AJS Structural Design Ltd.

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Sheet no. 1	Rev. C
Prepared by: TM	Date: JUN 17
Checked by: SS	Date: JUN 17
Title of Scheme HAYES GATE FARM	Job no: A3127

STRUCTURAL CALCULATIONS
FOR THE EXISTING PORTAL-FRAME
AGRICULTURAL BUILDING
AT
HAYES GATE FARM
STAR ROAD,
OAKAMOOR,
STOKE-ON-TRENT,
ST10 3BN

PREPARED IN ACCORDANCE WITH THE RELEVANT PARTS OF THE FOLLOWING CODES OF PRACTICE:-

BS 6399 LOADING FOR BUILDINGS
BS 5950 STRUCTURAL USE OF STEELWORK

DATE: JUN 2017
REF: A3127

REV A – JUL 17 – Revised wording of recommendations
REV B – SEP 17 – Revised location of bracing and member stays
REV C – JAN 18 – Building plan inserted to p2
Revised wording of conclusions

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Sheet no. **2**	Rev. **C**
Prepared by: **TM**	Date: **JUN 17**
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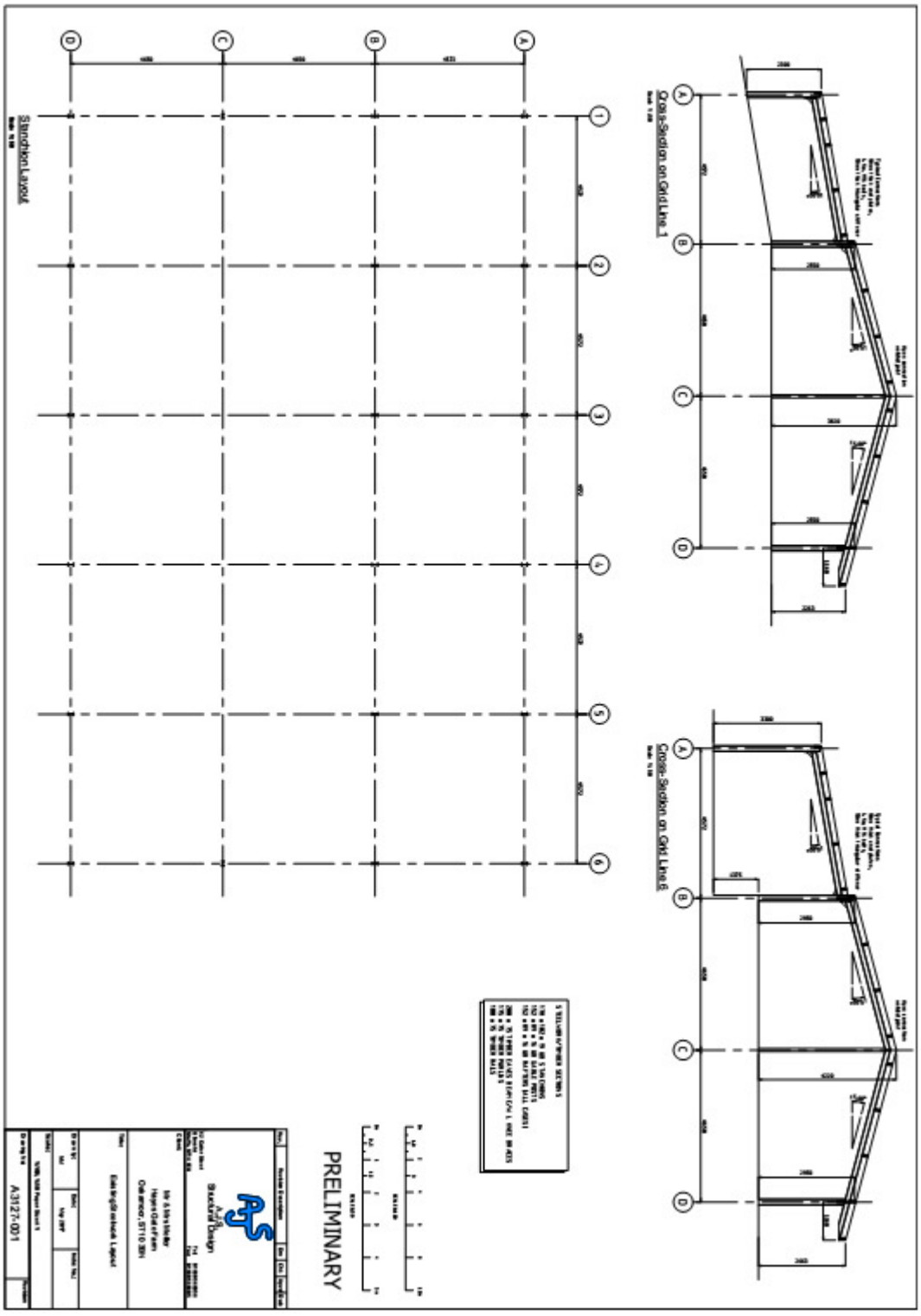
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

STRUCTURAL CALCULATIONS – STEEL-FRAME BUILDING



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Sheet no. **3**	Rev. **C**
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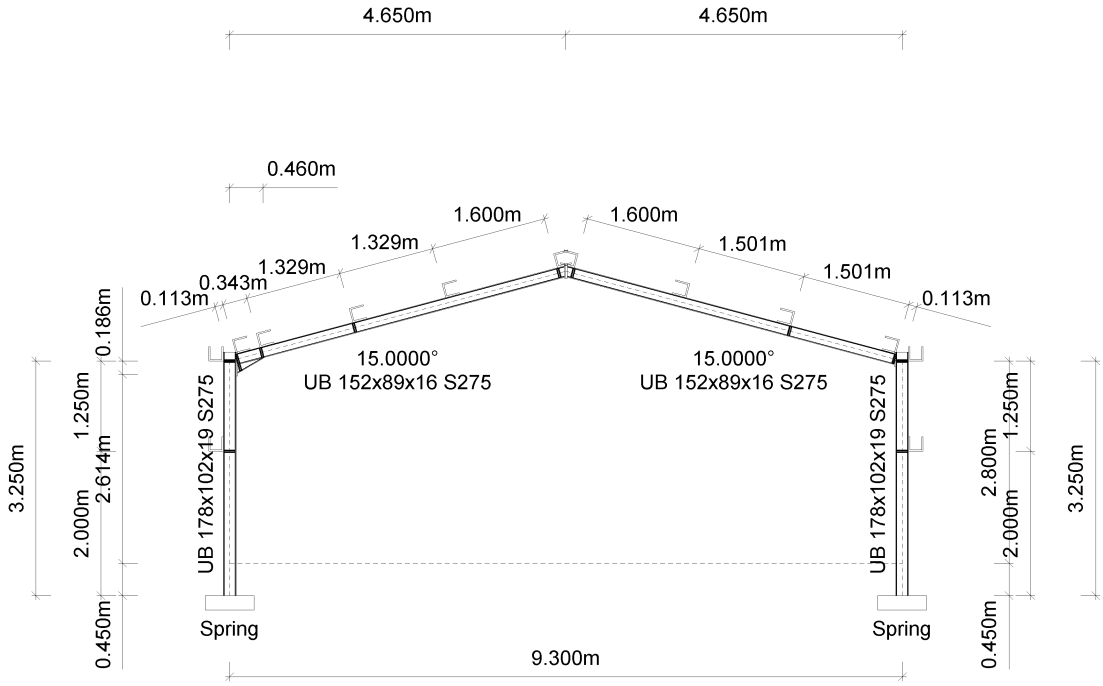
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

Analysis performed on most onerous, tallest frame; fully-loaded Grid 5 as if geometry is the same as the half-loaded Grid 6. Frames towards Grid 1 are not as high to eaves and therefore present a less onerous case.

REFERENCE: Portal Frame Grid 5



Frame Details

No. Spans	1	
Effective Frame Centres	4.572	m

Span Geometry

Span	Type	Axis	Lh Eaves [m]	Lh Apex [m]	Apex [m]	Rh Apex [m]	Rh Eaves [m]
Span 1	Standard	X	0.0	-	4.650	-	9.300
		Z	2.800	-	4.046	-	2.800

Wind Options

Wind Method	Standard	
Basic Wind Speed (Vb)	21.5	m/s
Ground Roughness	Country	
Upwind distance from sea to site	97.9	km
Altitude factor (Sa)	1.2900	
Seasonal factor (Ss)	1.0000	

Probability factor (Sp) 1.0000

Snow Options

Basic Snow Load (Sb) 0.600 kN/m²

Base Fixities

Base	Type	Level [m]		Vertical [kN/m]	Horizontal [kN/m]	Rotational [kNm/rad]	Capacity [%]	Capacity [kNm]
Span 1 Lh	Spring	-0.450	ULS	Restr.	Restr.	Free	1.00	
		-0.450	SLS	Restr.	Restr.	684.245	N/A	N/A
		-0.450	Stab	Restr.	Restr.	342.120	1.00	
Span 1 Rh	Spring	-0.450	ULS	Restr.	Restr.	Free	1.00	
		-0.450	SLS	Restr.	Restr.	684.245	N/A	N/A
		-0.450	Stab	Restr.	Restr.	342.120	1.00	

Haunches

Haunch	Length [m]	Depth [m]	Beta [°]	Gamma [°]	Offset X1 [mm]	Offset X2 [mm]	Filler Plate
Span 1 Lh Eaves	0.460	0.186	30.8208	15.8208	59.1	349.7	

Loadcases

Frame Dead Load (Dead)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Sheeting	Span 1	Vert.	0.180	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	2.2	-	3.250

Frame Service Load (Dead)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Span Area	Span 1	Vert.	0.050	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	0.8	-	3.250

Frame Imposed Load (Imposed)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Span Area	Span 1	Vert.	0.600	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	6.2	-	3.250

SLS, Wind: Side Left, Cpi -0.3000, Roof Cpe -ve

Member	qs [kN/m²]	Cpi	Cpe	L [m]	a [m]	Cae	Cai	%
Span 1 Lh Column	0.914	-0.3000	0.5520	3.250	5.609	0.9928	1.0000	100.00
Span 1 Lh Rafter	0.914	-0.3000	-0.8000	0.838	6.639	0.9801	1.0000	100.00
Span 1 Lh Rafter			-0.4000	3.976				
Span 1 Rh Rafter	0.914	-0.3000	-0.5000	3.976	6.639	0.9801	1.0000	100.00
Span 1 Rh Rafter			-0.9000	0.838				
Span 1 Rh Column	0.914	-0.3000	-0.3911	3.250	5.609	0.9928	1.0000	100.00

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	-12.1	-	3.250

SLS, Wind: Gable End Top, Cpi -0.3000, Roof Cpe -ve

Wind Loads

Member	qs [kN/m²]	Cpi	Cpe	L [m]	a [m]	Cae	Cai	%
Span 1 Lh Column	0.914	-0.3000	-0.8000	3.250	5.609	0.9928	1.0000	100.00
Span 1 Lh Rafter	0.914	-0.3000	-0.6000	4.814	6.639	0.9801	1.0000	100.00
Span 1 Rh Rafter	0.914	-0.3000	-0.6000	4.814	6.639	0.9801	1.0000	100.00
Span 1 Rh Column	0.914	-0.3000	-0.8000	3.250	5.609	0.9928	1.0000	100.00

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	-12.1	-	3.250

Design Wizard Options

Design Criteria

BS5950 Part1 : 2000

Maximum Hinge Rotation	6.0000	°
Percent Mp for Plasticity	99.00	%
Axial Load Factor	1.2500	

Design Limits

Eaves Deflection	Relative Limit	100.0	mm
Apex Deflection	Relative Limit	200.0	mm
Cladding Stiffness		0.0	%
Tie Elongation	No Limit		

Design Code: BS5950

Design Summary

Design Combination	Lambda p	Lambda r	Status
Sw + Dead + Serv. + Imp.	1.113	1.000	Pass
D+W LHS -0.3	2.323	1.000	Pass
D+W Gable -0.3	29.831	1.000	Pass
D+S+I+W LHS -0.3	1.261	1.000	Fail
D+S+I+W Side -0.3	1.132	1.000	Pass

Member Stability Status: Pass

Sw + Dead + Serv. + Imp.

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.758	Pass
Span 1 Rh Rafter	0.998	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.652	Pass
Span 1 Rh Column	0.718	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.525	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-7.6/32.5	na	42.3/46.5	na	14.7/32.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	9.5554		
Second order failure load factor λ_f	1.1134		
Pass			

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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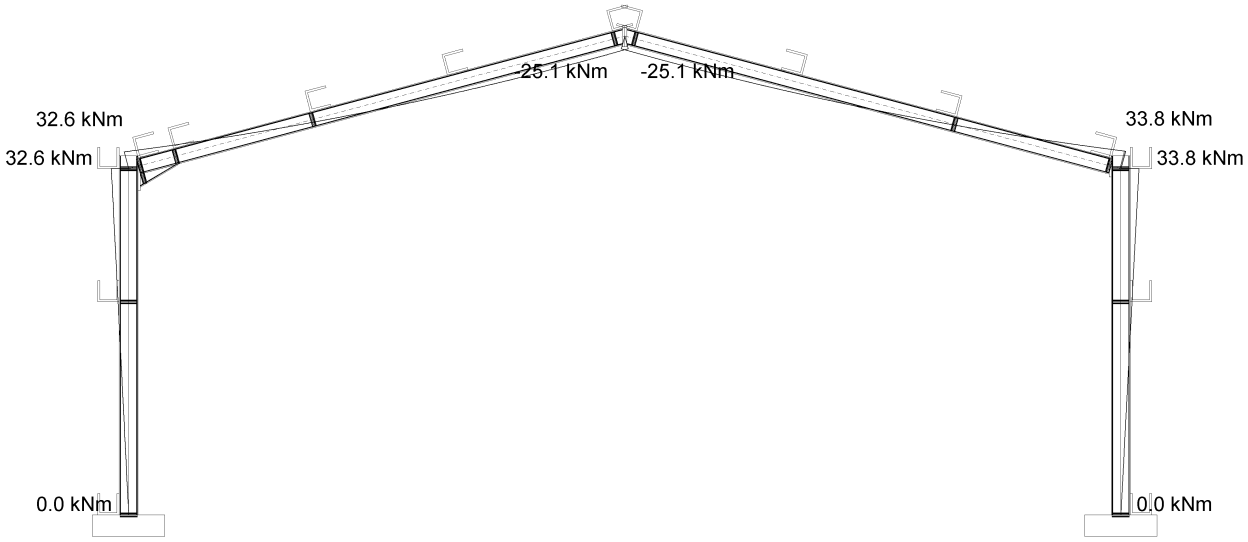
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

Bending Moment Diagram



D+W LHS -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.474	Pass
Span 1 Rh Rafter	0.386	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.394	Pass
Span 1 Rh Column	0.278	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.363	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	25.3/32.5	na	-1.2/46.5	na	24.7/32.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	-90.1072		
Second order failure load factor λ_f	3.1854		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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Sheet no. **11**	Rev. **C**
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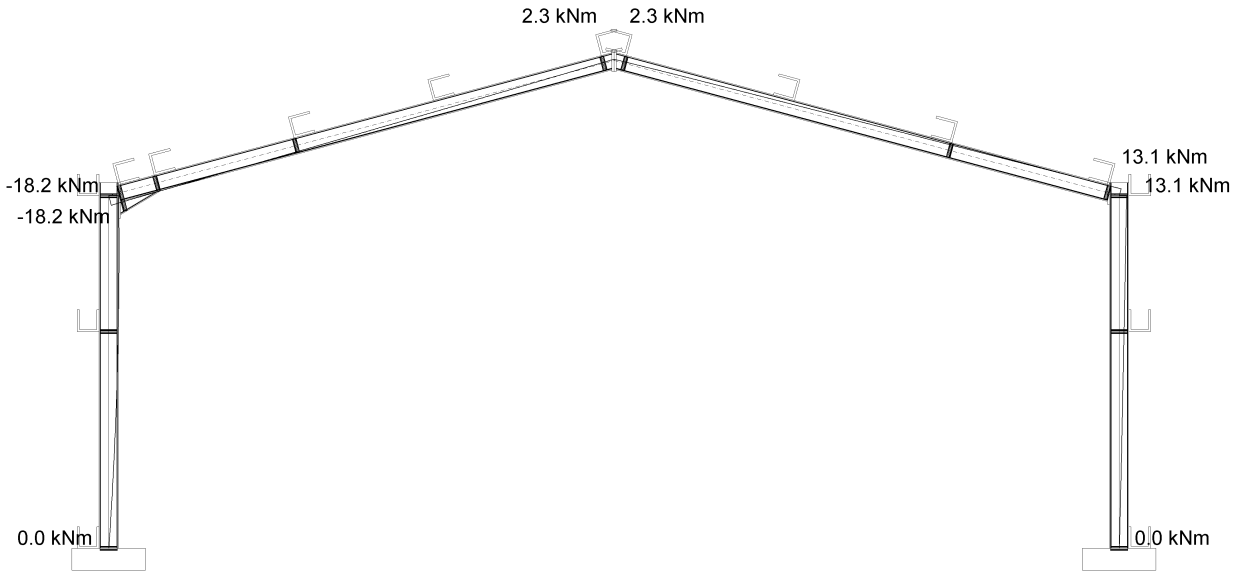
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

Bending Moment Diagram



D+W Gable -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.058	Pass
Span 1 Rh Rafter	0.057	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.065	Pass
Span 1 Rh Column	0.066	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.027	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-1.1/32.5	na	4.3/46.5	na	1.3/32.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	-52.3431		
Second order failure load factor λ_f	29.9276		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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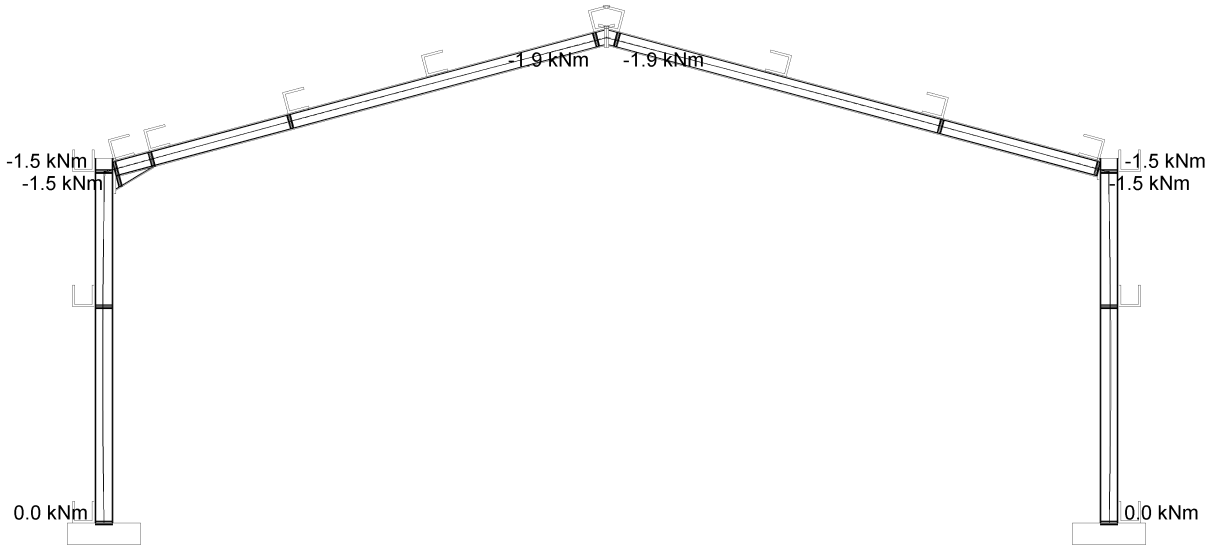
Bending Moment Diagram



D+S+I+W LHS -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.529	Pass
Span 1 Rh Rafter	0.997	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.080	Pass
Span 1 Rh Column	0.718	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.091	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Fail	19.6/32.5	na	30.3/46.5	na	35.6/32.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	19.8248		
Second order failure load factor λ_f	1.2608		

Pass

Member Stability

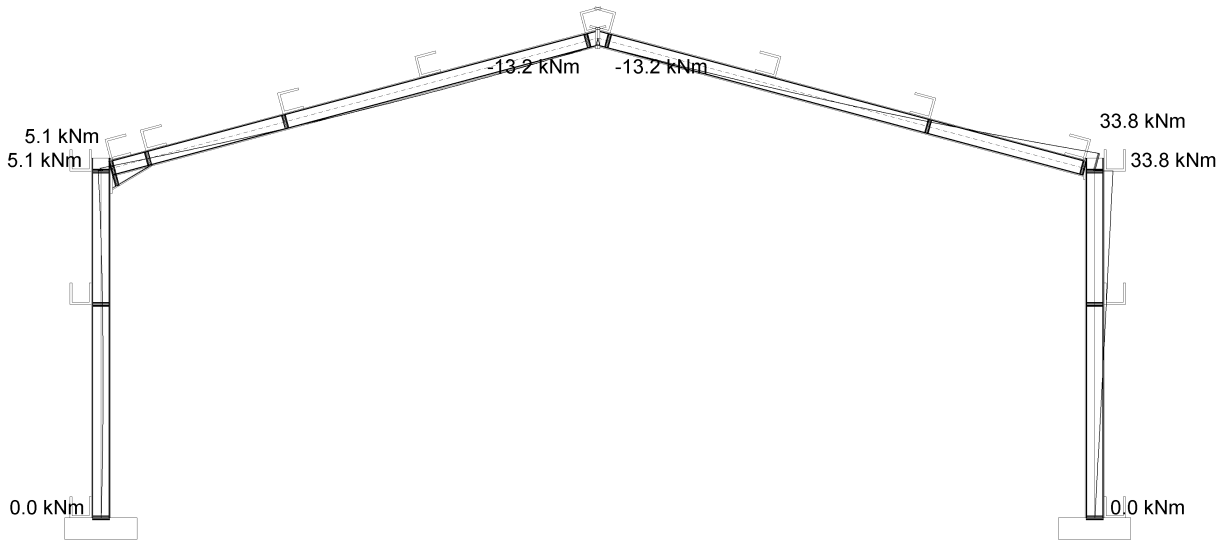
Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

Bending Moment Diagram



D+S+I+W Side -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.724	Pass
Span 1 Rh Rafter	0.998	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.676	Pass
Span 1 Rh Column	0.718	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.553	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-7.6/32.5	na	42.3/46.5	na	14.7/32.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	9.5568		
Second order failure load factor λ_f	1.1321		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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Sheet no. **17**	Rev. **C**
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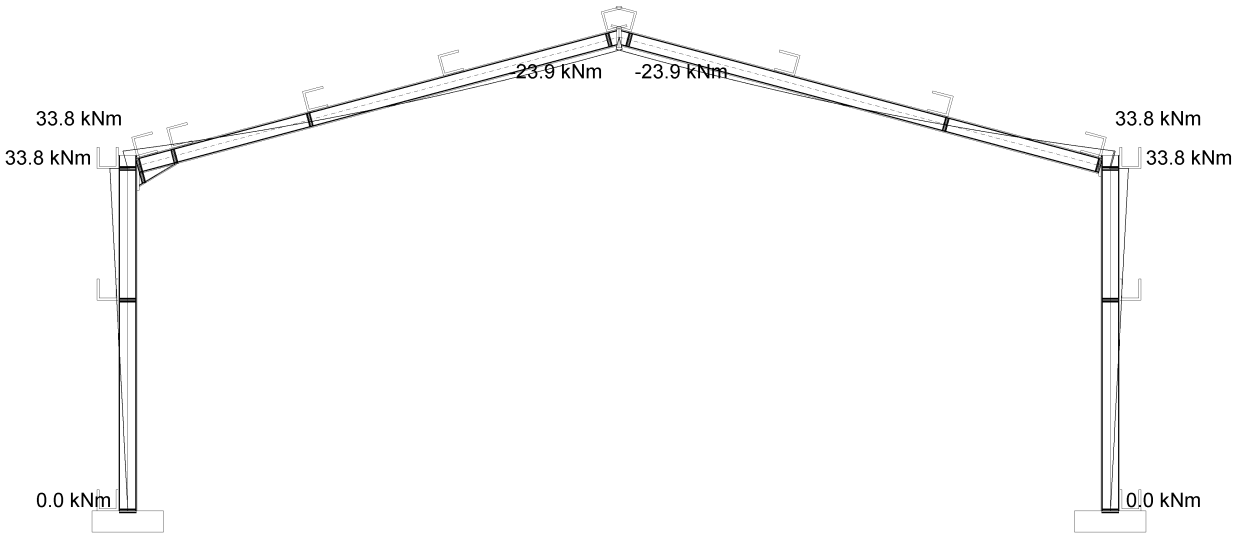
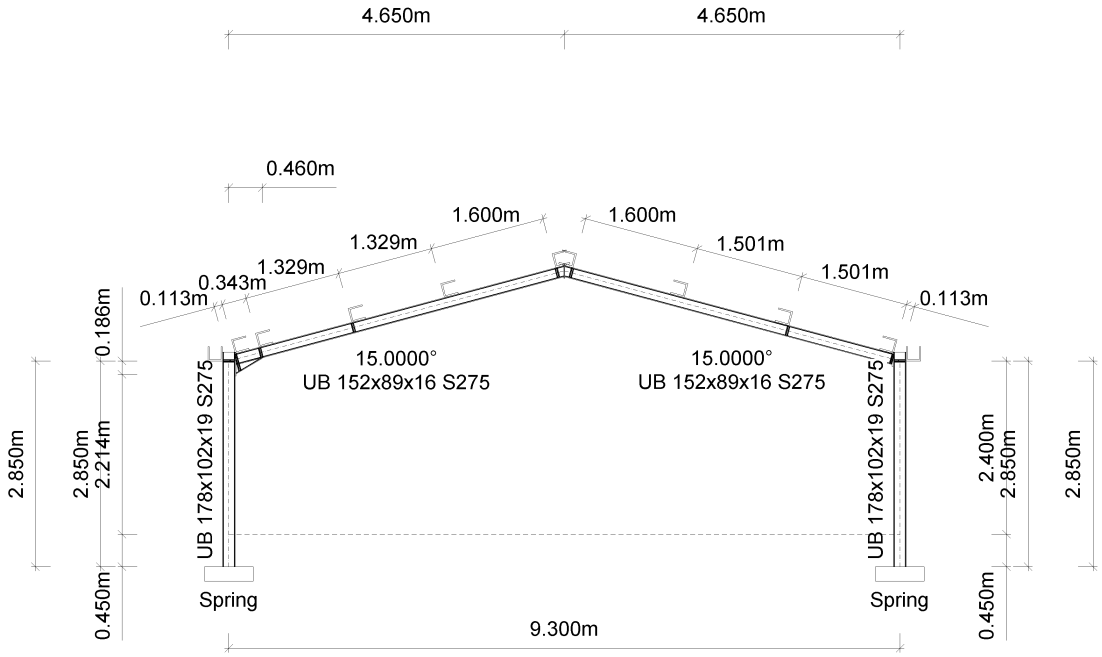
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

Bending Moment Diagram



REFERENCE: Portal Frame Grid 1

Frame Diagram



Frame Details

No. Spans	1	
Effective Frame Centres	4.572	m

Span Geometry

Span	Type	Axis	Lh Eaves [m]	Lh Apex [m]	Apex [m]	Rh Apex [m]	Rh Eaves [m]
Span 1	Standard	X	0.0	-	4.650	-	9.300
		Z	2.400	-	3.646	-	2.400

Wind Options

Wind Method	Standard	
Basic Wind Speed (Vb)	21.5	m/s
Ground Roughness	Country	
Upwind distance from sea to site	97.9	km
Altitude factor (Sa)	1.2900	

Seasonal factor (Ss)	1.0000
Probability factor (Sp)	1.0000

Snow Options

Basic Snow Load (Sb)	0.600	kN/m^2

Base Fixities

Base	Type	Level [m]		Vertical [kN/m]	Horizontal [kN/m]	Rotational [kNm/rad]	Capacity [%]	Capacity [kNm]
Span 1 Lh	Spring	-0.450	ULS	Restr.	Restr.	Free	1.00	
		-0.450	SLS	Restr.	Restr.	684.245	N/A	N/A
		-0.450	Stab	Restr.	Restr.	342.120	1.00	
Span 1 Rh	Spring	-0.450	ULS	Restr.	Restr.	Free	1.00	
		-0.450	SLS	Restr.	Restr.	684.245	N/A	N/A
		-0.450	Stab	Restr.	Restr.	342.120	1.00	

Haunches

Haunch	Length [m]	Depth [m]	Beta [°]	Gamma [°]	Offset X1 [mm]	Offset X2 [mm]	Filler Plate
Span 1 Lh Eaves	0.460	0.186	30.8208	15.8208	60.8	359.7	

Loadcases

Frame Dead Load (Dead)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Sheeting	Span 1	Vert.	0.180	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	2.2	-	2.850

Frame Service Load (Dead)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Span Area	Span 1	Vert.	0.050	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	0.8	-	2.850

Frame Imposed Load (Imposed)

Area Loads

Load Type	Span Member	Direction	$Load_1$ [kN/m²]	a [m]	$Load_2$ [kN/m²]	b [m]	Centres [m]
Span Area	Span 1	Vert.	0.600	-	-	-	4.572

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	6.2	-	2.850

SLS, Wind: Side Left, Cpi -0.3000, Roof Cpe -ve

Member	qs [kN/m²]	Cpi	Cpe	L [m]	a [m]	Cae	Cai	%
Span 1 Lh Column	0.914	-0.3000	0.5111	2.850	5.388	0.9958	1.0000	100.00
Span 1 Lh Rafter	0.914	-0.3000	-0.8000	0.838	6.639	0.9801	1.0000	100.00
Span 1 Lh Rafter			-0.4000	3.976				
Span 1 Rh Rafter	0.914	-0.3000	-0.5000	3.976	6.639	0.9801	1.0000	100.00
Span 1 Rh Rafter			-0.9000	0.838				
Span 1 Rh Column	0.914	-0.3000	-0.3816	2.850	5.388	0.9958	1.0000	100.00

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	-12.1	-	2.850

SLS, Wind: Gable End Top, Cpi -0.3000, Roof Cpe -ve

Member	qs [kN/m²]	Cpi	Cpe	L [m]	a [m]	Cae	Cai	%
Span 1 Lh Column	0.914	-0.3000	-0.8000	2.850	5.388	0.9958	1.0000	100.00
Span 1 Lh Rafter	0.914	-0.3000	-0.6000	4.814	6.639	0.9801	1.0000	100.00
Span 1 Rh Rafter	0.914	-0.3000	-0.6000	4.814	6.639	0.9801	1.0000	100.00
Span 1 Rh Column	0.914	-0.3000	-0.8000	2.850	5.388	0.9958	1.0000	100.00

Point Loads

Load Type	Span Member	Direction	F [kN]	M [kNm]	a [m]
Force	Span 1 Lh Column	Vert.	-12.1	-	2.850

Design Wizard Options

Design Criteria

BS5950 Part1 : 2000

Maximum Hinge Rotation	6.0000	°
Percent Mp for Plasticity	99.00	%
Axial Load Factor	1.2500	

Design Limits

Eaves Deflection	Relative Limit	100.0	mm
Apex Deflection	Relative Limit	200.0	mm
Cladding Stiffness		0.0	%
Tie Elongation	No Limit		

Design Code: BS5950

Design Summary

Design Combination	Lambda p	Lambda r	Status
Sw + Dead + Serv. + Imp.	1.137	1.000	Pass
D+W LHS -0.3	3.149	1.000	Pass
D+W Gable -0.3	29.534	1.000	Pass
D+S+I+W LHS -0.3	1.407	1.000	Pass
D+S+I+W Side -0.3	1.154	1.000	Pass

Member Stability Status: Pass

Sw + Dead + Serv. + Imp.

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.709	Pass
Span 1 Rh Rafter	0.997	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.649	Pass
Span 1 Rh Column	0.717	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.533	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-7.0/28.5	na	38.3/46.5	na	13.2/28.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	10.8903		
Second order failure load factor λ_f	1.1369		

Pass

Member Stability

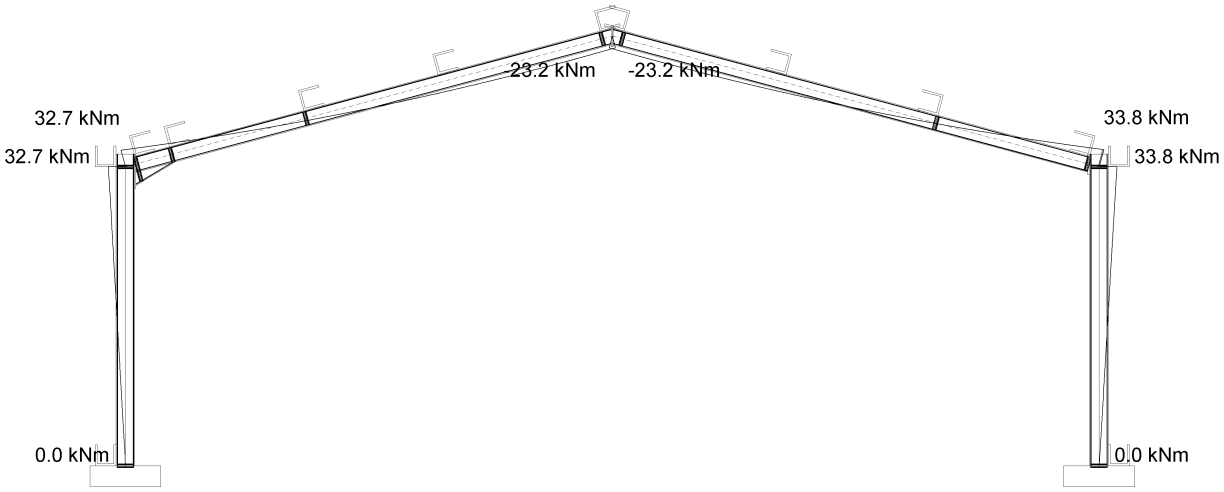
Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

Bending Moment Diagram



D+W LHS -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.359	Pass
Span 1 Rh Rafter	0.275	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.301	Pass
Span 1 Rh Column	0.198	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.275	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	16.3/28.5	na	-0.5/46.5	na	16.0/28.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	-98.6428		
Second order failure load factor λ_f	4.0353		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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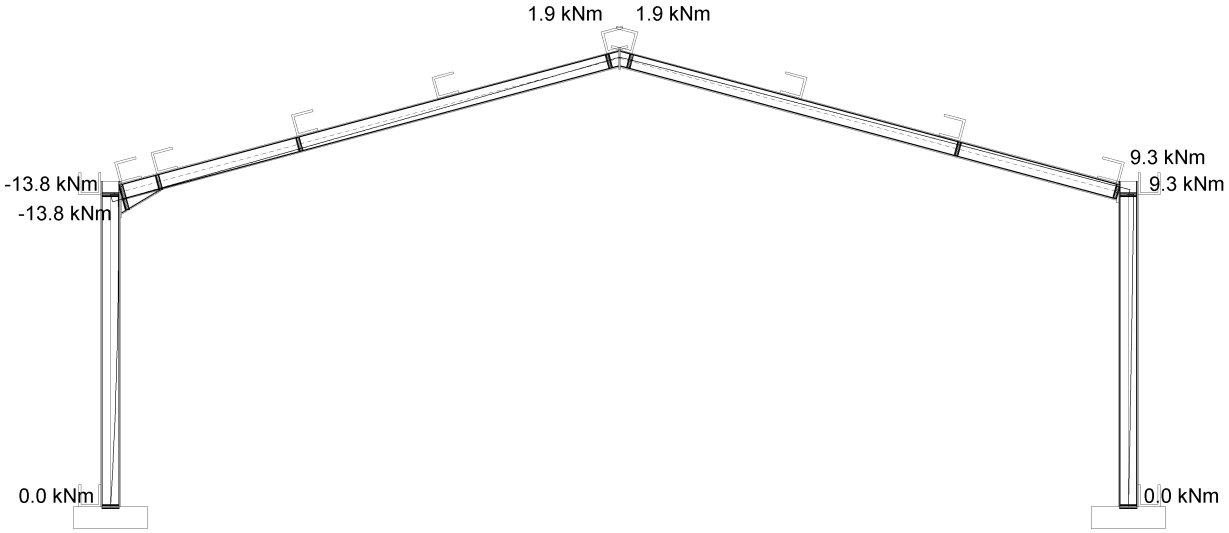
Bending Moment Diagram



D+W Gable -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.046	Pass
Span 1 Rh Rafter	0.048	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.046	Pass
Span 1 Rh Column	0.046	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.029	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-0.8/28.5	na	3.2/46.5	na	1.0/28.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	-59.1695		
Second order failure load factor λ_f	29.7474		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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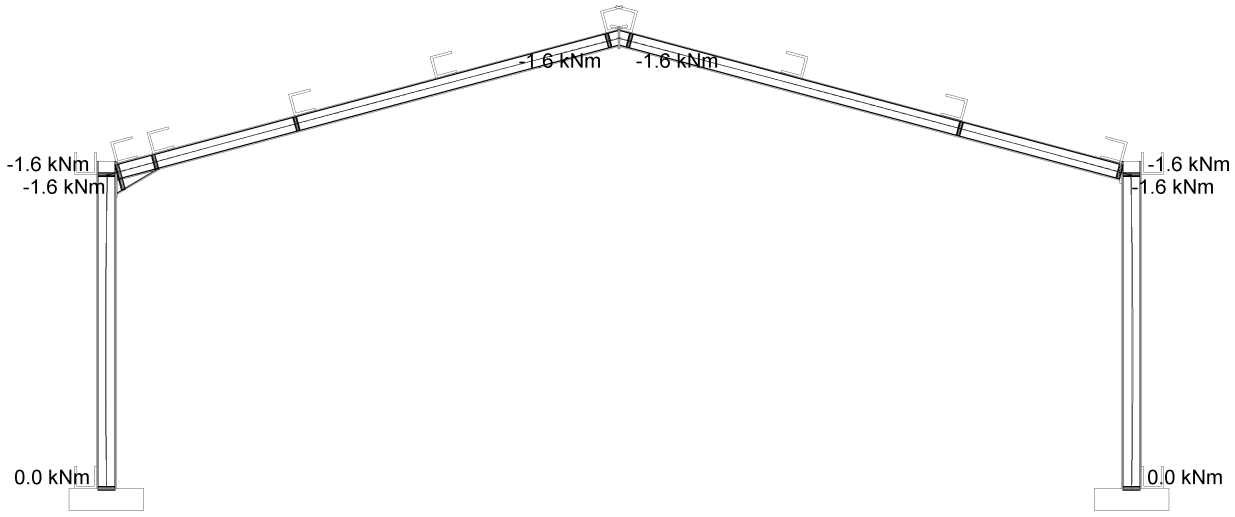
Bending Moment Diagram



D+S+I+W LHS -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.380	Pass
Span 1 Rh Rafter	0.957	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.205	Pass
Span 1 Rh Column	0.689	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.168	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	11.0/28.5	na	28.0/46.5	na	25.8/28.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	22.3144		
Second order failure load factor λ_f	1.4075		

Pass

Member Stability

Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

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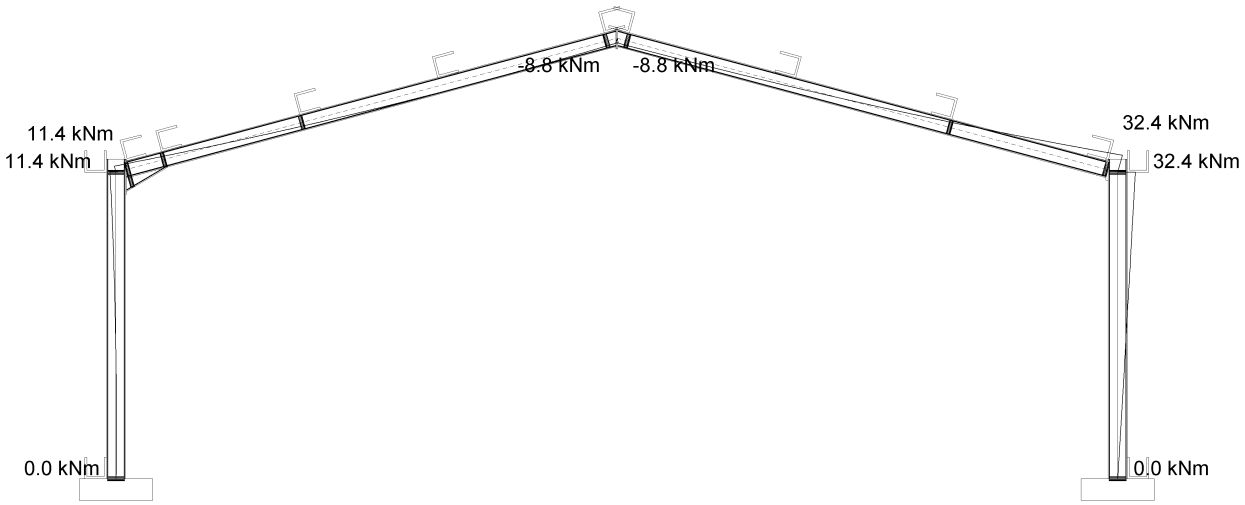
Bending Moment Diagram



D+S+I+W Side -0.3

Strength

Rafters

Member	U.R.	Status
Span 1 Lh Rafter	0.678	Pass
Span 1 Rh Rafter	0.997	Pass

Columns

Member	U.R.	Status
Span 1 Lh Column	0.670	Pass
Span 1 Rh Column	0.717	Pass

Haunches

Member	U.R.	Status
Span 1 Lh Rafter Lh Eaves	0.558	Pass

Serviceability

Span	Status	Lh Eaves(H)	Lh Apex(V)	Apex(V)	Rh Apex(V)	Rh Eaves(H)
Span 1	Pass	-7.0/28.5	na	38.3/46.5	na	13.2/28.5

Frame Stability

SCI Publication P 292

Item	Value	Units	Clause Ref.
Elastic critical load factor λ_{crit}	10.8922		
Second order failure load factor λ_f	1.1542		

Pass

Member Stability

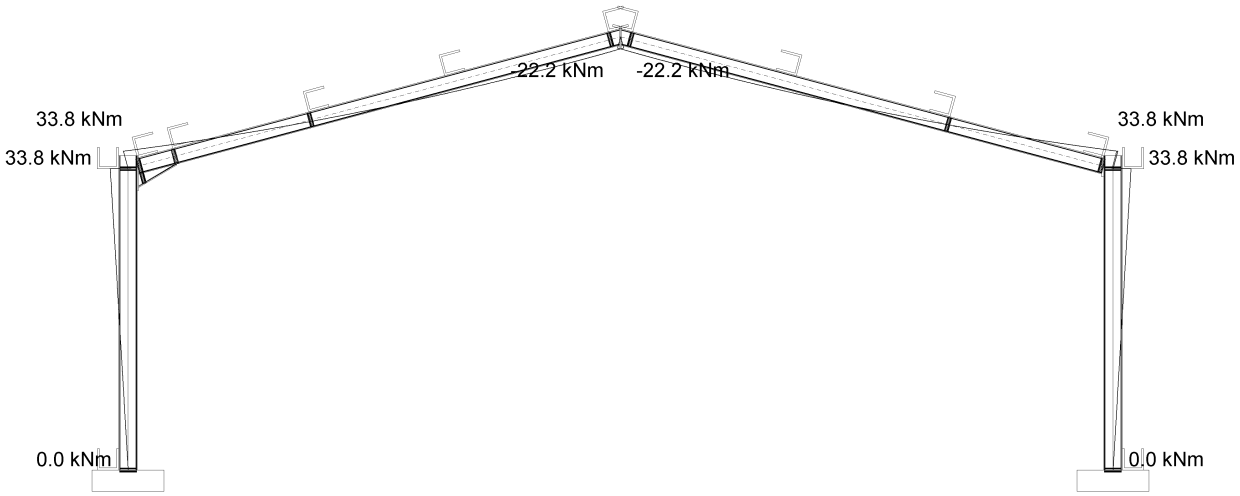
Rafters

Member	Status
Span 1 Lh Rafter	Pass
Span 1 Rh Rafter	Pass

Columns

Member	Status
Span 1 Lh Column	Pass
Span 1 Rh Column	Pass

Bending Moment Diagram



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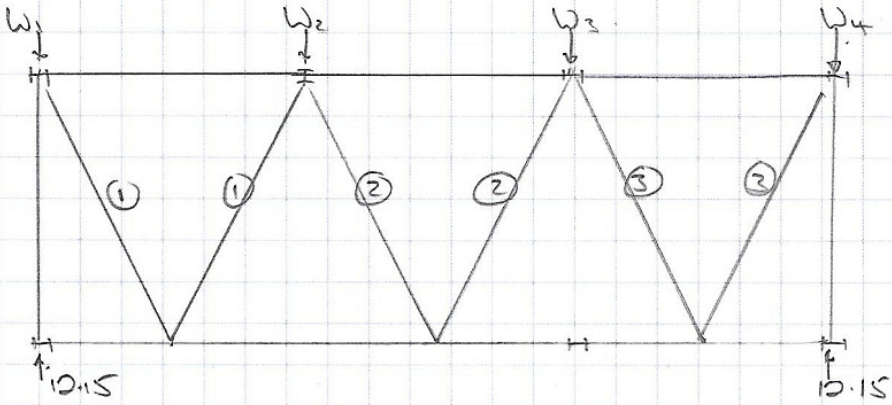
Sheet no. **33**	Rev. **C**
Prepared by: **TM**	Date: **JUN 17**
Checked by: **SS**	Date: **JUN 17**
Title of Scheme **HAYES GATE FARM**	Job no: **A3127**

ROOF BRACING



$W_1 = 1.031 \times 4.572/2 \times 2.95/2 = 3.5$

$W_2 = 1.031 \times 4.572 \times 4.22/2 = 9.9$

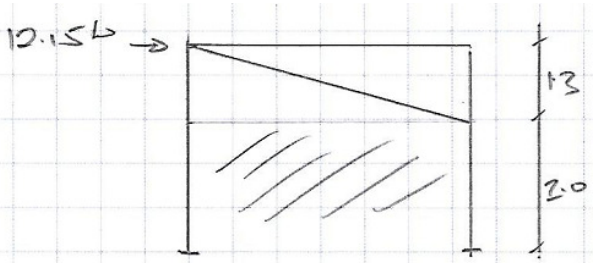
$W_3 = 1.031 \times 4.572 \times 2.95/2 = 7.0$

$W_4 = 1.031 \times 4.572/2 \times 3.3/2 = 3.9$

Brace	Length (m)	Axial (kN)	Section	Spacing
1	5.1	9.65 x 1.4 = 13.5	76 ø 3.2	37.1
2	5.1	1.4 x 1.4 = 2.0	76 ø 3.2	37.1
3	5.1	9.21 x 1.4 = 12.9	76 ø 3.2	37.1

EXISTING ROOF BRACING IS SUFFICIENT

ELEVATION BRACING



$\text{Axial} = \frac{12.15 \times 1.4}{4.572} \times 4.75$

$= 17.7 \text{ kN}$

Use 76 ø 3.2 CHS $P_{cs} = 37.1$ kN

EXISTING ELEVATION BRACING IS SUFFICIENT

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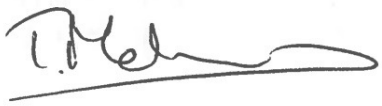
CONCLUSIONS – STEEL FRAME BUILDING

The structure is suitable for conversion to domestic use. No modification is required for the structure to meet the required standards.

- The portal frame structure conforms to BS5950 and is sufficient to bear loads derived from BS6399.
- Existing column stays at top of wall (knee braces from eaves beam) are sufficient.
- Exsiting rafter stays are sufficient.
- Existing CHS76.1x3.2 bracings in the roof and side elevations are sufficient.
- Grid 5 overdeflection issues are considered to be negligible as frame will be stiffened by existing bracing and diaphragm action of cladding materials; factors which are not taken into account in frame analysis. Furthermore, adjacent gable frame on grid 6 is half-loaded.
- Depth and extent of foundations has not been established, but there is no reason to suspect that they are not adequate.

Provided regular routine maintenance is undertaken, the property should remain structurally sound and serviceable for the foreseeable future, and suitable for conversion for domestic use.

Signed:



8.1.2018

Tim Melville MEng, MA(Cantab)
For and on behalf of AJS Structural Design Ltd