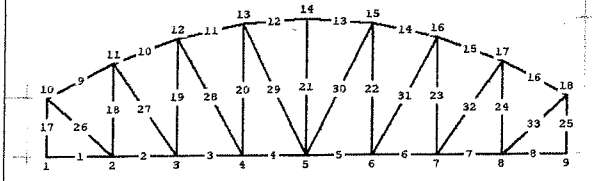
ProTruss2A

V9= 4 L9= 17,86 m H9= 2,9 m
N9= 18 joints and P9= 33 members

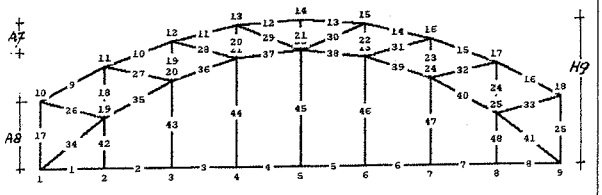
ProTruss3A


V9= 4 L9= 17,86 m H9= 3,15 m
N9= 16 joints and P9= 29 members

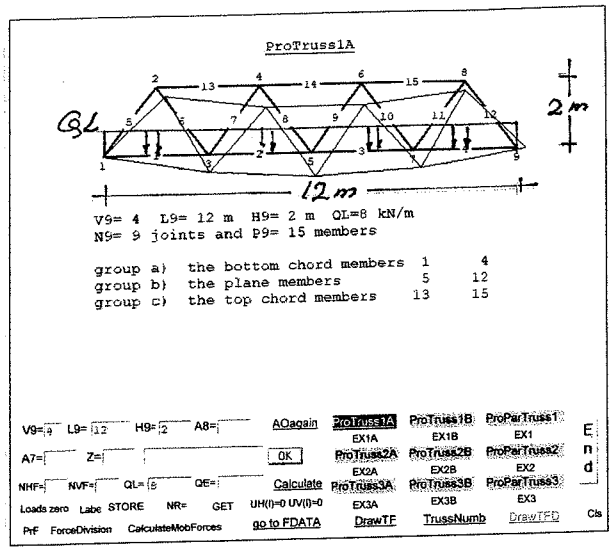
ProTruss2B

V9= 4 L9= 21,52 m H9= 2,85 m QL=5 kN/m
N9= 18 joints and P9= 33 members

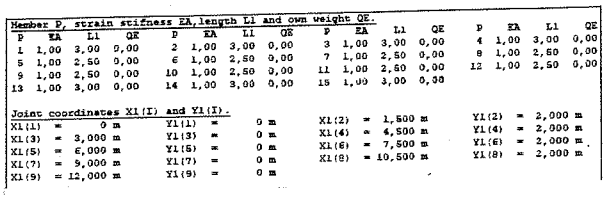
ProTruss3B

V9= 4 L9= 17,86 m H9= 3,15 m
N9= 16 joints and P9= 29 members

ProParTruss2

V9= 4 L9= 25,84 m H9= 6,85 m A8= 2,95 m QL=5 kN/m
N9= 18 joints and P9= 33 members

ProParTruss3


V9= 4 L9= 46 m H9= 13 m A8= 6 m A7= 2,7 m
N9= 25 joints and P9= 48 members



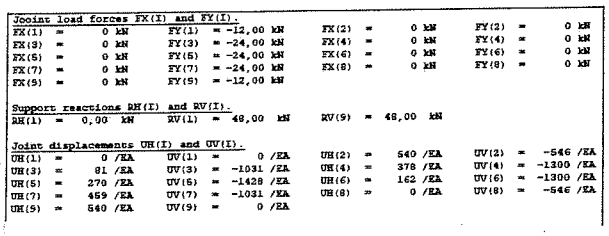


Member P, strain stifness EA,length L1 and own weight QE.

P	EA	L1	QE	P	EA	L1	QE	P	EA	L1	QE	P	EA	L1	QE
1	1,00	3,00	0,00	2	1,00	3,00	0,00	3	1,00	3,00	0,00	4	1,00	3,00	0,00
5	1,00	2,50	0,00	6	1,00	2,50	0,00	7	1,00	2,50	0,00	8	1,00	2,50	0,00
9	1,00	2,50	0,00	10	1,00	2,50	0,00	11	1,00	2,50	0,00	12	1,00	2,50	0,00
13	1,00	3,00	0,00	14	1,00	3,00	0,00	15	1,00	3,00	0,00				

Joint coordinates X1(I) and Y1(I).

X1(1) =	0 m	Y1(1) =	0 m	X1(2) =	1,500 m	Y1(2) =	2,000 m
X1(3) =	3,000 m	Y1(3) =	0 m	X1(4) =	4,500 m	Y1(4) =	2,000 m
X1(5) =	6,000 m	Y1(5) =	0 m	X1(6) =	7,500 m	Y1(6) =	2,000 m
X1(7) =	9,000 m	Y1(7) =	0 m	X1(8) =	10,500 m	Y1(8) =	2,000 m
X1(9) =	12,000 m	Y1(9) =	0 m				



Jooint load forces FX(I) and FY(I).

FX(1) =	0 kN	FY(1) =	-12,00 kN	FX(2) =	0 kN	FY(2) =	0 kN
FX(3) =	0 kN	FY(3) =	-24,00 kN	FX(4) =	0 kN	FY(4) =	0 kN
FX(5) =	0 kN	FY(5) =	-24,00 kN	FX(6) =	0 kN	FY(6) =	0 kN
FX(7) =	0 kN	FY(7) =	-24,00 kN	FX(8) =	0 kN	FY(8) =	0 kN
FX(9) =	0 kN	FY(9) =	-12,00 kN				

Support reactions RH(I) and RV(I).

RH(1) =	0,00 kN	RV(1) =	48,00 kN	RV(9) =	48,00 kN

Joint displacements UH(I) and UV(I).

UH(1) =	0 /EA	UV(1) =	0 /EA	UH(2) =	540 /EA	UV(2) =	-546 /EA
UH(3) =	81 /EA	UV(3) =	-1031 /EA	UH(4) =	378 /EA	UV(4) =	-1300 /EA
UH(5) =	270 /EA	UV(5) =	-1428 /EA	UH(6) =	162 /EA	UV(6) =	-1300 /EA
UH(7) =	459 /EA	UV(7) =	-1031 /EA	UH(8) =	0 /EA	UV(8) =	-546 /EA
UH(9) =	540 /EA	UV(9) =	0 /EA				

Examples TRUSSPROGRAM444.

ProTruss1A EX1A

Main variables to put in.
V9=4 number of spans, equal joint distances,
L9=12 m length of the truss, and
H9=2 m height of the truss.

QL=8 kN/m Q loads on the bottom chords.

To get this truss input as follows.
At the start cursor in TV9, type 4, next Tab, cursor in TL9, type 12 and Tab, cursor in TH9, type 2.
Click in TQL and type 8 for the distributed load on the bottom chords.

Click ProTruss1A, becomes blue. All members got strain stiffness EAA(P)=1.
Click DRAWTF to draw the truss and prints the data appearing below the drawn truss, with the member groups with member numbers.
Click TrussNumb numberig joints and members.
Click Calculate, for the main calculations, DRAWTFD gets enabled, and click DRAWTFD to draw the deformed truss.

Or, at the start, click EX1A, giving data V9=5, L9=12 m, H9=2 m and QL=8 kN/m. Next click ProTruss1A, DRAWTF, Calculate, DRAWTFD.

Click go to FDATA, the second form, and click PDATA to print member data P EA L1 QE, and FXFY for joint load forces FX(I) and FY(I) and reactions RH(I) and RV(I), and joint displce-ments UH(I) and UV(I).

Click PrF to print it like (partly) shown here below, on the left 45% size.

Member P, strain stifness EA,length L1 and own weight QE.

P	EA	L1	QE	P	EA	L1	QE	P	EA	L1	QE	P	EA	L1	QE
1	1,00	3,00	0,00	2	1,00	3,00	0,00	3	1,00	3,00	0,00	4	1,00	3,00	0,00
5	1,00	2,50	0,00	6	1,00	2,50	0,00	7	1,00	2,50	0,00	8	1,00	2,50	0,00
9	1,00	2,50	0,00	10	1,00	2,50	0,00	11	1,00	2,50	0,00	12	1,00	2,50	0,00
13	1,00	3,00	0,00	14	1,00	3,00	0,00	15	1,00	3,00	0,00				

Joint coordinates X1(I) and Y1(I).

X1(1) =	0 m	Y1(1) =	0 m	X1(2) =	1,500 m	Y1(2) =	2,000 m
X1(3) =	3,000 m	Y1(3) =	0 m	X1(4) =	4,500 m	Y1(4) =	2,000 m
X1(5) =	6,000 m	Y1(5) =	0 m	X1(6) =	7,500 m	Y1(6) =	2,000 m

Jooint load forces FX(I) and FY(I).

FX(1) =	0 kN	FY(1) =	-12,00 kN	FX(2) =	0 kN	FY(2) =	0 kN
FX(3) =	0 kN	FY(3) =	-24,00 kN	FX(4) =	0 kN	FY(4) =	0 kN
FX(5) =	0 kN	FY(5) =	-24,00 kN	FX(6) =	0 kN	FY(6) =	0 kN
FX(7) =	0 kN	FY(7) =	-24,00 kN	FX(8) =	0 kN	FY(8) =	0 kN
FX(9) =	0 kN	FY(9) =	-12,00 kN				

Support reactions RH(I) and RV(I).

RH(1) =	0,00 kN	RV(1) =	48,00 kN	RV(9) =	48,00 kN

Joint displacements UH(I) and UV(I).

UH(1) =	0 /EA	UV(1) =	0 /EA	UH(2) =	540 /EA	UV(2) =	-546 /EA
UH(3) =	81 /EA	UV(3) =	-1031 /EA	UH(4) =	378 /EA	UV(4) =	-1300 /EA
UH(5) =	270 /EA	UV(5) =	-1428 /EA	UH(6) =	162 /EA	UV(6) =	-1300 /EA

ProTrussIA

group a) the bottom chord members

MFS(1)	=	27,00 kN			MFS(2)	=	63,00 kN	
NAA(1,3)	=	-27,00	NAA(3,1)	=	27,00	NAA(3,5)	=	-63,00	NAA(5,3)	=	63,00
DAA(1,3)	=	0,00	DAA(3,1)	=	0,00	DAA(3,5)	=	0,00	DAA(5,3)	=	0,00
MFS(3)	=	63,00 kN				MFS(4)	=	27,00 kN			
NAA(5,7)	=	-63,00	NAA(7,5)	=	63,00	NAA(7,9)	=	-27,00	NAA(9,7)	=	27,00
DAA(5,7)	=	0,00	DAA(7,5)	=	0,00	DAA(7,9)	=	0,00	DAA(9,7)	=	0,00
LTF(2)	=	63,00 kN	LCF(0)	=	0,00 kN						

group b) the plane members

MFS(5)	=	-45,00 kN			MFS(6)	=	45,00 kN	
NAA(1,2)	=	45,00	NAA(2,1)	=	-45,00	NAA(2,3)	=	-45,00	NAA(3,2)	=	45,00
DAA(1,2)	=	0,00	DAA(2,1)	=	0,00	DAA(2,3)	=	0,00	DAA(3,2)	=	0,00
MFS(7)	=	-15,00 kN				MFS(8)	=	15,00 kN			
NAA(3,4)	=	15,00	NAA(4,3)	=	-15,00	NAA(4,5)	=	-15,00	NAA(5,4)	=	15,00
DAA(3,4)	=	0,00	DAA(4,3)	=	0,00	DAA(4,5)	=	0,00	DAA(5,4)	=	0,00
MFS(9)	=	15,00 kN				MFS(10)	=	-15,00 kN			
NAA(5,6)	=	-15,00	NAA(6,5)	=	15,00	NAA(6,7)	=	15,00	NAA(7,6)	=	-15,00
DAA(5,6)	=	0,00	DAA(6,5)	=	0,00	DAA(6,7)	=	0,00	DAA(7,6)	=	0,00
MFS(11)	=	45,00 kN				MFS(12)	=	-45,00 kN			
NAA(7,8)	=	-45,00	NAA(8,7)	=	45,00	NAA(8,9)	=	45,00	NAA(9,8)	=	-45,00
DAA(7,8)	=	0,00	DAA(8,7)	=	0,00	DAA(8,9)	=	0,00	DAA(9,8)	=	0,00
LTF(11)	=	45,00 kN	LCF(5)	=	-45,00 kN						

group c) the top chord members

MFS(13)	=	-54,00 kN			MFS(14)	=	-72,00 kN	
NAA(2,4)	=	54,00	NAA(4,2)	=	-54,00	NAA(4,6)	=	72,00	NAA(6,4)	=	-72,00
DAA(2,4)	=	0,00	DAA(4,2)	=	0,00	DAA(4,6)	=	0,00	DAA(6,4)	=	0,00
MFS(15)	=	-54,00 kN									
NAA(6,8)	=	54,00	NAA(8,6)	=	-54,00						
DAA(6,8)	=	0,00	DAA(8,6)	=	0,00						
LTF(0)	=	0,00 kN	LCF(14)	=	-72,00 kN						

Cls | MFORCES | AMEFORCES | PDATA | X1Y1 | FXFY | UHUV | MOBMFORCES | END

☐ DrawTPR ☐ MFORCESPR ☐ AMEFORCESPR ☐ MOBMFORCESPR ☐ SHORT

PrF back to form TRUSSPROGRAM4 PrPr OK

Going on with FDATA.

A click on AMEFORCES prints

'member forces' MFS(P),
Member end forces NAA(L,H) and NAA(H,L) and perpendicular to the member axis
DAA(L,H) and DAA(H,L) and
the largest 'menber force' MFS() for each group of members.

ProTrussIA

group a) the bottom chord members

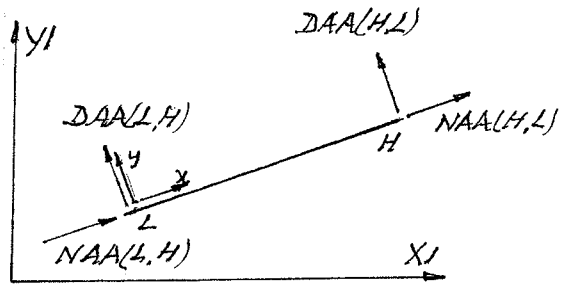
MFS(1)	=	27,00 kN	MFS(2)	=	63,00 kN	MFS(3)	=	63,00 kN	MFS(4)	=	27,00 kN
LTF(2)	=	63,00 kN	LCF(0)	=	0,00 kN						

group b) the plane members

MFS(5)	=	-45,00 kN	MFS(6)	=	45,00 kN	MFS(7)	=	-15,00 kN	MFS(8)	=	15,00 kN
MFS(9)	=	15,00 kN	MFS(10)	=	-15,00 kN	MFS(11)	=	45,00 kN	MFS(12)	=	-45,00 kN
LTF(11)	=	45,00 kN	LCF(5)	=	-45,00 kN						

group c) the top chord members

MFS(13)	=	-54,00 kN	MFS(14)	=	-72,00 kN	MFS(15)	=	-54,00 kN
LTF(0)	=	0,00 kN	LCF(14)	=	-72,00 kN			



Assumed direction for NAA(L,H) and NAA(H,L) is from lowest to highest member end number.

Member 7 with L=3 and H=4, of group b).

NAA(3,4)= 15,00 kN, directed as assumed.
NAA(4,3)= -15,00 kN, not directed as assumed but opposite directed.
Member 7 is a compression member, indicated with a member sign, so MFS(7)= -15,00 kN.

With a click on MFORCES the largest tension forse LTF() and largest compression force LCF() of a group are determined and printed.
Group b) LTF(11)= 45 kN and LCF(5)= -45 kN.

group b) the plane members

MFS(5)	=	-45,00 kN			MFS(6)	=	45,00 kN	
NAA(1,2)	=	45,00	NAA(2,1)	=	-45,00	NAA(2,3)	=	-45,00	NAA(3,2)	=	45,00
DAA(1,2)	=	0,00	DAA(2,1)	=	0,00	DAA(2,3)	=	0,00	DAA(3,2)	=	0,00
MFS(7)	=	-15,00 kN				MFS(8)	=	15,00 kN			
NAA(3,4)	=	15,00	NAA(4,3)	=	-15,00	NAA(4,5)	=	-15,00	NAA(5,4)	=	15,00
DAA(3,4)	=	0,00	DAA(4,3)	=	0,00	DAA(4,5)	=	0,00	DAA(5,4)	=	0,00
MFS(9)	=	15,00 kN				MFS(10)	=	-15,00 kN			
NAA(5,6)	=	-15,00	NAA(6,5)	=	15,00	NAA(6,7)	=	15,00	NAA(7,6)	=	-15,00
DAA(5,6)	=	0,00	DAA(6,5)	=	0,00	DAA(6,7)	=	0,00	DAA(7,6)	=	0,00
MFS(11)	=	45,00 kN				MFS(12)	=	-45,00 kN			
NAA(7,8)	=	-45,00	NAA(8,7)	=	45,00	NAA(8,9)	=	45,00	NAA(9,8)	=	-45,00
DAA(7,8)	=	0,00	DAA(8,7)	=	0,00	DAA(8,9)	=	0,00	DAA(9,8)	=	0,00
LTF(11)	=	45,00 kN	LCF(5)	=	-45,00 kN						

ProTrussIA

group a) the bottom chord members

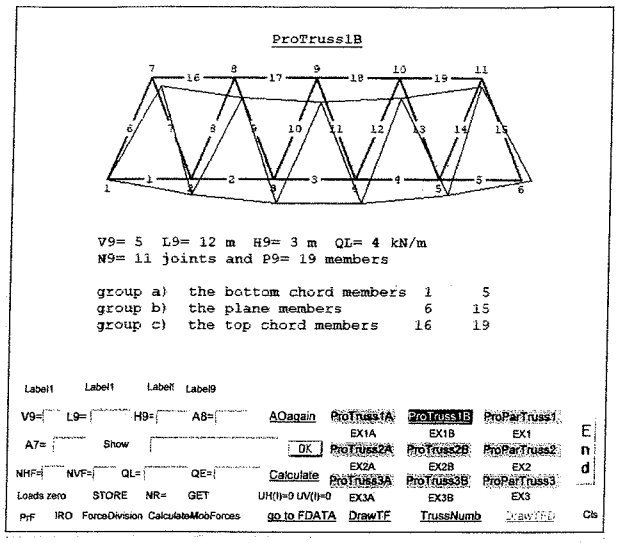
MFS(1)	=	27,00 kN	MFS(2)	=	63,00 kN	MFS(3)	=	63,00 kN	MFS(4)	=	27,00 kN
LTF(2)	=	63,00 kN	LCF(0)	=	0,00 kN						

group b) the plane members

MFS(5)	=	-45,00 kN	MFS(6)	=	45,00 kN	MFS(7)	=	-15,00 kN	MFS(8)	=	15,00 kN
MFS(9)	=	15,00 kN	MFS(10)	=	-15,00 kN	MFS(11)	=	45,00 kN	MFS(12)	=	-45,00 kN
LTF(11)	=	45,00 kN	LCF(5)	=	-45,00 kN						

group c) the top chord members

MFS(13)	=	-54,00 kN	MFS(14)	=	-72,00 kN	MFS(15)	=	-54,00 kN
LTF(0)	=	0,00 kN	LCF(14)	=	-72,00 kN			



ProTruss1B
group a) the bottom chord members

MFS(1)	=	7,68 kN			MFS(2)	=	19,20 kN	
NAA(1,2)	=	-7,68	NAA(2,1)	= 7,68	NAA(2,3)	=	-19,20	NAA(3,2) = 19,20
DAA(1,2)	=	0,00	DAA(2,1)	= 0,00	DAA(2,3)	=	0,00	DAA(3,2) = 0,00
MFS(3)	=	23,04 kN			MFS(4)	=	19,20 kN	
NAA(3,4)	=	-23,04	NAA(4,3)	= 23,04	NAA(4,5)	=	-19,20	NAA(5,4) = 19,20
DAA(3,4)	=	0,00	DAA(4,3)	= 0,00	DAA(4,5)	=	0,00	DAA(5,4) = 0,00
MFS(5)	=	7,68 kN						
NAA(5,6)	=	-7,68	NAA(6,5)	= 7,68				
DAA(5,6)	=	0,00	DAA(6,5)	= 0,00				
LTF(3)	=	23,04 kN	LCF(0)	= 0,00 kN				

group b) the plane members

MFS(6)	=	-20,68 kN			MFS(7)	=	20,68 kN	
NAA(1,7)	=	20,68	NAA(7,1)	= -20,68	NAA(2,7)	=	-20,68	NAA(7,2) = 20,68
DAA(1,7)	=	0,00	DAA(7,1)	= 0,00	DAA(2,7)	=	0,00	DAA(7,2) = 0,00
MFS(8)	=	-10,34 kN			MFS(9)	=	10,34 kN	
NAA(2,8)	=	10,34	NAA(8,2)	= -10,34	NAA(3,8)	=	-10,34	NAA(8,3) = 10,34
DAA(2,8)	=	0,00	DAA(8,2)	= 0,00	DAA(3,8)	=	0,00	DAA(8,3) = 0,00
MFS(10)	=	0,00 kN			MFS(11)	=	0,00 kN	
NAA(3,9)	=	0,00	NAA(9,3)	= 0,00	NAA(4,9)	=	0,00	NAA(9,4) = 0,00
DAA(3,9)	=	0,00	DAA(9,3)	= 0,00	DAA(4,9)	=	0,00	DAA(9,4) = 0,00
MFS(12)	=	10,34 kN			MFS(13)	=	-10,34 kN	
NAA(4,10)	=	-10,34	NAA(10,4)	= 10,34	NAA(5,10)	=	10,34	NAA(10,5) = -10,34
DAA(4,10)	=	0,00	DAA(10,4)	= 0,00	DAA(5,10)	=	0,00	DAA(10,5) = 0,00
MFS(14)	=	20,68 kN			MFS(15)	=	-20,68 kN	
NAA(5,11)	=	-20,68	NAA(11,5)	= 20,68	NAA(6,11)	=	20,68	NAA(11,6) = -20,68
DAA(5,11)	=	0,00	DAA(11,5)	= 0,00	DAA(6,11)	=	0,00	DAA(11,6) = 0,00
LTF(7)	=	20,68 kN	LCF(15)	= -20,68 kN				

group c) the top chord members

MFS(16)	=	-15,36 kN			MFS(17)	=	-23,04 kN	
NAA(7,8)	=	15,36	NAA(8,7)	= -15,36	NAA(8,9)	=	23,04	NAA(9,8) = -23,04
DAA(7,8)	=	0,00	DAA(8,7)	= 0,00	DAA(8,9)	=	0,00	DAA(9,8) = 0,00

Joojnt load forces FX(I) and FY(I).

FX(1)	=	0 kN	FY(1)	= -4,80 kN	FX(2)	=	0 kN	FY(2) = -9,60 kN
FX(3)	=	0 kN	FY(3)	= -9,60 kN	FX(4)	=	0 kN	FY(4) = -9,60 kN
FX(5)	=	0 kN	FY(5)	= -9,60 kN	FX(6)	=	0 kN	FY(6) = -4,80 kN
FX(7)	=	0 kN	FY(7)	= 0 kN	FX(8)	=	0 kN	FY(8) = 0 kN
FX(9)	=	0 kN	FY(9)	= 0 kN	FX(10)	=	0 kN	FY(10) = 0 kN
FX(11)	=	0 kN	FY(11)	= 0 kN				

Support reactions RH(I) and RV(I).

RH(1)	=	0,00 kN	RV(1)	= 24,00 kN	RV(6)	=	24,00 kN	

Case 1

Joint displacements UH(I) and UV(I).

UH(1)	=	0,0 /EA	UV(1)	= 0,0 /EA	UH(2)	=	13,4 /EA	UV(2) = -286,0 /EA
UH(3)	=	64,5 /EA	UV(3)	= -440,8 /EA	UH(4)	=	119,8 /EA	UV(4) = -440,8 /EA
UH(5)	=	165,9 /EA	UV(5)	= -286,0 /EA	UH(6)	=	184,3 /EA	UV(6) = 0,0 /EA
UH(7)	=	184,3 /EA	UV(7)	= -145,7 /EA	UH(8)	=	147,5 /EA	UV(8) = -371,6 /EA
UH(9)	=	92,2 /EA	UV(9)	= -451,8 /EA	UH(10)	=	36,9 /EA	UV(10) = -371,6 /EA
UH(11)	=	0,0 /EA	UV(11)	= -145,7 /EA				

Support reactions RH(I) and RV(I).

RH(1)	=	0,00 kN	RV(1)	= 24,00 kN	RV(6)	=	24,00 kN	

Case 2

Joint displacements UH(I) and UV(I).

UH(1)	=	0,0 /EA	UV(1)	= 0,0 /EA	UH(2)	=	9,2 /EA	UV(2) = -214,0 /EA
UH(3)	=	32,3 /EA	UV(3)	= -328,3 /EA	UH(4)	=	69,9 /EA	UV(4) = -328,3 /EA
UH(5)	=	92,9 /EA	UV(5)	= -214,0 /EA	UH(6)	=	52,2 /EA	UV(6) = 0,0 /EA
UH(7)	=	92,2 /EA	UV(7)	= -109,8 /EA	UH(8)	=	73,7 /EA	UV(8) = -275,9 /EA
UH(9)	=	46,1 /EA	UV(9)	= -333,9 /EA	UH(10)	=	18,4 /EA	UV(10) = -275,9 /EA
UH(11)	=	0,0 /EA	UV(11)	= -109,8 /EA				

MFS(2) = 19,20 kN
NAA(2,3) = -19,20 NAA(3,2) = 19,20
DAA(2,3) = 0,00 DAA(3,2) = 0,00

MFS(9) = 10,34 kN
NAA(3,8) = -10,34 NAA(8,3) = 10,34
DAA(3,8) = 0,00 DAA(8,3) = 0,00

MFS(17) = -23,04 kN
NAA(8,9) = 23,04 NAA(9,8) = -23,04
DAA(8,9) = 0,00 DAA(9,8) = 0,00

ProTruss1B EX1B

First case.

Basic variables to put in.
V9=5 number of spans, equal joint distances, real number of spans becomes 2*4=8.
L9=12 m length of the truss, and
H9=3 m height of the truss.
Assumed no own weight. QL= 4 kN/m.

At the start cursor in TV9, type 5, next Tab, cursor in TL9, type 12 and Tab, cursor in TH9, type 3. Put cursor in TQL and type 4.

Click ProTruss1B, becomes blue. All members got strain stiffness EAA(P)=1.
Click DRAWTF to draw the truss, the data just put in appear below it plus member data. Click TrussNumb for joint and member numbering. Next Calculate and DRAWTFD for the truss deformatin.

Click go to FDATA, and AMEFORCES. Results for some members are shown on the left.
A click on UXUY shows the joint displacements.

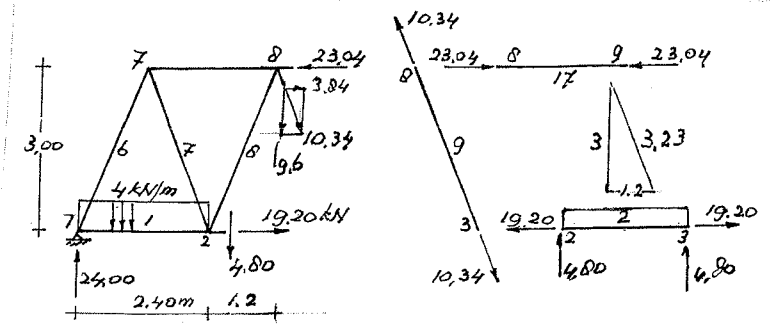
Second case.
Click AOAgain, input like above (or click EX1B and ProTruss1B), next DrawTF and TrussNumb.
Now some members get strainstiffness 2EA instead of 1EA, the members
1 to 5 of group a) and 16 to 19 of group c).
ST=1 for step in 1,2,3,4,5 etc.
Type in TSTRING for PEAA,P1,P2,ST,EA
PEAA,1,5,1,2 Enter and PEAA,16,19,1,2 Enter.
Next click Calculate, DRAWTFD and go to FDATA.

Check member 2 L= 2,4 m ΔL= F*L/'EA'

Case 1 UH(3)-UH(2)= (64,5-18,4)/EA= 46,1/EA
ΔL= (19,20*2,4)/1EA= 46,1/EA ok

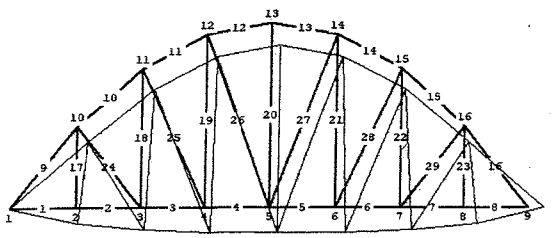
Case 2 UH(2)-UH(3)= (32,3-0,2)/EA= 23,1/EA
ΔL= (19,20*2,4)/2EA= 23,1/EA ok

Both cases same member end forces but different joint displacements. The truss is internally and externally statically determinate; member ends and joints are seen as hinges.



A part of the truss. Components of 10,34 kN, (10,34/3,23)*1,2= 3,84 kN and
(10,34/3,23)*3= 9,60 kN. Equilibrium?
∑ mom. joint 2= 0?
24*2,4 -4*2,4*1,2 +3,84**3 +9,6*1,2 -23,04*3= 57,6 -11,5 +11,5 +11,5 -69,1= 0 ok

ProParTruss1



V9= 4 L9= 18 m H9= 6,5 m
N9= 16 joints and P9= 29 members

group a)	the bottom chord members	1	8
group b)	the parabola chord members	9	16
group c)	the vertical plane members	17	23
group d)	the sloping plane members	24	29

PrF go to FDATA

Member P, strain stifness EA, length Ll and own weight QE.

P	EA	Ll	QE	P	EA	Ll	QE	P	EA	Ll	QE	P	EA	Ll	QE
1	1,00	2,25	0,60	2	1,00	2,25	0,60	3	1,00	2,25	0,60	4	1,00	2,25	0,60
5	1,00	2,25	0,60	6	1,00	2,25	0,60	7	1,00	2,25	0,60	8	1,00	2,25	0,60
9	1,00	3,63	0,60	10	1,00	3,03	0,60	11	1,00	2,56	0,60	12	1,00	2,25	0,60
13	1,00	2,25	0,60	14	1,00	2,56	0,60	15	1,00	3,03	0,60	16	1,00	3,63	0,60
17	1,00	2,84	0,60	18	1,00	4,88	0,60	19	1,00	6,09	0,60	20	1,00	6,50	0,60
21	1,00	6,09	0,60	22	1,00	4,88	0,60	23	1,00	2,84	0,60	24	1,00	3,63	0,60
25	1,00	5,37	0,60	26	1,00	6,50	0,60	27	1,00	6,50	0,60	28	1,00	5,37	0,60
29	1,00	3,63	0,60												

Joint coordinates XL(I) and YL(I).

XL(1) =	0 m	YL(1) =	0 m	XL(2) =	2,250 m	YL(2) =	0 m
XL(3) =	4,500 m	YL(3) =	0 m	XL(4) =	6,750 m	YL(4) =	0 m
XL(5) =	9,000 m	YL(5) =	0 m	XL(6) =	11,250 m	YL(6) =	0 m
XL(7) =	13,500 m	YL(7) =	0 m	XL(8) =	15,750 m	YL(8) =	0 m
XL(9) =	18,000 m	YL(9) =	0 m	XL(10) =	2,250 m	YL(10) =	2,844 m
XL(11) =	4,500 m	YL(11) =	4,875 m	XL(12) =	6,750 m	YL(12) =	6,394 m
XL(13) =	9,000 m	YL(13) =	6,500 m	XL(14) =	11,250 m	YL(14) =	6,094 m
XL(15) =	13,500 m	YL(15) =	4,875 m	XL(16) =	15,750 m	YL(16) =	2,844 m

Support reactions RH(I) and RV(I).

RH(1) = 0,00 kN RV(1) = 30,07 kN RV(9) = 30,07 kN

Joint displacements UH(I) and UV(I).

UH(1) =	0,0 /EA	UV(1) =	0,0 /EA	UH(2) =	55,5 /EA	UV(2) =	-437,0 /EA
UH(3) =	107,1 /EA	UV(3) =	-607,8 /EA	UH(4) =	163,1 /EA	UV(4) =	-683,0 /EA
UH(5) =	220,7 /EA	UV(5) =	-690,2 /EA	UH(6) =	278,3 /EA	UV(6) =	-633,0 /EA
UH(7) =	334,3 /EA	UV(7) =	-607,8 /EA	UH(8) =	387,9 /EA	UV(8) =	-437,0 /EA
UH(9) =	441,4 /EA	UV(9) =	0,0 /EA	UH(10) =	320,3 /EA	UV(10) =	-430,7 /EA
UH(11) =	332,2 /EA	UV(11) =	-595,8 /EA	UH(12) =	253,7 /EA	UV(12) =	-662,5 /EA
UH(13) =	220,7 /EA	UV(13) =	-651,2 /EA	UH(14) =	157,7 /EA	UV(14) =	-662,5 /EA
UH(15) =	109,2 /EA	UV(15) =	-595,8 /EA	UH(16) =	121,1 /EA	UV(16) =	-430,7 /EA

ProParTruss1

group a) the bottom chord members

MFS(1) =	23,79 kN			MFS(2) =	23,79 kN			
NAA(1,2) =	-23,79	NAA(2,1) =	23,79	NAA(2,3) =	-23,79	NAA(3,2) =	23,79
DAA(1,2) =	0,68	DAA(2,1) =	0,68	DAA(2,3) =	0,68	DAA(3,2) =	0,68
MFS(3) =	24,92 kN			MFS(4) =	25,58 kN			
NAA(3,4) =	-24,92	NAA(4,3) =	24,92	NAA(4,5) =	-25,58	NAA(5,4) =	25,58
DAA(3,4) =	0,68	DAA(4,3) =	0,68	DAA(4,5) =	0,68	DAA(5,4) =	0,68
MFS(5) =	25,58 kN			MFS(6) =	24,92 kN			
NAA(5,6) =	-25,58	NAA(6,5) =	25,58	NAA(6,7) =	-24,92	NAA(7,6) =	24,92
DAA(5,6) =	0,68	DAA(6,5) =	0,68	DAA(6,7) =	0,68	DAA(7,6) =	0,68
MFS(7) =	23,79 kN			MFS(8) =	23,79 kN			
NAA(7,8) =	-23,79	NAA(8,7) =	23,79	NAA(8,9) =	-23,79	NAA(9,8) =	23,79
DAA(7,8) =	0,68	DAA(8,7) =	0,68	DAA(8,9) =	0,68	DAA(9,8) =	0,68
LTF(4) =	25,58 kN	LCF(0) =	0,00 kN				

group b) the parabola chord members

MFS(9) =	-39,20 kN			MFS(10) =	-34,19 kN			
NAA(1,10) =	39,20	NAA(10,1) =	-37,49	NAA(10,11) =	34,19	NAA(11,10) =	-32,97
DAA(1,10) =	0,68	DAA(10,1) =	0,67	DAA(10,11) =	0,68	DAA(11,10) =	0,67
MFS(11) =	-29,46 kN			MFS(12) =	-26,34 kN			
NAA(11,12) =	29,46	NAA(12,11) =	-28,73	NAA(12,13) =	26,34	NAA(13,12) =	-26,10
DAA(11,12) =	0,68	DAA(12,11) =	0,67	DAA(12,13) =	0,67	DAA(13,12) =	0,68
MFS(13) =	-26,34 kN			MFS(14) =	-29,46 kN			
NAA(13,14) =	26,10	NAA(14,13) =	-26,34	NAA(14,15) =	28,73	NAA(15,14) =	-29,46
DAA(13,14) =	0,68	DAA(14,13) =	0,68	DAA(14,15) =	0,67	DAA(15,14) =	0,68
MFS(15) =	-34,19 kN			MFS(16) =	-39,20 kN			
NAA(15,16) =	32,97	NAA(16,15) =	-34,19	NAA(9,16) =	39,20	NAA(16,9) =	-37,49
DAA(15,16) =	0,67	DAA(16,15) =	0,68	DAA(9,16) =	-0,68	DAA(16,9) =	-0,67
LTF(0) =	0,00 kN	LCF(9) =	-39,20 kN					

group c) the vertical plane members

MFS(17) =	3,96 kN			MFS(18) =	3,93 kN			
NAA(2,10) =	-1,35	NAA(10,2) =	3,06	NAA(3,11) =	-1,01	NAA(11,3) =	3,93
DAA(2,10) =	0,00	DAA(10,2) =	0,00	DAA(3,11) =	0,00	DAA(11,3) =	0,00
MFS(19) =	5,19 kN			MFS(20) =	7,95 kN			
NAA(4,12) =	-1,54	NAA(12,4) =	5,19	NAA(5,13) =	-4,05	NAA(13,5) =	7,95
DAA(4,12) =	0,00	DAA(12,4) =	0,00	DAA(5,13) =	0,00	DAA(13,5) =	0,00
MFS(21) =	5,19 kN			MFS(22) =	3,93 kN			
NAA(6,14) =	-1,54	NAA(14,6) =	5,19	NAA(7,15) =	-1,01	NAA(15,7) =	3,93
DAA(6,14) =	0,00	DAA(14,6) =	0,00	DAA(7,15) =	0,00	DAA(15,7) =	0,00
MFS(23) =	3,96 kN							
NAA(8,16) =	-1,35	NAA(16,8) =	3,06					
DAA(8,16) =	0,00	DAA(16,8) =	0,00					
LTF(20) =	7,95 kN	LCF(0) =	0,00 kN					

group d) the sloping plane members

MFS(24) =	2,68 kN			MFS(25) =	3,03 kN			
NAA(3,10) =	-0,97	NAA(10,3) =	2,68	NAA(4,11) =	-0,10	NAA(11,4) =	3,03
DAA(3,10) =	-0,67	DAA(10,3) =	-0,68	DAA(4,11) =	-0,68	DAA(11,4) =	-0,67
MFS(26) =	2,47 kN			MFS(27) =	2,47 kN			
NAA(5,12) =	1,19	NAA(12,5) =	2,47	NAA(5,14) =	1,19	NAA(14,5) =	2,47
DAA(5,12) =	-0,68	DAA(12,5) =	-0,67	DAA(5,14) =	0,68	DAA(14,5) =	0,67
MFS(28) =	3,03 kN			MFS(29) =	2,68 kN			
NAA(6,15) =	-0,10	NAA(15,6) =	3,03	NAA(7,16) =	-0,97	NAA(16,7) =	2,68
DAA(6,15) =	0,67	DAA(15,6) =	0,68	DAA(7,16) =	0,68	DAA(16,7) =	0,67
LTF(25) =	3,03 kN	LCF(0) =	0,00 kN					

ProParTruss1

Basic variables to put in.
V9=4 number of spans, equal joint distances, real number of spans becomes 2*4=8.
L9=18 m length of the truss, and
H9=6,5 m height of the truss.
Assumed own weight of all members QE= .6 kN/m.

At the start cursor in TV9, type 4, next Tab, cursor in TL9, type 18 and Tab, cursor in TH9, type 6.5.

Click ProParTruss1, becomes blue, after that click in TQE and type .6 for own weight of the members.
Or PQEE,P1,P2,ST,QE with P1=1, P2=29, ST=1 and QE=.6 to type in TSTRING PQEE,1,29,1,.6 Enter.

Click DRAWTF to draw the truss and prints the data appearing below the drawn truss, with the member groups with member numbers. At same time the controls disappear and at the bottom of the form DrawTF is replaced by Calculate, at the bottom to be seen,

go to FDATA, Calculate, TrussNumb, DrawTFD.

Click TrussNumb to number joints and members, next Calculate and DrawTFD to draw the deformation, and go to FDATA to go to the second form.

Click PDATA, see the joint and member data and joint coordinates.

Click FXFY to see the joint load data FX(I) and FY(I), all zero, not shown here, and the joint displacements UH(I) and UV(I).

Click AMEFORCES for the member end forces of group a) and b), shown on the left, a second click gives the member end forces of group c) and d).

The largest member forces of group **b**) with member 9 to 16.
Largest tension member force LTF(0)=0, all members 9 to 16 are compression members.

Lrgest compression force
LCF(9)= -39,20 kN NAA(1,10) 39,20 kN MFS(9)

The largest member forces of group **c**) with member 17 to 23.
Largest tension member force.
LTF(20)= 7,95 kN NAA(13,5)=7,95 kN MFS(20)

Largest compression force LCF(0)=0, all vertical members 17 to 23 are tension members.

The largest member forces of group **d**) with member 24 to 29.
Largest tension member force.
LTF(25)= 3,03 kN NAA(11,4)= 3,03 kN MFS(25)

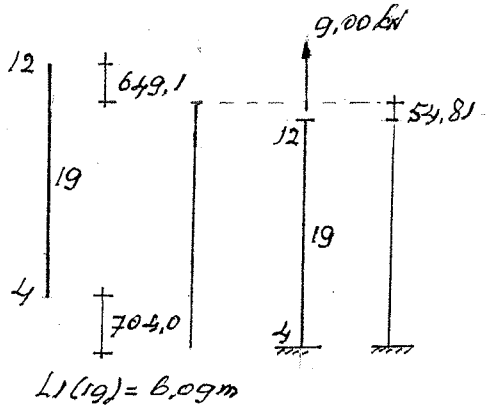
Largest compression force LCF(0)=0, all members 24 to 29 are tension members.

group c) the vertical plane members

MFS(17) =	9,00 kN			MFS(18) =	9,00 kN		
NAA(2,10) =	-9,00	NAA(10,2) =	9,00	NAA(3,11) =	-9,00	NAA(11,3) =	9,00
DAA(2,10) =	0,00	DAA(10,2) =	0,00	DAA(3,11) =	0,00	DAA(11,3) =	0,00
MFS(19) =	9,00 kN			MFS(20) =	9,00 kN		
NAA(4,12) =	-9,00	NAA(12,4) =	9,00	NAA(5,13) =	-9,00	NAA(13,5) =	9,00
DAA(4,12) =	0,00	DAA(12,4) =	0,00	DAA(5,13) =	0,00	DAA(13,5) =	0,00
MFS(21) =	9,00 kN			MFS(22) =	9,00 kN		
NAA(6,14) =	-9,00	NAA(14,6) =	9,00	NAA(7,15) =	-9,00	NAA(15,7) =	9,00
DAA(6,14) =	0,00	DAA(14,6) =	0,00	DAA(7,15) =	0,00	DAA(15,7) =	0,00
MFS(23) =	9,00 kN						
NAA(8,16) =	-9,00	NAA(16,8) =	9,00				
DAA(8,16) =	0,00	DAA(16,8) =	0,00				
LTF(18) =	9,00 kN	LCF(0) =	0,00 kN				

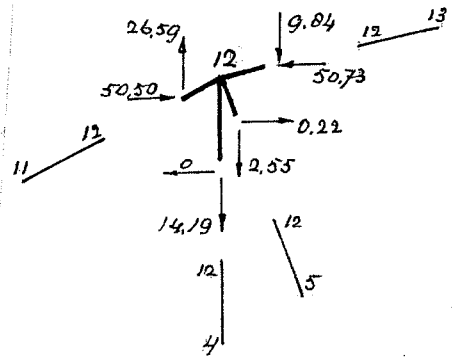
group d) the sloping plane members

MFS(24) =	0,00 kN			MFS(25) =	0,00 kN		
NAA(3,10) =	0,00	NAA(10,3) =	0,00	NAA(4,11) =	0,00	NAA(11,4) =	0,00
DAA(3,10) =	0,00	DAA(10,3) =	0,00	DAA(4,11) =	0,00	DAA(11,4) =	0,00
MFS(26) =	0,00 kN			MFS(27) =	0,00 kN		
NAA(5,12) =	0,00	NAA(12,5) =	0,00	NAA(5,14) =	0,00	NAA(14,5) =	0,00
DAA(5,12) =	0,00	DAA(12,5) =	0,00	DAA(5,14) =	0,00	DAA(14,5) =	0,00
MFS(28) =	0,00 kN			MFS(29) =	0,00 kN		
NAA(6,15) =	0,00	NAA(15,6) =	0,00	NAA(7,16) =	0,00	NAA(16,7) =	0,00
DAA(6,15) =	0,00	DAA(15,6) =	0,00	DAA(7,16) =	0,00	DAA(16,7) =	0,00
LTF(26) =	0,00 kN	LCF(24) =	0,00 kN				



group b) the parabola chord members

MFS(9) =	-79,37 kN			MFS(10) =	-67,76 kN		
D5(1,10) =	48,72	D5(10,1) =	-48,72	D5(10,11)=	49,85	D5(11,10)=	-49,85
D6(1,10) =	62,66	D6(10,1) =	-60,48	D6(10,11)=	45,91	D6(11,10)=	-44,09
MFS(11) =	-57,80 kN			MFS(12) =	-51,67 kN		
D5(11,12)=	50,50	D5(12,11)=	-50,50	D5(12,13)=	50,73	D5(13,12)=	-50,73
D6(11,12)=	28,12	D6(12,11)=	-26,59	D6(12,13)=	9,84	D6(13,12)=	-8,47
MFS(13) =	-51,67 kN			MFS(14) =	-57,80 kN		
D5(13,14)=	50,73	D5(14,13)=	-50,73	D5(14,15)=	50,50	D5(15,14)=	-50,50
D6(13,14)=	-8,47	D6(14,13)=	9,84	D6(14,15)=	-26,59	D6(15,14)=	28,12
MFS(15) =	-67,76 kN			MFS(16) =	-79,37 kN		
D5(15,16)=	49,85	D5(16,15)=	-49,85	D5(9,16) =	-48,72	D5(16,9) =	48,72
D6(15,16)=	-44,09	D6(16,15)=	45,91	D6(9,16) =	62,66	D6(16,9) =	-60,48
LTF(0) =	0,00 kN	LCF(9) =	-79,37 kN				



group c) the vertical plane members

MFS(17) =	12,96 kN			MFS(18) =	12,93 kN		
D5(2,10) =	0,00	D5(10,2) =	0,00	D5(3,11) =	0,00	D5(11,3) =	0,00
D6(2,10) =	-10,35	D6(10,2) =	12,06	D6(3,11) =	-10,01	D6(11,3) =	12,93
MFS(19) =	14,19 kN			MFS(20) =	16,95 kN		
D5(4,12) =	0,00	D5(12,4) =	0,00	D5(5,13) =	0,00	D5(13,5) =	0,00
D6(4,12) =	-10,54	D6(12,4) =	14,19	D6(5,13) =	-13,05	D6(13,5) =	16,95
MFS(21) =	14,19 kN			MFS(22) =	12,93 kN		
D5(6,14) =	0,00	D5(14,6) =	0,00	D5(7,15) =	0,00	D5(15,7) =	0,00
D6(6,14) =	-10,54	D6(14,6) =	14,19	D6(7,15) =	-10,01	D6(15,7) =	12,93
MFS(23) =	12,06 kN						
D5(8,16) =	0,00	D5(16,8) =	0,00				
D6(8,16) =	-10,35	D6(16,8) =	12,06				
LTF(20) =	16,95 kN	LCF(0) =	0,00 kN				

group d) the sloping plane members

MFS(24) =	2,68 kN			MFS(25) =	3,03 kN		
D5(3,10) =	1,13	D5(10,3) =	-1,13	D5(4,11) =	0,66	D5(11,4) =	-0,66
D6(3,10) =	-0,34	D6(10,3) =	2,52	D6(4,11) =	0,19	D6(11,4) =	3,03
MFS(26) =	2,47 kN			MFS(27) =	2,47 kN		
D5(5,12) =	0,22	D5(12,5) =	-0,22	D5(5,14) =	-0,22	D5(14,5) =	0,22
D6(5,12) =	1,35	D6(12,5) =	2,55	D6(5,14) =	1,35	D6(14,5) =	2,55
MFS(28) =	3,03 kN			MFS(29) =	2,68 kN		
D5(6,15) =	-0,66	D5(15,6) =	0,66	D5(7,16) =	-1,13	D5(16,7) =	1,13
D6(6,15) =	0,19	D6(15,6) =	3,03	D6(7,16) =	-0,34	D6(16,7) =	2,52
LTF(28) =	3,03 kN	LCF(0) =	0,00 kN				

Going on with ProParTruss1 preceding page.

Click back to form TRUSSPROGRAM444, click on the form next AOAgain.
V9=4 number of spans,
L9=18 m length of the truss,
H9=6,5 m height of the truss. Own weight QE=0.
Load on bottom chord members QL=4 kN/m.

Type 4 in TV9, Tab, 18 in TL9, Tab, 6.5 in TH9 and 4 in TQL, after input of these data

Click ProParTruss1,

next DrawTF, TrussNumb, controls disappear, and DrawTF is replaced by Calculate, click on it then DRAWTFD, go to FDATA, AMEFORCES two times
Members of group d, in this case, are zero members because of symmetric loading.

About the vertical member 19 *of group* **c**).
The vertical member end displacements are
UV(4)= -704,0/EA and UV(12)= -649,1/EA,
both negative value, so not as assumed upward but downward. The member lengthens
(704,0-649,1)/EA= 54,90/EA.

Suppose the member is clamped at member end 4.
Member end force NAA(12,4)= 9,00 kN, that's upward as assumed.
With Hooke's ΔL=FL/EA follows
9,00*6,09= 54,81/EA 'is' 94,90/EA. ok

Going on with ProParTruss1. Click AOagain.

V9=4, L9=18 m, H9= 6,5 m and QL=4 kN/m.
After input of these data click ProParTruss1.

Next type .6 in TQE for own weight 0,6 kN/m.

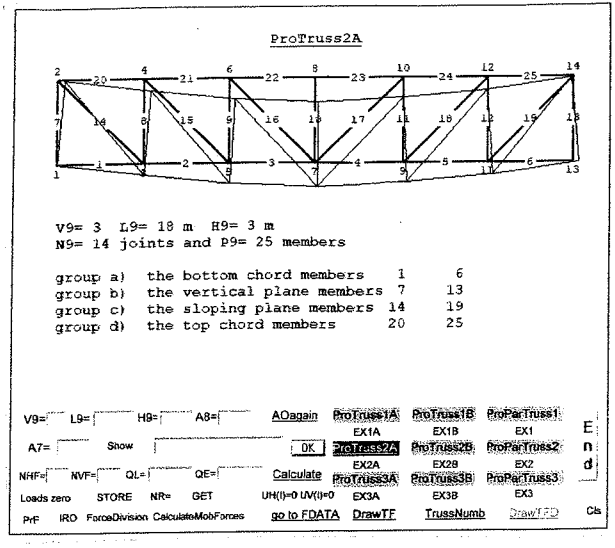
Click DrawTF, TrussNumb, Calculate, DrawTFD and go to FDATA and click on the left Cls.

Click AMEFORCES with right mouse button to get member end forces,
D5(,) assumed to the right and
D6(,) assumed upward,
acting at member ends, at the joint as large as but opposite directed,

Check of equilibrium of joint 12.

member 11	group b		
D5(12,11)=	-50,50 kN	D6(12,11)=	-26,59 kN
member 12	group b		
D5(12,13)=	50,73 kN	D6(12,13)=	9,84 kN
member 19	group c		
D5(12,4)=	0 kN	D5(12,4)=	14,19 kN
member 26	group d		
D5(12,5)=	-0,22 kN	D6(12,5)=	2,55 kN +
	-0,01 kN		0,01 kN

Joint 12 is in horizontal and vertical equilibrium... as expected.



ProTruss2A

group a) the bottom chord members

MFS(1) =	0,00 kN	MFS(2) =	6,00 kN	MFS(3) =	8,00 kN	MFS(4) =	8,00 kN
MFS(5) =	6,00 kN	MFS(6) =	0,00 kN				
LTF(4) =	8,00 kN	LCF(1) =	0,00 kN				

group b) the vertical plane members

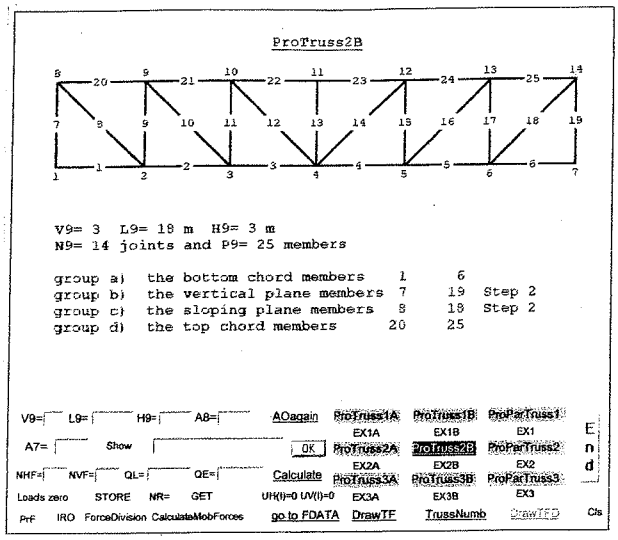
MFS(7) =	-6,00 kN	MFS(8) =	-6,00 kN	MFS(9) =	-2,00 kN	MFS(10) =	-6,00 kN
MFS(11) =	-2,00 kN	MFS(12) =	-6,00 kN	MFS(13) =	-6,00 kN		
LTF(0) =	0,00 kN	LCF(8) =	-6,00 kN				

group c) the sloping plane members

MFS(14) =	8,49 kN	MFS(15) =	2,83 kN	MFS(16) =	2,83 kN	MFS(17) =	2,83 kN
MFS(18) =	2,83 kN	MFS(19) =	8,49 kN				
LTF(14) =	8,49 kN	LCF(0) =	0,00 kN				

group c) the sloping plane members

MFS(14) =	**8,49 kN**	**MFS(15) =**	**2,83 kN**
MFS(18) =	**2,83 kN**	**MFS(19) =**	**8,49 kN**
LTF(14) =	**8,49 kN**	**LCF(0) =**	**0,00 kN**



ProTruss2B

group a) the bottom chord members

MFS(1) =	0,00 kN	MFS(2) =	6,00 kN	MFS(3) =	8,00 kN	MFS(4) =	8,00 kN
MFS(5) =	6,00 kN	MFS(6) =	0,00 kN				
LTF(4) =	8,00 kN	LCF(1) =	0,00 kN				

group b) the vertical plane members

MFS(7) =	-6,00 kN	MFS(9) =	-6,00 kN	MFS(11) =	-2,00 kN	MFS(13) =	-6,00 kN
MFS(15) =	-2,00 kN	MFS(17) =	-6,00 kN	MFS(19) =	-6,00 kN		
LTF(0) =	0,00 kN	LCF(7) =	-6,00 kN				

group c) the sloping plane members

MFS(8) =	8,49 kN	MFS(10) =	2,83 kN	MFS(12) =	2,83 kN	MFS(14) =	2,83 kN
MFS(16) =	2,83 kN	MFS(18) =	8,49 kN				
LTF(18) =	8,49 kN	LCF(0) =	0,00 kN				

group c) the sloping plane members

MFS(8) =	**8,49 kN**	**MFS(10) =**	**2,83 kN**
MFS(16) =	**2,83 kN**	**MFS(18) =**	**8,49 kN**
LTF(18) =	**8,49 kN**	**LCF(0) =**	**0,00 kN**

ProTruss2**A**

Basic variables to put in.
V9=3 number of spans, equal joint distances, real number of spans becomes 2*3=6.
L9=18 m length of the truss, and
H9=3 m height of the truss.

At the start cursor in TV9, type 3, next Tab, cursor in TL9, type 18 and Tab, cursor in TH9, type 3. No own weight QE.

Numbering joints 1-3-5-7-9-11-13 and 2-4-6-8-10-12-14 with step ST=2.
Numbering members, bottom chord 1-2-3-4-5-6, verticals 7-8-9-10-11-12-13, ST=1, sloping members 14-15-16-17-18-19 and top chord members 20-21-22-23-24-25. ST=1

Joints 4, 8 and 12 are loaded with vertical load forces of 4 kN. Then type in TSTRING FY(4)=-4 Enter, FY(8)=-4 Enter and FY(12)=-4 Enter.
Or in another way, type 3 in TNFV, and in TSTRING for I,FY(I)
4,-4 Enter, 8,-4, Enter and 12,-4 Enter.

Click ProTruss2A and click DrawTF, TrussNumb, Calculate, DrawTFd and go to FDATAFDA and Cls if necessary.
To determine the largest tension and compression member per group click MFORCES. Group a), b) and c) printed on the left, and d).
Group c) gives LTF(14)= 8,49 kN, tension member. Can be member 19 as well, symmetry.
No compression member, with LCF(0)= 0 kN.

ProTruss2**B** Click AOagain first.

Again V9=3, L9=18 and H9=3.
With different joint and member numbering.

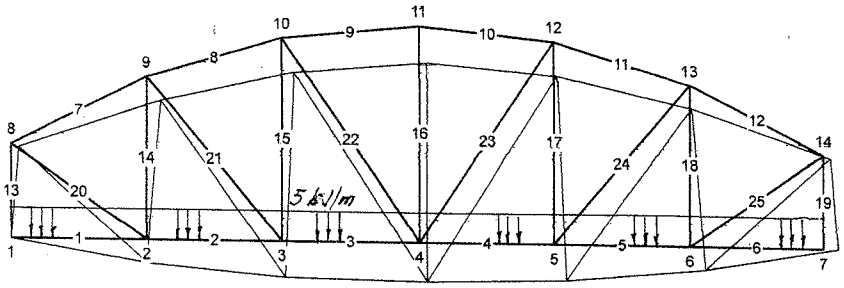
Numbering joints 1-2-3-4-5-6 and 8-9-10-11-12-13-14 with step ST=1
Numbering members, bottom chord 1-2-3-4-5-6, verticals 7-9-11-13-15-17-19
sloping members 8-10-12-14-16-18 and ST=2
top chord members 20-21-22-23-24-25. ST=1

Comparing with ProTruss2A different joint numbers for input of joint load forces at same places. After data input like done above
Joints 9, 11 and 13 are loaded with vertical load forces of 4 kN. Then type in TSTRING FY(9)=-4 Enter, FY(11)=-4 Enter and FY(13)=-4 Enter.
Or in another way, type in TNVF 3, in TSTRING for I,FY(I)
9,-4 Enter, **11**,-4, Enter and **13**,-4 Enter.

Click ProTruss2b, etc, and go to FDATA and click MFORCES.

Group c) gives LTF(18)= 8,49 kN, tension member. Can be member 8 as well, symmetry.
No compression member, with LCF(0)= 0 kN.
Group b) with LCF(7)= -6,00 kN, compression indicated with a minus sign.

ProParTruss2



EX2 V9= 3 L9= 25,84 m H9= 6,85 m A8= 2,95 m
N9= 14 joints and P9= 25 members QL= 5 kN/m

group a)	the bottom chord members	1	To	6
group b)	the parabola chord members	7	To	12
group c)	the vertical plane members	13	To	19
group d)	the sloping plane members	20	To	25

ProParTruss2

group a) the bottom chord members

MFS(1) =	0,00 kN						
NAA(1,2) =	0,00	NAA(2,1) =	0,00	MFS(2) =	45,31 kN		
DAA(1,2) =	0,00	DAA(2,1) =	0,00	NAA(2,3) =	-45,31	NAA(3,2) =	45,31
MFS(3) =	57,81 kN			DAA(2,3) =	0,00	DAA(3,2) =	0,00
NAA(3,4) =	-57,81	NAA(4,3) =	57,81	MFS(4) =	57,81 kN		
DAA(3,4) =	0,00	DAA(4,3) =	0,00	NAA(4,5) =	-57,81	NAA(5,4) =	57,81
MFS(5) =	45,31 kN			DAA(4,5) =	0,00	DAA(5,4) =	0,00
NAA(5,6) =	-45,31	NAA(6,5) =	45,31	MFS(6) =	0,00 kN		
DAA(5,6) =	0,00	DAA(6,5) =	0,00	NAA(6,7) =	0,00	NAA(7,6) =	0,00
LTF(3) =	57,81 kN	LCF(1) =	0,00 kN	DAA(6,7) =	0,00	DAA(7,6) =	0,00

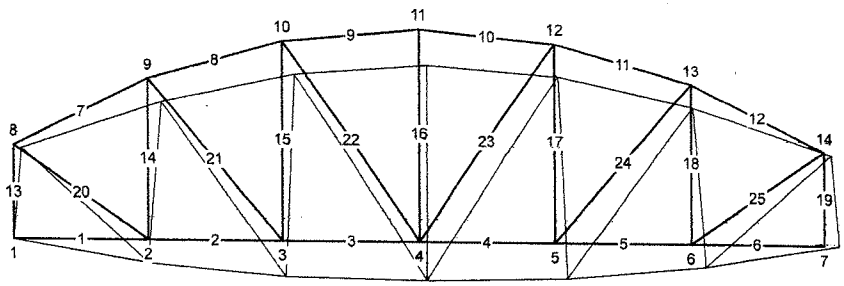
group b) the parabola chord members

MFS(7) =	-50,72 kN						
NAA(8,9) =	50,72	NAA(9,8) =	-50,72	MFS(8) =	-60,39 kN		
DAA(8,9) =	0,00	DAA(9,8) =	0,00	NAA(9,10) =	60,39	NAA(10,9) =	-60,39
MFS(9) =	-61,23 kN			DAA(9,10) =	0,00	DAA(10,9) =	0,00
NAA(10,11) =	61,23	NAA(11,10) =	-61,23	MFS(10) =	-61,23 kN		
DAA(10,11) =	0,00	DAA(11,10) =	0,00	NAA(11,12) =	61,23	NAA(12,11) =	-61,23
MFS(11) =	-60,39 kN			DAA(11,12) =	0,00	DAA(12,11) =	0,00
NAA(12,13) =	60,39	NAA(13,12) =	-60,39	MFS(12) =	-50,72 kN		
DAA(12,13) =	0,00	DAA(13,12) =	0,00	NAA(13,14) =	50,72	NAA(14,13) =	-50,72
LTF(0) =	0,00 kN	LCF(9) =	-61,23 kN	DAA(13,14) =	0,00	DAA(14,13) =	0,00

group c) the vertical plane members

MFS(13) =	-53,83 kN						
NAA(1,8) =	53,83	NAA(8,1) =	-53,83	MFS(14) =	-9,50 kN		
DAA(1,8) =	0,00	DAA(8,1) =	0,00	NAA(2,9) =	9,50	NAA(9,2) =	-9,50
MFS(15) =	6,68 kN			DAA(2,9) =	0,00	DAA(9,2) =	0,00
NAA(3,10) =	-6,68	NAA(10,3) =	6,68	MFS(16) =	12,26 kN		
DAA(3,10) =	0,00	DAA(10,3) =	0,00	NAA(4,11) =	-12,26	NAA(11,4) =	12,26
MFS(17) =	6,68 kN			DAA(4,11) =	0,00	DAA(11,4) =	0,00
NAA(5,12) =	-6,68	NAA(12,5) =	6,68	MFS(18) =	-9,50 kN		
DAA(5,12) =	0,00	DAA(12,5) =	0,00	NAA(6,13) =	9,50	NAA(13,6) =	-9,50
MFS(19) =	-53,83 kN			DAA(6,13) =	0,00	DAA(13,6) =	0,00
NAA(7,14) =	53,83	NAA(14,7) =	-53,83				
DAA(7,14) =	0,00	DAA(14,7) =	0,00				
LTF(16)	12,26 kN	LCF(13)	-53,83 kN				

QL=5 kN/m - FDATA - AMEFORCESPR - PrPrOK 70%



V9= 3 L9= 25,84 m H9= 6,85 m A8= 2,95 m
N9= 14 joints and P9= 25 members QL= 5 kN/m

group a)	the bottom chord members	1	To	6
group b)	the parabola chord members	7	To	12
group c)	the vertical plane members	13	To	19
group d)	the sloping plane members	20	To	25

ProParTruss2

group a) the bottom chord members

MFS(1) =	0,00 kN	MFS(2) =	45,31 kN	MFS(3) =	57,81 kN
MFS(4) =	57,81 kN	MFS(5) =	45,31 kN	MFS(6) =	0,00 kN
LTF(3) =	57,81 kN	LCF(1) =	0,00 kN		

group b) the parabola chord members

MFS(7) =	-50,72 kN	MFS(8) =	-60,39 kN	MFS(9) =	-61,23 kN
MFS(10) =	-61,23 kN	MFS(11) =	-60,39 kN	MFS(12) =	-50,72 kN
LTF(0) =	0,00 kN	LCF(9) =	-61,23 kN		

group c) the vertical plane members

MFS(13) =	-53,83 kN	MFS(14) =	-9,50 kN	MFS(15) =	6,68 kN
MFS(16) =	12,26 kN	MFS(17) =	6,68 kN	MFS(18) =	-9,50 kN
MFS(19) =	-53,83 kN	LTF(16) =	12,26 kN	LCF(13) =	-53,83 kN

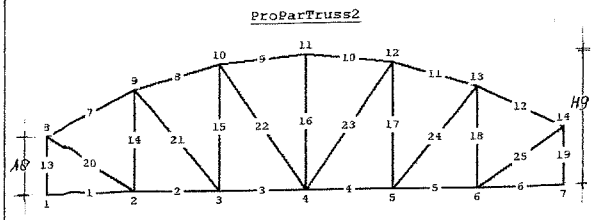
group d) the sloping plane members

MFS(20) =	54,92 kN	MFS(21) =	19,41 kN	MFS(22) =	5,58 kN
MFS(23) =	5,58 kN	MFS(24) =	19,41 kN	MFS(25) =	54,92 kN
LTF(20) =	54,92 kN	LCF(0) =	0,00 kN		

QL=5 kN/m - FDATA - MFORCESPR - PrPrOK 70%

group d) the sloping plane members

MFS(20) =	54,92 kN						
NAA(2,8) =	-54,92	NAA(8,2) =	54,92	MFS(21) =	19,41 kN		
DAA(2,8) =	0,00	DAA(8,2) =	0,00	NAA(3,9) =	-19,41	NAA(9,3) =	19,41
MFS(22) =	5,58 kN			DAA(3,9) =	0,00	DAA(9,3) =	0,00
NAA(4,10) =	-5,58	NAA(10,4) =	5,58	MFS(23) =	5,58 kN		
DAA(4,10) =	0,00	DAA(10,4) =	0,00	NAA(4,12) =	-5,58	NAA(12,4) =	5,58
MFS(24) =	19,41 kN			DAA(4,12) =	0,00	DAA(12,4) =	0,00
NAA(5,13) =	-19,41	NAA(13,5) =	19,41	MFS(25) =	54,92 kN		
DAA(5,13) =	0,00	DAA(13,5) =	0,00	NAA(6,14) =	-54,92	NAA(14,6) =	54,92
LTF(20)	54,92 kN	LCF(0) =	0,00 kN	DAA(6,14) =	0,00	DAA(14,6) =	0,00



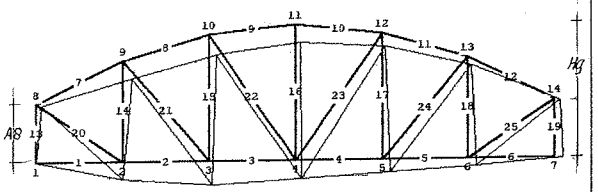
V9= 3 L9= 25,84 m H9= 6,85 m A8= 2,95 m QL=0 kN/m
N9= 14 joints and P9= 25 members

group a)	the bottom chord members	1	6
group b)	the parabola chord members	7	12
group c)	the vertical plane members	13	19
group d)	the sloping plane members	20	25

ProParTruss2

TRU=8	I4=1	I5=7					
Joint	1	2	3	4	5	6	7
K1=1	12,00	-	-	-	-	-	-
K1=2	15,98	5,02	-	-	-	-	-
K1=3	16,89	16,62	2,49	-	-	-	-
K1=1	3,76	17,24	-	-	-	-	-
K1=2	11,84	19,14	5,02	-	-	-	-
K1=3	-	16,89	16,62	2,49	-	-	-
K1=1	3,11	15,65	17,24	-	-	-	-
K1=2	-	11,84	19,14	5,02	-	-	-
K1=3	-	-	16,89	16,62	2,49	-	-
K1=1	-	3,11	15,65	17,24	-	-	-
K1=2	-	-	11,84	19,14	5,02	-	-
K1=3	-	-	-	16,89	16,62	2,49	-
K1=1	-	-	3,11	15,65	17,24	-	-
K1=2	-	-	-	11,84	19,14	5,02	-
K1=3	-	-	-	-	16,89	16,62	2,49
K1=1	-	-	-	3,11	15,65	17,24	-
K1=2	-	-	-	-	11,84	19,14	5,02
K1=3	-	-	-	-	-	16,89	7,11
K1=1	-	-	-	-	3,11	15,65	17,24
K1=2	-	-	-	-	-	11,84	12,16
K1=3	-	-	-	-	-	-	15,00

ProParTruss2



V9= 3 L9= 25,84 m H9= 6,85 m A8= 2,95 m QL=0 kN/m
N9= 14 joints and P9= 25 members

group a)	the bottom chord members	1	6
group b)	the parabola chord members	7	12
group c)	the vertical plane members	13	19
group d)	the sloping plane members	20	25

ProParTruss2

group a) the bottom chord members

MFS(1)	=	3,00 kN			MFS(2)	=	20,66 kN	
NAA(1,2)	=	0,00	NAA(2,1)	= 0,00	NAA(2,3)	=	-20,66	NAA(3,2) = 20,66
DAA(1,2)	=	0,00	DAA(2,1)	= 0,00	DAA(2,3)	=	0,00	DAA(3,2) = 0,00
MFS(3)	=	22,42 kN			MFS(4)	=	11,21 kN	
NAA(3,4)	=	-22,42	NAA(4,3)	= 22,42	NAA(4,5)	=	-11,21	NAA(5,4) = 11,21
DAA(3,4)	=	0,00	DAA(4,3)	= 0,00	DAA(4,5)	=	0,00	DAA(5,4) = 0,00
MFS(5)	=	7,03 kN			MFS(6)	=	0,00 kN	
NAA(5,6)	=	-7,03	NAA(6,5)	= 7,03	NAA(6,7)	=	0,00	NAA(7,6) = 0,00
DAA(5,6)	=	0,00	DAA(6,5)	= 0,00	DAA(6,7)	=	0,00	DAA(7,6) = 0,00
LTF(3)	=	22,42 kN	LCF(1)	= 0,00 kN				

group b) the parabola chord members

MFS(7)	=	-23,13 kN			MFS(8)	=	-23,42 kN	
NAA(8,9)	=	23,13	NAA(9,8)	= -23,13	NAA(9,10)	=	23,42	NAA(10,9) = -23,42
DAA(8,9)	=	0,00	DAA(9,8)	= 0,00	DAA(9,10)	=	0,00	DAA(10,9) = 0,00
MFS(9)	=	-15,33 kN			MFS(10)	=	-15,33 kN	
NAA(10,11)	=	15,33	NAA(11,10)	= -15,33	NAA(11,12)	=	15,33	NAA(12,11) = -15,33
DAA(10,11)	=	0,00	DAA(11,10)	= 0,00	DAA(11,12)	=	0,00	DAA(12,11) = 0,00
MFS(11)	=	-11,71 kN			MFS(12)	=	-7,37 kN	
NAA(12,13)	=	11,71	NAA(13,12)	= -11,71	NAA(13,14)	=	7,37	NAA(14,13) = -7,37
DAA(12,13)	=	0,00	DAA(13,12)	= 0,00	DAA(13,14)	=	0,00	DAA(14,13) = 0,00
LTF(9)	=	0,00 kN	LCF(8)	= -23,42 kN				

group c) the vertical plane members

MFS(13)	=	-24,55 kN			MFS(14)	=	1,55 kN	
NAA(1,8)	=	24,55	NAA(8,1)	= -24,55	NAA(2,9)	=	-1,55	NAA(9,2) = 1,55
DAA(1,8)	=	0,00	DAA(8,1)	= 0,00	DAA(2,9)	=	0,00	DAA(9,2) = 0,00
MFS(15)	=	15,12 kN			MFS(16)	=	3,17 kN	
NAA(3,10)	=	-15,12	NAA(10,3)	= 15,12	NAA(4,11)	=	-3,17	NAA(11,4) = 3,17
DAA(3,10)	=	0,00	DAA(10,3)	= 0,00	DAA(4,11)	=	0,00	DAA(11,4) = 0,00
MFS(17)	=	-4,97 kN			MFS(18)	=	-4,81 kN	
NAA(5,12)	=	4,97	NAA(12,5)	= -4,97	NAA(6,13)	=	4,81	NAA(13,6) = -4,81
DAA(5,12)	=	0,00	DAA(12,5)	= 0,00	DAA(6,13)	=	0,00	DAA(13,6) = 0,00

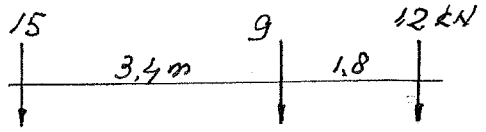
ProParTruss2 EX2

Like on the preceding page, V9=3, L9=25,84 m, H9=6,85 m and A8= 2,95 m. Click AOagain for new start. At the start cursor in TV9, type 3, Tab, cursor in TL9, type 25.84, Tab, cursor in TH9, type 6.85, Tab, cursor in TA8, type 2.95. In TQL type QL=0.

Click ProParTruss2, DrawTF. All controls disappear except at the bottom, with go to FDATA, Calculate appeared, TrussNumb and DRAWTFD. Click TrussNumb.

No loads so nothing happens when clicking Calculate and DrawTFD. Click on the form to get back the controls.

A mobile force system.



MF=3 forces.

Type in TSTRING MF=3 Enter, next 1,12,0 Enter, 2,9,1.8 Enter, 3,15,3.4 Enter.

Each force is placed on a joint of the bottom chord, the other two forces will be divided to be placed (and added) on the corresponding joints.

With a click on ForceDivision controls disappear and all possibilities appear on the form like shown on the left.

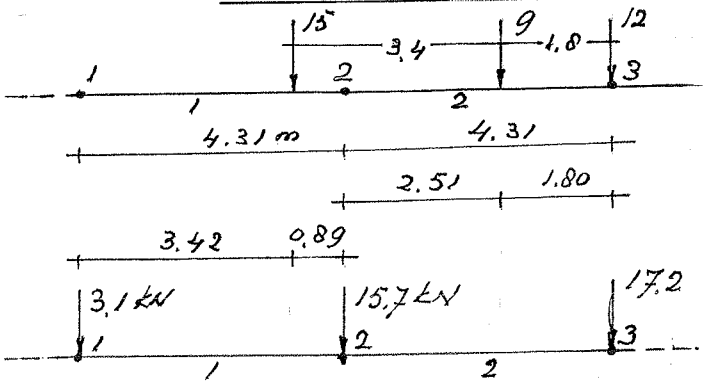
Click somewhere on the form to get the controls back. Going on on next page.

ProParTruss2, mobile forces case I3=3 K=1.

Click AOagain for new start. In TQL type QL=0.

Input like done above, no mobile forces.

Underlned case, I3=3 K=1 12 kN on joint 3.



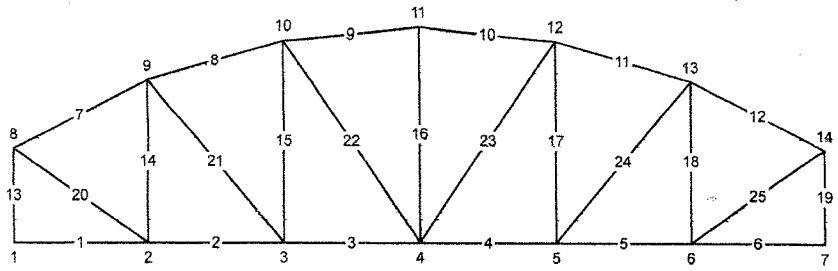
To type in TSTRING FY(1)=-3.1 Enter, FY(2)=-15.7 Enter, FY(3)=-17.2 Enter. Etc.

MFS(19)	=	-8,35 kN						
NAA(7,14)	=	8,35	NAA(14,7)	= -8,35				
DAA(7,14)	=	0,00	DAA(14,7)	= 0,00				
LTF(15)	=	15,12 kN	LCF(13)	= -24,55 kN				

group d) the sloping plane members

MFS(20)	=	25,05 kN			MFS(21)	=	2,72 kN	
NAA(2,8)	=	-25,05	NAA(8,2)	= 25,05	NAA(3,9)	=	-2,72	NAA(9,3) = 2,72
DAA(2,8)	=	0,00	DAA(8,2)	= 0,00	DAA(3,9)	=	0,00	DAA(9,3) = 0,00
MFS(22)	=	-11,96 kN			MFS(23)	=	8,15 kN	
NAA(4,10)	=	11,96	NAA(10,4)	= -11,96	NAA(4,12)	=	-8,15	NAA(12,4) = 8,15
DAA(4,10)	=	0,00	DAA(10,4)	= 0,00	DAA(4,12)	=	0,00	DAA(12,4) = 0,00
MFS(24)	=	6,49 kN			MFS(25)	=	8,52 kN	
NAA(5,13)	=	-6,49	NAA(13,5)	= 6,49	NAA(6,14)	=	-8,52	NAA(14,6) = 8,52
DAA(5,13)	=	0,00	DAA(13,5)	= 0,00	DAA(6,14)	=	0,00	DAA(14,6) = 0,00
LTF(20)	=	25,05 kN	LCF(22)	= -11,96 kN				

ProParTruss2



V9= 3 L9= 25,84 m H9= 6,85 m A8= 2,95 m
N9= 14 joints and P9= 25 members

group a)	the bottom chord members	1	To	6
group b)	the parabola chord members	7	To	12
group c)	the vertical plane members	13	To	19
group d)	the sloping plane members	20	To	25

MF= 3 mobile forces
MFF(1) = 12,00 kN MA(1) = 0,00 m
MFF(2) = 9,00 kN MA(2) = 1,80 m
MFF(3) = 15,00 kN MA(3) = 3,40 m

I3= 1 K1= 3
group a) the bottom chord members
LTF1(2) = 13,05 kN LCF1(1) = 0,00 kN
group b) the parabola chord members
LTF1(0) = 0,00 kN LCF1(7) = -14,61 kN
group c) the vertical plane members
LTF1(14)= 7,68 kN LCF1(13)= -15,51 kN
group d) the sloping plane members
LTF1(20)= 15,82 kN LCF1(21)= -5,26 kN

I3= 2 K1= 1
LTF1(2) = 12,09 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(7) = -13,54 kN
LTF1(14)= 8,96 kN LCF1(13)= -14,37 kN
LTF1(20)= 14,66 kN LCF1(21)= -6,80 kN

I3= 2 K1= 2
LTF1(2) = 16,24 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(7) = -18,18 kN
LTF1(15)= 8,80 kN LCF1(13)= -19,30 kN
LTF1(20)= 19,69 kN LCF1(22)= -6,97 kN

I3= 2 K1= 3
LTF1(3) = 24,10 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(8) = -25,17 kN
LTF1(15)= 14,38 kN LCF1(13)= -26,40 kN •
• LTF1(20)= 26,93 kN LCF1(22)= -10,76 kN

I3= 3 K1= 1
LTF1(3) = 22,43 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(8) = -23,43 kN
LTF1(15)= 15,12 kN LCF1(13)= -24,53 kN
LTF1(20)= 25,03 kN LCF1(22)= -11,97 kN

I3= 3 K1= 2
LTF1(3) = 25,80 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(8) = -26,94 kN
LTF1(15)= 13,63 kN LCF1(13)= -25,14 kN
LTF1(20)= 25,65 kN LCF1(22)= -9,52 kN

I3= 3 K1= 3
• LTF1(3) = 27,38 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(8) = -28,61 kN
LTF1(16)= 5,61 kN LCF1(13)= -20,40 kN
LTF1(20)= 20,81 kN LCF1(0) = 0,00 kN

case I3=3 K=1 see prec. page

01

I3= 4 K1= 1
LTF1(3) = 26,97 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(8) = -28,17 kN
LTF1(16) = 5,45 kN LCF1(13) = -21,65 kN
LTF1(20) = 22,08 kN LCF1(0) = 0,00 kN

I3= 4 K1= 2
LTF1(3) = 25,69 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(10) = -28,80 kN •
LTF1(16) = 5,77 kN LCF1(13) = -19,14 kN
LTF1(20) = 19,52 kN LCF1(0) = 0,00 kN

I3= 4 K1= 3
LTF1(4) = 27,32 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(11) = -28,54 kN
LTF1(17) = 5,75 kN LCF1(19) = -21,60 kN
LTF1(25) = 22,04 kN LCF1(23) = -0,29 kN

I3= 5 K1= 1
LTF1(4) = 27,32 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(11) = -28,54 kN
LTF1(16) = 5,54 kN LCF1(19) = -20,35 kN
LTF1(25) = 20,77 kN LCF1(0) = 0,00 kN

I3= 5 K1= 2
LTF1(4) = 27,32 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(11) = -28,54 kN
LTF1(17) = 9,54 kN LCF1(19) = -22,86 kN
LTF1(25) = 23,32 kN LCF1(23) = -4,56 kN

I3= 5 K1= 3
LTF1(4) = 22,55 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(12) = -23,66 kN
LTF1(17) = 15,21 kN • LCF1(19) = -25,11 kN
LTF1(25) = 25,62 kN LCF1(23) = -12,04 kN •

I3= 6 K1= 1
LTF1(4) = 23,81 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(11) = -24,87 kN
LTF1(17) = 13,72 kN LCF1(19) = -26,35 kN
LTF1(25) = 26,89 kN LCF1(23) = -10,07 kN

I3= 6 K1= 2
LTF1(5) = 20,07 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(12) = -22,47 kN
LTF1(17) = 12,92 kN LCF1(19) = -23,85 kN
LTF1(25) = 24,33 kN LCF1(23) = -10,23 kN

I3= 6 K1= 3
LTF1(5) = 11,85 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(12) = -13,27 kN
LTF1(18) = 8,78 kN LCF1(19) = -14,08 kN
LTF1(25) = 14,36 kN LCF1(24) = -6,66 kN

I3= 7 K1= 1
LTF1(5) = 12,72 kN LCF1(1) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(12) = -14,24 kN
LTF1(18) = 6,94 kN LCF1(19) = -15,12 kN
LTF1(25) = 15,42 kN LCF1(23) = -5,22 kN

Here below for each group of members the largest member tension forces LLTF() and member compression forces LLCF() of all calculations.

group a) the bottom chord members
LLTF(3) = 27,38 kN • LLCF(1) = 0,00 kN

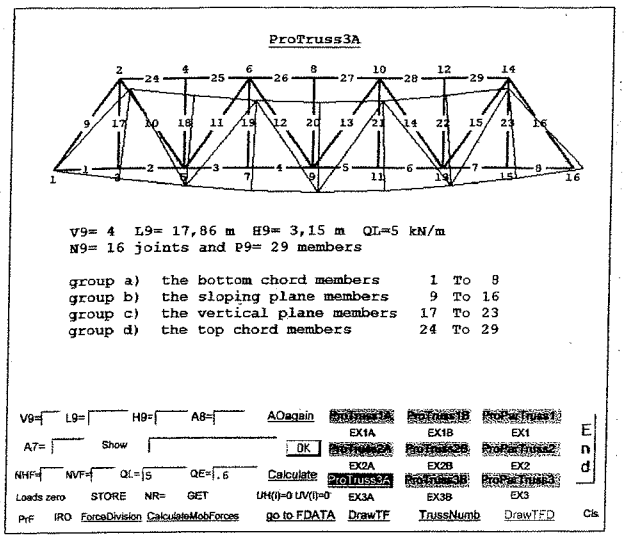
group b) the parabola chord members
LLTF(12) = 0,00 kN LLCF(10) = -28,80 kN •

group c) the vertical plane members
LLTF(17) = 15,21 kN • LLCF(13) = -26,40 kN •

group d) the sloping plane members
LLTF(20) = 26,93 kN • LLCF(23) = -12,04 kN •

Going on with first example of the preceding page. After a click on ForceDivision follows a click on CalculateMobForces.
With 7 joints 1 to 7 and 3 mobile forces 7*3=21 main calculations are carried out. Each time one of the three forces is put on a joint.
Next click go to FDATA and click MOBMFORCESPR of the 'check control', click finally PrProOK to get all the results of the 21 calculations printed.
To compare the values of the preceding page with the case I3=3 K1=1.

LTF1(3)= 22,43 kN and MFS(3)= 22,42 kN
LTF1(20)= 25,03 kN and MFS(20)= 25,05 kN
LCF1(13)=-24,53 kN and MFS(13)=-24,55 kN etc.



ProTruss3A

group a) the bottom chord members

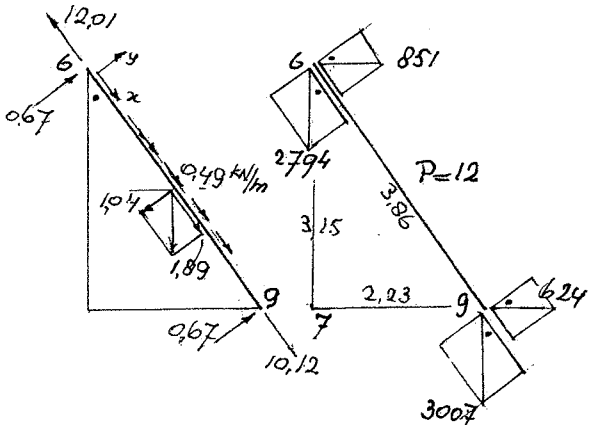
MFS(1)	= 44,29 kN				MFS(2)	= 44,29 kN		
NAA(1,3)	= -44,29	NAA(3,1)	= 44,29		NAA(3,5)	= -44,29	NAA(5,3)	= 44,29
DAA(1,3)	= 0,67	DAA(3,1)	= 0,67		DAA(3,5)	= 0,67	DAA(5,3)	= 0,67
MFS(3)	= 95,46 kN				MFS(4)	= 95,46 kN		
NAA(5,7)	= -95,46	NAA(7,5)	= 95,46		NAA(7,9)	= -95,46	NAA(9,7)	= 95,46
DAA(5,7)	= 0,67	DAA(7,5)	= 0,67		DAA(7,9)	= 0,67	DAA(9,7)	= 0,67
MFS(5)	= 95,46 kN				MFS(6)	= 95,46 kN		
NAA(9,11)	= -95,46	NAA(11,9)	= 95,46		NAA(11,13)	= -95,46	NAA(13,11)	= 95,46
DAA(9,11)	= 0,67	DAA(11,9)	= 0,67		DAA(11,13)	= 0,67	DAA(13,11)	= 0,67
MFS(7)	= 44,29 kN				MFS(8)	= 44,29 kN		
NAA(13,16)	= -44,29	NAA(16,13)	= 44,29		NAA(15,16)	= -44,29	NAA(16,15)	= 44,29
DAA(13,15)	= 0,67	DAA(15,13)	= 0,67		DAA(15,16)	= 0,67	DAA(16,16)	= 0,67
LCF(5)	= 95,46 kN	LCF(0)	= 0,00 kN					

group b) the sloping plane members

MFS(9)	= -77,55 kN				MFS(10)	= 56,25 kN		
NAA(1,2)	= 77,55	NAA(2,1)	= -75,66		NAA(2,5)	= -56,25	NAA(5,2)	= 54,36
DAA(1,2)	= 0,67	DAA(2,1)	= 0,67		DAA(2,5)	= 0,67	DAA(5,2)	= 0,67
MFS(11)	= -34,13 kN				MFS(12)	= 12,01 kN		
NAA(5,6)	= 34,13	NAA(6,5)	= -32,24		NAA(6,9)	= -12,01	NAA(9,6)	= 10,12
DAA(5,6)	= 0,67	DAA(6,5)	= 0,67		DAA(6,9)	= 0,67	DAA(9,6)	= 0,67
MFS(13)	= 12,01 kN				MFS(14)	= -34,13 kN		
NAA(9,10)	= -10,12	NAA(10,9)	= 12,01		NAA(10,13)	= 32,24	NAA(13,10)	= -34,13
DAA(9,10)	= 0,67	DAA(10,9)	= 0,67		DAA(10,13)	= 0,67	DAA(13,10)	= 0,67
MFS(15)	= 56,25 kN				MFS(16)	= -77,55 kN		
NAA(13,14)	= -56,36	NAA(14,13)	= 56,25		NAA(14,16)	= 75,66	NAA(16,14)	= -77,55
DAA(13,14)	= 0,67	DAA(14,13)	= 0,67		DAA(14,16)	= 0,67	DAA(16,14)	= 0,67
LTF(15)	= 56,25 kN	LCF(16)	= -77,55 kN					

group c) the vertical plane members

MFS(9)	= -77,55 kN				MFS(10)	= 56,25 kN		
NAA(1,2)	= 77,55	NAA(2,1)	= -75,66		NAA(2,5)	= -56,25	NAA(5,2)	= 54,36
DAA(1,2)	= 0,67	DAA(2,1)	= 0,67		DAA(2,5)	= 0,67	DAA(5,2)	= 0,67



RH(1) = 0,00 kN RV(1) = 69,91 kN RV(16) = 69,91 kN

UH(1)	= 0,0 /EA	UV(1)	= 0,0 /EA	UH(2)	= 1191,9 /EA	UV(2)	= -1207,3 /EA
UH(3)	= 98,9 /EA	UV(3)	= -1249,6 /EA	UH(4)	= 1021,7 /EA	UV(4)	= -2180,8 /EA
UH(5)	= 197,8 /EA	UV(5)	= -2173,6 /EA	UH(6)	= 851,4 /EA	UV(6)	= -2793,8 /EA
UH(7)	= 410,9 /EA	UV(7)	= -2836,2 /EA	UH(8)	= 624,0 /EA	UV(8)	= -3014,5 /EA
UH(9)	= 624,0 /EA	UV(9)	= -3007,3 /EA	UH(10)	= 396,6 /EA	UV(10)	= -2793,8 /EA
UH(11)	= 837,1 /EA	UV(11)	= -2936,2 /EA	UH(12)	= 226,3 /EA	UV(12)	= -2180,9 /EA
UH(13)	= 1050,2 /EA	UV(13)	= -2173,6 /EA	UH(14)	= 56,1 /EA	UV(14)	= -1207,3 /EA
UH(15)	= 1149,1 /EA	UV(15)	= -1249,6 /EA	UH(16)	= 1248,0 /EA	UV(16)	= 0,0 /EA

ProTruss3A EX3A

V9=4, L9=17,86 m, H9=3,15 m and QL= 5 kN/m.
Click AOagain to start.
Type 4 in TV9, Tab, 17.86 in TL9, Tab,
3.15 in TH9 and 5 in TQL.

Click now ProTruss3A before typing .6 in TQE for own weight of 0,6 kN/m of all members.

Click DrawTF, TrussNumb, Calculate, DrawTFD for the form print.
Next go to FDATA, PDATA to see the lengths of the members, AMEFORCES and UHUV for the displacements.

Consideration of member 12.
In the figure the lengths of the members
P=12 3,86 m, P=19 3,15 m, P=4 2,23 m.
UH(6)= 851/EA and UV(6)= -2794/EA,
UH(9)= 624/EA, and UV(9)= -3007/EA
The joint displacements are drawn with their real directions.

The components along the member axis, x /EA,
member end 6
(851/3,86)*2,23= 492 (2794/3,86)*3,15= 2280
member end 9
(624/3.86)*2,23= 360 (3007/3,86)*3,15= 2454

Member end 6 displaces in direction 6-9
492 +2280= 2772 /EA and
member end 9 displaces in direction 6-9
360 +2454= 2814 /EA,

member 12 lengthens 2814-2727= 42 /EA.

Suppose member end 9 is a clamp. Member 12 is loaded with member end force of 12,01 kN, and own weight load of 0,6 kN/m with the component along the member (0,6/3,86)*3,15= 0,50 kN/m.

Member end force 12,01 kN lengthens member 12,
(12,01*3,86)/EA= 46/EA
The distributed load of 0,50 kN/m shortens member 12, and with formula Q*L^2/2EA follows
(0,5*3,86^2)/2EA= 4/EA,

member 12 lengthens 46-4= 42/EA like above.

Or, suppose member end 6 is a clamp.

Member end force 10,12 kN lengthens member 12,
(10,12*3,86)/EA= 39/EA
The distributed load of 0,50 kN/m lengthens member 12, (0,5*3,86^2)/2EA= 4/EA,

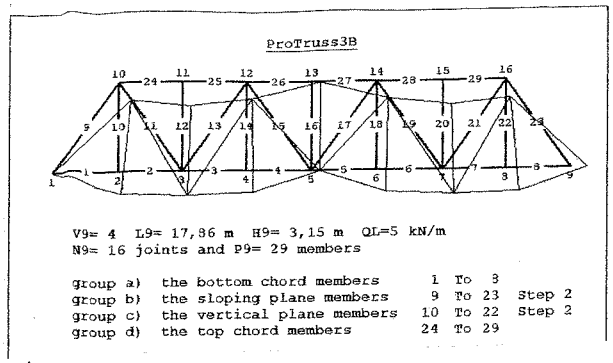
member 12 lengthens 39+4= 43/EA 'is' 42/EA.

Reactions RV(1) and RV(16) both 69,91 kN.
Own weight 0,6 kN/m.

14 horizontal members, 14*2,23*0,6= 18,73 kN
7 vertical members, 7*3,15*0,6= 13,23 kN
8 sloping members, 8*3,86*0,6= 18,53 kN

QL=5 kN/m 8*2,23*5= 89,20 kN
139,69 kN

That's 139,69/2= 69,85 kN 'is' 69,91 kN.



ProTruss3B EX3A

Like ProTruss3A but with different joint and member numbering, except the horizontal member numbering.
V9=4, L9=17,86 m, H9=3,15 m and QL= 5 kN/m.
No own weight.
Click ProTruss3B after putting in the given start data.
A change. Joint 5 is now supported by a roller support. Therefore type in TSTRING
PV(5)=1 Enter and UV(5)=0 Enter.

Click DrawTF, TrussNumb, Calculate, DrawTFD for the form print.

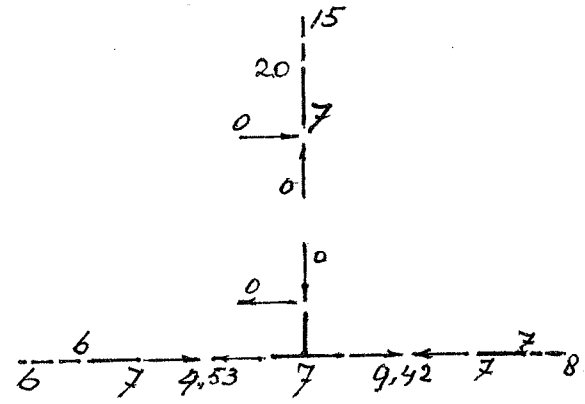
Next go to FDATA and click
AMEFORCES with right mouse button
to get member end forces D5(L,H), D6(L,H), D5(H,L) and D6(H,L).
Some results of member 7 are shown on the left.

Consideration of joint 7 separated from the truss. Checking equilibrium.

Member end forces D5(,) assumed to be directed to the right, and
member end forces D6(,) assumed to be directed upward. (Later with frames assumed downward.)
At the joint act member end forces as large as but opposite directed.

c)

MFS(20) =	0,00 kN		
D5(7,15) =	0,00	D5(15,7) =	0,00
D6(7,15) =	0,00	D6(15,7) =	0,00

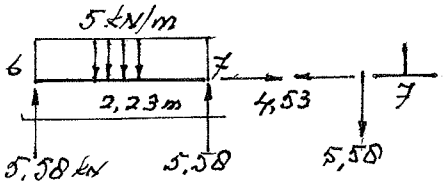


First picture on the left.
Member 20 is a zero member, D5(7,15)=0 and D6(7,15)=0. Member 12 and 16 are zero members as well.

a)

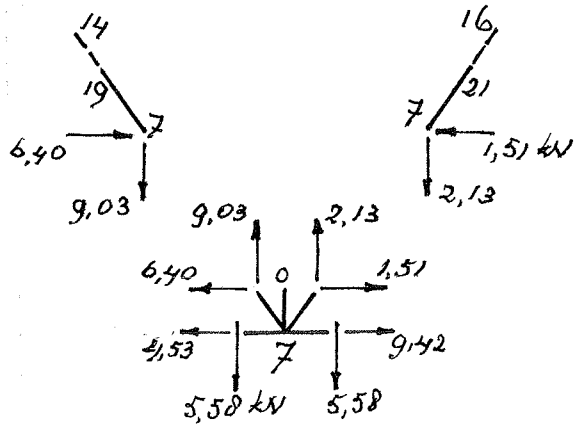
MFS(7) =	9,42 kN		
D5(7,8) =	-9,42	D5(8,7) =	9,42
D6(7,8) =	0,00	D6(8,7) =	0,00
MFS(6) =	4,53 kN		
D5(6,7) =	-4,53	D5(7,6) =	4,53
D6(6,7) =	0,00	D6(7,6) =	0,00

member 6 D5(7,6)= 4,53 kN, to the right
D6(7,6)= 0



Due to 5 kN/m (2,23*5)/2= 5,58 kN upward.
At joint 7 as large as but opposite directed.

member 7 D5(7,8)= -9,42 kN, not to the right but to the left.
D6(7,8)= 0
Due to 5 kN/m (2,23*5)/2= 5,58 kN upward.



Second picture.

member 19 D5(7,14)= 6,40 kN, to the right.
D6(7,14)= -9,03 kN, downward.

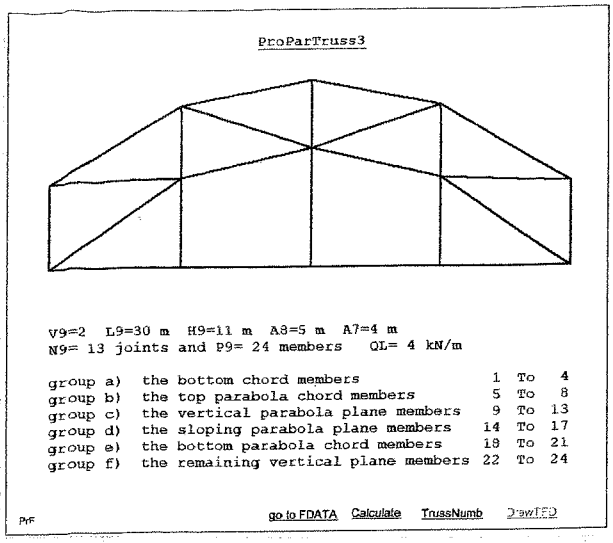
member 21 D5(7,16)= -1,51 kN, to the left
D6(7,16)= -2,13 kN, downward.

b)

MFS(19) =	11,07 kN		
D5(7,14) =	6,40	D5(14,7) =	-6,40
D6(7,14) =	-9,03	D6(14,7) =	9,03
MFS(21) =	2,61 kN		
D5(7,16) =	-1,51	D5(16,7) =	1,51
D6(7,16) =	-2,13	D6(16,7) =	2,13

$\sum$ hor.= 0?
6,40+4,53 -1,51-9,42= 10,93-10,93= 0 ok

$\sum$ vert.= 0?
9,03+2,13 -5,58-5,58= 11,16-11,16= 0 ok



ProParTruss3

V9=2 L9=30 m H9=11 m A8=5 m A7=4 m
QL= 4 kN/m.
No own weight. All member ends are hinges.
Click AOagain for new start.

Type 2 in TV9, Tab, 30 in TL9, Tab, 11 in TH9, Tab, 5 in TA8, 4 in TA7 and 4 in TQL.

Click ProParTruss3.
First case.
Click DrawTF, controls disappear, at the bottom of the form to be seen
go to FDATA Calculate TrussNumb DrawTFD.

Click TrussNumb, Calculate, and DrawTFD for the final form print with deformed truss.
Next go to FDATA and click PDATA, UHUV and MFORCES, see some results on the left.

Second case.
Like above same data to put in. All members have strain stiffness 1'EA'.
Next the strain stiffness EA of the members of group b) and group e) are changed to 2'EA'.

Therefore to type in TSTRING PEAA,P1,P2,ST,EA,
for group b) PEAA,5,8,1,**2** Enter,
for group e) PEAA,18,21,1,**2** Enter. Etc.

The truss is internal statically inditerminate, the results of both cases will be different.

Case 1 UH(3)= 615/EA UV(3)= -2568/EA
Case 2 UH(3)= 596/EA UV(3)= -1856/EA

Case 1 NAA(3,4)=-40,99 kN NAA(6,7)= 33,55 kN
Case 2 NAA(3,4)=-39,70 kN NAA(6,7)= 35,42 kN

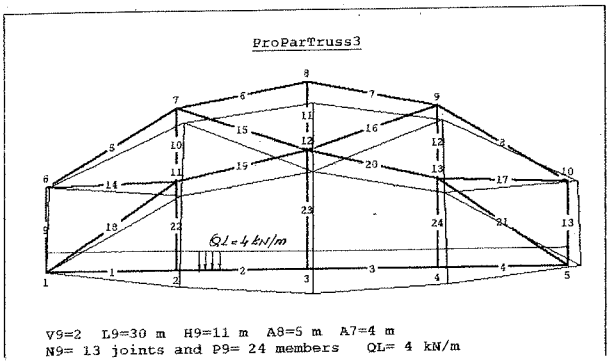
A small truss with ProParTruss3.

V9=1 L9=10 H9=6 A8=4 A7=4 FX(4)=10
A value A7 >=0 must be put in TA7.
In TSTRING FX(4)=10 Enter.
After input of data click ProParTruss3, etc.
The truss is internal statically indeterminate.

Joint displacements UH(I) and UV(I).

UH(1)	=	0 /EA	UV(1)	=	0 /EA
UH(3)	=	615 /EA	UV(3)	=	-2568 /EA
UH(5)	=	1230 /EA	UV(5)	=	0 /EA
UH(7)	=	786 /EA	UV(7)	=	-1528 /EA
UH(9)	=	444 /EA	UV(9)	=	-1528 /EA

MFS(3)	=	40,99 kN			
NAA(3,4)	=	-40,99	NAA(4,3)	=	40,99
DAA(3,4)	=	0,00	DAA(4,3)	=	0,00
LTF(3)	=	40,99 kN	LCF(0)	=	0,00

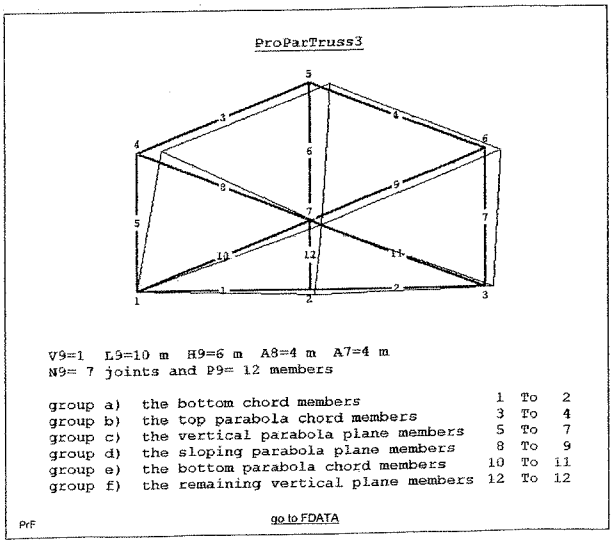


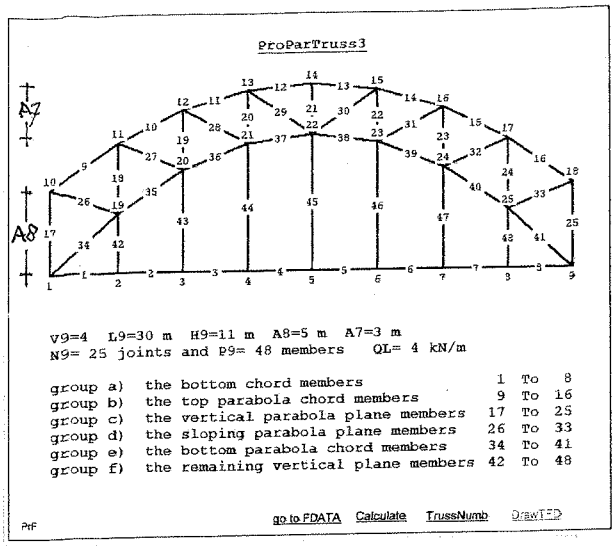
Joint displacements UH(I) and UV(I).

UH(1)	=	0 /EA	UV(1)	=	0 /EA
UH(3)	=	596 /EA	UV(3)	=	-1856 /EA
UH(5)	=	1191 /EA	UV(5)	=	0 /EA
UH(7)	=	669 /EA	UV(7)	=	-1091 /EA
UH(9)	=	522 /EA	UV(9)	=	-1091 /EA

ProParTruss3
group a) the bottom chord members

MFS(1)	=	39,70 kN			
NAA(1,2)	=	-39,70	NAA(2,1)	=	39,70
DAA(1,2)	=	0,00	DAA(2,1)	=	0,00
MFS(3)	=	39,70 kN			
NAA(3,4)	=	-39,70	NAA(4,3)	=	39,70
DAA(3,4)	=	0,00	DAA(4,3)	=	0,00
LTF(3)	=	39,70 kN	LCF(0)	=	0,00 kN





V9=4 L9=30 m H9=11 m A8=5 m A7=3 m
N9= 25 joints and P9= 48 members QL= 4 kN/m

group a)	the bottom chord members	1	To	8
group b)	the top parabola chord members	9	To	16
group c)	the vertical parabola plane members	17	To	25
group d)	the sloping parabola plane members	26	To	33
group e)	the bottom parabola chord members	34	To	41
group f)	the remaining vertical plane members	42	To	48

ProParTruss3

group a) the bottom chord members

MFS(1) =	60,78 kN	MFS(2) =	60,78 kN	MFS(3) =	60,78 kN	MFS(4) =	60,78 kN
MFS(5) =	60,78 kN	MFS(6) =	60,78 kN	MFS(7) =	60,78 kN	MFS(8) =	60,78 kN
LTF(4) =	60,78 kN	LCF(0) =	0,00 kN				

group b) the top parabola chord members

MFS(9) =	-25,79 kN	MFS(10) =	-47,70 kN	MFS(11) =	-62,52 kN	MFS(12) =	-66,88 kN
MFS(13) =	-66,88 kN	MFS(14) =	-62,52 kN	MFS(15) =	-47,70 kN	MFS(16) =	-25,79 kN
LTF(0) =	0,00 kN	LCF(12) =	-66,88 kN				

group c) the vertical parabola plane members

MFS(17) =	-25,68 kN	MFS(18) =	-19,17 kN	MFS(19) =	-8,35 kN	MFS(20) =	4,69 kN
MFS(21) =	12,17 kN	MFS(22) =	4,69 kN	MFS(23) =	-8,35 kN	MFS(24) =	-19,17 kN
MFS(25) =	-25,68 kN						
LTF(21) =	12,17 kN	LCF(26) =	-25,68 kN				

group d) the sloping parabola plane members

MFS(26) =	22,63 kN	MFS(27) =	23,79 kN	MFS(28) =	19,52 kN	MFS(29) =	9,66 kN
MFS(30) =	9,66 kN	MFS(31) =	19,92 kN	MFS(32) =	23,79 kN	MFS(33) =	22,63 kN
LTF(27) =	23,79 kN	LCF(0) =	0,00 kN				

group e) the bottom parabola chord members

MFS(34) =	-83,66 kN	MFS(35) =	-48,42 kN	MFS(36) =	-20,01 kN	MFS(37) =	-1,14 kN
MFS(38) =	-1,14 kN	MFS(39) =	-20,01 kN	MFS(40) =	-48,42 kN	MFS(41) =	-83,66 kN
LTF(0) =	0,00 kN	LCF(34) =	-83,66 kN				

group f) the remaining vertical plane members

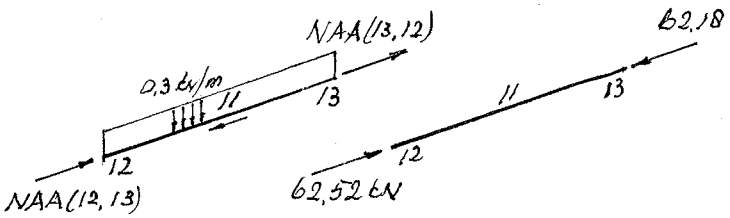
MFS(42) =	17,19 kN	MFS(43) =	17,93 kN	MFS(44) =	18,38 kN	MFS(45) =	18,53 kN
MFS(46) =	18,38 kN	MFS(47) =	17,93 kN	MFS(48) =	17,18 kN		
LTF(45) =	18,53 kN	LCF(0) =	0,00 kN				

ProParTruss3 EX3

V9=4 L9=30 m H9=11 m A8=5 m A7=3 m
QL= 4 kN/m Input own weight QE= 0,3 kN/m in TQE after a click on ProParTruss3!!
Click AOagain for new start.
After data typed in the text boxes, DrawTF, controls disappear, at the bottom of appear go to FDATA Calculate TrussNumb DrawTFD.

Click TrussNumb, Calculate, and DrawTFD.
Next go to FDATA and click MFORCES showing for the members of each group if it is a tension member or a compression member, with MFS(P).

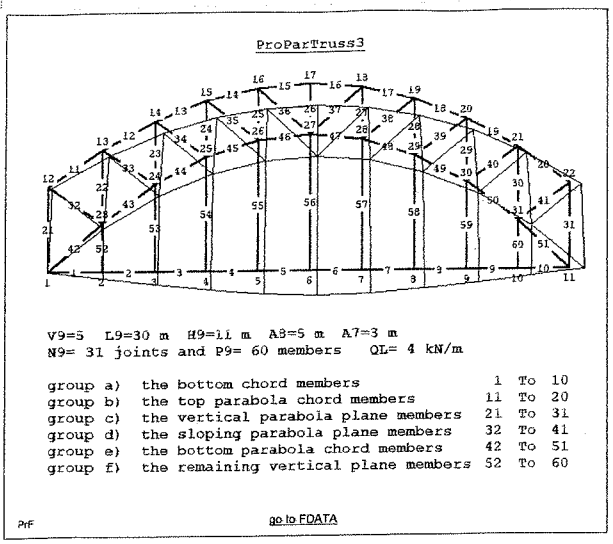
For instance group b), member 11, 12-13.
The largest of the two member end forces is 62,52 kN, pushes at member end 12, so member 11 is a compression member, MFS(11)= -62,52 kN.
The minus sign is assumed to indicate a 'compression member'.
The Largest of group b) is MFS(12)= -66,68 kN, LCF(12)= -66,68 kN. C for compression.
No tension member, LTF(0)= 0 kN.



Next page after AMEFORCESPR and PrProOK.

group b) the top parabola chord members

MFS(9) =	-25,79 kN	MFS(10) =	-47,70 kN	MFS(11) =	-62,52 kN	MFS(12) =	-66,88 kN
MFS(13) =	-66,88 kN	MFS(14) =	-62,52 kN	MFS(15) =	-47,70 kN	MFS(16) =	-25,79 kN
LTF(0) =	0,00 kN	LCF(12) =	-66,88 kN				



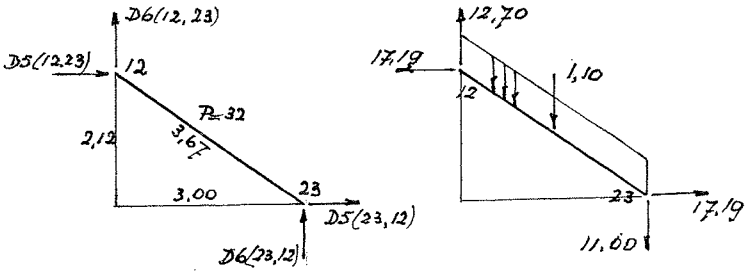
V9=5 L9=30 m H9=11 m A8=5 m A7=3 m
N9= 31 joints and P9= 60 members QL= 4 kN/m

group a)	the bottom chord members	1	To	10
group b)	the top parabola chord members	11	To	20
group c)	the vertical parabola plane members	21	To	31
group d)	the sloping parabola plane members	32	To	41
group e)	the bottom parabola chord members	42	To	51
group f)	the remaining vertical plane members	52	To	60

D5(11,22) =	0,00	D5(22,11) =	0,00
D6(11,22) =	27,13	D6(22,11) =	-25,63
LTF(26) =	10,27 kN	LCF(21) =	-27,13 kN

ProParTruss3

V9=5 L9=30 m H9=11 m A8=5 m A7=3 m
QL= 4 kN/m. Own weight QE=0,3 kN/m.
Click AOagain for new start. After input of data and calculations go to FDATA and click with right mouse button
AMEFORCES for the member end forces D5(,) assumed to the right, and D6(,) assumed upward.



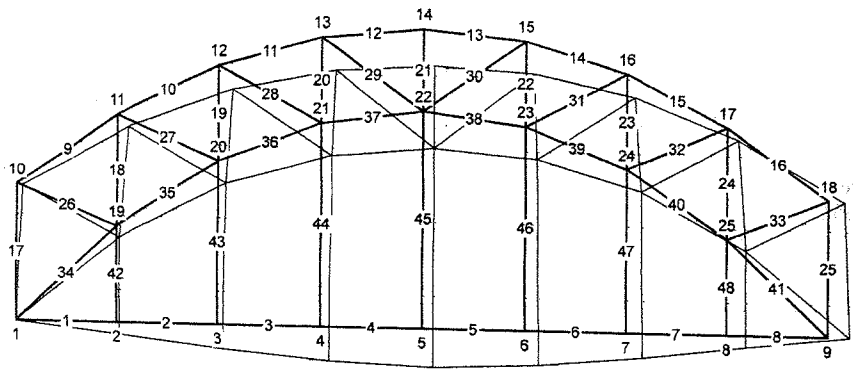
Member 32 Own weight 3,67*0,3=1,10 kN.
After drawing the member end forces with their real directions is Σ hor.= 0, Σ vert.= 0 and Σ mom.= 0.

group d) the sloping parabola plane members

MFS(32) =	21,37 kN		
D5(12,23) =	-17,19	D5(23,12) =	17,19
D6(12,23) =	12,70	D6(23,12) =	-11,60

MFS(33) =	22,48 kN		
D5(13,24) =	-18,34	D5(24,13) =	18,34
D6(13,24) =	13,01	D6(24,13) =	-11,93

ProParTruss3



V9= 4 L9= 30 m H9= 11 m A8= 5 m A7= 3 m QL= 4 kN/m QE= 0,3 kN/m
N9= 25 joints and P9= 48 members

group a)	the bottom chord members	I	To	8
group b)	the top parabola chord members	9	To	16
group c)	the vertical parabola plane members	17	To	25
group d)	the sloping parabola plane members	26	To	33
group e)	the bottom parabola chord members	34	To	41
group f)	the remaining vertical plane members	42	To	48

ProParTruss3

group a) the bottom chord members

MFS(1) = 60,78 kN			MFS(2) = 60,78 kN					
NAA(1,2) = -60,78	NAA(2,1) = 60,78		NAA(2,3) = -60,78		NAA(3,2) = 60,78			
DAA(1,2) = 0,56	DAA(2,1) = 0,56		DAA(2,3) = 0,56		DAA(3,2) = 0,56			
MFS(3) = 60,78 kN			MFS(4) = 60,78 kN					
NAA(3,4) = -60,78	NAA(4,3) = 60,78		NAA(4,5) = -60,78		NAA(5,4) = 60,78			
DAA(3,4) = 0,56	DAA(4,3) = 0,56		DAA(4,5) = 0,56		DAA(5,4) = 0,56			
MFS(5) = 60,78 kN			MFS(6) = 60,78 kN					
NAA(5,6) = -60,78	NAA(6,5) = 60,78		NAA(6,7) = -60,78		NAA(7,6) = 60,78			
DAA(5,6) = 0,56	DAA(6,5) = 0,56		DAA(6,7) = 0,56		DAA(7,6) = 0,56			
MFS(7) = 60,78 kN			MFS(8) = 60,78 kN					
NAA(7,8) = -60,78	NAA(8,7) = 60,78		NAA(8,9) = -60,78		NAA(9,8) = 60,78			
DAA(7,8) = 0,56	DAA(8,7) = 0,56		DAA(8,9) = 0,56		DAA(9,8) = 0,56			
LTF(4) = 60,78 kN	LCF(0) = 0,00 kN							

group b) the top parabola chord members

MFS(9) = -25,79 kN			MFS(10) = -47,70 kN					
NAA(10,11) = 25,79	NAA(11,10) = -25,00		NAA(11,12) = 47,70		NAA(12,11) = -47,14			
DAA(10,11) = 0,56	DAA(11,10) = 0,56		DAA(11,12) = 0,56		DAA(12,11) = 0,56			
MFS(11) = -62,52 kN			MFS(12) = -66,88 kN					
NAA(12,13) = 62,52	NAA(13,12) = -62,18		NAA(13,14) = 66,88		NAA(14,13) = -66,77			
DAA(12,13) = 0,56	DAA(13,12) = 0,56		DAA(13,14) = 0,56		DAA(14,13) = 0,56			
MFS(13) = -66,88 kN			MFS(14) = -62,52 kN					
NAA(14,15) = 66,77	NAA(15,14) = -66,88		NAA(15,16) = 62,18		NAA(16,15) = -62,52			
DAA(14,15) = 0,56	DAA(15,14) = 0,56		DAA(15,16) = 0,56		DAA(16,15) = 0,56			
MFS(15) = -47,70 kN			MFS(16) = -25,79 kN					
NAA(16,17) = 47,14	NAA(17,16) = -47,70		NAA(17,18) = 25,00		NAA(18,17) = -25,79			
DAA(16,17) = 0,56	DAA(17,16) = 0,56		DAA(17,18) = 0,56		DAA(18,17) = 0,56			
LTF(0) = 0,00 kN	LCF(12) -66,88 kN							

group c) the vertical parabola plane members

MFS(17) = -25,68 kN						MFS(18) = -19,17 kN		
NAA(1,10) = 25,68	NAA(10,1) = -24,18					NAA(11,19) = 19,93	NAA(19,11) = -19,17	
DAA(1,10) = 0,00	DAA(10,1) = 0,00					DAA(11,19) = 0,00	DAA(19,11) = 0,00	
MFS(19) = -8,85 kN						MFS(20) = 4,69 kN		
NAA(12,20) = 7,80	NAA(20,12) = -8,85					NAA(13,21) = -4,69	NAA(21,13) = 3,75	
DAA(12,20) = 0,00	DAA(20,12) = 0,00					DAA(13,21) = 0,00	DAA(21,13) = 0,00	
MFS(21) = 12,17 kN						MFS(22) = 4,69 kN		
NAA(14,22) = -12,17	NAA(22,14) = 11,97					NAA(15,23) = -4,69	NAA(23,15) = 3,75	
DAA(14,22) = 0,00	DAA(22,14) = 0,00					DAA(15,23) = 0,00	DAA(23,15) = 0,00	
MFS(23) = -8,85 kN						MFS(24) = -19,17 kN		
NAA(16,24) = 7,80	NAA(24,16) = -8,85					NAA(17,25) = 19,93	NAA(25,17) = -19,17	
DAA(16,24) = 0,00	DAA(24,16) = 0,00					DAA(17,25) = 0,00	DAA(25,17) = 0,00	
MFS(25) = -25,68 kN								
NAA(9,18) = 25,68	NAA(18,9) = -24,18							
DAA(9,18) = 0,00	DAA(18,9) = 0,00							
LTF(21) 12,17 kN	LCF(25) -25,68 kN							

group d) the sloping parabola plane members

MFS(26) = 22,63 kN						MFS(27) = 23,79 kN		
NAA(10,19) = -22,63	NAA(19,10) = 22,18					NAA(11,20) = -23,79	NAA(20,11) = 23,31	
DAA(10,19) = 0,56	DAA(19,10) = 0,56					DAA(11,20) = 0,56	DAA(20,11) = 0,56	
MFS(28) = 19,92 kN						MFS(29) = 8,66 kN		
NAA(12,21) = -19,92	NAA(21,12) = 19,32					NAA(13,22) = -8,66	NAA(22,13) = 7,87	
DAA(12,21) = 0,56	DAA(21,12) = 0,56					DAA(13,22) = 0,56	DAA(22,13) = 0,56	
MFS(30) = 8,66 kN						MFS(31) = 19,92 kN		
NAA(15,22) = -8,66	NAA(22,15) = 7,87					NAA(16,23) = -19,92	NAA(23,16) = 19,32	
DAA(15,22) = -0,56	DAA(22,15) = -0,56					DAA(16,23) = -0,56	DAA(23,16) = -0,56	
MFS(32) = 23,79 kN						MFS(33) = 22,63 kN		
NAA(17,24) = -23,79	NAA(24,17) = 23,31					NAA(18,25) = -22,63	NAA(25,18) = 22,18	
DAA(17,24) = -0,56	DAA(24,17) = -0,56					DAA(18,25) = -0,56	DAA(25,18) = -0,56	
LTF(27) 23,79 kN	LCF(0) = 0,00 kN							

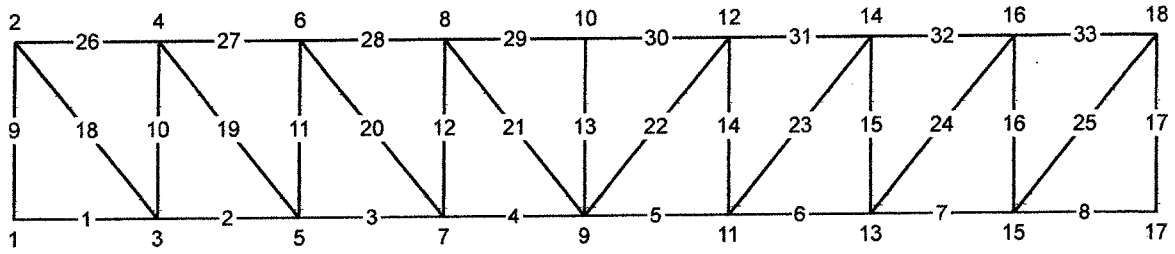
group e) the bottom parabola chord members

MFS(34) = -83,66 kN						MFS(35) = -48,42 kN		
NAA(1,19) = 83,66	NAA(19,1) = -82,51					NAA(19,20) = 48,42	NAA(20,19) = -47,67	
DAA(1,19) = 0,56	DAA(19,1) = 0,56					DAA(19,20) = 0,56	DAA(20,19) = 0,56	
MFS(36) = -20,01 kN						MFS(37) = -1,14 kN		
NAA(20,21) = 20,01	NAA(21,20) = -19,56					NAA(21,22) = 1,14	NAA(22,21) = -0,99	
DAA(20,21) = 0,56	DAA(21,20) = 0,56					DAA(21,22) = 0,56	DAA(22,21) = 0,56	
MFS(38) = -1,14 kN						MFS(39) = -20,01 kN		
NAA(22,23) = 0,99	NAA(23,22) = -1,14					NAA(23,24) = 19,56	NAA(24,23) = -20,01	
DAA(22,23) = 0,56	DAA(23,22) = 0,56					DAA(23,24) = 0,56	DAA(24,23) = 0,56	
MFS(40) = -48,42 kN						MFS(41) = -83,66 kN		
NAA(24,25) = 47,67	NAA(25,24) = -48,42					NAA(9,25) = 83,66	NAA(25,9) = -82,61	
DAA(24,25) = 0,56	DAA(25,24) = 0,56					DAA(9,25) = -0,56	DAA(25,9) = -0,56	
LTF(0) = 0,00 kN	LCF(34) -83,66 kN							

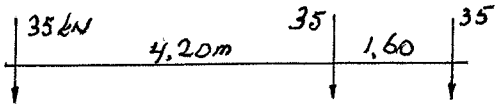
group f) the remaining vertical plane members

MFS(42) = 17,18 kN						MFS(43) = 17,93 kN		
NAA(2,19) = -16,13	NAA(19,2) = 17,13					NAA(3,20) = -16,13	NAA(20,3) = 17,93	
DAA(2,19) = 0,00	DAA(19,2) = 0,00					DAA(3,20) = 0,00	DAA(20,3) = 0,00	
MFS(44) = 18,38 kN						MFS(45) = 18,53 kN		
NAA(4,21) = -16,13	NAA(21,4) = 13,33					NAA(5,22) = -16,13	NAA(22,5) = 18,53	
DAA(4,21) = 0,00	DAA(21,4) = 0,00					DAA(5,22) = 0,00	DAA(22,5) = 0,00	
MFS(46) = 18,38 kN						MFS(47) = 17,93 kN		
NAA(6,23) = -16,13	NAA(23,6) = 13,33					NAA(7,24) = -16,13	NAA(24,7) = 17,93	
DAA(6,23) = 0,00	DAA(23,6) = 0,00					DAA(7,24) = 0,00	DAA(24,7) = 0,00	
MFS(48) = 17,18 kN								
NAA(8,25) = -16,13	NAA(25,8) = 17,13							
DAA(8,25) = 0,00	DAA(25,8) = 0,00							
LTF(45) 18,53 kN	LCF(0) = 0,00 kN							

ProTruss2A



V9= 4 L9= 16,8 m H9= 2,6 m
N9= 18 joints and P9= 33 members



group a)	the bottom chord members	1	To	8
group b)	the vertical plane members	9	To	17
group c)	the sloping plane members	18	To	25
group d)	the top chord members	26	To	33

MF= 3 mobile forces
MFF(1) = 35,00 kN MA(1) = 0,00 m
MFF(2) = 35,00 kN MA(2) = 1,60 m
MFF(3) = 35,00 kN MA(3) = 4,20 m

I3= 1 K1= 3
group a) the bottom chord members
LTF1(4) = 84,13 kN LCF1(1) = 0,00 kN
group b) the vertical plane members
LTF1(12)= 20,83 kN LCF1(10)= -49,17 kN
group c) the sloping plane members
LTF1(18)= 63,20 kN LCF1(21)= -26,78 kN
group d) the top chord members
LTF1(0) = 0,00 kN LCF1(28)= -84,13 kN

I3= 3 K1= 1
LTF1(2) = 30,62 kN LCF1(1) = 0,00 kN
LTF1(12)= 5,42 kN LCF1(9) = -37,92 kN
LTF1(18)= 48,74 kN LCF1(19)= -6,96 kN
LTF1(0) = 0,00 kN LCF1(26)= -30,63 kN

I3= 3 K1= 3
LTF1(4) = 115,60 kN LCF1(1) = 0,00 kN
LTF1(12)= 7,29 kN LCF1(9) = -71,04 kN
LTF1(18)= 91,32 kN LCF1(21)= -9,37 kN
LTF1(0) = 0,00 kN LCF1(28)= -115,60 kN

I3= 5 K1= 1
LTF1(3) = 68,65 kN LCF1(1) = 0,00 kN
LTF1(12)= 14,17 kN LCF1(9) = -55,83 kN
LTF1(18)= 71,77 kN LCF1(20)= -18,21 kN
LTF1(0) = 0,00 kN LCF1(27)= -68,65 kN

I3= 5 K1= 3
LTF1(5) = 114,09 kN LCF1(1) = 0,00 kN
LTF1(13)= 0,00 kN LCF1(9) = -57,92 kN
LTF1(18)= 74,45 kN LCF1(0) = 0,00 kN
LTF1(0) = 0,00 kN LCF1(29)= -130,58 kN

I3= 7 K1= 1
LTF1(4) = 96,75 kN LCF1(1) = 0,00 kN
LTF1(12)= 23,96 kN LCF1(9) = -54,37 kN
LTF1(18)= 69,90 kN LCF1(21)= -30,80 kN
LTF1(0) = 0,00 kN LCF1(28)= -96,75 kN

After input of truss data and mobile forces click ForceDivision, load cases appear, not all visible if too many, click on the form to delete them and click CalculateMobForces. So 2 cases omitted.

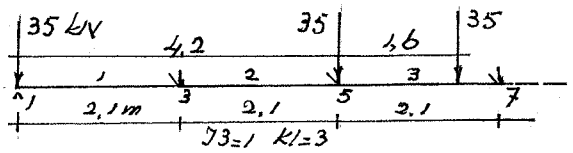
Click Go to FDATA and click MOBMFORCESPR, next PrPrOK to print the results by the printer.

I3 is joint number of the bottom chord. K1 is force number.
I3=1 and K1=3, the 3rd force of 35 kN on joint 1, the 2nd and 1st force on the right of it.
I3=5 and K1=2, the 2nd force on joint 5, the 1st on the right and the 3rd on the left of it.

I3= 3 K1= 2
LTF1(3) = 58,56 kN LCF1(1) = 0,00 kN
LTF1(12)= 12,08 kN LCF1(9) = -57,92 kN
LTF1(18)= 74,45 kN LCF1(20)= -15,53 kN
LTF1(0) = 0,00 kN LCF1(27)= -58,56 kN

Case I3=1 - K1=1, 2nd and 3rd on the left of joint 1 omitted, and
case I3=1 - K1=2, 1st on the right of joint 1 and 3rd on the left of joint 1 omitted.
So 2 cases omitted.

I3= 5 K1= 2
LTF1(4) = 84,13 kN LCF1(1) = 0,00 kN
LTF1(12)= 20,83 kN LCF1(10)= -49,17 kN
LTF1(18)= 63,20 kN LCF1(21)= -26,78 kN
LTF1(0) = 0,00 kN LCF1(28)= -84,13 kN



I3= 7 K1= 2
LTF1(4) = 115,60 kN LCF1(1) = 0,00 kN
LTF1(12)= 7,29 kN LCF1(9) = -71,04 kN
LTF1(18)= 91,32 kN LCF1(21)= -9,37 kN
LTF1(0) = 0,00 kN LCF1(28)= -115,60 kN

I3= 7 K1= 3

LTF1(5) =	124,35 kN	LCF1(1) =	0,00 kN
LTF1(14)=	9,79 kN	LCF1(16)=	-60,21 kN
LTF1(24)=	77,39 kN	LCF1(22)=	-12,59 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-124,35 kN

I3= 9 K1= 1

LTF1(4) =	114,76 kN	LCF1(1) =	0,00 kN
LTF1(13)=	0,00 kN	LCF1(9) =	-67,92 kN
LTF1(18)=	87,30 kN	LCF1(0) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(29)=	-119,81 kN

I3= 9 K1= 2

LTF1(5) =	114,09 kN	LCF1(1) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(9) =	-57,92 kN
LTF1(19)=	74,45 kN	LCF1(0) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(30)=	-130,58 kN

I3= 9 K1= 3

LTF1(5) =	99,62 kN	LCF1(1) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(17)=	-73,33 kN
LTF1(25)=	94,27 kN	LCF1(0) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(30)=	-102,31 kN

I3= 11 K1= 1

LTF1(5) =	121,66 kN	LCF1(1) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(9) =	-54,79 kN
LTF1(19)=	70,43 kN	LCF1(0) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(29)=	-127,21 kN

I3= 11 K1= 2

LTF1(5) =	124,35 kN	LCF1(1) =	0,00 kN
LTF1(14)=	9,79 kN	LCF1(16)=	-60,21 kN
LTF1(24)=	77,39 kN	LCF1(22)=	-12,59 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-124,35 kN

I3= 11 K1= 3

LTF1(5) =	74,88 kN	LCF1(1) =	0,00 kN
LTF1(14)=	18,54 kN	LCF1(17)=	-59,79 kN
LTF1(25)=	76,86 kN	LCF1(22)=	-23,83 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-74,88 kN

I3= 13 K1= 1

LTF1(5) =	118,46 kN	LCF1(1) =	0,00 kN
LTF1(14)=	6,67 kN	LCF1(16)=	-63,33 kN
LTF1(24)=	81,41 kN	LCF1(22)=	-8,57 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-118,46 kN

I3= 13 K1= 2

LTF1(5) =	99,62 kN	LCF1(1) =	0,00 kN
LTF1(13)=	0,00 kN	LCF1(17)=	-73,33 kN
LTF1(25)=	94,27 kN	LCF1(0) =	0,00 kN
LTF1(0) =	0,00 kN	LCF1(30)=	-102,31 kN

I3= 13 K1= 3

LTF1(6) =	42,40 kN	LCF1(1) =	0,00 kN
LTF1(15)=	8,75 kN	LCF1(16)=	-26,25 kN
LTF1(24)=	33,74 kN	LCF1(23)=	-11,25 kN
LTF1(0) =	0,00 kN	LCF1(32)=	-42,40 kN

I3= 15 K1= 1

LTF1(5) =	93,73 kN	LCF1(1) =	0,00 kN
LTF1(14)=	1,88 kN	LCF1(17)=	-76,46 kN
LTF1(25)=	98,28 kN	LCF1(22)=	-2,41 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-93,73 kN

I3= 15 K1= 2

LTF1(5) =	74,88 kN	LCF1(1) =	0,00 kN
LTF1(14)=	18,54 kN	LCF1(17)=	-59,79 kN
LTF1(25)=	76,86 kN	LCF1(22)=	-23,83 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-74,88 kN

I3= 15 K1= 3

LTF1(7) =	24,74 kN	LCF1(1) =	0,00 kN
LTF1(16)=	4,38 kN	LCF1(17)=	-30,62 kN
LTF1(25)=	39,37 kN	LCF1(24)=	-5,62 kN
LTF1(0) =	0,00 kN	LCF1(33)=	-24,74 kN

I3= 17 K1= 1

LTF1(5) =	62,26 kN	LCF1(1) =	0,00 kN
LTF1(14)=	15,42 kN	LCF1(17)=	-46,25 kN
LTF1(25)=	59,45 kN	LCF1(22)=	-19,82 kN
LTF1(0) =	0,00 kN	LCF1(31)=	-62,26 kN

Case I3=17 - K1=2, 1st on the right of joint 17 and 3rd force on the left of joint 17, and case I3=17 - K1=3, 1st and 2nd force on the right of joint 17.
Four cases calculated but results not shown.
With 9 bottom chord joints results of 9*MF= 9*3= 27 minus 2*2 is 23 cases are shown.
When clicking MOBFORCES results of all cases appear on the screen in a single column, just click and click...

group a) the bottom chord members
LLTF(5) = 124,35 kN LLCF(1) = 0,00 kN

group b) the vertical plane members
LLTF(12)= 23,96 kN LLCF(17)= -76,46 kN

group c) the sloping plane members
LLTF(25)= 98,28 kN LLCF(21)= -30,80 kN

group d) the top chord members
LLTF(33)= 0,00 kN LLCF(29)= -130,58 kN

With forces in reversed order final results.

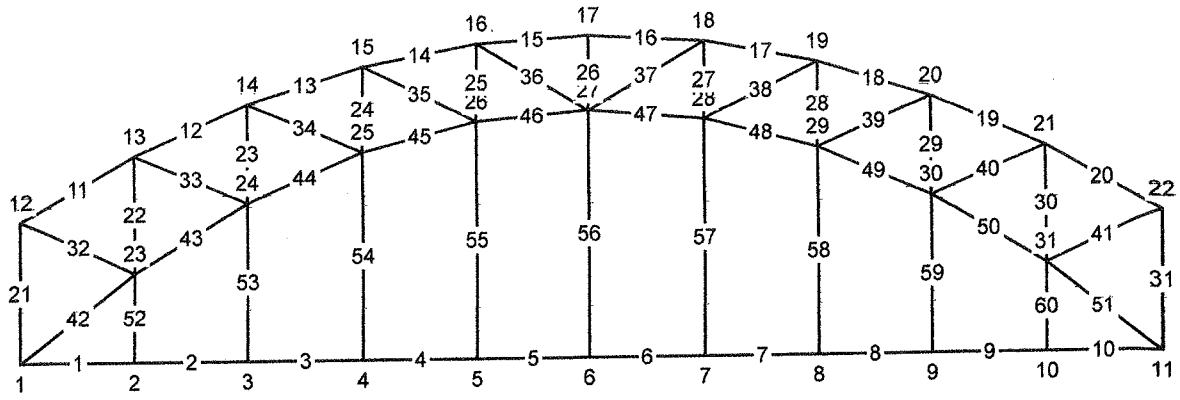
group a) the bottom chord members
LLTF(4) = 124,35 kN LLCF(1) = 0,00 kN

group b) the vertical plane members
LLTF(14)= 23,96 kN LLCF(9) = -76,46 kN

group c) the sloping plane members
LLTF(18)= 98,28 kN LLCF(22)= -30,80 kN

group d) the top chord members
LLTF(33)= 0,00 kN LLCF(29)= -130,58 kN

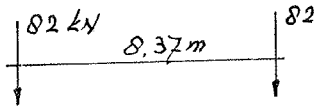
ProParTruss3



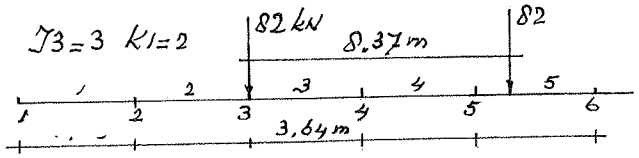
V9= 5 L9= 36,4 m H9= 10,3 m A8= 4,5 m A7= 2,4 m
N9= 31 joints and P9= 60 members

group a)	the bottom chord members	1	To	10
group b)	the top parabola chord members	11	To	20
group c)	the vertical parabola plane members	21	To	31
group d)	the sloping parabola plane members	32	To	41
group e)	the bottom parabola chord members	42	To	51
group f)	the remaining vertical plane members	52	To	60

MF= 2 mobile forces
MFF(1) = 82,00 kN MA(1) = 0,00 m
MFF(2) = 82,00 kN MA(2) = 8,37 m



After input mobile forces click ForceDivision and CalculateMobForces.



Click Go to FDATA next MOBMFORCESPR, SHORT and PrPrOK to get the results by the printer shown here.

I3= 1 K1= 2
group a) the bottom chord members
LTF1(10)= 36,98 kN LCF1(0) = 0,00 kN
group b) the top parabola chord members
LTF1(19)= 17,24 kN LCF1(12)= -94,63 kN
group c) the vertical parabola plane members
LTF1(24)= 33,49 kN LCF1(22)= -41,81 kN
group d) the sloping parabola plane members
LTF1(33)= 57,63 kN LCF1(36)= -36,80 kN
group e) the bottom parabola chord members
LTF1(44)= 53,89 kN LCF1(49)= -57,48 kN
group f) the remaining vertical plane members
LTF1(53)= 57,45 kN LCF1(0) = 0,00 kN

I3= 2 K1= 1
LTF1(10)= 17,59 kN LCF1(0) = 0,00 kN
LTF1(18)= 10,44 kN LCF1(11)= -67,31 kN
LTF1(22)= 16,90 kN LCF1(21)= -60,05 kN
LTF1(32)= 64,14 kN LCF1(35)= -17,06 kN
LTF1(43)= 47,73 kN LCF1(49)= -29,29 kN
LTF1(52)= 82,00 kN LCF1(0) = 0,00 kN

I3= 3 K1= 1
LTF1(8) = 33,23 kN LCF1(0) = 0,00 kN
LTF1(19)= 16,87 kN LCF1(12)= -107,40 kN
LTF1(23)= 32,01 kN LCF1(22)= -46,72 kN
LTF1(33)= 64,61 kN LCF1(35)= -32,75 kN
LTF1(44)= 70,70 kN LCF1(49)= -53,03 kN
LTF1(53)= 82,00 kN LCF1(0) = 0,00 kN

I3= 2 K1= 2
LTF1(10)= 65,77 kN LCF1(0) = 0,00 kN
LTF1(19)= 26,33 kN LCF1(13)= -142,89 kN
LTF1(25)= 52,36 kN LCF1(21)= -77,36 kN
LTF1(32)= 82,63 kN LCF1(36)= -67,87 kN
LTF1(45)= 72,72 kN LCF1(49)= -97,91 kN
LTF1(52)= 82,00 kN LCF1(0) = 0,00 kN

I3= 3 K1= 2
LTF1(10)= 87,87 kN LCF1(0) = 0,00 kN
LTF1(19)= 23,67 kN LCF1(14)= -152,62 kN
LTF1(25)= 50,38 kN LCF1(22)= -60,39 kN
LTF1(33)= 82,35 kN LCF1(36)= -55,20 kN
LTF1(46)= 62,27 kN LCF1(50)= -122,16 kN
LTF1(53)= 82,00 kN LCF1(0) = 0,00 kN

I3= 4 K1= 1

LTF1(10)=	58,07 kN	LCF1(0) =	0,00 kN
LTF1(19)=	25,22 kN	LCF1(13)=	-148,77 kN
LTF1(24)=	53,72 kN	LCF1(21)=	-63,73 kN
LTF1(32)=	68,07 kN	LCF1(36)=	-58,82 kN
LTF1(45)=	86,47 kN	LCF1(49)=	-88,41 kN
LTF1(54)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 5 K1= 1

LTF1(10)=	82,42 kN	LCF1(0) =	0,00 kN
LTF1(19)=	26,50 kN	LCF1(14)=	-162,25 kN
LTF1(25)=	70,54 kN	LCF1(21)=	-52,86 kN
LTF1(37)=	70,80 kN	LCF1(36)=	-88,66 kN
LTF1(46)=	77,24 kN	LCF1(50)=	-116,52 kN
LTF1(55)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 6 K1= 1

LTF1(10)=	98,44 kN	LCF1(0) =	0,00 kN
LTF1(20)=	15,44 kN	LCF1(16)=	-155,11 kN
LTF1(26)=	19,73 kN	LCF1(27)=	-47,34 kN
LTF1(37)=	99,22 kN	LCF1(41)=	-14,71 kN
LTF1(46)=	36,15 kN	LCF1(50)=	-130,86 kN
LTF1(56)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 7 K1= 1

LTF1(10)=	105,30 kN	LCF1(0) =	0,00 kN
LTF1(20)=	3,06 kN	LCF1(17)=	-147,38 kN
LTF1(27)=	26,71 kN	LCF1(28)=	-48,50 kN
LTF1(38)=	92,11 kN	LCF1(37)=	-14,57 kN
LTF1(47)=	39,61 kN	LCF1(42)=	-133,63 kN
LTF1(57)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 8 K1= 1

LTF1(8) =	101,42 kN	LCF1(0) =	0,00 kN
LTF1(11)=	12,54 kN	LCF1(15)=	-145,31 kN
LTF1(28)=	20,45 kN	LCF1(29)=	-51,21 kN
LTF1(39)=	85,12 kN	LCF1(32)=	-11,95 kN
LTF1(48)=	36,72 kN	LCF1(43)=	-131,40 kN
LTF1(58)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 9 K1= 1

LTF1(10)=	87,87 kN	LCF1(0) =	0,00 kN
LTF1(12)=	23,67 kN	LCF1(17)=	-152,62 kN
LTF1(27)=	50,38 kN	LCF1(30)=	-60,39 kN
LTF1(40)=	82,35 kN	LCF1(37)=	-55,20 kN
LTF1(47)=	62,27 kN	LCF1(43)=	-122,16 kN
LTF1(59)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 10 K1= 1

LTF1(10)=	65,77 kN	LCF1(0) =	0,00 kN
LTF1(12)=	26,33 kN	LCF1(18)=	-142,89 kN
LTF1(27)=	52,36 kN	LCF1(31)=	-77,36 kN
LTF1(41)=	82,63 kN	LCF1(37)=	-67,87 kN
LTF1(48)=	72,72 kN	LCF1(44)=	-97,91 kN
LTF1(60)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 11 K1= 1

LTF1(7) =	36,98 kN	LCF1(0) =	0,00 kN
LTF1(12)=	17,24 kN	LCF1(19)=	-94,63 kN
LTF1(28)=	33,49 kN	LCF1(30)=	-41,81 kN
LTF1(40)=	57,63 kN	LCF1(37)=	-36,80 kN
LTF1(49)=	53,89 kN	LCF1(44)=	-57,48 kN
LTF1(59)=	57,45 kN	LCF1(0) =	0,00 kN

I3= 4 K1= 2

LTF1(10)=	101,42 kN	LCF1(0) =	0,00 kN
LTF1(20)=	12,54 kN	LCF1(16)=	-145,31 kN
LTF1(24)=	20,45 kN	LCF1(23)=	-51,21 kN
LTF1(34)=	85,12 kN	LCF1(41)=	-11,95 kN
LTF1(45)=	36,72 kN	LCF1(50)=	-131,40 kN
LTF1(54)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 5 K1= 2

LTF1(10)=	105,30 kN	LCF1(0) =	0,00 kN
LTF1(11)=	3,06 kN	LCF1(14)=	-147,38 kN
LTF1(25)=	26,71 kN	LCF1(24)=	-48,50 kN
LTF1(35)=	92,11 kN	LCF1(36)=	-14,57 kN
LTF1(46)=	39,61 kN	LCF1(42)=	-133,63 kN
LTF1(55)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 6 K1= 2

LTF1(8) =	98,44 kN	LCF1(0) =	0,00 kN
LTF1(11)=	15,44 kN	LCF1(16)=	-155,11 kN
LTF1(26)=	19,73 kN	LCF1(25)=	-47,34 kN
LTF1(36)=	99,22 kN	LCF1(32)=	-14,71 kN
LTF1(47)=	36,15 kN	LCF1(43)=	-130,86 kN
LTF1(56)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 7 K1= 2

LTF1(8) =	82,42 kN	LCF1(0) =	0,00 kN
LTF1(12)=	26,50 kN	LCF1(17)=	-162,25 kN
LTF1(27)=	70,54 kN	LCF1(31)=	-52,86 kN
LTF1(36)=	70,80 kN	LCF1(37)=	-88,66 kN
LTF1(47)=	77,24 kN	LCF1(43)=	-116,52 kN
LTF1(57)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 8 K1= 2

LTF1(7) =	58,07 kN	LCF1(0) =	0,00 kN
LTF1(12)=	25,22 kN	LCF1(18)=	-148,77 kN
LTF1(28)=	53,72 kN	LCF1(31)=	-63,73 kN
LTF1(41)=	68,07 kN	LCF1(37)=	-58,82 kN
LTF1(48)=	86,47 kN	LCF1(44)=	-88,41 kN
LTF1(58)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 9 K1= 2

LTF1(10)=	33,23 kN	LCF1(0) =	0,00 kN
LTF1(12)=	16,87 kN	LCF1(19)=	-107,40 kN
LTF1(29)=	32,01 kN	LCF1(30)=	-46,72 kN
LTF1(40)=	64,61 kN	LCF1(38)=	-32,75 kN
LTF1(49)=	70,70 kN	LCF1(44)=	-53,03 kN
LTF1(59)=	82,00 kN	LCF1(0) =	0,00 kN

I3= 10 K1= 2

LTF1(10)=	17,59 kN	LCF1(0) =	0,00 kN
LTF1(13)=	10,44 kN	LCF1(20)=	-67,31 kN
LTF1(30)=	16,90 kN	LCF1(31)=	-60,05 kN
LTF1(41)=	64,14 kN	LCF1(38)=	-17,06 kN
LTF1(50)=	47,73 kN	LCF1(44)=	-29,29 kN
LTF1(60)=	82,00 kN	LCF1(0) =	0,00 kN

Click MOBMFORCESPR and SHORT, then the truss, input data, mobile forces and the final results here below are printed by the printer.

group a) the bottom chord members
LLTF(10)= 105,30 kN LLCF(0) = 0,00 kN

group b) the top parabola chord members
LLTF(19)= 26,50 kN LLCF(14)= -162,25 kN

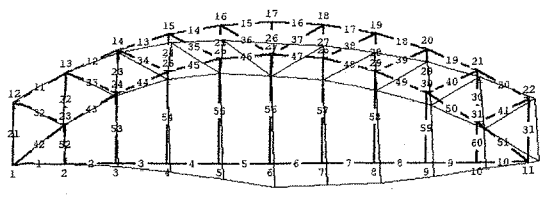
group c) the vertical parabola plane members
LLTF(27)= 70,54 kN LLCF(31)= -77,36 kN

group d) the sloping parabola plane members
LLTF(36)= 99,22 kN LLCF(36)= -88,66 kN

group e) the bottom parabola chord members
LLTF(48)= 86,47 kN LLCF(42)= -133,63 kN

group f) the remaining vertical plane members
LLTF(60)= 82,00 kN LLCF(0) = 0,00 kN

ProParTruss3



V9=5 L9=36,4 m H9=10,3 m A8=4,5 m A7=2,4 m
N9= 31 joints and P9= 60 members

group a)	the bottom chord members	1	To	10
group b)	the top parabola chord members	11	To	20
group c)	the vertical parabola plane members	21	To	31
group d)	the sloping parabola plane members	32	To	41
group e)	the bottom parabola chord members	42	To	51
group f)	the remaining vertical plane members	52	To	60

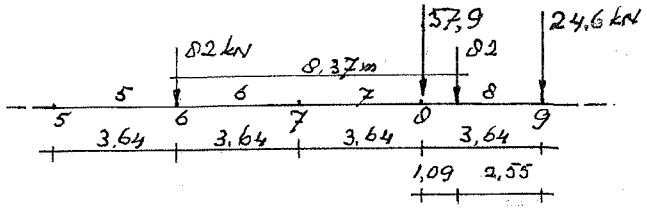
NAA(20,21)=	82,08	NAA(21,20)=	-82,08	NAA(21,22)=	26,84	NAA(22,21)=	-26,34
DAA(20,21)=	0,00	DAA(21,20)=	0,00	DAA(21,22)=	0,00	DAA(22,21)=	0,00
LTF(11) =	15,43 kN	LCF(16) =	-155,10 kN				

group c) the vertical parabola plane members

MFS(21) =	13,77 kN			MFS(22) =	-2,86 kN		
NAA(1,12) =	-13,77	NAA(12,1) =	13,77	NAA(13,23)=	2,86	NAA(23,13)=	-2,86
DAA(1,12) =	0,00	DAA(12,1) =	0,00	DAA(13,23)=	0,00	DAA(23,13)=	0,00
MFS(23) =	-20,56 kN			MFS(24) =	-36,73 kN		
NAA(14,24)=	20,56	NAA(24,14)=	-20,56	NAA(15,25)=	36,73	NAA(25,15)=	-36,73
DAA(14,24)=	0,00	DAA(24,14)=	0,00	DAA(15,25)=	0,00	DAA(25,15)=	0,00
MFS(25) =	-47,33 kN			MFS(26) =	19,73 kN		
NAA(16,26)=	47,33	NAA(26,16)=	-47,33	NAA(17,27)=	-19,73	NAA(27,17)=	19,73
DAA(16,26)=	0,00	DAA(26,16)=	0,00	DAA(17,27)=	0,00	DAA(27,17)=	0,00
MFS(27) =	3,72 kN			MFS(28) =	14,41 kN		
NAA(18,28)=	-3,72	NAA(28,18)=	3,72	NAA(19,29)=	-14,41	NAA(29,19)=	14,41
DAA(18,28)=	0,00	DAA(28,18)=	0,00	DAA(19,29)=	0,00	DAA(29,19)=	0,00
MFS(29) =	-32,63 kN			MFS(30) =	-41,33 kN		
NAA(20,30)=	32,63	NAA(30,20)=	-32,63	NAA(21,31)=	41,33	NAA(31,21)=	-41,33
DAA(20,30)=	0,00	DAA(30,20)=	0,00	DAA(21,31)=	0,00	DAA(31,21)=	0,00
MFS(31) =	-23,95 kN						
NAA(11,22)=	23,95	NAA(22,11)=	-23,95				
DAA(11,22)=	0,00	DAA(22,11)=	0,00				
LTF(26) =	19,73 kN	LCF(25) =	-47,33 kN				

Example of page 18.

Calculation for case I3=6 - K1=2, page 19.
the 2nd force of 82 kN is placed on joint I3=6,
the 1st force of 82 kN is placed at 8,37 m on
the right of loint 6, on member 8.
First force of 82 kN is divided over joint 8
and 9. Member length 36,4/10= 3,64 m.
Like on the preceding page.
V9=5 L9=36,4 m H9=10,3 m A8=4,5 m A7=2,4 m



(1,09/3,64)*82= 24,6 kN on joint 9 and
(2,55/3,64)*82= 57,4 kN on joint 8, rounded.

After input of the truss data type in TSTRING
FY(6)=-82 Enter, FY(8)=-57.4 Enter, and
FY(9)=-24.6 Enter.

Click DrawTF, TrussNumb, Calculate, DrawTFD to draw the truss with deformation.
Next click go to FDATA and click AMEFORCES for each group of members follow MFS(), NAA(L,H) and NAA(H,L) and after that underlined the largest tension value LTF(P) and largest compression vaLue LCF(P). Some of them on the left.

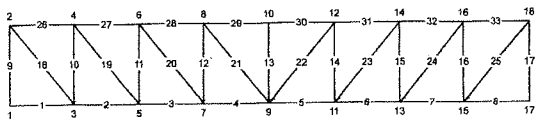
I3= 6 K1= 2

LTF1(8) =	98,44 kN	LCF1(0) =	0,00 kN	a)	LTF(8)=	98,44 kN	LCF(0)=	0 kN
LTF1(11)=	15,44 kN	LCF1(16)=	-155,11 kN	b)	LTF(11)=	15,43 kN	LCF(16)=	-155,10 kN
LTF1(26)=	19,73 kN	LCF1(25)=	-47,34 kN	c)	LTF(26)=	19,73 kN	LCF(25)=	-47,33 kN
LTF1(36)=	99,22 kN	LCF1(32)=	-14,71 kN	d)	LTF(36)=	99,21 kN	LCF(32)=	-14,71 kN
LTF1(47)=	36,15 kN	LCF1(43)=	-130,86 kN	e)	LTF(47)=	36,14 kN	LCF(43)=	-130,85 kN
LTF1(56)=	82,00 kN	LCF1(0) =	0,00 kN	f)	LTF(56)=	82,00 kN	LCF(0)=	0

ProTruss2A of page 16.

V9=4 L9=16.8 m H9=2.6 m
After input click ProTruss2A, type in TSTRING
MF=3 Enter, 1,35,0 Enter,
2,35,1.6 Enter and 3,35,4.2 Enter.

ProTruss2A



V9=4 L9= 16,8 m H9= 2,6 m
N9= 18 joints and P9= 33 members

group a)	the bottom chord members	1	To	8
group b)	the vertical plane members	9	To	17
group c)	the sloping plane members	18	To	25
group d)	the top chord members	26	To	33

MF= 3 mobile forces
MFF(1) = 35,00 kN MA(1) = 0,00 m
MFF(2) = 35,00 kN MA(2) = 1,60 m
MFF(3) = 35,00 kN MA(3) = 4,20 m

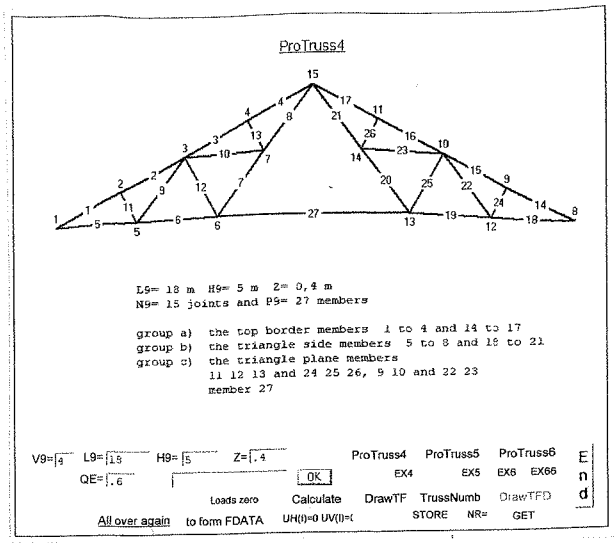
group a)	the bottom chord members			group b)	the vertical plane members		
LLTF(5) =	124,35 kN	LLCF(1) =	0,00 kN	LLTF(12)=	23,96 kN	LLCF(17)=	-76,46 kN
group c)	the sloping plane members			group d)	the top chord members		
LLTF(25)=	98,28 kN	LLCF(21)=	-30,80 kN	LLTF(33)=	0,00 kN	LLCF(29)=	-130,58 kN

group a)	the bottom chord members			group b)	the vertical plane members		
LLTF(4) =	124,35 kN	LLCF(1) =	0,00 kN	LLTF(14)=	23,96 kN	LLCF(9) =	-76,46 kN
group c)	the sloping plane members			group d)	the top chord members		
LLTF(18)=	98,28 kN	LLCF(22)=	-30,80 kN	LLTF(33)=	0,00 kN	LLCF(29)=	-130,58 kN

After data input click Show to check input.
Click Forcedivision showing load force cases, click the Form to get back the controls, click CalculateMobForces, go to FDATA.
Click SHORT and PrPr OK to get the printer print shown on the left with the largest LLTF() and LLCF() for each group of members.

The mobile forces in reversed order.
Back to the first form, click UV(I)=0 UH(I)=0,
Click Show, ah, FY(17)=-35, make it zero in TSTRING FY(17)=0 Enter. Click Show, ok, click IRO, Show, forces in reversed order.
ForceDivision, click form, CalculateMobForces, go to FDATA, SHORT and PrProOK, second results below the first.
Compairing results.

LLTF(**5**)= 124,35 kN and LLTF(**4**)= 124,35 kN,
LLTF(**25**)= 98,28 kN and LLTF(**18**)= 98,28 kN,
LLCF(**21**)= -30,80 kN and LLCF(**22**)= -30,80 kN.
Note the different member numbers.



ProTruss**4** L9=18 m H9= 5 m Z= 0,4 m

TRUSSPROGRAM5555

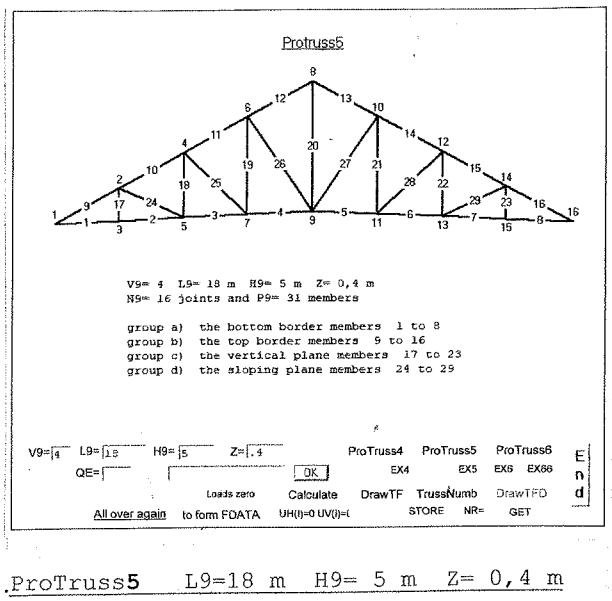
Three 'roof trusses'.

ProTruss**4** page 22 31

L9=18 m H9=5 m Z=0.4 m

N9= 15 joints and
P9= 27 members divided into 4 groups.

a) the top border members 1 to 4 and 14 to 17
b) triangle side members 5 to 8 and 18 to 21
c) the triangle plane members
11 12 13 and 24 25 26, 9 10 and 22 23
member 27



.ProTruss**5** L9=18 m H9= 5 m Z= 0,4 m

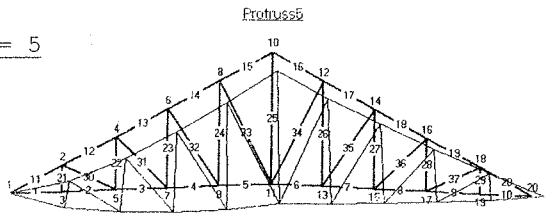
ProTruss**5** page 25 34

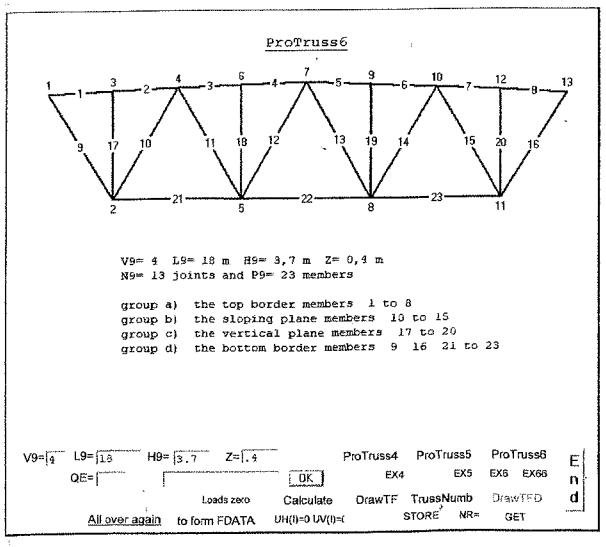
V9=4 L9=18 m H9=5 m Z=0.4 m

V9= 1, 2, 3 etc.
N9= V9*4= 16 joints and
P9= V9*8-3= 29 members divided into 4 groups.

a) the bottom border members 1 to 8
b) the top border members 9 to 16
c) the vertical plane members 17 to 23
d) the sloping plane mebers 24 to 29

V9= 5





ProTruss**6** L9=18 m H9= 3,7 m Z= 0,4 m

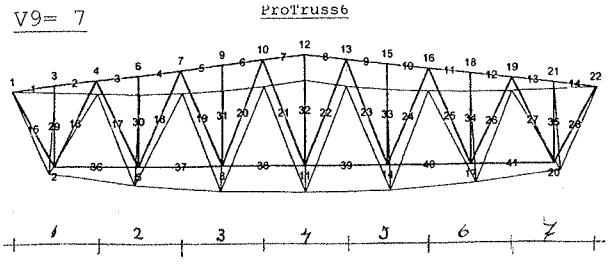
ProTruss**6** page 27 38

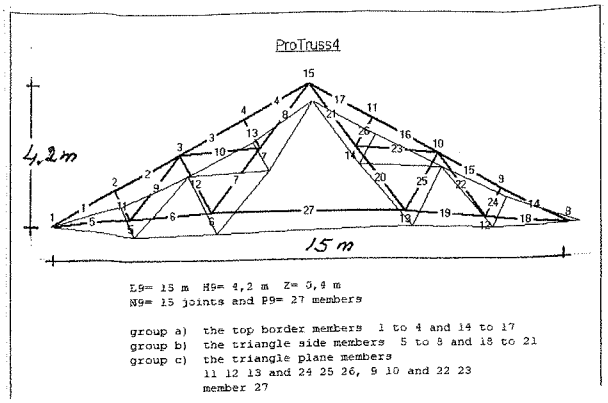
V9=4 L9=18 H9=3.7 Z=0.4

V9= 1, 2, 3 etc.
N9= V9*2+1= 13 joints and
P9= V9*6-1= 23 members divided into 4 groups.

a) the top border members 1 to 8
b) the sloping plane members 10 to 15
c) the vertrical plane members 17 to 20
d) the bottom border members 9 16 21 to 23

V9= 7

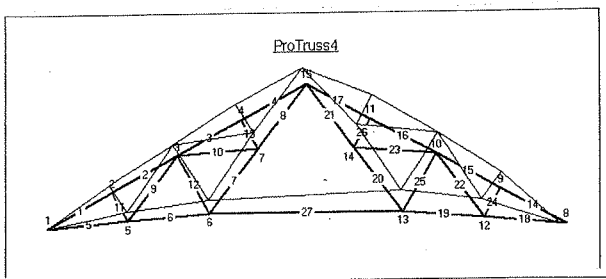




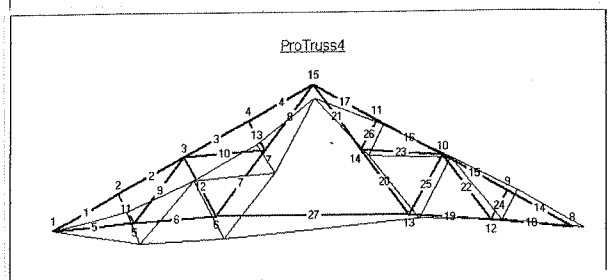
L9= 15 m H9= 4,2 m Z= 0,9 m
N9= 15 joints and P9= 27 members

group a) the top border members 1 to 4 and 14 to 17
group b) the triangle side members 5 to 8 and 18 to 21
group c) the triangle plane members
11 12 13 and 24 25 26, 9 10 and 22 23
member 27

```
ProTruss4
the top border members
MFS(1) =  -53,24 kN    MFS(2) =  -53,24 kN    MFS(3) =  -53,24 kN    MFS(4) =  -53,24 kN
MFS(14) =  -29,72 kN   MFS(15) =  -29,72 kN   MFS(16) =  -29,72 kN   MFS(17) =  -29,72 kN
  LTF(0) =    0,00 kN   LCF(3) =  -53,24 kN

the triangle side members
MFS(5) =   65,06 kN    MFS(6) =   52,05 kN    MFS(7) =   28,76 kN    MFS(8) =   41,78 kN
MFS(18) =  26,02 kN    MFS(19) =  26,02 kN    MFS(20) =   2,74 kN    MFS(21) =   2,74 kN
  LTF(5) =   65,06 kN   LCF(0) =    0,00 kN

the triangle plane members
MFS(9) =   13,01 kN    MFS(10) =  13,01 kN    MFS(11) =  -10,74 kN   MFS(12) =  -21,49 kN
MFS(13) =  -10,74 kN
MFS(22) =    0,00 kN   MFS(23) =    0,00 kN   MFS(24) =    0,00 kN   MFS(25) =    0,00 kN
MFS(26) =    0,00 kN
  LTF(10) =  13,01 kN   LCF(12) =  -21,49 kN

MFS(27) =   24,31 kN


RH(1) =  -21,00 kN     RV(1) =   25,19 kN     RV(8) =   12,32 kN

UH(1) =     0,0 /EA    UV(1) =     0,0 /EA    UH(2) =   571,9 /EA    UV(2) =  -1255,4 /EA
UH(3) =   669,0 /EA    UV(3) =  -1662,9 /EA   UH(4) =   679,3 /EA    UV(4) =  -1915,5 /EA
UH(5) =   274,0 /EA    UV(5) =  -1410,2 /EA   UH(6) =   426,3 /EA    UV(6) =  -1780,8 /EA
UH(7) =   718,4 /EA    UV(7) =  -1881,6 /EA   UH(8) =   791,4 /EA    UV(8) =     0,0 /EA
UH(9) =   449,3 /EA    UV(9) =   -741,5 /EA   UH(10) =  317,6 /EA    UV(10) = -1107,4 /EA

UH(11) =  226,1 /EA    UV(11) =  -1401,6 /EA  UH(12) =  656,8 /EA    UV(12) =  -857,7 /EA
UH(13) =  562,3 /EA    UV(13) =  -1244,4 /EA  UH(14) =  289,6 /EA    UV(14) =  -1437,2 /EA
UH(15) =  279,8 /EA    UV(15) =  -1436,3 /EA
```




```
ProTruss4
the top border members
MFS(1) =   20,33 kN    MFS(2) =   20,33 kN    MFS(3) =   20,33 kN    MFS(4) =   20,33 kN
MFS(14) =  39,14 kN    MFS(15) =  35,14 kN    MFS(16) =  35,14 kN    MFS(17) =  39,14 kN
  LTF(15) =  35,14 kN   LCF(0) =    0,00 kN

the triangle side members
MFS(5) =   -0,94 kN    MFS(6) =   -0,94 kN    MFS(7) =   -0,10 kN    MFS(8) =   -0,10 kN
MFS(18) =  -32,17 kN   MFS(19) =  -21,76 kN   MFS(20) =  -20,92 kN   MFS(21) =  -31,33 kN
  LTF(0) =    0,00 kN   LCF(18) =  -32,17 kN

the triangle plane members
MFS(9) =    0,00 kN    MFS(10) =   0,00 kN    MFS(11) =   0,00 kN    MFS(12) =   0,00 kN
MFS(13) =   0,00 kN
MFS(22) =  -10,41 kN   MFS(23) =  -10,41 kN   MFS(24) =   8,60 kN    MFS(25) =  17,19 kN
MFS(26) =   8,60 kN
  LTF(25) =  17,19 kN   LCF(22) =  -10,41 kN

MFS(27) =   -0,88 kN
```

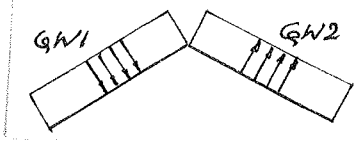



```
ProTruss4
the top border members
MFS(1) =  -32,91 kN    MFS(2) =  -32,91 kN    MFS(3) =  -32,91 kN    MFS(4) =  -32,91 kN
MFS(14) =   9,42 kN    MFS(15) =   9,42 kN    MFS(16) =   9,42 kN    MFS(17) =   9,42 kN
  LTF(16) =   9,42 kN   LCF(4) =  -32,91 kN

the triangle side members
MFS(5) =   64,12 kN    MFS(6) =   51,11 kN    MFS(7) =   28,66 kN    MFS(8) =   41,68 kN
MFS(18) =  -6,14 kN    MFS(19) =   4,27 kN    MFS(20) =  -18,18 kN   MFS(21) =  -28,59 kN
  LTF(5) =   64,12 kN   LCF(21) =  -28,59 kN

the triangle plane members
MFS(9) =   13,01 kN    MFS(10) =  13,01 kN    MFS(11) =  -10,74 kN   MFS(12) =  -21,49 kN
MFS(13) =  -10,74 kN
MFS(22) =  -10,41 kN   MFS(23) =  -10,41 kN   MFS(24) =   8,60 kN    MFS(25) =  17,19 kN
MFS(26) =   8,60 kN
  LTF(25) =  17,19 kN   LCF(12) =  -21,49 kN

MFS(27) =   23,43 kN
```

Example. EX4

First case. QW1= 5 kN/m QW2= 0 kN/m

Click in TL9 and type 15, Tab, cursor in TH9, type 4.2, Tab, cursor in TZ9, type .4.



Assumed direction of wind load forces, QW1 and QW2 belong together, in the example separated.
After input of truss data click ProTruss4.
Next the wind loads QW=,QW1,QW2 in TSTRING
QW=,5,0 Enter.
Or click EX4 and ProTruss4.

Next DRawTF to draw the truss, click TrussNumb to number joints and members.
Click Calculate and DrawTFD to draw the deformation of the truss.

Click to form FDATA and click MFORCES to get the member forces MFS(), the largest tension forces LTF() and compression forces LCF() for each group of members.
And UHUV for the joint displacement

Second case. QW1= 0 kN/m QW2= 4 kN/m

Going on with the first case. Go back to the first form, click go back to TRUSSPROGRAMS.

Click Loads zero, UH(I)=0UV(I)=0 an Cls.

In TSTRING type QW=,0,4 Enter, and click DrawTF, TrussNumb, Calculate and DrawTFD, go to FDATA, Cls, MFORCES, and UHUV shown here below.

```
RH(1) =  -16,80 kN     RV(1) =   -9,85 kN     RV(8) =  -20,15 kN

UH(1) =     0,0 /EA    UV(1) =     0,0 /EA    UH(2) =  -155,3 /EA    UV(2) =   366,7 /EA
UH(3) =  -213,8 /EA    UV(3) =   560,6 /EA    UH(4) =  -270,8 /EA    UV(4) =   751,5 /EA
UH(5) =   -39,0 /EA    UV(5) =   431,8 /EA    UH(6) =   -59,5 /EA    UV(6) =   647,0 /EA
UH(7) =  -231,9 /EA    UV(7) =   773,7 /EA    UH(8) =  -281,6 /EA    UV(8) =     0,0 /EA
UH(9) =    57,6 /EA    UV(9) =   777,8 /EA    UH(10) =   88,4 /EA    UV(10) =  1004,9 /EA

UH(11) =   80,5 /EA    UV(11) =  1163,0 /EA   UH(12) =  -131,1 /EA   UV(12) =   873,9 /EA
UH(13) =  -64,4 /EA    UV(13) =  1052,1 /EA   UH(14) =   123,6 /EA   UV(14) =  1125,2 /EA
UH(15) =  -233,5 /EA   UV(15) =   774,5 /EA
```

Third case. QW1= 5 kN/m QW2= 4 kN/m

Click Loads zero and UH(I)=0UV(I)=0, next QW=,5,4 Enter, DrawTF, TrussNumb etc.

Comparing some calcualtion results.

Case 1	MFS(1)= -53,24 kN	UV(15)= -1436/EA
Case 2	MFS(1)= 20,33 kN	UV(15)= 775/EA +
Case 3	MFS(1)= -32,91 kN	UV(15)= -662/EA

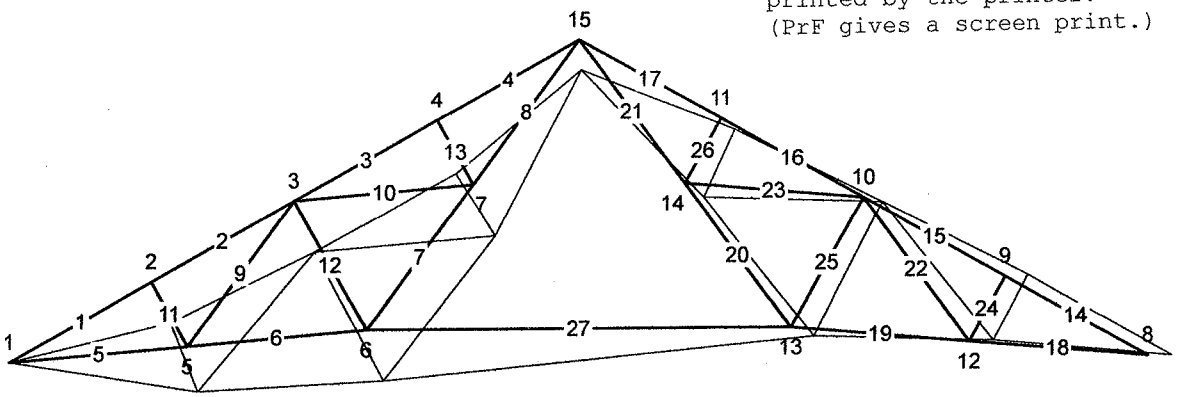
group b)

Case 1	LTF(5)= 65,05 kN	LCF(0)= 0
Case 2	LTF(0)= 0	LCF(18)= -32,17 kN
Case 3	LTF(5)= 64,12 kN	LCF(21)= -28,59 kN

```
RH(1) =  -97,80 kN     RV(1) =   15,33 kN     RV(8) =   -7,83 kN

UH(1) =     0,0 /EA    UV(1) =     0,0 /EA    UH(2) =   416,6 /EA    UV(2) =  -888,7 /EA
UH(3) =   455,2 /EA    UV(3) =  -1102,3 /EA   UH(4) =   408,5 /EA    UV(4) =  -1163,6 /EA
UH(5) =   235,1 /EA    UV(5) =   -978,4 /EA   UH(6) =   366,8 /EA    UV(6) =  -1103,8 /EA
UH(7) =   486,5 /EA    UV(7) =  -1108,0 /EA   UH(8) =   509,8 /EA    UV(8) =     0,0 /EA
UH(9) =   506,9 /EA    UV(9) =    36,3 /EA    UH(10) =  406,0 /EA    UV(10) =  -102,5 /EA

UH(11) =  396,5 /EA    UV(11) =  -238,6 /EA   UH(12) =  525,7 /EA    UV(12) =    16,2 /EA
UH(13) =  497,5 /EA    UV(13) =  -192,3 /EA   UH(14) =  413,2 /EA    UV(14) =  -307,9 /EA
UH(15) =   46,4 /EA    UV(15) =  -661,8 /EA
```

ProTruss4

Click met left mouse button
AMEFORCESPR for these results
printed by the printer.
(PrF gives a screen print.)



L9= 15 m H9= 4,2 m Z= 0,4 m
N9= 15 joints and P9= 27 members

Third case prec. page.

group a) the top border members 1 to 4 and 14 to 17
group b) the triangle side members 5 to 8 and 18 to 21
group c) the triangle plane members
11 12 13 and 24 25 26, 9 10 and 22 23
member 27

ProTruss4

the top border members

MFS(1)	=	-32,91 kN				MFS(2)	=	-32,91 kN			
NAA(1,2)	=	32,91	NAA(2,1)	=	-32,91	NAA(2,3)	=	32,91	NAA(3,2)	=	-32,91
DAA(1,2)	=	0,00	DAA(2,1)	=	0,00	DAA(2,3)	=	0,00	DAA(3,2)	=	0,00
MFS(3)	=	-32,91 kN				MFS(4)	=	-32,91 kN			
NAA(3,4)	=	32,91	NAA(4,3)	=	-32,91	NAA(4,15)	=	32,91	NAA(15,4)	=	-32,91
DAA(3,4)	=	0,00	DAA(4,3)	=	0,00	DAA(4,15)	=	0,00	DAA(15,4)	=	0,00
MFS(14)	=	9,42 kN				MFS(15)	=	9,42 kN			
NAA(8,9)	=	-9,42	NAA(9,8)	=	9,42	NAA(9,10)	=	-9,42	NAA(10,9)	=	9,42
DAA(8,9)	=	0,00	DAA(9,8)	=	0,00	DAA(9,10)	=	0,00	DAA(10,9)	=	0,00
MFS(16)	=	9,42 kN				MFS(17)	=	9,42 kN			
NAA(10,11)	=	-9,42	NAA(11,10)	=	9,42	NAA(11,15)	=	-9,42	NAA(15,11)	=	9,42
DAA(10,11)	=	0,00	DAA(11,10)	=	0,00	DAA(11,15)	=	0,00	DAA(15,11)	=	0,00
LTF(16)	=	9,42 kN	LCF(4)	=	-32,91 kN						

the triangle side members

MFS(5)	=	64,12 kN				MFS(6)	=	51,11 kN			
NAA(1,5)	=	-64,12	NAA(5,1)	=	64,12	NAA(5,6)	=	-51,11	NAA(6,5)	=	51,11
DAA(1,5)	=	0,00	DAA(5,1)	=	0,00	DAA(5,6)	=	0,00	DAA(6,5)	=	0,00
MFS(7)	=	28,66 kN				MFS(8)	=	41,68 kN			
NAA(6,7)	=	-28,66	NAA(7,6)	=	28,66	NAA(7,15)	=	-41,68	NAA(15,7)	=	41,68
DAA(6,7)	=	0,00	DAA(7,6)	=	0,00	DAA(7,15)	=	0,00	DAA(15,7)	=	0,00
MFS(18)	=	-6,14 kN				MFS(19)	=	4,27 kN			
NAA(8,12)	=	6,14	NAA(12,8)	=	-6,14	NAA(12,13)	=	-4,27	NAA(13,12)	=	4,27
DAA(8,12)	=	0,00	DAA(12,8)	=	0,00	DAA(12,13)	=	0,00	DAA(13,12)	=	0,00
MFS(20)	=	-18,18 kN				MFS(21)	=	-28,59 kN			
NAA(13,14)	=	18,18	NAA(14,13)	=	-18,18	NAA(14,15)	=	28,59	NAA(15,14)	=	-28,59
DAA(13,14)	=	0,00	DAA(14,13)	=	0,00	DAA(14,15)	=	0,00	DAA(15,14)	=	0,00
LTF(5)	=	64,12 kN	LCF(21)	=	-28,59 kN						

the triangle plane members

MFS(9)	=	13,01 kN				MFS(10)	=	13,01 kN			
NAA(3,5)	=	-13,01	NAA(5,3)	=	13,01	NAA(3,7)	=	-13,01	NAA(7,3)	=	13,01
DAA(3,5)	=	0,00	DAA(5,3)	=	0,00	DAA(3,7)	=	0,00	DAA(7,3)	=	0,00
MFS(11)	=	-10,74 kN				MFS(12)	=	-21,49 kN			
NAA(2,5)	=	10,74	NAA(5,2)	=	-10,74	NAA(3,6)	=	21,49	NAA(6,3)	=	-21,49
DAA(2,5)	=	0,00	DAA(5,2)	=	0,00	DAA(3,6)	=	0,00	DAA(6,3)	=	0,00
MFS(13)	=	-10,74 kN									
NAA(4,7)	=	10,74	NAA(7,4)	=	-10,74						
DAA(4,7)	=	0,00	DAA(7,4)	=	0,00						
MFS(22)	=	-10,41 kN				MFS(23)	=	-10,41 kN			
NAA(10,12)	=	10,41	NAA(12,10)	=	-10,41	NAA(10,14)	=	10,41	NAA(14,10)	=	-10,41
DAA(10,12)	=	0,00	DAA(12,10)	=	0,00	DAA(10,14)	=	0,00	DAA(14,10)	=	0,00

MFS(24) =	8,60 kN			MFS(25) =	17,19 kN		
NAA(9,12) =	-8,60	NAA(12,9) =	8,60	NAA(10,13)=	-17,19	NAA(13,10)=	17,19
DAA(9,12) =	0,00	DAA(12,9) =	0,00	DAA(10,13)=	0,00	DAA(13,10)=	0,00
MFS(26) =	8,60 kN						
NAA(11,14)=	-8,60	NAA(14,11)=	8,60				
DAA(11,14)=	0,00	DAA(14,11)=	0,00				
LTF(25) =	17,19 kN	LCF(12) =	-21,49 kN				

MFS(27) = 23,43 kN

ProTruss4

the top border members

MFS(1) =	-32,91 kN	MFS(2) =	-32,91 kN	MFS(3) =	-32,91 kN	MFS(4) =	-32,91 kN
MFS(14) =	9,42 kN	MFS(15) =	9,42 kN	MFS(16) =	9,42 kN	MFS(17) =	9,42 kN
LTF(16) =	9,42 kN	LCF(4) =	-32,91 kN				

the triangle side members

MFS(5) =	64,12 kN	MFS(6) =	51,11 kN	MFS(7) =	28,66 kN	MFS(8) =	41,68 kN
MFS(18) =	-6,14 kN	MFS(19) =	4,27 kN	MFS(20) =	-18,18 kN	MFS(21) =	-28,59 kN
LTF(5) =	64,12 kN	LCF(21) =	-28,59 kN				

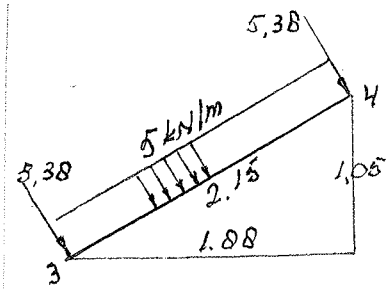
the triangle plane members

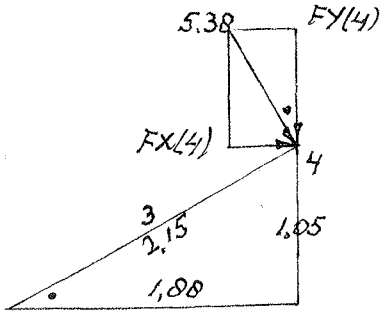
MFS(9) =	13,01 kN	MFS(10) =	13,01 kN	MFS(11) =	-10,74 kN	MFS(12) =	-21,49 kN
MFS(13) =	-10,74 kN						
MFS(22) =	-10,41 kN	MFS(23) =	-10,41 kN	MFS(24) =	8,60 kN	MFS(25) =	17,19 kN
MFS(26) =	8,60 kN						
LTF(25) =	17,19 kN	LCF(12) =	-21,49 kN				

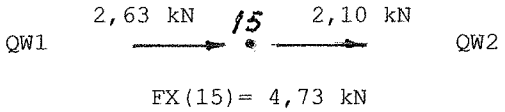
MFS(27) = 23,43 kN

X1(1) =	0,000 m	Y1(1) =	0,000 m	X1(2) =	1,875 m	Y1(2) =	1,050 m
X1(3) =	3,750 m	Y1(3) =	2,100 m	X1(4) =	5,625 m	Y1(4) =	3,150 m
X1(5) =	2,351 m	Y1(5) =	0,200 m	X1(6) =	4,702 m	Y1(6) =	0,400 m
X1(7) =	6,101 m	Y1(7) =	2,300 m	X1(8) =	15,000 m	Y1(8) =	0,000 m
X1(9) =	13,125 m	Y1(9) =	1,050 m	X1(10) =	11,250 m	Y1(10) =	2,100 m

FX(1) =	2,63 kN	FY(1) =	-4,69 kN	FX(2) =	5,25 kN	FY(2) =	-9,38 kN
FX(3) =	5,25 kN	FY(3) =	-9,38 kN	FX(4) =	5,25 kN	FY(4) =	-9,38 kN
FX(5) =	0,00 kN	FY(5) =	0,00 kN	FX(6) =	0,00 kN	FY(6) =	0,00 kN
FX(7) =	0,00 kN	FY(7) =	0,00 kN	FX(8) =	2,10 kN	FY(8) =	3,75 kN
FX(9) =	4,20 kN	FY(9) =	7,50 kN	FX(10) =	4,20 kN	FY(10) =	7,50 kN







FX(15)= 4,73 kN

Joint load FX(3) and FY(3) forces of joint 3.

X1(4)-X1(3)= 5,625-3,750= 1,88 m
Y1(4)-Y1(3)= 3,150-2,100= 1,05 m

L1=Sqr(1.88^2+1.05^2)= Sqr(4.63)= 2,15 m
Or click PDATA, with L1= 2,149 m.

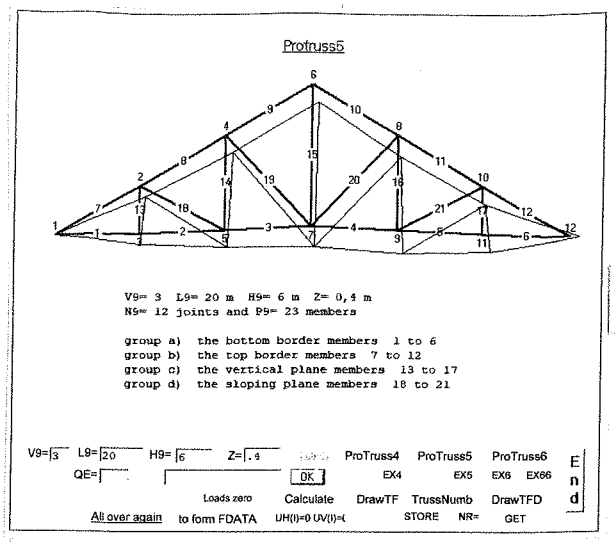
Wind load 5 kN/m over 2,15 m, 5*2,15= 10,75 kN,
on joint 3 and 4 10,75/2= 5,38 kN

FX(4)/1,05= 5,38/2,15

FX(4)= 1,05*(5,38/2,15)= 2,63 *2= 5,26 kN

FY(4)/1,88= 5,38/2,15

FY(4)= 1,88*(5,38/2,15)= 4,70 *2= 9,40 kN



Example. EX5

V9=3 L9= 20 m H9= 6 m Z=0.4 m
After input of these data click ProTruss5 and type in TSTRING FY(9)=-7 Enter.
(FY(I) is assumed upward, therefore here a minus sign.)

Next DrawTF, TrussNumb, Calculate, DrawTFD and click go to FDATA.
There click with right mouse button!! AMEFORCES to get D5(,), D6(,) and MF(,).

Fig.1.
Equilibrium of joint 9.

D5(9,7)= 8,33 kN D5(9,11)= -8,33 kN
D6(9,7)= -0,33 kN D6(9,11)= 0,33 kN

D5(9,8)= 0 kN D5(9,10)= 0 kN
D6(9,8)= -7,00 kN D699,10)= 0 kN

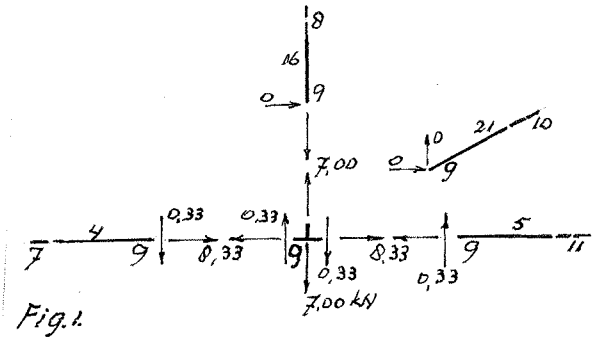


Fig.1.

The member end forces acting at the member ends are drawn with their real directions. At the joint act forces as large as but opposite directed.

ProTruss5
the bottom border members

MFS(1)	=	4,17 kN				MFS(2)	=	4,17 kN			
D5(1,3)	=	-4,17	D5(3,1)	=	4,17	D5(3,5)	=	-4,17	D5(5,3)	=	4,17
D6(1,3)	=	-0,17	D6(3,1)	=	0,17	D6(3,5)	=	-0,17	D6(5,3)	=	0,17
MFS(3)	=	4,17 kN				MFS(4)	=	8,34 kN			
D5(5,7)	=	-4,17	D5(7,5)	=	4,17	D5(7,9)	=	-8,33	D5(9,7)	=	8,33
D6(5,7)	=	-0,17	D6(7,5)	=	0,17	D6(7,9)	=	0,33	D6(9,7)	=	-0,33
MFS(5)	=	8,34 kN				MFS(6)	=	8,34 kN			
D5(9,11)	=	-8,33	D5(11,9)	=	8,33	D5(11,12)	=	-8,33	D5(12,11)	=	8,33
D6(9,11)	=	0,33	D6(11,9)	=	-0,33	D6(11,12)	=	0,33	D6(12,11)	=	-0,33
LTF(4)	=	8,34 kN	LCF(0)	=	0,00 kN						

ProTruss5
the vertical plane members

MFS(13)	=	0,00 kN				MFS(14)	=	0,00 kN			
D5(2,3)	=	0,00	D5(3,2)	=	0,00	D5(4,5)	=	0,00	D5(5,4)	=	0,00
D6(2,3)	=	0,00	D6(3,2)	=	0,00	D6(4,5)	=	0,00	D6(5,4)	=	0,00
MFS(15)	=	5,00 kN				MFS(16)	=	7,00 kN			
D5(6,7)	=	0,00	D5(7,6)	=	0,00	D5(8,9)	=	0,00	D5(9,8)	=	0,00
D6(6,7)	=	5,00	D6(7,6)	=	-5,00	D6(8,9)	=	7,00	D6(9,8)	=	-7,00
MFS(17)	=	0,00 kN									
D5(10,11)	=	0,00	D5(11,10)	=	0,00						
D6(10,11)	=	0,00	D6(11,10)	=	0,00						
LTF(16)	=	7,00 kN	LCF(0)	=	0,00 kN						

the sloping plane members

MFS(18)	=	0,00 kN				MFS(19)	=	0,00 kN			
D5(2,5)	=	0,00	D5(5,2)	=	0,00	D5(4,7)	=	0,00	D5(7,4)	=	0,00
D6(2,5)	=	0,00	D6(5,2)	=	0,00	D6(4,7)	=	0,00	D6(7,4)	=	0,00
MFS(20)	=	-6,13 kN				MFS(21)	=	0,00 kN			
D5(7,8)	=	4,17	D5(8,7)	=	-4,17	D5(8,10)	=	0,00	D5(10,8)	=	0,00
D6(7,8)	=	4,50	D6(8,7)	=	-4,50	D6(8,10)	=	0,00	D6(10,8)	=	0,00
LTF(21)	=	0,00 kN	LCF(20)	=	-6,13 kN						

Fig.2.
member 8
NAA(2,4)= 4,86 kN NAA(4,2)= -4,86 kN
DAA(2,4)= 0 kN DAA(4,2)= 0 kN

ProTruss5
the bottom border members

MFS(1)	=	4,17 kN				MFS(2)	=	4,17 kN			
NAA(1,3)	=	-4,17	NAA(3,1)	=	4,17	NAA(3,5)	=	-4,17	NAA(5,3)	=	4,17
DAA(1,3)	=	0,00	DAA(3,1)	=	0,00	DAA(3,5)	=	0,00	DAA(5,3)	=	0,00
MFS(3)	=	4,17 kN				MFS(4)	=	8,34 kN			
NAA(5,7)	=	-4,17	NAA(7,5)	=	4,17	NAA(7,9)	=	-8,34	NAA(9,7)	=	8,34
DAA(5,7)	=	0,00	DAA(7,5)	=	0,00	DAA(7,9)	=	0,00	DAA(9,7)	=	0,00
MFS(5)	=	8,34 kN				MFS(6)	=	8,34 kN			
NAA(9,11)	=	-8,34	NAA(11,9)	=	8,34	NAA(11,12)	=	-8,34	NAA(12,11)	=	8,34
DAA(9,11)	=	0,00	DAA(11,9)	=	0,00	DAA(11,12)	=	0,00	DAA(12,11)	=	0,00
LTF(4)	=	8,34 kN	LCF(0)	=	0,00 kN						

the top border members

MFS(7)	=	-4,86 kN				MFS(8)	=	-4,86 kN			
NAA(1,2)	=	4,86	NAA(2,1)	=	-4,86	NAA(2,4)	=	4,86	NAA(4,2)	=	-4,86
DAA(1,2)	=	0,00	DAA(2,1)	=	0,00	DAA(2,4)	=	0,00	DAA(4,2)	=	0,00
MFS(9)	=	-4,86 kN				MFS(10)	=	-4,86 kN			
NAA(4,6)	=	4,86	NAA(6,4)	=	-4,86	NAA(6,8)	=	4,86	NAA(8,6)	=	-4,86
DAA(4,6)	=	0,00	DAA(6,4)	=	0,00	DAA(6,8)	=	0,00	DAA(8,6)	=	0,00
MFS(11)	=	-9,72 kN				MFS(12)	=	-9,72 kN			
NAA(8,10)	=	9,72	NAA(10,8)	=	-9,72	NAA(10,12)	=	9,72	NAA(12,10)	=	-9,72
DAA(8,10)	=	0,00	DAA(10,8)	=	0,00	DAA(10,12)	=	0,00	DAA(12,10)	=	0,00
LTF(0)	=	0,00 kN	LCF(11)	=	-9,72 kN						

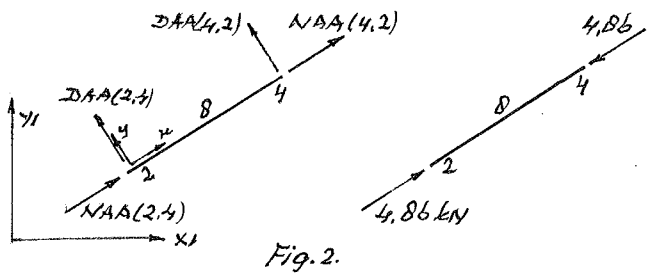


Fig.2.

Figure on the right with member and forces drawn with their real directions, the forces push at the member ends, it's a compression member. It has been agreed to indicate it with a minus sign, so MFS(8)= -4,86 kN.

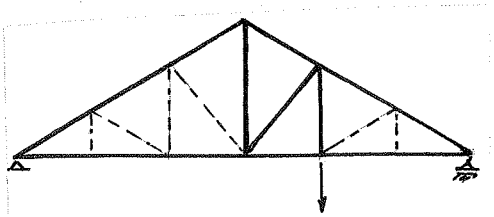
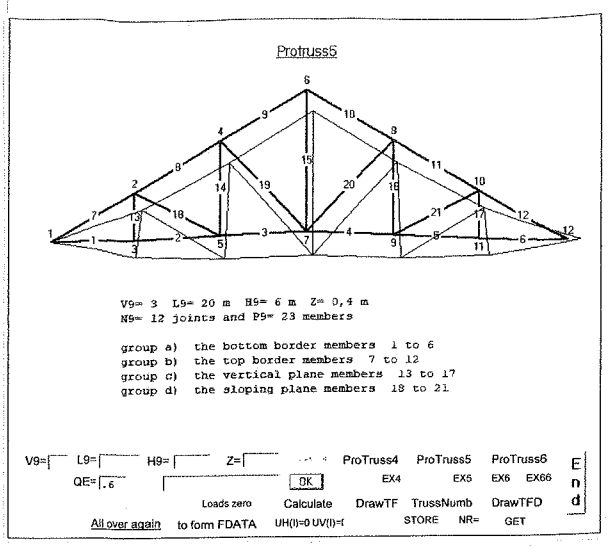


Fig.3.

Fig.3.
Only joint load force FY(9)= -7 kN, and no own weight. There are 6 zero members.... without them the truss would collapse... because of the member end hinges.



P	All	L1	QE	P	All	L1	QE	P	All	L1	QE	P	All	L1	QE
1	1,00	3,336	0,60	2	1,00	3,336	0,60	3	1,00	3,336	0,60	4	1,00	3,336	0,60
5	1,00	3,336	0,60	6	1,00	3,336	0,60	7	1,00	3,887	0,60	8	1,00	3,887	0,60
9	1,00	3,887	0,60	10	1,00	3,887	0,60	11	1,00	3,887	0,60	12	1,00	3,887	0,60
13	1,00	1,867	0,60	14	1,00	3,733	0,60	15	1,00	5,600	0,60	16	1,00	3,733	0,60
17	1,00	1,867	0,60	18	1,00	3,757	0,60	19	1,00	4,906	0,60	20	1,00	4,906	0,60
21	1,00	3,757	0,60												

X1(1) =	0,000 m	Y1(1) =	0,000 m	X1(2) =	3,333 m	Y1(2) =	2,000 m
X1(3) =	3,333 m	Y1(3) =	0,133 m	X1(4) =	6,667 m	Y1(4) =	4,000 m
X1(5) =	6,667 m	Y1(5) =	0,267 m	X1(6) =	10,000 m	Y1(6) =	6,000 m
X1(7) =	10,000 m	Y1(7) =	0,400 m	X1(8) =	13,333 m	Y1(8) =	4,000 m
X1(9) =	13,333 m	Y1(9) =	0,267 m	X1(10) =	16,667 m	Y1(10) =	2,000 m
X1(11) =	16,667 m	Y1(11) =	0,133 m	X1(12) =	20,000 m	Y1(12) =	0,000 m

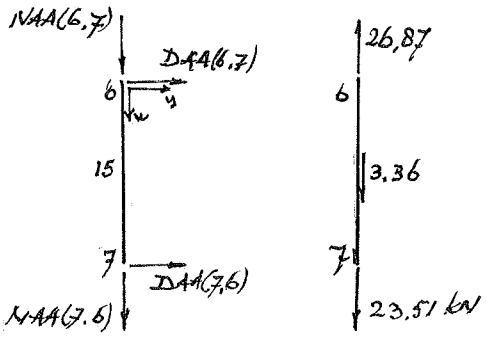
FX(1) =	0,00 kN	FY(1) =	-2,17 kN	FX(2) =	0,00 kN	FY(2) =	-4,02 kN
FX(3) =	0,00 kN	FY(3) =	-2,56 kN	FX(4) =	0,00 kN	FY(4) =	-4,92 kN
FX(5) =	0,00 kN	FY(5) =	-4,25 kN	FX(6) =	0,00 kN	FY(6) =	-4,01 kN
FX(7) =	0,00 kN	FY(7) =	-6,63 kN	FX(8) =	0,00 kN	FY(8) =	-4,92 kN
FX(9) =	0,00 kN	FY(9) =	-4,25 kN	FX(10) =	0,00 kN	FY(10) =	-4,02 kN
FX(11) =	0,00 kN	FY(11) =	-2,56 kN	FX(12) =	0,00 kN	FY(12) =	-2,17 kN

the top border members

MFS(7) =	-44,48 kN					MFS(8) =	-37,63 kN		
NAA(1,2) =	44,48	NAA(2,1) =	-48,28	NAA(2,4) =	37,63	NAA(4,2) =	-36,43		
DAA(1,2) =	1,00	DAA(2,1) =	1,00	DAA(2,4) =	1,00	DAA(4,2) =	1,00		
MFS(5) =	-28,98 kN					MFS(10) =	-28,98 kN		
NAA(4,6) =	28,98	NAA(6,4) =	-27,78	NAA(6,8) =	27,78	NAA(8,6) =	-28,98		
DAA(4,6) =	1,00	DAA(6,4) =	1,00	DAA(6,8) =	1,00	DAA(8,6) =	1,00		
MFS(11) =	-37,63 kN					MFS(12) =	-44,48 kN		
NAA(8,10) =	36,43	NAA(10,8) =	-37,63	NAA(10,12)=	43,28	NAA(12,10)=	-44,48		
DAA(8,10) =	1,00	DAA(10,8) =	1,00	DAA(10,12)=	1,00	DAA(12,10)=	1,00		
LTF(0) =	0,00 kN	LCF(7) =	-44,48 kN						

ProTruss5
the vertical plane members

MFS(13) =	3,12 kN					MFS(14) =	8,66 kN		
NAA(2,3) =	-3,12	NAA(3,2) =	2,00	NAA(4,5) =	-8,66	NAA(5,4) =	6,42		
DAA(2,3) =	0,00	DAA(3,2) =	0,00	DAA(4,5) =	0,00	DAA(5,4) =	0,00		
MFS(15) =	26,87 kN					MFS(16) =	8,66 kN		
NAA(6,7) =	-26,87	NAA(7,6) =	23,51	NAA(8,9) =	-8,66	NAA(9,8) =	6,42		
DAA(6,7) =	0,00	DAA(7,6) =	0,00	DAA(8,9) =	0,00	DAA(9,8) =	0,00		
MFS(17) =	3,12 kN								
NAA(10,11)=	-3,12	NAA(11,10)=	2,00						
DAA(10,11)=	0,00	DAA(11,10)=	0,00						
LTF(15) =	26,87 kN	LCF(0) =	0,00 kN						



member 15 Fig.2.
L1= 5,60 m 5,60*0,6= 3,36 kN
NAA(6,7)= -26,87 NAA(7,6)= 23,51 kN
MFS(15)= 26,87 kN, tension member.

Example.

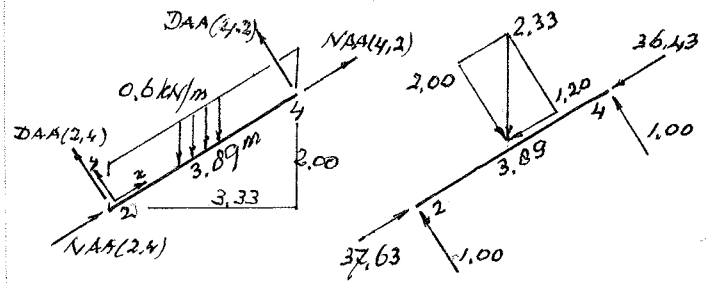
V9=3 L9= 20 m H9= 6 m Z=0.4 m
After input of these data click ProTruss5.

Suppose own weight of the members QE=0.6 kN/m. type 0.6 in TQE, at same time all members have For P=1 To P9 QEE(P)=.6. (With input QE not necessary to click ProTruss5 again.)
Next DrawTF, TrussNumb, Calculate, DrawTFD, the truss and deformation appear.

Click go to FDATA and click PDATA for member data and X1Y1 for joint coordinates and AMEFORCES to get the member end forces NAA(,), DAA(,) and MFS().

Fig.1.
member 8
The member ends are hinges. QE= 0,6 kN/m.
PDATA gives length L1= 3,887 m.
a= X1(4)-X1(2)= 6,667-3,334= 3,334 m
b= Y1(4)-Y1(2)= 4,000-2,000= 2,000 m
Length L1= Sqr(5,334^2+2,000^2)= 3,888 m

own weight is 3,89*0,6= 2,33 kN
The components are
(2,33/3,89)*3,33= 2,00 kN
(2,33/3,89)*2,00= 1,20 kN



NAA(2,4)= 37,63 kN NAA(4,2)= -36,43 kN
DAA(2,4)= 1,00 kN DAA(4,2)= 1,00 kN

These member end forces acting at the member ends are drawn with their real directions. Both forces push at the member ends, compression, 37,63 is larger than 36,43 therefore

MFS(8)= -37,63 kN, a compression member.

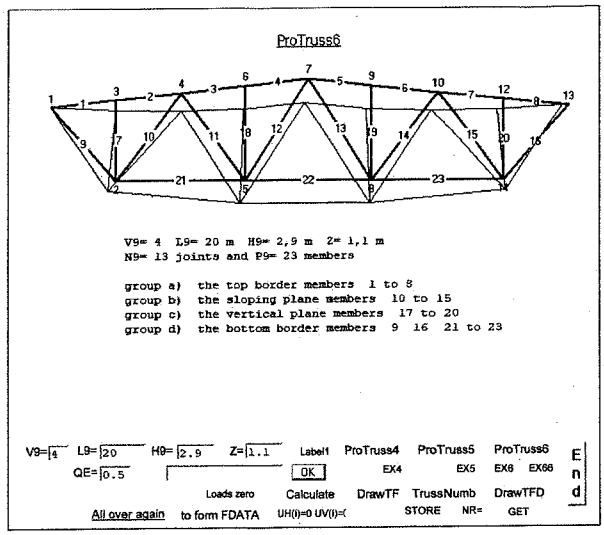
Joint load forces FY(2) and FY(4).

Joint load force FY(I) assumed upward.
Joint 2 with FY(2)= -4,02 kN is sum of

member 7	(3,89*0,6)/2=	1,17 kN
member 8	(3,89*0,6)/2=	1,17 kN
member 13	(1,87*0,6)/2=	0,56 kN
member 18	(3,76*0,6)/2=	1,13 kN
		4,03 kN ok

Joint 4 with FY(4)= -4,92 kN

member 7	(3,89*0,6)/2=	1,17 kN
member 8	(3,89*0,6)/2=	1,17 kN
member 13	(3,73*0,6)/2=	1,12 kN
member 18	(3,76*0,6)/2=	1,47 kN
		4,93 kN ok



Example. EX6

V9=4 L9= 20 m H9= 2.9 m Z=1.1 m
After input of these data click ProTruss6.

Suppose own weight of the members QE=0.5 kN/m.
type 0.5 in TQE.
Next DrawTF, TrussNumb, Calculate, DrawTFD, the truss and the truss deformation is drawn.

Click go to FDATA and click PDATA for member data and X1Y1 for joint coordinates and AMEFORCES to get the member end forces NAA(,), DAA(,) and MFS().
Next page with printer prints with a click on AMEFORCESPR.

Fig.1.
member 11

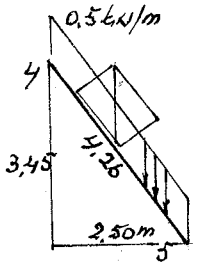
a= X1(5)-X1(4)= 7,50-5,00= 2,50 m
b= Y1(4)-Y1(5)= 3,45-0,00= 3,45 m
L1= Sqr(2,50^2+3,45^2)= 4,26 m

UH(4)= -2,4 /EA UV(4)= -676,8 /EA
UH(5)= -190,5 /EA UV(5)= -855,8 /WA

The displacements at the member ends are drawn here below with real directions, not on same scale, otherwise not 'visible'.
Calculation of the components.

joint 4 a= (2,4/4,26)*2,50= 1,4 /EA
b= (676,8/4,26)*3,45= 548,1 /EA

joint 5 c= (190,5/4,26)*2,50= 111,8 /EA
d= (855,8/4,26)*3,45= 693,1 /EA



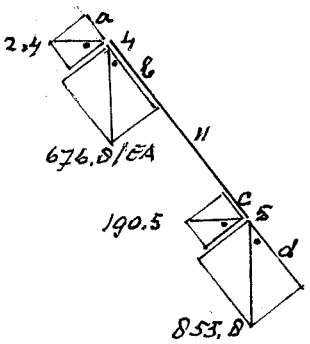


Fig.1.

b-a= 548,1-1,4= 546,7 /EA
d-c= 693,1-111,8= 581,3 /EA
member 11 lengthens 581,3-546,7= 34,6 /EA

Fig.2.
NAA(4,5)= -8,99 kN NAA(5,4)= 7,26 kN
MFS(11)= 8,99 kN, a tension member.

Distributed member load along the member is
(0,5/4,26)*3,45= 0,40 kN/m

0,40*4,26= 1,70 kN 8,99-7,26= 1,73 kN ok
Lengthening due to 0,40 kN/m is
(0,4*4,26^2)/2= 3,63 /EA
and due to 7,26 kN, Hooke,
(7,26*4,26)/EA= 30,93/EA, together
3,63+30,93= 34,56 is 34,6 /EA. ok

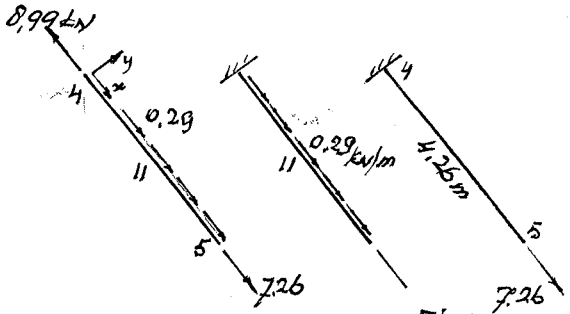
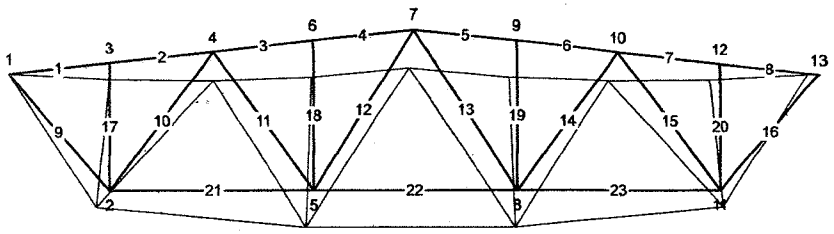


Fig.2.

ProTruss6



V9= 4 L9= 20 m H9= 2,9 m Z= 1,1 m
N9= 13 joints and P9= 23 members
group a) the top border members 1 to 8
group b) the sloping plane members 10 to 15
group c) the vertical plane members 17 to 20
group d) the bottom border members 9 16 21 to 23

ProTruss6

the top border members

MFS(1)	=	-15,26 kN				MFS(2)	=	-15,26 kN			
NAA(1,3)	=	15,26	NAA(3,1)	=	-15,12	NAA(3,4)	=	15,26	NAA(4,3)	=	-15,12
DAA(1,3)	=	0,62	DAA(3,1)	=	0,63	DAA(3,4)	=	0,63	DAA(4,3)	=	0,63
MFS(3)	=	-28,37 kN				MFS(4)	=	-28,37 kN			
NAA(4,6)	=	28,37	NAA(6,4)	=	-28,23	NAA(6,7)	=	28,37	NAA(7,6)	=	-28,23
DAA(4,6)	=	0,63	DAA(6,4)	=	0,63	DAA(6,7)	=	0,63	DAA(7,6)	=	0,63
MFS(5)	=	-28,37 kN				MFS(6)	=	-28,37 kN			
NAA(7,9)	=	28,23	NAA(9,7)	=	-28,37	NAA(9,10)	=	28,23	NAA(10,9)	=	-28,37
DAA(7,9)	=	0,63	DAA(9,7)	=	0,63	DAA(9,10)	=	0,62	DAA(10,9)	=	0,63
MFS(7)	=	-15,26 kN				MFS(8)	=	-15,26 kN			
NAA(10,12)	=	15,12	NAA(12,10)	=	-15,26	NAA(12,13)	=	15,12	NAA(13,12)	=	-15,26
DAA(10,12)	=	0,62	DAA(12,10)	=	0,63	DAA(12,13)	=	0,63	DAA(13,12)	=	0,62
LTF(0)	=	0,00 kN	LCF(3)	=	-28,37 kN						

the sloping plane members

MFS(10)	=	-14,94 kN				MFS(11)	=	8,99 kN			
NAA(2,4)	=	14,94	NAA(4,2)	=	-13,21	NAA(4,5)	=	-8,99	NAA(5,4)	=	7,26
DAA(2,4)	=	0,63	DAA(4,2)	=	0,62	DAA(4,5)	=	0,62	DAA(5,4)	=	0,63
MFS(12)	=	2,52 kN				MFS(13)	=	2,52 kN			
NAA(5,7)	=	-0,52	NAA(7,5)	=	2,52	NAA(7,8)	=	-2,52	NAA(8,7)	=	0,52
DAA(5,7)	=	0,63	DAA(7,5)	=	0,62	DAA(7,8)	=	0,63	DAA(8,7)	=	0,62
MFS(14)	=	8,99 kN				MFS(15)	=	-14,94 kN			
NAA(8,10)	=	-7,26	NAA(10,8)	=	8,99	NAA(10,11)	=	13,21	NAA(11,10)	=	-14,94
DAA(8,10)	=	0,62	DAA(10,8)	=	0,63	DAA(10,11)	=	0,62	DAA(11,10)	=	0,63
LTF(14)	=	8,99 kN	LCF(15)	=	-14,94 kN						

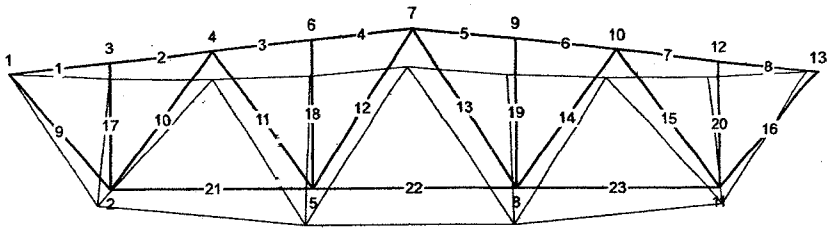
the vertical plane members

MFS(17)	=	-2,85 kN				MFS(18)	=	-3,12 kN			
NAA(2,3)	=	2,85	NAA(3,2)	=	-1,26	NAA(5,6)	=	3,12	NAA(6,5)	=	-1,26
DAA(2,3)	=	0,00	DAA(3,2)	=	0,00	DAA(5,6)	=	0,00	DAA(6,5)	=	0,00
MFS(19)	=	-3,12 kN				MFS(20)	=	-2,85 kN			
NAA(8,9)	=	3,12	NAA(9,8)	=	-1,26	NAA(11,12)	=	2,85	NAA(12,11)	=	-1,26
DAA(8,9)	=	0,00	DAA(9,8)	=	0,00	DAA(11,12)	=	0,00	DAA(12,11)	=	0,00
LTF(0)	=	0,00 kN	LCF(19)	=	-3,12 kN						

the bottom border members

MFS(9)	=	23,85 kN				MFS(16)	=	23,85 kN			
NAA(1,2)	=	-23,85	NAA(2,1)	=	22,40	NAA(11,13)	=	-22,40	NAA(13,11)	=	23,85
DAA(1,2)	=	0,62	DAA(2,1)	=	0,63	DAA(11,13)	=	0,63	DAA(13,11)	=	0,62
MFS(21)	=	23,36 kN				MFS(22)	=	27,32 kN			
NAA(2,5)	=	-23,36	NAA(5,2)	=	23,36	NAA(5,8)	=	-27,32	NAA(8,5)	=	27,32
DAA(2,5)	=	1,25	DAA(5,2)	=	1,25	DAA(5,8)	=	1,25	DAA(8,5)	=	1,25
MFS(23)	=	23,36 kN									
NAA(8,11)	=	-23,36	NAA(11,8)	=	23,36						
DAA(8,11)	=	1,25	DAA(11,8)	=	1,25						
LTF(22)	=	27,32 kN	LCF(0)	=	0,00 kN						

ProTruss6



V9= 4 L9= 20 m H9= 2,9 m Z= 1,1 m
N9= 13 joints and P9= 23 members
group a) the top border members 1 to 8
group b) the sloping plane members 10 to 15
group c) the vertical plane members 17 to 20
group d) the bottom border members 9 16 21 to 23

ProTruss6

the top border members

MFS(1)	=	-15,26 kN				MFS(2)	=	-15,26 kN			
D5(1,3)	=	15,10	D5(3,1)	=	-15,10	D5(3,4)	=	15,10	D5(4,3)	=	-15,10
D6(1,3)	=	2,29	D6(3,1)	=	-1,03	D6(3,4)	=	2,29	D6(4,3)	=	-1,03
MFS(3)	=	-28,37 kN				MFS(4)	=	-28,37 kN			
D5(4,6)	=	28,13	D5(6,4)	=	-28,13	D5(6,7)	=	28,13	D5(7,6)	=	-28,13
D6(4,6)	=	3,72	D6(6,4)	=	-2,47	D6(6,7)	=	3,72	D6(7,6)	=	-2,47
MFS(5)	=	-28,37 kN				MFS(6)	=	-28,37 kN			
D5(7,9)	=	28,13	D5(9,7)	=	-28,13	D5(9,10)	=	28,13	D5(10,9)	=	-28,13
D6(7,9)	=	-2,47	D6(9,7)	=	3,72	D6(9,10)	=	-2,47	D6(10,9)	=	3,72
MFS(7)	=	-15,26 kN				MFS(8)	=	-15,26 kN			
D5(10,12)	=	15,10	D5(12,10)	=	-15,10	D5(12,13)	=	15,10	D5(13,12)	=	-15,10
D6(10,12)	=	-1,03	D6(12,10)	=	2,29	D6(12,13)	=	-1,03	D6(13,12)	=	2,29
LTF(0)	=	0,00 kN	LCF(3)	=	-28,37 kN						

the sloping plane members

MFS(10)	=	-14,94 kN				MFS(11)	=	8,99 kN			
D5(2,4)	=	8,26	D5(4,2)	=	-8,26	D5(4,5)	=	-4,77	D5(5,4)	=	4,77
D6(2,4)	=	12,46	D6(4,2)	=	-10,33	D6(4,5)	=	7,64	D6(5,4)	=	-5,51
MFS(12)	=	2,52 kN				MFS(13)	=	2,52 kN			
D5(5,7)	=	-0,80	D5(7,5)	=	0,80	D5(7,8)	=	-0,80	D5(8,7)	=	0,80
D6(5,7)	=	-0,11	D6(7,5)	=	2,47	D6(7,8)	=	2,47	D6(8,7)	=	-0,11
MFS(14)	=	8,99 kN				MFS(15)	=	-14,94 kN			
D5(8,10)	=	-4,77	D5(10,8)	=	4,77	D5(10,11)	=	8,26	D5(11,10)	=	-8,26
D6(8,10)	=	-5,51	D6(10,8)	=	7,64	D6(10,11)	=	-10,33	D6(11,10)	=	12,46
LTF(14)	=	8,99 kN	LCF(15)	=	-14,94 kN						

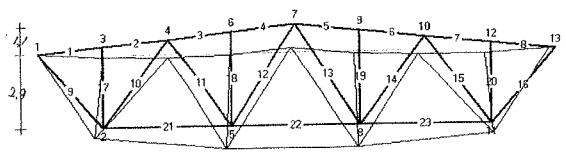
the vertical plane members

MFS(17)	=	-2,85 kN				MFS(18)	=	-3,12 kN			
D5(2,3)	=	0,00	D5(3,2)	=	0,00	D5(5,6)	=	0,00	D5(6,5)	=	0,00
D6(2,3)	=	2,85	D6(3,2)	=	-1,26	D6(5,6)	=	3,12	D6(6,5)	=	-1,26
MFS(19)	=	-3,12 kN				MFS(20)	=	-2,85 kN			
D5(8,9)	=	0,00	D5(9,8)	=	0,00	D5(11,12)	=	0,00	D5(12,11)	=	0,00
D6(8,9)	=	3,12	D6(9,8)	=	-1,26	D6(11,12)	=	2,85	D6(12,11)	=	-1,26
LTF(0)	=	0,00 kN	LCF(19)	=	-3,12 kN						

the bottom border members

MFS(9)	=	23,85 kN				MFS(16)	=	23,85 kN			
D5(1,2)	=	-15,10	D5(2,1)	=	15,10	D5(11,13)	=	-15,10	D5(13,11)	=	15,10
D6(1,2)	=	18,47	D6(2,1)	=	-16,56	D6(11,13)	=	-16,56	D6(13,11)	=	18,47
MFS(21)	=	23,36 kN				MFS(22)	=	27,32 kN			
D5(2,5)	=	-23,36	D5(5,2)	=	23,36	D5(5,8)	=	-27,32	D5(8,5)	=	27,32
D6(2,5)	=	1,25	D6(5,2)	=	1,25	D6(5,8)	=	1,25	D6(8,5)	=	1,25
MFS(23)	=	23,36 kN									
D5(8,11)	=	-23,36	D5(11,8)	=	23,36						
D6(8,11)	=	1,25	D6(11,8)	=	1,25						
LTF(22)	=	27,32 kN	LCF(0)	=	0,00 kN						

ProTruss6



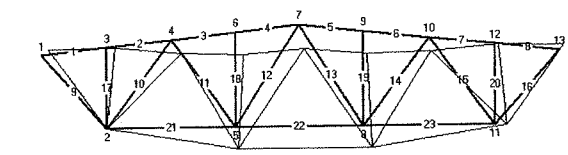
V9= 4 L9= 20 m H9= 2,9 m Z= 1,1 m
N9= 13 joints and P9= 23 members

group a) the top border members 1 to 8
group b) the sloping plane members 10 to 15
group c) the vertical plane members 17 to 20
group d) the bottom border members 9 16 21 to 23

RH(1) =	0,00 kN	RV(1) =	20,76 kN	RV(13) =	20,76 kN			
UH(1) =	0,00 /EA	UV(1) =	0,00 /EA	UH(2) =	-307,28 /EA	UV(2) =	-381,81 /EA	
UH(3) =	4,28 /EA	UV(3) =	-388,32 /EA	UH(4) =	-2,43 /EA	UV(4) =	-676,79 /EA	
UH(5) =	-190,48 /EA	UV(5) =	-956,80 /EA	UH(6) =	-59,44 /EA	UV(6) =	-963,96 /EA	
UH(7) =	-122,17 /EA	UV(7) =	-890,06 /EA	UH(8) =	-53,86 /EA	UV(8) =	-855,80 /EA	
UH(9) =	-190,90 /EA	UV(9) =	-863,96 /EA	UH(10) =	-241,91 /EA	UV(10) =	-676,79 /EA	
UH(11) =	62,94 /EA	UV(11) =	-381,81 /EA	UH(12) =	-248,62 /EA	UV(12) =	-988,82 /EA	
UH(13) =	-244,94 /EA	UV(13) =	0,00 /EA					

P	All	L1	QE	P	All	L1	QE	P	All	L1	QE
1	1,00	2,515	0,50	5	1,00	2,515	0,50	8	1,00	2,515	0,50
4	1,00	2,515	0,50	6	1,00	2,515	0,50	7	1,00	2,515	0,50
9	1,00	3,829	0,50	10	1,00	4,261	0,50	11	1,00	4,261	0,50
13	1,00	4,717	0,50	14	1,00	4,261	0,50	15	1,00	4,261	0,50
17	1,00	3,175	0,50	18	1,00	3,725	0,50	19	1,00	3,725	0,50
21	1,00	5,000	0,50	22	1,00	5,000	0,50	23	1,00	5,000	0,50

ProTruss6



V9= 4 L9= 20 m H9= 2,9 m Z= 1,1 m
N9= 13 joints and P9= 23 members

RH(2) =	0,00 kN	RV(2) =	20,76 kN	RV(11) =	20,76 kN			
UH(1) =	99,10 /EA	UV(1) =	75,76 /EA	UH(2) =	0,00 /EA	UV(2) =	0,00 /EA	
UH(3) =	111,33 /EA	UV(3) =	-6,51 /EA	UH(4) =	133,89 /EA	UV(4) =	-182,78 /EA	
UH(5) =	41,67 /EA	UV(5) =	-302,38 /EA	UH(6) =	111,82 /EA	UV(6) =	-310,54 /EA	
UH(7) =	77,44 /EA	UV(7) =	-326,42 /EA	UH(8) =	113,31 /EA	UV(8) =	-302,38 /EA	
UH(9) =	43,06 /EA	UV(9) =	-310,54 /EA	UH(10) =	20,99 /EA	UV(10) =	-182,79 /EA	
UH(11) =	154,88 /EA	UV(11) =	0,00 /EA	UH(12) =	43,55 /EA	UV(12) =	-6,51 /EA	
UH(13) =	55,78 /EA	UV(13) =	75,76 /EA					

ProTruss6

the top border members

MFS(1) =	1,33 kN			MFS(2) =	1,33 kN			
D5(1,3) =	-1,25	D5(3,1) =	1,25	D5(3,4) =	-1,25	D5(4,3) =	1,25	
D6(1,3) =	0,49	D6(3,1) =	0,77	D6(3,4) =	0,49	D6(4,3) =	0,77	
MFS(3) =	-14,35 kN			MFS(4) =	-14,35 kN			
D5(4,6) =	14,19	D5(6,4) =	-14,19	D5(6,7) =	14,19	D5(7,6) =	-14,19	
D6(4,6) =	2,19	D6(6,4) =	-0,93	D6(6,7) =	2,19	D6(7,6) =	-0,93	
MFS(5) =	-14,35 kN			MFS(6) =	-14,35 kN			
D5(7,9) =	14,19	D5(9,7) =	-14,19	D5(9,10) =	14,19	D5(10,9) =	-14,19	
D6(7,9) =	-0,93	D6(9,7) =	2,19	D6(9,10) =	-0,93	D6(10,9) =	2,19	
MFS(7) =	1,33 kN			MFS(8) =	1,33 kN			
D5(10,12)=	-1,25	D5(12,10)=	1,25	D5(12,13)=	-1,25	D5(13,12)=	1,25	
D6(10,12)=	0,77	D6(12,10)=	0,49	D6(12,13)=	0,77	D6(13,12)=	0,49	
LTF(8) =	1,33 kN	LCF(8) =	-14,35 kN					

the sloping plane members

MFS(10) =	-17,16 kN			MFS(11) =	10,98 kN			
D5(2,4) =	9,56	D5(4,2) =	-9,56	D5(4,5) =	-5,88	D5(5,4) =	5,88	
D6(2,4) =	14,26	D6(4,2) =	-12,13	D6(4,5) =	9,18	D6(5,4) =	-7,05	
MFS(12) =	-1,29 kN			MFS(13) =	-1,29 kN			
D5(5,7) =	0,15	D5(7,5) =	-0,15	D5(7,8) =	0,15	D5(8,7) =	-0,15	
D6(5,7) =	1,43	D6(7,5) =	0,93	D6(7,8) =	0,93	D6(8,7) =	1,43	
MFS(14) =	10,98 kN			MFS(15) =	-17,16 kN			
D5(8,10) =	-5,88	D5(10,8) =	5,88	D5(10,11)=	9,56	D5(11,10)=	-9,56	
D6(8,10) =	-7,05	D6(10,8) =	9,18	D6(10,11)=	-12,13	D6(11,10)=	14,26	
LTF(11) =	10,98 kN	LCF(10) =	-17,16 kN					

ProTruss6

the vertical plane members

MFS(17) =	-2,85 kN			MFS(19) =	-3,12 kN			
D5(2,3) =	0,00	D5(3,2) =	0,00	D5(5,6) =	0,00	D5(6,5) =	0,00	
D6(2,3) =	2,85	D6(3,2) =	-1,26	D6(5,6) =	3,12	D6(6,5) =	-1,26	
MFS(19) =	-3,12 kN			MFS(20) =	-2,85 kN			
D5(8,9) =	0,00	D5(9,8) =	0,00	D5(11,12)=	0,00	D5(12,11)=	0,00	
D6(8,9) =	3,12	D6(9,8) =	-1,26	D6(11,12)=	2,85	D6(12,11)=	-1,26	
LTF(0) =	0,00 kN	LCF(18) =	-3,12 kN					

the bottom border members

MFS(9) =	-2,64 kN			MFS(16) =	-2,64 kN			
D5(1,2) =	1,25	D5(2,1) =	-1,25	D5(11,13)=	1,25	D5(13,11)=	-1,25	
D6(1,2) =	-0,49	D6(2,1) =	2,41	D6(11,13)=	2,41	D6(13,11)=	-0,49	
MFS(21) =	8,31 kN			MFS(22) =	14,35 kN			
D5(2,5) =	-8,31	D5(5,2) =	8,31	D5(5,8) =	-14,35	D5(8,5) =	14,35	
D6(2,5) =	1,25	D6(5,2) =	1,25	D6(5,8) =	1,25	D6(8,5) =	1,25	
MFS(23) =	8,31 kN							
D5(8,11) =	-8,31	D5(11,8) =	8,31					
D6(8,11) =	1,25	D6(11,8) =	1,25					
LTF(22) =	14,35 kN	LCF(16) =	-2,64 kN					

Continuation of preceding two pages, of EX6.

For the supports 1 and 13 are
PV(1)=1, PH(1)=1 and PV(13)=1
which are set when clicking ProTruss6.

UH(2)= -307,28 /EA UV(2)= -381,81 /EA
UH(11)= 62,94 /EA UV(11)= -381,81 /EA

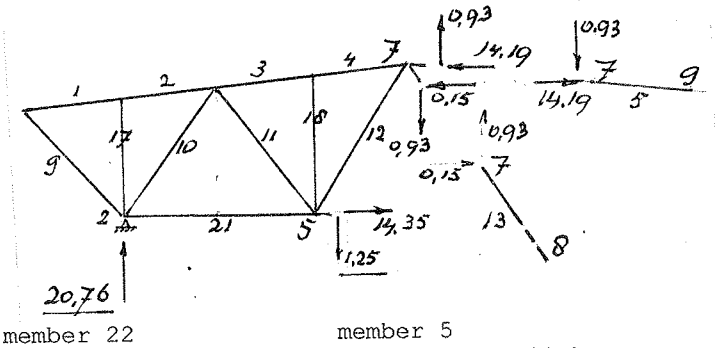
Now for supports 2 and 11 will become
PV(2)=1, PH(2)=1 and PV(11)=1.

Removing support 1 and 13, to type in TSTRING,
PV(1)=0 Enter, PH(1)=0 Enter and
PV(13)=0 Enter.
For the new supports 2 and 11,
PV(2)=1 Enter, PH(2)=1 Enter and
PV(11)=1 Enter.

Next click DrawTF, TrussNumb, Cls and first UH(I)=0 UV(I)=0 ! and after that Calculate and DrawTFD. Then go to FDATA.
NB If a support displacement is prescribed and unequal zero, then put in that value after clicking UH(I)=0 UV(I)=0 before Calculate.

Click UHUV for UH(I) and UV(I). Since the indications PV(I) and PH(I) are not printed note the displacements of the supports
UV(2)=0, UH(2)=0 and UV(11)=0.

And to compare with the case before,
UH(1)= 99,10 /EA UV(1)= 75,76 /EA
UH(13)= 55,78 /EA UV(13)= 75,76 /EA



member 22
D5(5,8)= -14,35 kN
D6(5,8)= 1,25 kN
member 13
D5(7,8)= 0,15 kN
D6(7,8)= 0,93 kN

member 5
D5(7,9)= 14,19 kN
D6(7,9)= -0,93 kN

RV(2)= 20,76 kN

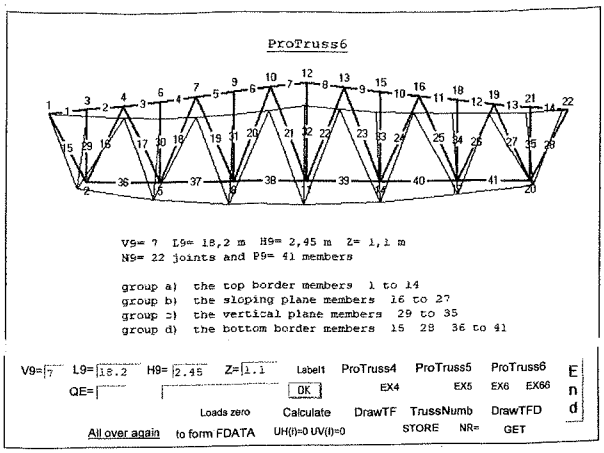
Σ hor.= 0 14,19+0,15 -14,35= -0,01 ok

Click PDATA to find the member lengths, her below given with rounded values. Own weight members 0,5 kN/m.

member 1	2,52 m	9	3,83 m	17	3,18 m
2	2,52 m	10	4,26 m	18	3,73 m
3	2,52 m	11	4,26 m	21	5,00 m
4	2,52 m	12	4,72 m		
	10,08 m		17,07 m		11,91 m

Total length (10,08+17,07+11,91)= 39,06 m
Own weight 39,06*0,5= 19,53 kN

Σ vert.= 0 19,53+1,25= 20,78 kN ≈ 20,76 kN ok

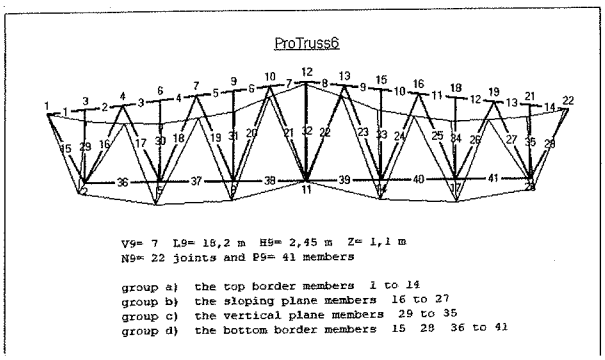


P	All	L1	QE	P	All	L1	QE	P	All	L1	QE	P	All	L1	QE
1	5,00	1,309	0,80	2	5,00	1,309	0,80	3	5,00	1,309	0,80	4	5,00	1,309	0,80
5	5,00	1,309	0,80	6	5,00	1,309	0,80	7	5,00	1,309	0,80	8	5,00	1,309	0,80
9	5,00	1,309	0,80	10	5,00	1,309	0,80	11	5,00	1,309	0,80	12	5,00	1,309	0,80
13	5,00	1,309	0,80	14	5,00	1,309	0,80	15	1,00	2,774	0,16	16	1,00	3,055	0,16
17	1,00	3,055	0,16	18	1,00	3,342	0,16	19	1,00	3,342	0,16	20	1,00	3,633	0,16
21	1,00	3,633	0,16	22	1,00	3,633	0,16	23	1,00	3,633	0,16	24	1,00	3,342	0,16
25	1,00	3,342	0,16	26	1,00	3,055	0,16	27	1,00	3,055	0,16	28	1,00	2,774	0,16
29	1,00	2,607	0,16	30	1,00	2,921	0,16	31	1,00	3,236	0,16	32	1,00	3,550	0,16
33	1,00	3,236	0,16	34	1,00	2,921	0,16	35	1,00	2,607	0,16	36	2,00	2,600	0,32
37	2,00	2,600	0,32	38	2,00	2,600	0,32	39	2,00	2,600	0,32	40	2,00	2,600	0,32
41	2,00	2,600	0,32												

RH(1) =	0,00 kN	RV(1) =	15,17 kN	RV(22) =	15,17 kN		
UH(1) =	0,00 /EA	UV(1) =	0,00 /EA	UH(2) =	-60,28 /EA	UV(2) =	-80,16 /EA
UH(3) =	8,17 /EA	UV(3) =	-83,44 /EA	UH(4) =	15,21 /EA	UV(4) =	-157,47 /EA
UH(5) =	-44,08 /EA	UV(5) =	-217,24 /EA	UH(6) =	18,51 /EA	UV(6) =	-220,98 /EA
UH(7) =	15,64 /EA	UV(7) =	-266,56 /EA	UH(8) =	-19,53 /EA	UV(8) =	-297,38 /EA
UH(9) =	18,45 /EA	UV(9) =	-301,61 /EA	UH(10) =	14,43 /EA	UV(10) =	-313,21 /EA
UH(11) =	7,35 /EA	UV(11) =	-313,00 /EA	UH(12) =	7,35 /EA	UV(12) =	-299,29 /EA
UH(13) =	0,27 /EA	UV(13) =	-313,21 /EA	UH(14) =	34,23 /EA	UV(14) =	-297,38 /EA
UH(15) =	-3,76 /EA	UV(15) =	-301,61 /EA	UH(16) =	-4,94 /EA	UV(16) =	-266,84 /EA
UH(17) =	58,78 /EA	UV(17) =	-217,24 /EA	UH(18) =	-3,81 /EA	UV(18) =	-220,99 /EA
UH(19) =	-0,52 /EA	UV(19) =	-157,47 /EA	UH(20) =	74,98 /EA	UV(20) =	-80,16 /EA
UH(21) =	6,52 /EA	UV(21) =	-83,44 /EA	UH(22) =	14,70 /EA	UV(22) =	0,00 /EA

ProTruss6
the bottom border members

MFS(15) =	15,54 kN			MFS(29) =	15,54 kN		
NAA(1,2) =	-15,54	NAA(2,1) =	15,15	NAA(20,22)=	-15,15	NAA(22,20)=	15,54
DAA(1,2) =	0,10	DAA(2,1) =	0,10	DAA(20,22)=	0,10	DAA(22,20)=	0,10
MFS(36) =	12,46 kN			MFS(37) =	18,88 kN		
NAA(2,5) =	-12,46	NAA(5,2) =	12,46	NAA(5,9) =	-18,88	NAA(8,5) =	18,88
DAA(2,5) =	0,42	DAA(5,2) =	0,42	DAA(5,9) =	0,42	DAA(8,5) =	0,42
MFS(39) =	20,68 kN			MFS(39) =	20,68 kN		
NAA(8,11) =	-20,68	NAA(11,8) =	20,68	NAA(11,14)=	-20,68	NAA(14,11)=	20,68
DAA(8,11) =	0,42	DAA(11,8) =	0,42	DAA(11,14)=	0,42	DAA(14,11)=	0,42
MFS(40) =	18,88 kN			MFS(41) =	12,46 kN		
NAA(14,17)=	-18,88	NAA(17,14)=	18,88	NAA(17,20)=	-12,46	NAA(20,17)=	12,46
DAA(14,17)=	0,42	DAA(17,14)=	0,42	DAA(17,20)=	0,42	DAA(20,17)=	0,42
LTF(38) =	20,68 kN	LCF(0) =	0,00 kN				



RH(1) =	0,00 kN	RV(1) =	6,46 kN	RV(11) =	17,41 kN	RV(22) =	6,46 kN
UH(1) =	0,00 /EA	UV(1) =	0,00 /EA	UH(2) =	-16,19 /EA	UV(2) =	-27,69 /EA
UH(3) =	2,59 /EA	UV(3) =	-30,96 /EA	UH(4) =	4,36 /EA	UV(4) =	-48,64 /EA
UH(5) =	-10,64 /EA	UV(5) =	-60,35 /EA	UH(6) =	4,94 /EA	UV(6) =	-64,09 /EA
UH(7) =	3,13 /EA	UV(7) =	-55,81 /EA	UH(8) =	-5,20 /EA	UV(8) =	-51,68 /EA
UH(9) =	1,88 /EA	UV(9) =	-55,90 /EA	UH(10) =	-2,25 /EA	UV(10) =	-28,15 /EA
UH(11) =	-4,34 /EA	UV(11) =	0,00 /EA	UH(12) =	-4,34 /EA	UV(12) =	-6,44 /EA
UH(13) =	-6,44 /EA	UV(13) =	-28,15 /EA	UH(14) =	-3,48 /EA	UV(14) =	-51,68 /EA
UH(15) =	-10,57 /EA	UV(15) =	-55,90 /EA	UH(16) =	-11,83 /EA	UV(16) =	-59,91 /EA
UH(17) =	1,55 /EA	UV(17) =	-60,35 /EA	UH(18) =	-13,63 /EA	UV(18) =	-64,09 /EA
UH(19) =	-13,05 /EA	UV(19) =	-48,64 /EA	UH(20) =	7,51 /EA	UV(20) =	-27,69 /EA
UH(21) =	-11,67 /EA	UV(21) =	-30,96 /EA	UH(22) =	-8,69 /EA	UV(22) =	0,00 /EA

ProTruss6
the vertical plane members

MFS(29) =	-1,46 kN			MFS(30) =	-1,51 kN		
NAA(2,3) =	1,46	NAA(3,2) =	-1,05	NAA(5,6) =	1,51	NAA(6,5) =	-1,05
DAA(2,3) =	0,00	DAA(3,2) =	0,00	DAA(5,6) =	0,00	DAA(6,5) =	0,00
MFS(31) =	-1,57 kN			MFS(32) =	-2,10 kN		
NAA(8,9) =	1,57	NAA(9,8) =	-1,05	NAA(11,12)=	2,10	NAA(12,11)=	-1,58
DAA(8,9) =	0,00	DAA(9,8) =	0,00	DAA(11,12)=	0,00	DAA(12,11)=	0,00
MFS(33) =	-1,57 kN			MFS(34) =	-1,51 kN		
NAA(14,15)=	1,57	NAA(15,14)=	-1,05	NAA(17,18)=	1,51	NAA(18,17)=	-1,05
DAA(14,15)=	0,00	DAA(15,14)=	0,00	DAA(17,18)=	0,00	DAA(18,17)=	0,00
MFS(35) =	-1,46 kN						
NAA(20,21)=	1,46	NAA(21,20)=	-1,05				
DAA(20,21)=	0,00	DAA(21,20)=	0,00				
LTF(0) =	0,00 kN	LCF(32) =	-2,10 kN				

Example. EX66

V9=7 L9= 18.2 m H9= 2.45 m Z=1.1 m
After input of these data click ProTruss6.
At the start all A11(P)= 1 EA.

Now some changes, strain stiffness 5EA for the members P=1 to 14, in TSTRING PA11,P1,P2,A1 is
PA11,1,14,5 Enter,
and 2EA for members P=36 to 41, so
PA11,36,41,2 Enter.

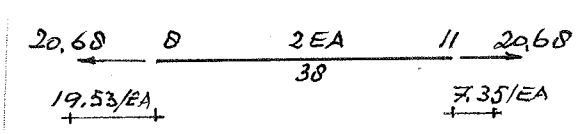
And, just some arbitrarily chosen own weight QEE(P) of groups of members, PQEE,P1,P2,QE.
QE= 0.8 kN\m for the members 1 to 14,
PQEE,1,14,.8 Enter, further

PQEE,15,35,0.16 Enter,

PQEE,36,41,0.32 Enter.

With go to FDATA to the second form and click PDATA to see the strain stiffnesses and the distributed member loads, back to first form.
Next click DrawTF, TrussNumb, Calculate and DrawTFD, the truss plus deformation is drawn.

member 38 L1= 2,60 m
NAA(8,11)= -20,68 kN NAA(11,8)= 20,68 kN



UH(8)= -19,53/EA UH(11)= 7,35/EA
The member lengthes (19,53+7,35)/EA= 26,88/EA

Hooke (20,68*2,60)/2EA= 26,88/EA ok

Going on with the current case.
Suppose joint 11 is a horizontal roller support, type in TSTRING PV(11)=1 Enter.
Click Cls before drawing again the truss.
Click DrawTF and TrussNumb, truss with numbering appears, next
UH(I)=0 UV(I)=0 and after that Calculate and DrawTFD to get the deformation as well.

member 30

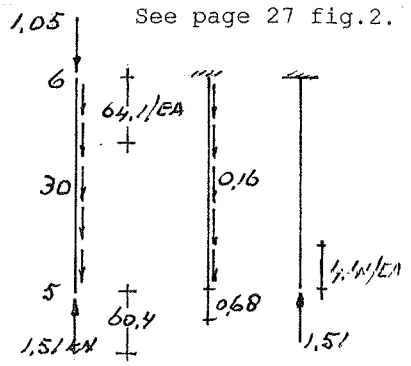
L1=2,92 m

Own weight 0,16 kN/m

NAA(6,5)= -1,05 kN
NAA(5,6)= 1,51 kN

member with 1EA

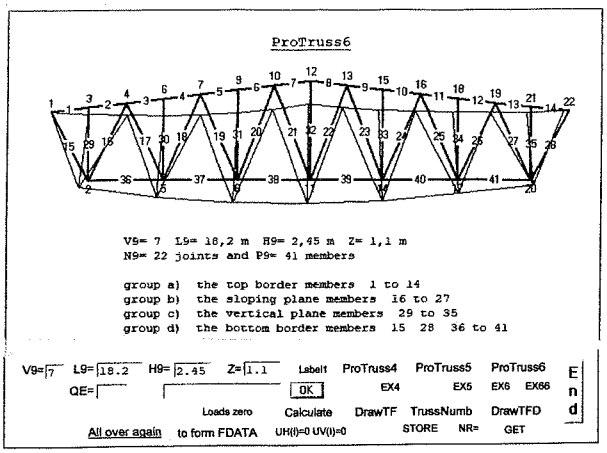
UV(6)= -64,1/EA
UV(5)= 60,4/EA



See page 27 fig.2.

Member 30 shortens (64,1-60,4)/EA= 3,7/EA.
Due to 0,32 kN/m (0,16*2,92^2)/2= 0,68/EA.
Due to 1,51 kN (1,51*2,92)/EA= 4,41/EA.

(4,41-0,68/EA= 3,73/EA is 3,7/EA ok

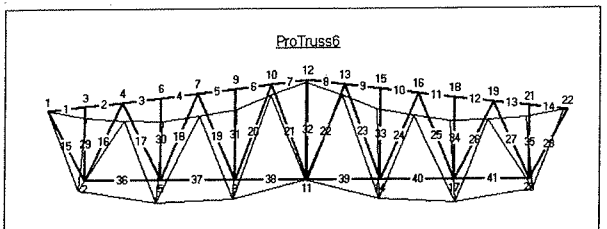


P	All	L1	QE	P	All	L1	QE	P	All	L1	QE	P	All	L1	QE
1	5,00	1,309	0,80	2	5,00	1,309	0,80	3	5,00	1,309	0,80	4	5,00	1,309	0,80
5	5,00	1,309	0,80	6	5,00	1,309	0,80	7	5,00	1,309	0,80	8	5,00	1,309	0,80
9	5,00	1,309	0,80	10	5,00	1,309	0,80	11	5,00	1,309	0,80	12	5,00	1,309	0,80
13	5,00	1,309	0,80	14	5,00	1,309	0,80	15	1,00	2,774	0,16	16	1,00	3,055	0,16
17	1,00	3,055	0,16	18	1,00	3,342	0,16	19	1,00	3,342	0,16	20	1,00	3,633	0,16
21	1,00	3,633	0,16	22	1,00	3,633	0,16	23	1,00	3,633	0,16	24	1,00	3,342	0,16
25	1,00	3,342	0,16	26	1,00	3,055	0,16	27	1,00	3,055	0,16	28	1,00	2,774	0,16
29	1,00	2,607	0,16	30	1,00	2,521	0,16	31	1,00	3,236	0,16	32	1,00	3,550	0,16
33	1,00	3,236	0,16	34	1,00	2,921	0,16	35	1,00	2,607	0,16	36	2,00	2,600	0,32
37	2,00	2,600	0,32	38	2,00	2,600	0,32	39	2,00	2,600	0,32	40	2,00	2,600	0,32
41	2,00	2,600	0,32												

RH(1) =	0,00 kN	RV(1) =	15,17 kN	RV(22) =	15,17 kN						
UH(1) =	0,00 /EA	UV(1) =	0,00 /EA	UH(2) =	-60,28 /EA	UV(2) =	-80,16 /EA				
UH(3) =	8,17 /EA	UV(3) =	-89,44 /EA	UH(4) =	15,21 /EA	UV(4) =	-157,47 /EA				
UH(5) =	-44,98 /EA	UV(5) =	-217,24 /EA	UH(6) =	18,51 /EA	UV(6) =	-220,98 /EA				
UH(7) =	19,64 /EA	UV(7) =	-266,54 /EA	UH(8) =	-19,53 /EA	UV(8) =	-297,38 /EA				
UH(9) =	18,45 /EA	UV(9) =	-301,61 /EA	UH(10) =	14,43 /EA	UV(10) =	-313,21 /EA				
UH(11) =	7,35 /EA	UV(11) =	-312,00 /EA	UH(12) =	7,35 /EA	UV(12) =	-259,25 /EA				
UH(13) =	0,27 /EA	UV(13) =	-313,21 /EA	UH(14) =	34,23 /EA	UV(14) =	-297,38 /EA				
UH(15) =	-3,76 /EA	UV(15) =	-301,61 /EA	UH(16) =	-4,94 /EA	UV(16) =	-266,54 /EA				
UH(17) =	58,78 /EA	UV(17) =	-217,24 /EA	UH(18) =	-3,81 /EA	UV(18) =	-220,98 /EA				
UH(19) =	-0,52 /EA	UV(19) =	-157,47 /EA	UH(20) =	74,98 /EA	UV(20) =	-80,16 /EA				
UH(21) =	6,52 /EA	UV(21) =	-89,44 /EA	UH(22) =	14,70 /EA	UV(22) =	0,00 /EA				

ProTruss6
the bottom border members

MFS(15) =	15,54 kN					MFS(28) =	15,54 kN				
NAA(1,2) =	-15,54	NAA(2,1) =	15,15			NAA(20,22)=	-15,15	NAA(22,20)=	15,54		
DAA(1,2) =	0,10	DAA(2,1) =	0,10			DAA(20,22)=	0,10	DAA(22,20)=	0,10		
MFS(36) =	12,46 kN					MFS(37) =	18,88 kN				
NAA(2,5) =	-12,46	NAA(5,2) =	12,46			NAA(5,8) =	-18,88	NAA(8,5) =	18,88		
DAA(2,5) =	0,42	DAA(5,2) =	0,42			DAA(5,8) =	0,42	DAA(8,5) =	0,42		
MFS(38) =	20,68 kN					MFS(39) =	20,68 kN				
NAA(6,11) =	-20,68	NAA(11,8) =	20,68			NAA(11,14)=	-20,68	NAA(14,11)=	20,68		
DAA(8,11) =	0,42	DAA(11,8) =	0,42			DAA(11,14)=	0,42	DAA(14,11)=	0,42		
MFS(40) =	18,88 kN					MFS(41) =	12,46 kN				
NAA(14,17)=	-18,88	NAA(17,14)=	18,88			NAA(17,20)=	-12,46	NAA(20,17)=	12,46		
DAA(14,17)=	0,42	DAA(17,14)=	0,42			DAA(17,20)=	0,42	DAA(20,17)=	0,42		
LTF(38) =	20,68 kN	LCF(0) =	0,00 kN								



RH(1) =	0,00 kN	RV(1) =	6,46 kN	RV(11) =	17,41 kN	RV(22) =	6,46 kN				
UH(1) =	0,00 /EA	UV(1) =	0,00 /EA	UH(2) =	-16,19 /EA	UV(2) =	-27,69 /EA				
UH(3) =	2,95 /EA	UV(3) =	-30,96 /EA	UH(4) =	4,36 /EA	UV(4) =	-48,64 /EA				
UH(5) =	-10,64 /EA	UV(5) =	-60,35 /EA	UH(6) =	4,94 /EA	UV(6) =	-64,09 /EA				
UH(7) =	3,13 /EA	UV(7) =	-59,81 /EA	UH(8) =	-5,20 /EA	UV(8) =	-51,68 /EA				
UH(9) =	3,88 /EA	UV(9) =	-56,90 /EA	UH(10) =	-2,25 /EA	UV(10) =	-28,15 /EA				
UH(11) =	-4,34 /EA	UV(11) =	0,00 /EA	UH(12) =	-4,34 /EA	UV(12) =	-6,44 /EA				
UH(13) =	-6,44 /EA	UV(13) =	-28,15 /EA	UH(14) =	-3,48 /EA	UV(14) =	-51,68 /EA				
UH(15) =	-10,57 /EA	UV(15) =	-55,90 /EA	UH(16) =	-11,82 /EA	UV(16) =	-55,81 /EA				
UH(17) =	1,95 /EA	UV(17) =	-60,35 /EA	UH(18) =	-13,63 /EA	UV(18) =	-64,09 /EA				
UH(19) =	-13,05 /EA	UV(19) =	-48,64 /EA	UH(20) =	7,61 /EA	UV(20) =	-27,69 /EA				
UH(21) =	-11,67 /EA	UV(21) =	-30,96 /EA	UH(22) =	-8,69 /EA	UV(22) =	0,00 /EA				

ProTruss6
the vertical plane members

MFS(29) =	-1,46 kN					MFS(30) =	-1,51 kN				
NAA(2,3) =	1,46	NAA(3,2) =	-1,05			NAA(5,6) =	1,51	NAA(6,5) =	-1,05		
DAA(2,3) =	0,00	DAA(3,2) =	0,00			DAA(5,6) =	0,00	DAA(6,5) =	0,00		
MFS(31) =	-1,57 kN					MFS(32) =	-2,10 kN				
NAA(8,9) =	1,57	NAA(9,8) =	-1,05			NAA(11,12)=	2,10	NAA(12,11)=	-1,53		
DAA(8,9) =	0,00	DAA(9,8) =	0,00			DAA(11,12)=	0,00	DAA(12,11)=	0,00		
MFS(33) =	-1,57 kN					MFS(34) =	-1,51 kN				
NAA(14,15)=	1,57	NAA(15,14)=	-1,05			NAA(17,18)=	1,51	NAA(18,17)=	-1,05		
DAA(14,15)=	0,00	DAA(15,14)=	0,00			DAA(17,18)=	0,00	DAA(18,17)=	0,00		
MFS(35) =	-1,46 kN										
NAA(20,21)=	1,46	NAA(21,20)=	-1,05								
DAA(20,21)=	0,00	DAA(21,20)=	0,00								
LTF(0) =	0,00 kN	LCF(32) =	-2,10 kN								

Example. EX66

V9=7 L9= 18.2 m H9= 2.45 m Z=1.1 m
After input of these data click ProTruss6.
At the start all A11(P)= 1 EA.

Now some changes, strain stiffness 5EA for the members P=1 to 14, in TSTRING PA11,P1,P2,A1 is
PA11,1,14,5 Enter,
and 2EA for members P=36 to 41, so
PA11,36,41,2 Enter.

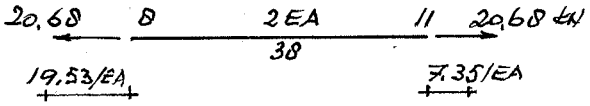
And, just some arbitrarily chosen own weight QEE(P) of groups of members, PQEE,P1,P2,QE.
QE= 0.8 kN\m for the members 1 to 14,
PQEE,1,14,.8 Enter, further

PQEE,15,35,0,16 Enter and

PQEE,36,41,0.32 Enter.

With go to FDATA to the second form and click PDATA to see the strain stiffnesses and the distributed member loads, back to first form.
Next click DrawTF, TrussNumb, Calculate and DrawTFD, the truss plus deformation is drawn.

member 38 L1= 2,60 m
NAA(8,11)= -20,68 kN NAA(11,8)= 20,68 kN



UH(8)= -19,53/EA UH(11)= 7,35/EA
The member lengthes (19,53+7,35)/EA= 26,88/EA

Hooke (20,68*2,60)/2EA= 26,88/EA ok

Going on with the current case.
Suppose joint 11 is a horizontal roller support, type in TSTRING PH(11)=1 Enter.

Click DrawTF and TrussNumb, truss with numbering appears, next
UH(I)=0 UV(I)=0 and after that Calculate and DrawTFD to get the deformation as well.

member 30

See page 27 fig.2.

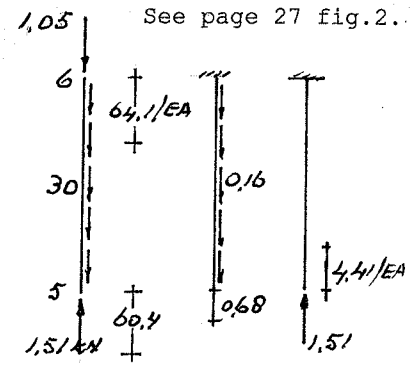
L1=2,92 m

Own weight 0,16 kN/m

NAA(6,5)= -1,05 kN
NAA(5,6)= 1,51 kN

member with 1EA

UV(6)= -64,1/EA
UV(5)= 60,4/EA



Member 30 shortens (64,1-60,4)/EA= 3,7/EA.
Due to 0,32 kN/m (0,16*2,92^2)/2= 0,68/EA.
Due to 1,51 kN (1,51*2,92)/EA= 4,41/EA.

(4,41-0,68/EA= 3,73/EA is 3,7/EA ok

```
Private Sub PROTRUSS4()
N9=15 : P9=27 : BW=L9/8 : CH=H9/4
FH=(H9-Z)/2 : D=(H9/2-Z)*H9/(4*BW)
AW=(2*BW+D)/2 : EW=(4*BW-2*AW)/2

'The joint data.
T=0 : S=1
For I=1 To 6
If I<5 Then
X1(I)=T*BW : Y1(I)=T*CH
X1(I+7)=L9-T*BW : Y1(I+7)=T*CH
T=T+1
ElseIf I=5 Or I=6 Then
```

Private Sub PROTRUSS4()

Programming joint and member data of the truss shown below.
Fig.1a and 1b.
First the basic data, L9, H9 and Z.
The number of joints N9=15, the number of members, see next page, is P9=27.

The joint data.
The joints are numbered as follows, first the left part and then the right part, taking in account the symmetrie of the truss.

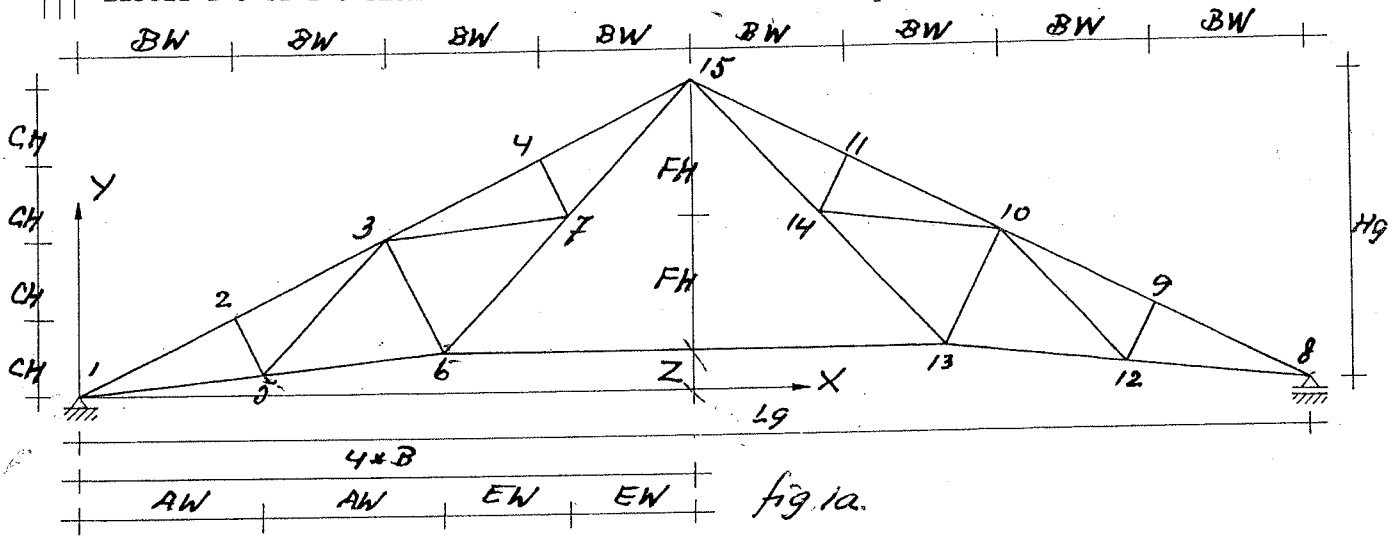


fig.1a.

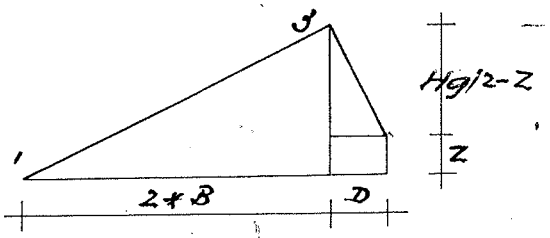


fig.1b.

Simmilarity of triangles gives

D/(H9/2-Z)=H9/(4*BW) so that
D=(H9/2-Z)*H9/(4*BW), then become

AW=(2*B1+D)/2 and EW=(4*B1-2*AW)/2.

Then the joint coordinates are following. See the code on the left.

X1(I)=T*BW	Y1(I)=T*CH	Y1(I+7)=T*CH
X1(1)=0*BW	Y1(1)=0*CH	Y1(8)=0*CH
X1(2)=1*BW	Y1(2)=1*CH	Y1(9)=1*CH
X1(3)=2*BW	Y1(3)=2*CH	Y1(10)=2*CH
X1(4)=3*BW	Y1(4)=3*CH	Y1(11)=3*CH
X1(I)=S*AW	**Y1(I)=S*Z/2**	**Y1(I+7)=S*Z/2**
X1(5)=1*AW	Y1(5)=1*Z/2	Y1(12)=1*Z/2
X1(6)=2*AW	Y1(6)=2*Z/2	Y1(13)=2*Z/2
X1(7)=2*A+EW	Y1(7)=FH+Z	Y1(14)=FH+Z
		Y1(15)=H9

```
X1(I)=S*AW : Y1(I)=S*Z/2
X1(I+7)=L9-S*AW : Y1(I+7)=S*Z/2
S=S+1
End If
Next I
X1(7)=2*AW+EW : Y1(7)=FH+Z
X1(14)=L9-2*AW-EW : Y1(14)=FH+Z
X1(15)=L9/2 : Y1(15)=H9
For I=1 To 15

PH(I)=0 : PV(I)=0
UH(I)=0 : UV(I)=0
SH(I)=0 : SV(I)=0
Next I
PH(1)=1 : PV(1)=1 : PV(8)=1
```

When the coordinates of the joints are known the member lengths L11(P) can be calculated. All other joint data are set zero. After that follow for the supports:

PH(1)=1 because the horizontal displacement of joint 1 is prescribed, and PV(1)=1 and PV(8)=1 because the vertical displacements of these joints are prescribed.
NB. FX(I)=0 : FY(I)=0, and QEE(P)=0 is in PROTRUSS4, -5 and -6 omitted, see page 221.

```
For P=1 To 13
If P<4 Then LL(P)=P : HH(P)=P+1
If P=4 Then LL(P)=4 : HH(P)=15
If P=5 Then LL(P)=1 : HH(P)=5
If P=6 Or P=7 Then _
LL(P)=P-1 : HH(P)=P
If P=8 Then LL(P)=7 : HH(P)=15
```

The member data.

Fig.2.
First the members of the left part are numbered in a chosen order as shown here, after that the members of the right part taking into account the symmetrie of the truss.

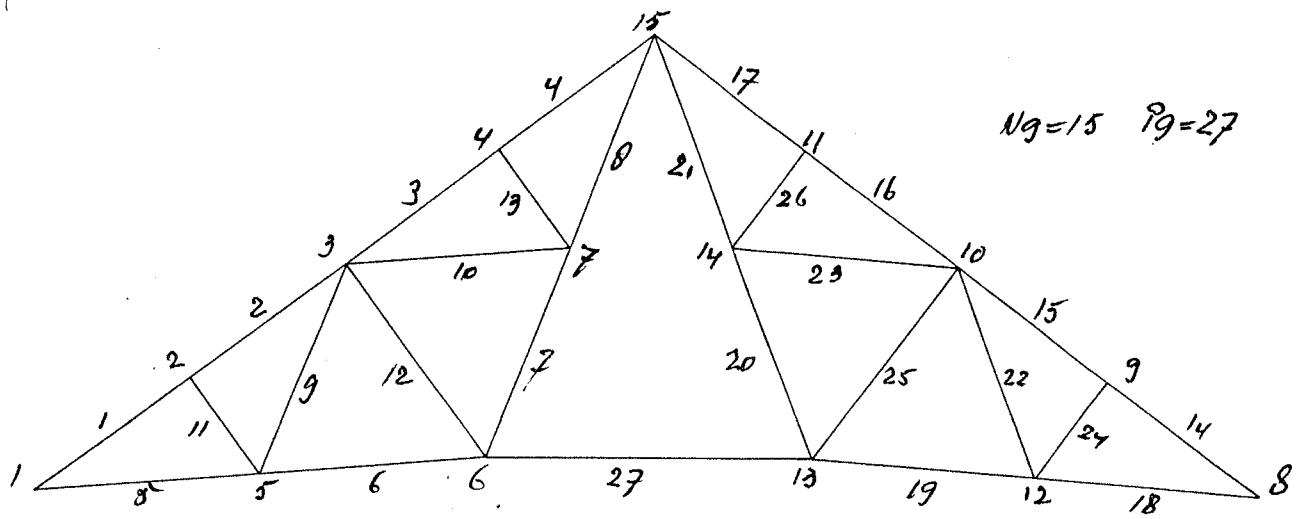


Fig. 2.

```
If P=9 Then LL(P)=3 : HH(P)=5
If P=10 Then LL(P)=3 : HH(P)=7
If P>10 Then
LL(P)=P-9 : HH(P)=LL(P)+3
End If
Next P
```

Then follow the the member numbers with their lowest member end numbers LL(P) and highest member end numbers HH(P).
First the data of the first 13 members determined, after that the other 13 members of the right part with E=P+13, LL(P+7) and HH(P+7) except member 17=4+13 and member 21=8+13 with LL(P+7) and HH(P+7). See the code left above.

```
For P=1 To 13 : E=P+13
If P=4 Or P=8 Then
LL(E)=LL(P)+7 : HH(E)=15
Else
LL(E)=LL(P)+7 : HH(E)=HH(P)+7
End If
Next P : LL(27)=6 : HH(27)=13
```

left part			right part				
P	L	H	P	L	H		
1	1	2	14	8	9	1+7= 8	2+7= 9
2	2	3	15	9	10	2+7= 9	3+7=10
3	3	4	16	10	11		
4	4	15	17	11	15	P=4	
5	1	5	18	8	12		
6	5	6	19	12	13		
7	6	7	20	13	14		
8	7	15	21	14	15	P=8	
9	3	5	22	10	12	3+7=10	5+7=12
10	3	7	23	10	14	3+7=10	7+7=14
11	2	5	24	9	12	2+7= 9	5+7=12
12	3	6	25	10	13		
13	4	7	26	11	14		

```
For P=1 To P9 : L=LL(P) : H=HH(P)
D1=X1(H)-X1(L) : D2=Y1(H)-Y1(L)
L11(P)=Sqr(D1^2+D2^2)
A11(P)=1 : EAA(P)=A11(P)
Next P
End Sub
```

Finally member 27
with LL(27)=6 and HH(27)=13.

```
For P = 1 To 13
Select Case P
Case Is< 4 : LL(P)=P : HH(P)=P + 1
Case 4 : LL(P)=4 : HH(P)=15
Case 5 : LL(P)=1 : HH(P)=5
Case 6,7 : LL(P)=P-1 : HH(P)=P
Case 8 : LL(P)=7 : HH(P)=15
Case 9 : LL(P)=3 : HH(P)=5
Case 10 : LL(P)= 3: HH(P) = 7
Case Is > 10: LL(P)=P-9 : HH(P)= _
LL(P)+3
End Select
Next P
```

On the left the code for LL(P) and HH(P) for the first 13 members now with Select Case - End Select. There's not much difference in a situation like this, but in other cases it gives great advantages. For instance
If P=3 Or P=7 Or P=11 Or P=12
can be shorter when writing
Case 3,7,9,11,12
See page , page .

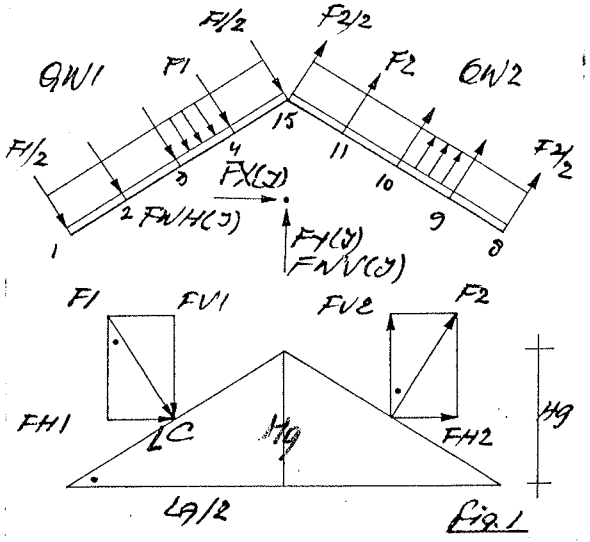
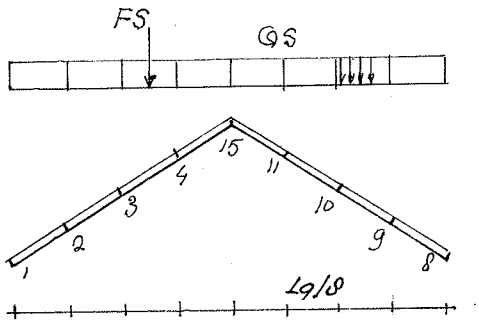


Fig.1

```
Private Sub WINDLOAD4()
LC=Sqr(H9^2+(L9/2)^2)
F1=QW1*LC/4 : F2=QW2*LC/4
FH1=F1*H9/LC : FV1=F1*(L9/2)/LC
FH2=F2*H9/LC : FV2=F2*(L9/2)/LC

  For I=1 To 15
  Select Case I
  Case 1
  FWH(I)=FH1/2 : FWV(I)=-FV1/2
  Case 2 To 4
  FWH(I)=FH1 : FWV(I)=-FV1
  Case 8
  FWH(I)=FH2/2 : FWV(I)=FV2/2
  Case 9 To 11
  FWH(I)=FH2 : FWV(I)=FV2
  Case 15
  FWH(I)=FH1/2+FH2/2
  FWV(I)=-FV1/2+FV2/2
  Case Else : FWH(I)=0 : FWV(I)=0
  End Select
  Next I
End Sub
```




```
Private Sub SNOWLOAD4()
FS=QS*L9/8

  For I=1 To 15
  Select Case I
  Case 1,8 : FSV(I)=-FS/2
  Case 2,3,4,9,10,11 : FSV(I)=-FS
  Case Else : FSV(I)=0
  End Select
  Next I
End Sub
```

Private Sub WINDLOAD4()

Calculation of joint load forces FWH(I) and FWV(I) due to wind load.
This subroutine belongs to PROTRUSS4 page .

Fig.1.
The wind blows horizontally from the left. Then on the left roof plane acts a wind load QW1 kN/m, wind pressure, and
on the right roof plane a wind load QW2 kN/m, wind sucking,
both perpendicular to the roof plane.
With height H9 and half length L9/2 follows length LC=Sqr(H9^2+(L9/2)^2).

On the joints, at the places of the purlins, act the concentrated forces,
F1=QW1*LC/4 and F1/2 on the left, and
F2=QW2*LC/4 and F2/2 on the right.

With similarity of triangles follow

FH1/F1=H9/LC then FH1=F1*H9/LC
FV1/F1=(L9/2)/LC then FV1=F1*(L9/2)/LC

FH2/F2=H9/LC then FH2=F2*H9/LC
FV2/F2=(L9/2)/LC then FV2=F2*(L9/2)/LC

Now the horizontal and vertical joint load forces due to the wind, FWH(I) resp. FWV(I), can be written
For I=1 To 15, so for all the joints. This is done with Select Case - End Select.
Case I=1 for which follows, see fig. 1,
FWH(I)=FH1/2 : FWV=(I)=-FV1/2.
The assumption for vertical joint load forces is upward, therefore -FV1/2. Then
Case 2 To 4 for the joints 2,3 and 4 with
FWH(I)=FH1 : FWV(I)=-FV1. And Then
Case 8 and Case 9 To 11, and then joint 15
Case 15 with contributions from both sides,
FWH(I)=FH1/2+FH2/2 and
FWV(I)=-FV1/2+FV2/2.
Finally Case Else for all the other joints with
FWH(I)=0 : FWV(I)=0.
End Select
Next I
End Sub

Private Sub SNOWLOAD4()

Calculation of joint load forces FSV(I) due to snow load.

The snow is a vertical distributed load of QS/m on a horizontal plane with length L9, then is FS=QS*L9/8 kN.
Now the vertical joint loads FSV(I) can be determined with Select Case - End Select with
For I=1 To 15 joints.
Case 1,8 : FSV(I)=-FS/2
Case 2,3,4,9,10,11 : FSV(I)=-FS
(One can write also Case 2 To 4,9 To 11 :)
And for the other joints without snow load,
Case Else : FSV(I)=0.
End Select
Next I
End Sub

```
Private Sub PROTRUSS5()
N9=V9*4 : P9=V9*8-3
BW=L9/(V9*2) : CH=H9/V9
T=0 : S=0
For I=1 To V9*4-1 Step 2
X1(I)=T*BW : Y1(I)=S*Z/V9
T=T+1
If I<V9*2+1 Then S=S+1 Else S=S-1
Next I
X1(N9)=T*BW : Y1(N9)=0
```

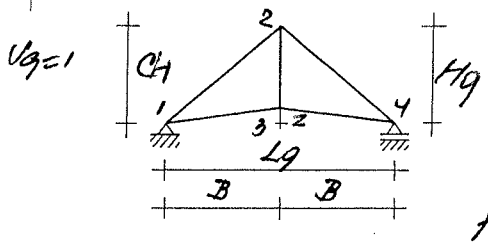


fig1a.

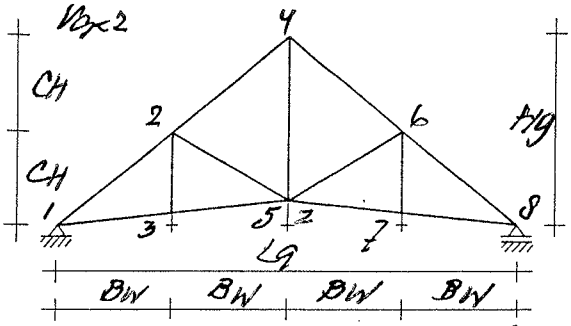


fig.1b

I	V9=2 X1(I) T*BW	V9=2 Y1(I) S*Z/V9	I	V9=3 X1(I) T*BW	V9=3 Y1(I) S*Z/V9
1	0*BW	0*Z/2	1	0*BW	0*Z/3
3	1*BW	1*Z/2	3	1*BW	1*Z/3
			5	2*BW	2*Z/3
5	2*BW	2*Z/2	7	3*BW	3*Z/3
			9	4*BW	2*Z/3
7	3*BW	1*Z/2	11	5*BW	1*Z/3
8	4*BW	0*Z/2	12	6*BW	0*Z/3

I	V9=2 X1(I) T*BW	V9=2 Y1(I) S*CH	I	V9=3 X1(I) T*BW	V9=3 Y1(I) S*CH
			2	1*BW	1*CH
2	1*BW	1*CH	4	2*BW	2*CH
4	2*BW	2*CH	6	3*BW	3*CH
6	3*BW	1*CH	8	4*BW	2*CH
			10	5*BW	1*CH

```
T=1 : S=1
For I=2 To N9-2 Step 2
X1(I)=T*BW : Y1(I)=S*CH
T=T+1
If I<V9*2 Then S=S+1 Else S=S-1
Next I

For I=1 To N9
FX(I)=0 : FY(I)=0
PH(I)=0 : PV(I)=0
UH(I)=0 : UV(I)=0
SH(I)=0 : SV(I)=0
Next I
PH(1)=1 : PV(1)=1 : PV(N9)=1
```

Private Sub PROTRUSS5()

Programming joint and member data of the roof truss shown below.

Fig.1a, 1b and 1c.
The basic data are L9, H9, V and Z9.
V9 indicates the size of the construction.
The joint data.
The joints are numbered regularly in a chosen arbitrary way, from left to right. The number of joints are N9=V9*2, BW=L9/(V9*2).

V9=1	N9=1*4= 4	BW=L9/(1*2)=L9/2
V9=2	N9=2*4= 8	BW=L9/(2*2)=L9/4
V9=3	N9=3*4=12	Bw=L9/(3*2)=L9/6

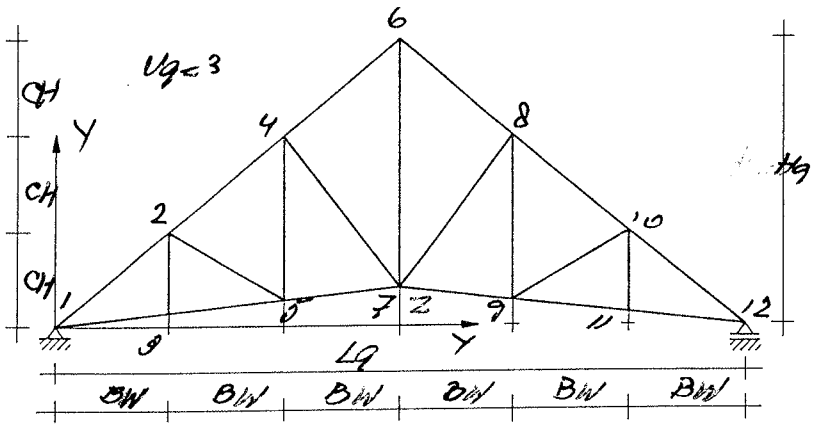


Fig.1c.
The coordinates X1(I) and Y1(I) of the joints of the bottom border are written on the left for V9=2 and V9=3.

See the code on left on top.
The successive joint number difference is 2 except of the last two joints. First T=0 and S=0. For V9=2 and V9=3 follow
For I=1 To 7 and For I=1 To 11 Step 2
Each time after X1(I) and Y1(I) becomes T=T+1. And as long I<V9*2+1 becomes S=S+1. Is I>=V9*2+1 then is counted back with S=S-1. The last joint N9 is treated seperatedly, T got the correct value with T=T+1, then X1(N()=T*BW.

And after that the joint coordinates of the joints at the places of the purlins between first joint 1 and last joint N9. See the code left below.

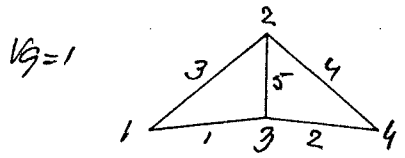
And after that the joint coordinates of the joints at the places of the purlins between first joint 1 and last joint N9. See the code left below. For I=2 To N9-2 Step 2.

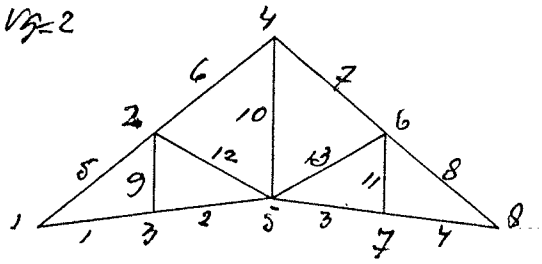
	CH=H9/V9	N9-2	V9*2
V9=1	CH=H9/1	4-2= 2	1*2=2
V9=2	CH=H9/2	8-2= 6	2*2=4
V9=3	CH=H9/3	12-2=10	3*2=6

The determination of X1(I) and Y1(I) is like before.
Then all other joint data are set zero. After that for the two supports, joint 1 and N9, follow because of prescribed displacements,

PH(1)=1 : PV(1)=1 : PV(N9)=1.

```
A=1 : B=1 : C=2 : D=2 : E=V9*2+1
For P=1 To P9
'a) The bottom border members.
If P<V9*2 Then
LL(P)=A : HH(P)=A+2 : A=HH(P)
ElseIf P=V9*2 Then
LL(P)=A : HH(P)=A+1
```





V9=1 V9*2=1*2=2
V9=2 V9*2=2*2=4
V9=3 V9*2=3*2=6

fig.2.

V9=1			V9=2			V9=3		
P	L	H	P	L	H	P	L	H
						1	1	3
			1	1	3	2	3	5
1	1	3	2	3	5	3	5	7
2	3	4	3	5	7	4	7	9
			4	7	8	5	9	11
						6	11	12

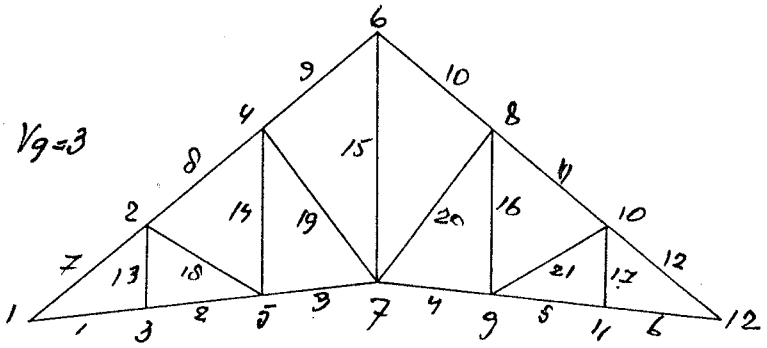
```
'b) The roof border members.
ElseIf P=V9*2+1 Then
LL(P)=B : HH(P)=B+1 : B=HH(P)
ElseIf P>V9*2+1 And P<V9*4+1 Then
LL(P)=B : HH(P)=B+2 : B=HH(P)
```

	V9*2+1	V9*4+1
V9=1	1*2+1=3	1*4+1= 5
V9=2	2*2+1=5	2*4+1= 9
V9=3	3*2+1=7	3*4+1=13

V9=1			V9=2			V9=3		
P	L	H	P	L	H	P	L	H
						7	1	2
			5	1	2	8	2	4
3	1	2	6	2	4	9	4	6
4	2	4	7	4	6	10	6	8
			8	6	8	11	8	10
						12	10	12

The member data.

Fig.3.
The members are numbered from left to right in the following order:
a) the bottom border members,
b) the roof border members,
c) the vertical plane members, and
d) the sloping plane members.
The number of members are P9=V9*8-3.
V9=1 P9=1*8-3= 8-3= 5
V9=2 P9=2*8-3=16-3=13
V9=3 P9=3*8-3=24-3=21



Determination of the lowest and highest member end numbers LL(P and HH(P) of the members P=1 To P9.

a) The bottom border members.

For these members the difference between LL(P) and HH(P) is 2 except for the last member V9*2 with a difference of 1.
LL(P) of the first member is for every V9 LL(1)=1, therefore first A=1.
Is P<P9*2 then LL(P)=A and HH(P)=A+2 and becomes A=HH(P).

For V9=2 then follow
P=1 LL(1)=A=1 HH(1)=A+2=1+2=3 A=HH(1)=3
P=2 LL(2)=A=3 HH(2)=A+2=3+2=5 A=HH(2)=5
P=3 LL(3)=A=5 HH(3)=A+2=5+2=7 A=HH(3)=7
The last member V9*2=2*2=4 is taken apart.
Is P=V9*2 then LL(P)=A and HH(P)=A+1.
P=4 LL(P)=A=7 HH(P)=A+1=7+1=8

b) The roof border members.

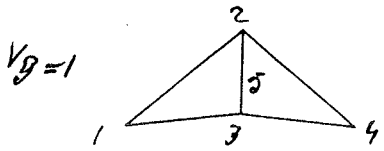
The difference between LL(P) and HH(P) is 2 except for the first member P=V9*2+1 with a joint number difference of 1. For each V9 is LL(P)=1, therefore first B=1. The first member is taken apart.
If P=V9*2+1 then LL(P)=B=1 and HH(P)=B+1=1+1=2, after that becomes B=HH(P), so B=2.

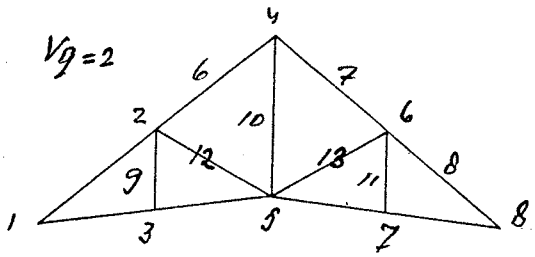
For V9=3 is P=V9*2+1=3*2+1=6+1=7 with LL(7)=1 and HH(7)=2, and B=2. Then follows
ElseIf P>V9*2+1 And P<V9*4+1
P>3*2+1=6+1=7 and P<3*4+1=12+1=13

P= 8 LL(8)=B=2 HH(8)=B+2=2+2= 4 B=HH(8)=4
P= 9 LL(9)=B=4 HH(9)=B+2=4+2= 6 B=HH(9)=6
P=10 LL(10)=B=6 HH(10)=B+2=6+2= 8 B=HH(10)=8

And so for member 11 and 12<13.

```
'c) The vertical plane members.
ElseIf P>=V9*4+1 And P<V9*6 Then
LL(P)=C : HH(P)=C+1 : C=HH(P)+1

'd) The sloping plane members.
ElseIf P>=V9*6 And P<=V9*7-2 Then
LL(P)=D : HH(P)=D+3 : D=HH(P)-1
ElseIf P>=V9*7-1 And P<=P9 Then
LL(P)=E : HH(P)=E+1 : E=HH(P)+1
End If
Next P
```






```
For I=P To P9 : L=LL(P) : H=HH(P)
D1=X1(H)-X1(L) : D2=Y1(H)-Y1(L)
L11(P)=Sqr(D1^2+D2^2)
A11(P)=1 : EAA(P)=A11(P)
Next P
End Sub
```

	V9*4+1	V9*6	V9*7-1	P9
V9=1	5	6	6	5
V9=2	9	12	13	13
V9=3	13	18	20	21

V9=1			V9=2			V9=2		
P	L	H	P	L	H	P	L	H
						13	2	3
			9	2	3	14	4	5
5	2	3	10	4	5	15	6	7
			11	6	7	16	8	9
						17	10	11
						18	2	5
			12	2	5	19	4	7
			13	5	6	20	7	8
						21	9	10

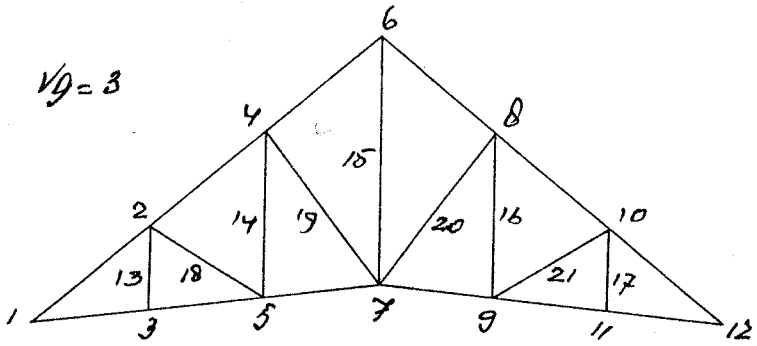
Fig.3.
c) The vertical plane members.

These are the members V9*4+1 to V9*6-1, so
ElseIf P>=V9*4+1 And P<V9*6

V9=1 P>=1*4+1= 4+1= 5 and P<1*6= 6
V9=2 P>=2*4+1= 8+1= 9 and P<2*6=12
V9=3 P>=3*4+1=12+1=13 and P<3*6=18

The difference between the member end numbers LL(P) and HH(P) is 1. Of the vertical member always is LL(P)=2, therefore first C=2, see the preceding page before For P=1 To P9. Then are LL(P)=C and HH(P)=C+1 and becomes C=HH(P)+1 for the next member.

For V9=2 Then follow
P= 9 LL(9)=C=2 HH(9)=C+1=3 C=HH(9)+1= 4
P=10 LL(10)=C=4 HH(10)=C+1=5 C=HH(10)+1= 6
P=11 LL(11)=C=6 HH(11)=C+1=7 (C=HH(11)+1= 8)



d) The sloping plane members. fig.3.

They are divided into two groups.
Left of the middle the members V9*6 To V9*7-2.
ElseIf P>=V9*6 And P<V9*7-1
Of the first member V9*6 is always LL(P)=2, therefore forst D=2.
The difference between LL(P) and HH(P) is 3, so LL(P)=D and HH(P)=D+3 and becomes D=HH(P)-1.

For V9=1 follows
ElseIf P>=V9*6=6 And P<V9*7-1=6, there is no member 6 because P9=V9*8-3=1*8-3=5.

For V9=2 follows
ElseIf P>=V9*6=12 And P<V9*7-1=13, so only member 12 with
P=12 LL(12)=D=2 HH(12)=D+3=5 (D=HH(12)-1=4)

For V9=3 follows
ElseIf P>=3*6=18 and P<3*7-1=20, so the members 18 and 19.
P=18 LL(18)=D=2 HH(18)=D+3=5 D=HH(18)-1=4
P=19 LL(19)=D=4 HH(19)=D+3=7 (D=HH(19)-1=6)

Right of the middle the members V9*7-1 To P9.
ElseIf P>=V9*7-1 And P<=P9
For V9=2 then P>=2*7-1=13 to P9=V9*8-3=2*8-3=13.
For the first member always LL(P)=V9*2+1, therefore first E=V9*2+1. The difference between LL(P) and HH(P) is 1, so that LL(P)=E and HH(P)=E+1 and becomes E=HH(P)+1.
For V9=2 follows with first E=V9*2+1=2*2+1=5;
P=13 LL(13)=E=5 HH(13)=E+1=6 (E=HH(P)+1=7)
End Sub

```
Private Sub WINDLOAD5()
LC=Sqr(H9^2+(L9/2)^2)
F1=QW1*LC/V9 : F2=QW2*LC/V9
FH1=F1*H9/LC : FV1=F1*(L9/2)/LC
FH2=F2*H9/LC : FV2=F2*(L9/2)/LC
For I=1 To N9
FWH(I)=0 : FWV(I)=0
Next I

FWH(1)=FH1/2 : FWV(1)=-FV1/2
FWH(N9)=FH2/2 : FWV(N9)=FV2/2

For I=2 To N9-2 Step 2
If I<V9*2 Then
FWH(I)=FH1 : FWV(I)=-FV1
ElseIf I=V9*2 Then
FWH(I)=FH1/2+FH2/2
FWV(I)=-FV1/2+FV2/2
ElseIf I>V9*2 Then
FWH(I)=FH2 : FWV(I)=FV2
End If
Next I

End Sub
```

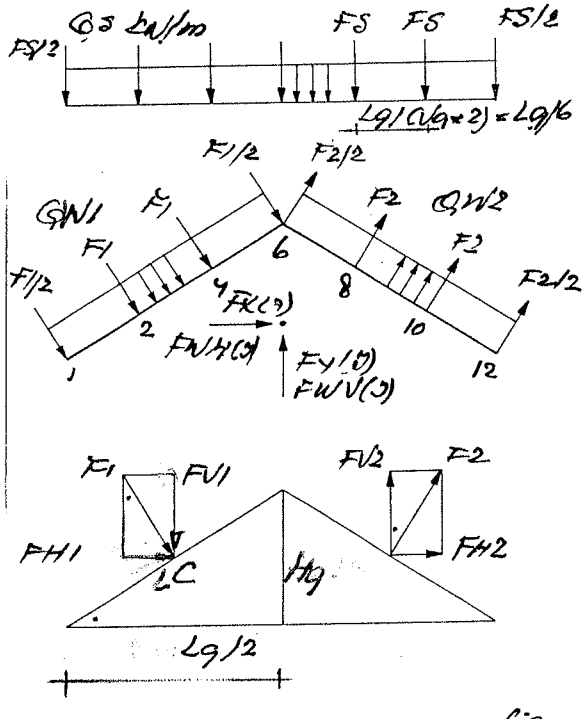


fig.1.

```
Private Sub SNOWLOAD5()
FS=QS*L9/(V9*2)
For I=1 To N9
FSV(I)=0
Next I

FSV(1)=-FS/2 : FSV(N9)=-FS/2

For I=2 To N9-2 Step 2
FSV(I)=-FS
Next I

End Sub
```

Private Sub WINDLOAD5()

Calculation of joint load forces FWH(I) and FWV(I) due to wind load.
This subroutine belongs to PROTRUSS5 dealt with on the preceding pages.

Fig.1.
If the wind blows horizontally from the left then on the left roof border acts a wind load QW1 kN/m (that is snow load in kN/m^2 times distance in m between the trusses), wind pressure, and on the right roof border QW2 kN/m, wind sucking.
With height H9 and half length/width L9/2 is length LC=Sqr(H9^2+(L9/2)^2).

On the joints, at the places of the purlins act following concentrated load forces,
FW1=QW1*LC/V9 and F1/2 on the left, and
FW2=QW2*LC/V9 and F2/2 on the right.
For the figure is V9=3.

With similarity of triangles follow

FH1/F1=H9/LC then FH1=F1*H9?LC
FV1/F1=(L9/2)/LC then FV1=F1*(L9/2)/LC

FH2/F2=H9/LC then FH2=F2*H9/LC
FV2/F2=(L9/2)/LC then FV2=F2*(L9/2)/LC

First for all the N9 joints the wind load forces FWH(I) and FWV(I) are made zero.
Then follow the joint wind load forces for the joints of the roof borders. The first joint 1 and last joint N9 are taken apart;
FWH(1)=FH1/2 : FWV(1)=-FV1/2
FWH(N9)=FH2/2 : FWV(N9)=FV2/2.

After that follow the joints, if V9=3,
For I=2 To N9-2 Step 2. N9=V9*4=3*4=12 so
For I=2 To 12-2=10 Step 2.

If I<V9*2=6 then become
FWH(I)=FH1 and FWV(I)=-FV1.
If I=V9*2 then for the top joint are
FWH(I)=FH1/2+FH2/2 and
FWV(I)=-FV1/2+FV2/2.
If I>V9/2 Then become
FWH(I)=FH2 and FWV(I)=FV2. And Next and
End Sub.

Private Sub SNOWLOAD5()

Calculation of the vertical joint load forces FSV(I) due to snow load.
FS=QS*L9/(V9*2)
First for all joints the forces FSV(I) are made zero. After that follow for joint 1 and N9:
FSV(1)=-FS/2 and FSV(N9)=-FS/2. And then like here above
For I=2 To N9-2 Step 2 but without an exception for the top joint,
FSV(I)=-FS
V9=1 only joint 2, V9=2 joints 2, 4 and 6, and V9=3 the joints 2, 4, 6, 8 and 10.
Next I

End Sub

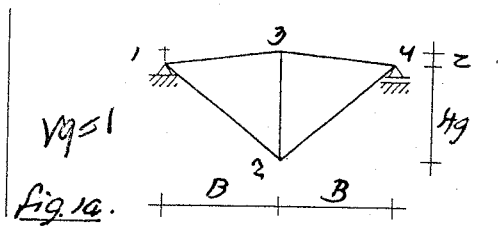


fig.1a.

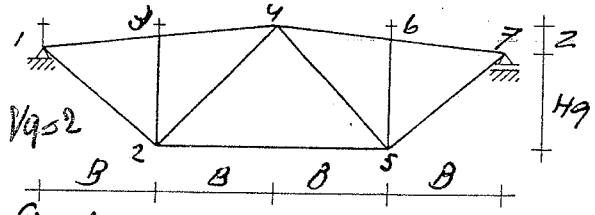


fig.1b.

V9=1 X1(I)=		V9=2 X1(I)=		V9=3 X1(I)=	
1	0	1	0	1	0
2	B+0*2*B	2	B+0*2*B	2	B+0*2*B
3	1*B	3	1*B	3	1*B
4	2*B	4	2*B	4	2*B
		5	B+1*2*B	5	B+1*2*B
		6	3*B	6	3*B
		7	4*B	7	4*B
				8	B+2*2*B
				9	5*B
				10	6*B

```
Private Sub PROTRUSS6()
N9=V9*3+1 : P9=V9*6-1
H=H9 : B=L9/(V9*2)
X1(I)=0
A=1 : S=0 : T=1
For I=2 To N9
  If A=1 Then
  X1(I)=B+S*2*B : A=A+1 : S=S+1
  Else If A=2 Or A=3 Then
  X1(I)=T*B : A=A+1 : T=T+1
  End If
  If A=4 Then A=1
Next I
```

Private Sub PROTRUSS6()

Programming joint and member data of trusses with construction forms as shown here in the figures.

Fig.1a, 1b, 1c.
To begin with a single 'triangle' with a vertical.With every next figure a triangle with vertical is added.
V9 indicates how 'large' the truss is, the number of triangles with a vertical member.
Basic data are length L9, height H9, Z and V9.

The joint data.
For each triangle with a vertical the joints are numbered as follows. From left joint 1 down and to the right to joint 2, then vertical up to joint 3 and to the right to joint 4. Then for the next triangle starting with 4 down to 5 and up to 6 and to the right to 7. And so on.
For each truss V9 the number of joint can be derived from the figures.

```
V9=1   N9=V9*3+1=1*3+1= 4      (=4+0*3)
V9=2   N9=V9*3+1=2*3+1= 7      (=4+1*3)
V9=3   N9=V9*3+1=3*3+1=10      (=4+2*3)
...
V9=7   N9=V9*3+1=7*3+1=22      (=4+6*3)
```

Horizontal distance B becomes B=L9/(V9*2).

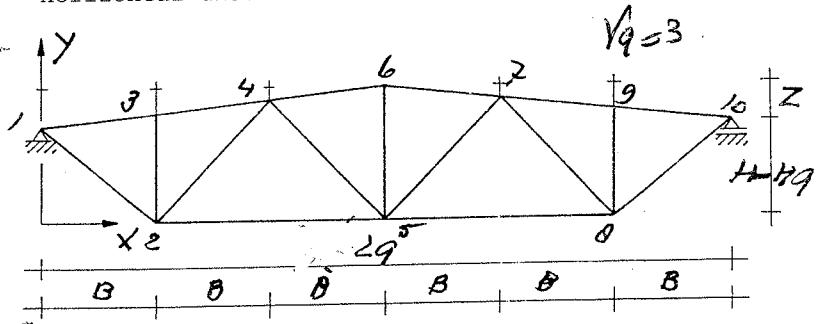
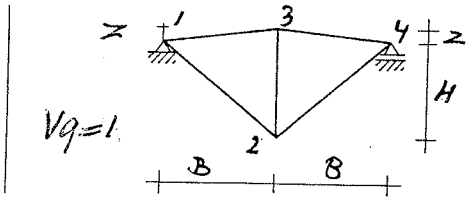


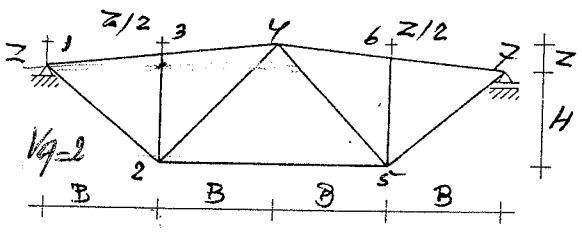
fig.c.

The X1-coordinates according to construction axis X.
On the left the joint coordinates are written out for the three figures. Joint 1 is taken apart, X1(1)=0.
Then follow the joints For I=2 To N9.
First A=1 : S=0 : T=1.
If A=1 then follows X1(I)=B+S*2*B for the joints of the bottom border, 2, 2 and 5, 2 and 5 and 8. With A every three joints are counted.
If A=2 or A=3 then is X1(I)=T*B. When A has become 4 then another three joints follow, then A is set A=1 for the next first joint of three.
Here below is written out the determination of the X1() coordinates for V9=2.

```
A=1  S=0  T=1
For I=2 To N9=7
I=2   A=1   X1(2)=B+0*2*B   A=A+1=2   S=S+1=1

I=3   A=2   X1(3)=T*B=1*B   A=A+1=3   T=T+1=2

I=4   A=3   X1(4)=T*B=2*B   A=A+1=4   T=T+1=3
      A=4   Is A=4 then becomes A=1.

I=5   A=1   X1(5)=B+1*2*B   A=A+1=2   (S=S+1=2)
I=6   A=2   X1(6)=T*B=3*B   A=A+1=3   T=T+1=4
I=7   A=3   X1(7)=T*B=4*B  (A=A+1=4   T=T+1=5)
```

V9=1 Y1(I)=		V9=2 Y1(I)=		V9=3 Y1(I)=	
1	H	1	H	1	H
2	0	2	0	2	0
3	H+1*Z/1	3	H+1*Z/2	3	H+1*Z/3
4	H+0*Z/1	4	H+2*Z/2	4	H+2*Z/3
		5	0	5	0
		6	H+1*Z/2	6	H+3*Z/3
		7	H+0*Z/2	7	H+2*Z/3
				8	0
				9	H+1*Z/3
				10	H+0*Z/3





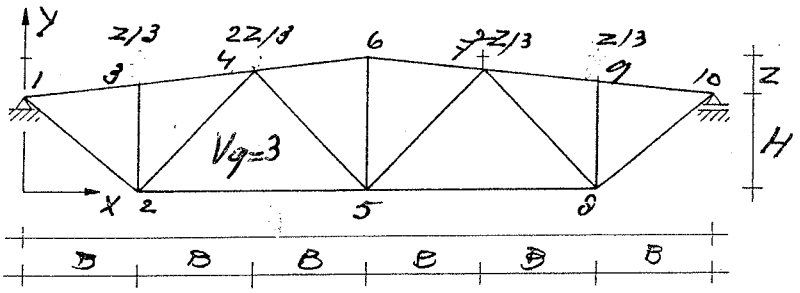

```
Y1(1)=H
A=1 : S=1 : C=0
For I=2 To N9
If A=1 Then
Y1(I)=0 : A=A+1
ElseIf A=2 Or A=3 Then
Y1(I)=H+S*Z/V9 : A=A+1 : C=C+1
If C<V9 Then
S=S+1
Else
S=S-1
End If
End If
If A=4 Then A=1
Next I

For I=1 To N9
FX(I)=0 : FY(I)=0
PH(I)=0 : PV(I)=0
UH(I)=0 : UV(I)=0
SH(I)=0 : SV(I)=0
Next I
PH(1)=1 : PV(1)=1 : PV(N9)=1
```

The Y1-coordinates according to construction axis Y.

Fig.2.
On the left the coordinates for the cases V9=1, 2 and 3 are written out.
Joint 1 is taken apart, Y1(1)=H.

First A=1 : S=1 : C=0.
Then follow the joints For I=2 To N9. See the code below on the left.
A=1 for the first joint I=2.
If A=1 then follows Y1(I)=0 for the joint of the bottom border, and becomes A=A+1=1+1=2 for the second joint of three which are counted with A.

Is A=2 or A=3 then the Y1-coordinates become Y1(I)=H+S*Z/V9, with first S=1.
Starting with joint 3 the joints of the top chord are counted with C, before C=0.
As long as C<V9 the Y1-coordinate of a joint of the top chord becomes larger (up to and including the joint in the middle), and becomes S=S+1.
After the joint in the middle the Y1-coordinate becomes smaller, then becomes S=S-1.
After three joints then has become A=4 and follows A=1 for the next first joint of three.



Below determining the Y1-coordinates for V9=2.

A=1 S=1 C=0
Y1(I)=

I=2 A=1 Y1(2)=0 A=A+1=2

I=3 A=2 Y1(3)=H+1*Z/2 A=A+1=3 C=C+1=1
C=1<V9=2 yes, then S=S+1=2.

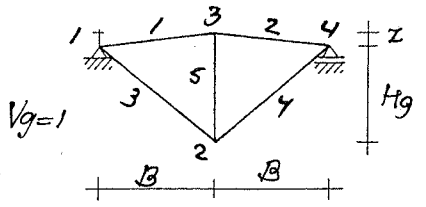
I=4 A=3 Y1(4)=H+2*Z/2 A=A+1=4 C=C+1=2
C=2<V9=2 no, now S=S-1=1
A=4 then becomes A=1.

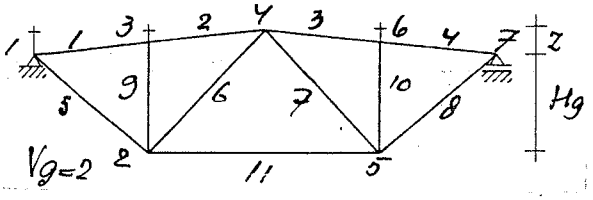
I=5 A=1 Y1(5)=0 A=A+1=2

I=6 A=2 Y1(6)=H+1*Z/2 A=A+1=3 C=C+1=3
C=3<V9=2 no, and thus S=S-1=0.

I=7 A=3 Y1(7)=H+0*Z/2

Before starting the main calculation, (and input of loads), page , the start values of all N9 joint data are made zero. The displacements UH(1) and UV(I) of joint 1, and UV(N9) of joint N9 are prescribed, therefore PH(1)=1, PV(1)=1 and PV(N9)=1.





	V9*2	V9*4	V9*5	P9
V9=1	2	4	5	5
V9=2	4	8	10	11
V9=3	6	12	15	17

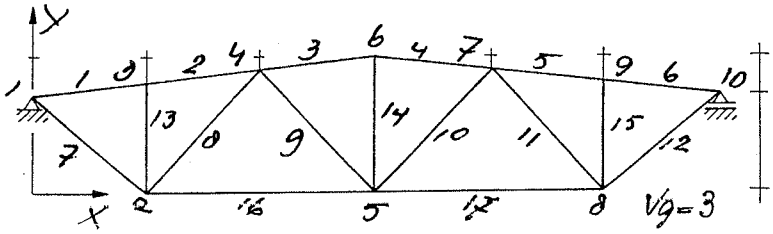
V9=1			V9=2			V9=3		
P	L	H	P	L	H	P	L	H
1	1	3	1	1	3	1	1	3
2	3	4	2	3	4	2	3	4
			3	4	6	3	4	6
			4	6	7	4	6	7
						5	7	9
					V9*2=	6	9	10
3	1	2	5	1	2	7	1	2
4	2	4	6	2	4	8	2	4
			7	4	5	9	4	5
			8	5	7	10	5	7
						11	7	8
					V9*4=	12	8	10
5	2	3	9	2	3	13	2	3
			10	5	6	14	5	6
					V9*5=	15	8	9
			11	2	5	16	2	5
					P9=	17	5	8

```
P9=V9*6-1
A=1 : B=1
For P=1 To V9*4 Step 2
  If P<V9*2 Then
  LL(P)=A : HH(P)=A+2 : A=HH(P)
  LL(P+1)=A : HH(P+1)=A+1
  A=HH(P+1)
  Else
  LL(P)=B : HH(P)=B+1 : B+HH(P)
  LL(P+1)=B : HH(P+1)=B+2
  B=HH(P+1)
  End If
Next P
```

The member data.

The members are numbered from left to right as follows, first
a) the top border members, then
b) the sloping plane members, next
c) the vertical plane members, and finally
d) the bottom border members.
For a truss V9 one finds the following numbers of members.

V9=1 P9=V9*6-1=1*6-1= 5 (5+(V9-1)*6)
V9=2 P9=V9*6-1=2*6-1=11 id
V9=3 P9=V9*6-1=3*6-1=17 id



Determination of the lowest and highest member end numbers LL(P) and HH(P).
One the left the member end numbers are given for V9=1 To 3 for the assumed joint numbering.

a) The top border members, number V9*2.
The group is divided into pairs. For the first member of a pair the difference between LL(P) and HH(P) is equal 2, and for the second member of the pair the difference is equal 1.
Further is HH(P) of the first member equal to LL(P) of the second member.
LL(P) of the first member of the group of top border members is always LL(P)=1, therefore first A=1.
Suppose V9=2, then follow if P<V9*2=4

P=1 P<V9*2 is 1<4 yes
The members 1 and 2.
LL(P)=LL(1)=A=1 HH(1)=A+2=3 A=HH(1)=3
LL(P+1)=LL(2)=A=3 HH(2)=A+1=4 A=HH(2)=4
P=3 P<V9*2 is 3<4 yes
The members 3 and 4.
LL(P)=LL(3)=A=4 HH(3)=A+2=6 A=HH(3)=6
LL(P+1)=LL(4)=A=6 HH(4)=A+1=7
After Next P P has become P=5.

b) The sloping plane members. The number is also V9*2. This group is dividid into pairs as well. The difference between LL(P) and HH(P) of the first member of a pair is 1, and of the second member 2.
HH(P) of the first member is equal to LL(P) of of the second member.
LL(P) of the first member of this group is for each V9 always one, therefore first B=1. Now going on with V9=2
P=5 P<V9*2 is 5<4 no
The members 5 and 6.
LL(P)=LL(5)=B=1 HH(5)=B+1=2 B=HH(5)=2
LL(P+1)=LL(6)=B=2 HH(6)=B+2=4 B=HH(6)=4
P=7 P<V9*2 is 7<4 no
LL(P)=LL(7)=B=4 HH(7)=B+1=5 B=HH(7)=5
LL(P+1)=LL(8)=B=5 HH(8)=B+2=7
Thus LL(P) and HH(P) of the first V9*4=8 members are dtermined.

V9=1			V9=2			V9=3		
P	L	H	P	L	H	P	L	H
					V9*4=12	8	10	
5	2	3	9	2	3	13	2	3
			10	5	6	14	5	6
					V9*5=15	8	9	
			11	2	5	16	2	5
					P9=17	5	8	

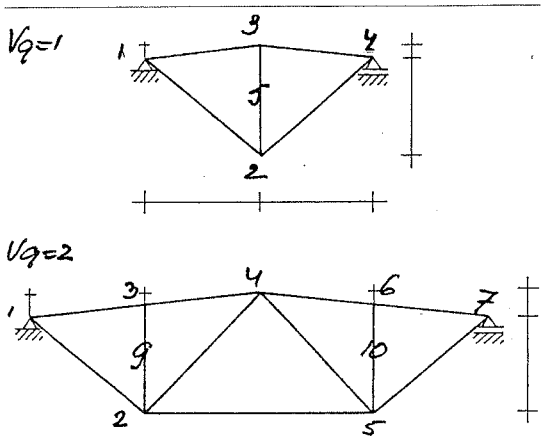


Fig.4.

```
C=2 : D=2
For P=V9*4+1 To P9
If P<V9*5+1 Then
LL(P)=C : HH(P)=C+1 : C=HH(P)+2
Else
LL(P)=D : HH(P)=D+3 : D=HH(P)
End If
Next P

For P=1 To P9 : L=LL(P) : H=HH(P)
D1=X1(H)-X1(L) : D2=Y1(H)-Y1(L)
L11(P)=SQR(D1^2+D2^2)
A11(P)=1 : EAA(P)=A11(P) :QEE(P)=0
Next P

End Sub
```

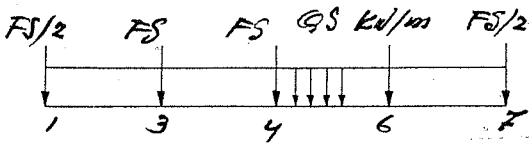


Fig.5.

```
Private Sub SNOWLOAD6()
FS=QS*L9/(V9*2)
For I=1 To N9
FSV(I)=0
Next I
FSV(1)=-FS/2 : FSV(N9)=-FS/2
For I=3 To N9-1 Step 3
If I<N9-1 Then
FSV(I)=-FS : FSV(I+1)=-FS
Else
FSV(I)=-FS
End If
Next I

End Sub
```

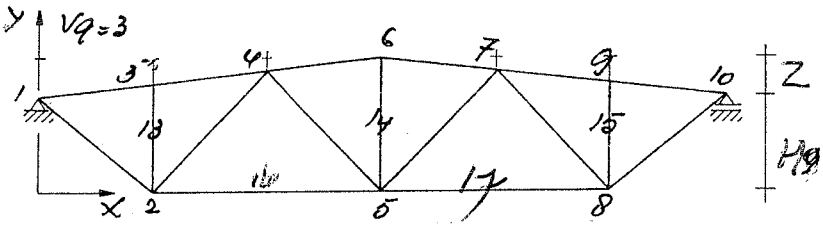
c) The vertical plane members.

Fig.4.
These are the members V9*4+1 to V9*5.
For each V9 for the first member of this group is always LL(P)=2, therefore first C=2.
The difference between LL(P) and HH(P) is always 1, and LL(P) of a next member is equal to HH(P)0f the preceding member plus 2.
With V9=3 is
the first member V9*4+1=3*4+1=13, and the last member of the group is V9*5=3*5=15.
For P=V9*4+1 To P9=13 To 17

P=13 P<V9*5+1 is 13<16? yes
LL(13)=C=2 HH(13)=C+1=3 C=HH(13)+2=5

P=14 14<16? yes
LL(14)=C=5 HH(14)=C+1=6 C=HH(14)+2=8

P=15 15<16? yes
LL(15)=C=8 HH(15)=C+1=9



d) The bottom border members.
These are the members V9*5+1 to P9. If V9=3 the members 16 and 17.
Of the first member of this group always is LL(P)=2, therefore first D=2.
The difference between LL(P) and HH(P) is always 3, and LL(P) of a next member is equal to HH(P) of the preceding member.

P=16 P<V9*5+1 is 16<16? no, then Else
LL(16)=D=2 HH(16)=D+3=5 D=HH(16)=5

P=17 17<16? no
LL(17)=D=5 HH(17)=D+3=8

And when V9=1?
For P=V9*4+1 To P9=5 To 5

P=5 P<V9*5+1 is 5<6? yes
LL(5)=C=2 HH(5)=C+1=3
for the vertical member.

With Next P becomes P=6, end of For-Next. There is no bottom border member P=6 for V9=1.
Next the member lengths are calculated and the strain stiffness becomes EAA(P)=1, and own weight is set QEE(P)=0.
End Sub.

Private Sub SNOWLOAD6() (see page)
Calculation of joint load forces of the top border due to snow load.
Fig.5.
Due to QS kN/m is FS=QS*L9/(V9*2).
All N9 vertical forces FSV(I) are first set zero. For joint 1 and joint N9 follow FSV(1)=-FS/2 and FSV(N9)=-FS/2.
The first joint with a 'whole' FS is always joint 3, the last with FS joint N9-1.
For I=3 To N9-1 Step 3 With V9=2 as follows,
For I=3 To 6 Step 3
I=3 3<N9-1=6? yes
FSV(3)=-FS and FSV(3+1)=FSV(4)=-FS
I=6 6<6? no FSV(6)=-FS
End Sub.