

Inspection Report

Seas End Hall, Spalding

Client: Organic By Design Ltd

Address: Seas End Hall
Hall Lane
Spalding
PE12 6LB

Reference: J7238

Revision: Rev P01

Date: 23 August 2024



TELLETT ENGINEERING CONSULTANTS

Suite 2 Orchard House, Tebbutts Rd, St Neots, Cambs, PE19 1AW

T: 01480 570 067

W: www.t3ec.com

Project
Document Title
Project number
Reference
Revision
Date

Inspection Report
Seas End Hall, Spalding
J7238
J7238\R001\P01
Rev P01
23/08/2024

Revision Control

Revision	Date	Originator	Checker	Approver	Description
Rev P01	23/08/2024	M Dungarwalla	J Tellett	J Tellett	For review

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it..

Contents

1	Introduction.....	1-1
2	Property Overview	2-2
3	Basement.....	3-3
3.1	Basement Construction.....	3-4
3.2	Beams over Basement.....	3-5
3.3	Basement Beam 1, 2, 3 Replacement Design.....	3-8
3.4	Basement Beam 4 Replacement Design.....	3-8
4	Structural Movement	4-9
4.1	External Window Headers.....	4-9
4.2	Observed Cracking	4-10
4.3	Potential Causes.....	4-13
4.3.1	First Floor Shower Room and Bathroom	4-13
4.3.2	Second Floor Room.....	4-13
4.4	Further Investigation	4-14
5	Conclusion	5-15
6	Appendix A – House Plans.....	6-16
7	Appendix B – Basement Beam 1, 2, 3 Replacement Design	7-19
8	Appendix C – Basement Beam 4 Replacement Design.....	8-20

1 Introduction

Tellett Engineering were commissioned to undertake a site visit to Seas End Hall to inspect the existing property and advise on any potential structural concerns or defects. The property was visited on 19th July 2024 to undertake a visual inspection. This report reflects the condition of the various parts of the property at the time of our inspection. House floor plans are included in Appendix A.

We have not inspected parts of the structure which were covered, unexposed or inaccessible during the visit, and are therefore unable to report that any such part of the property is free from defect.

This report shall be for the private and confidential use of the Client for whom it has been prepared and may not be reproduced in whole or in part, or relied upon by third parties for any use without the express written authority of Tellett Engineering Consultants Limited.

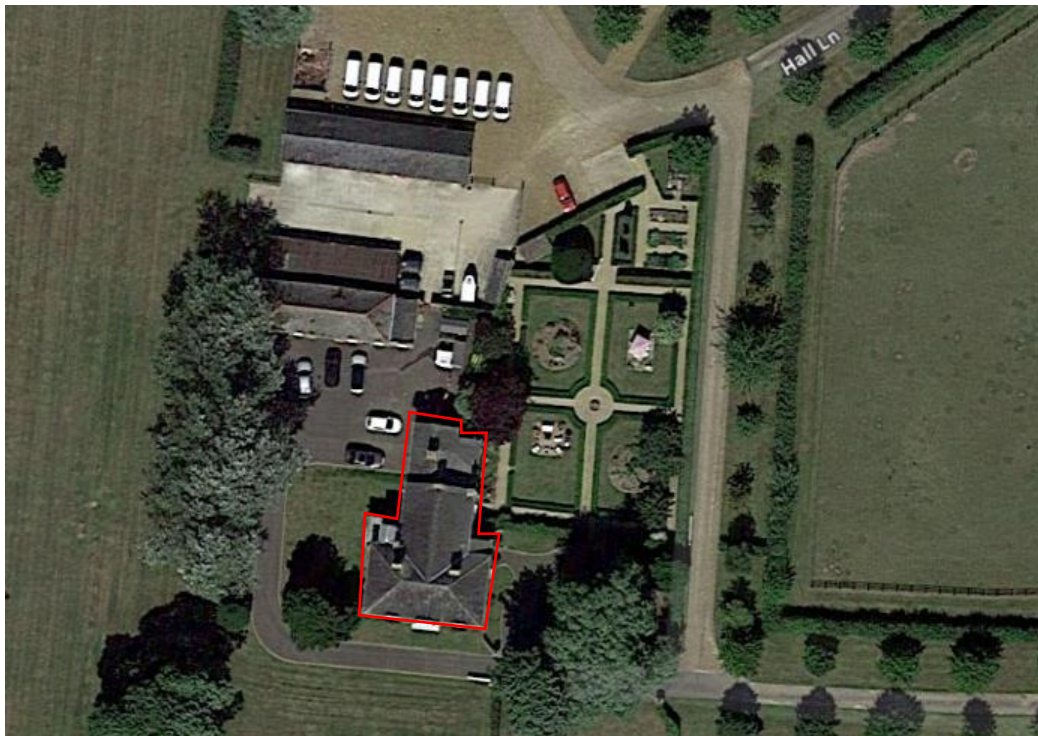


Figure 1-1 Aerial View of Property (Main House Outlined)

2 Property Overview

The property is a large 2-storey house that has been extended and developed over time from an original farmhouse. As such, the property contains brickwork of varying ages and a mix of old and modern structure. The structure is primarily traditional construction incorporating load-bearing brickwork walls, timber joists floors and timber construction roofs, although it is evident that this has been supplemented with steelwork in some areas. The external walls contain lime mortar, however some areas have been re-pointed in cement mortar. The windows appear to be relatively modern given their slender frames.

There are 3 distinct sections to the house, each with an individual duo-pitched roof, in addition to smaller 2-storey projections with flat roofs. The loft over the central section of the house is accessible with an exposed roof structure containing modern timber rafters. The house is served by 2 main staircases, with additional stairs accommodating level differences between the rooms and different sections of the property. The ceiling heights across the building vary considerably, with the kitchen having a double-storey ceiling height, and the opposite side of the house containing three storeys at reduced height. The majority of walls are aligned through the storeys, except for the large opening in the kitchen internal wall and over the snug, where steelwork is expected to have been installed as transfer structure. There are 8 bedrooms and 6 bathrooms at first floor, with various living spaces at ground floor, and a part basement within the South section of the house.



South Elevation



East Elevation



North-West Elevation



West Elevation

Figure 2-1 Photographs of External Elevations

3 Basement

The basement is a circa. 3m wide strip that runs along the full width of the South section of the house. It is accessed via a stair below one of the house staircases. There is reduced height, with several piped services running through, and brickwork plinths running along both sides. There is an external window at one end.



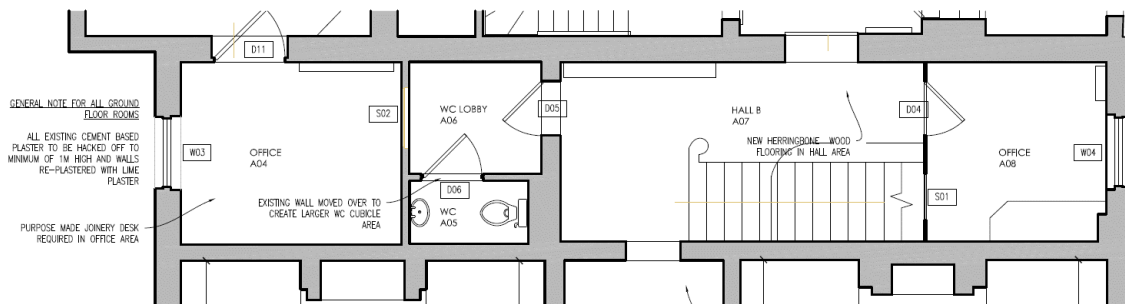
Figure 3-1 Inside the Basement



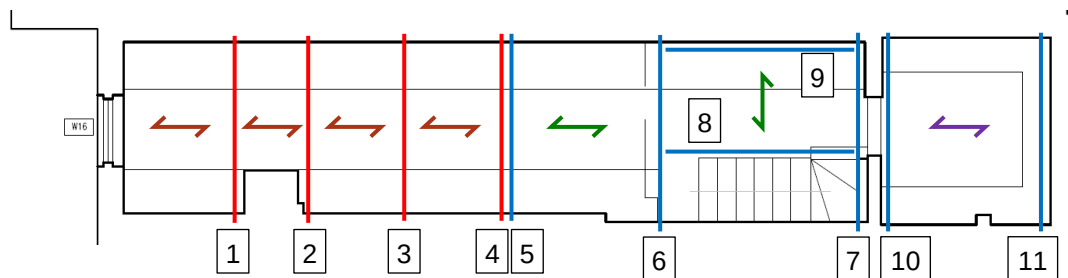
Figure 3-2 Basement Window

3.1 Basement Construction

Brickwork walls surrounding the basement support the ground floor above, which is a mix of different constructions as shown below.



Ground Floor Plan Over Basement



**Basement Plan Showing Structure Over
(with beam number references)**

Floor Span	Structure
	Old timber joists with varying sizes from 60x60mm to 70x100mm deep. Supplemented with new joists in some areas. Supported on old timber beams.
	Modern concrete slab on steel composite deck. Supported on steel beams.
	Modern 50x175mm deep timber joists at 450m centres. Supported on steel beams.

The brickwork walls enclosing the basement are susceptible to rising damp. The ends of the timber beams are built into the wall, and it is unknown whether damp proof courses have been installed to protect the timber from rot. The old timber members should be investigated by a timber specialist to determine the extent of rot.

3.2 Beams over Basement

Beam no.	Photographs with comments	
1	 70x150mm deep timber beam and supported joists appear to be in good serviceable condition.	 Whilst there are no apparent defects, there is a lack of support to the beam end. We recommend this is rectified either with installation of a short timber post or filling the recess with brickwork to provide support.
2	 The timber beam is not a modern regular timber section. Approximate size is 210x230mm deep. We recommend that a timber specialist investigates the extent of rot in the beam, with the member replaced if significant loss of section is found.	

3	 80x170mm deep timber beam and supported joists appear to be in good serviceable condition.	
4	 	 The timber beam is not a modern regular timber section. Approximate size is 230x260mm deep. It supports timber joists from one side only and most likely the masonry wall above. We recommend that a timber specialist investigates the extent of rot in the beam, with the member replaced if significant loss of section is found.

5, 6, 7, 8, 9	 Modern concrete slab on steel composite decking supported on steel beams. Beams supported on padstones in the brickwork wall. Structure in good condition.	
10, 11	 Modern timber joists supported on steel beams. Structure in good condition.	

3.3 Basement Beam 1, 2, 3 Replacement Design

A beam design is provided in case investigation and testing finds that the condition of the existing timber member is unsuitable and requires replacement.

The beam is designed to support the timber joist floor at ground level only.

Dead load (timber joist floor) $DL = 0.60\text{kN/m}^2 \times 3\text{m}/2 = 0.90\text{kN/m}$

Live load (residential + light partitions) $LL = 2.10\text{kN/m}^2 \times 3\text{m}/2 = 3.15\text{kN/m}$

Refer to Appendix A for beam design.

If the steel beam will be built into the damp masonry wall, the steel should be galvanised to BS EN ISO 1461 to achieve a coating thickness of 85µm.

3.4 Basement Beam 4 Replacement Design

A beam design is provided in case investigation and testing finds that the condition of the existing timber member is unsuitable and requires replacement. Site investigation is recommended to confirm that the beam supports the masonry wall above.

The beam is designed to support the timber joist floor at ground level, and a 2-storey masonry wall.

Dead load (timber joist floor) $DL = 0.60\text{kN/m}^2 \times 1.5\text{m}/2 = 0.45\text{kN/m}$

Dead load (brick wall above) $DL = 18\text{kN/m}^3 \times 0.215\text{m} \times 5\text{m} = 19.35\text{kN/m}$

Live load (residential + light partitions) $LL = 2.10\text{kN/m}^2 \times 1.5\text{m}/2 = 1.58\text{kN/m}$

Refer to Appendix B for beam design.

If the steel beam will be built into the damp masonry wall, the steel should be galvanised to BS EN ISO 1461 to achieve a coating thickness of 85µm.

4 Structural Movement

In general, the external brickwork appeared to be in good condition for the age of the structure, with no obvious signs of excessive structural movement or cracking.

There are many external windows to the house with brickwork headers.

Cracks within the internal plaster finishes were observed during the visit, indicating that some movement of the structure may have occurred. It is unknown when these cracks first appeared and whether they are increasing in size over time as part of ongoing movement.

4.1 External Window Headers

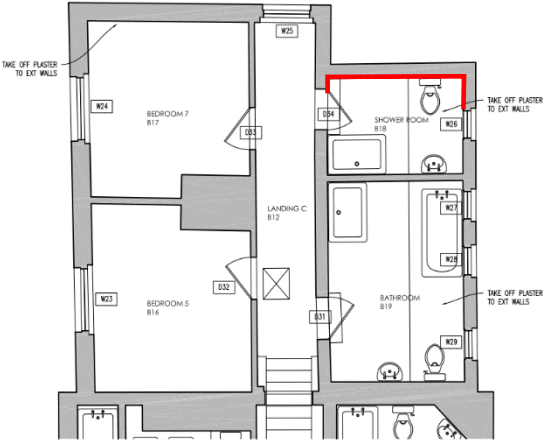
In general, the brickwork headers are in good condition, showing little sign of movement. In some areas, the bricks have slipped a little and the header has dipped, however remedial works are not considered necessary for such minor movement.

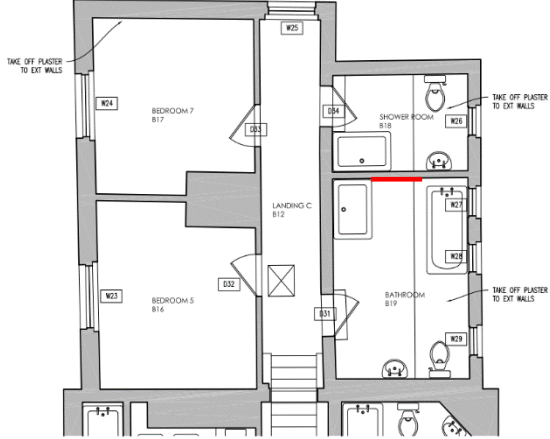
It is unknown whether structural lintels are present over the windows. This should be investigated, with the option to then install new lintels or to strengthen the existing lintels to prevent further deflection.



Figure 4-1 External Window Header

4.2 Observed Cracking

Location Key with Comments	Photographs
 Cracking to the inside of the first floor external wall. Crack to the top and sides of the wall panel, in the order of 1mm wide. Crack has extended through top of window frame. This section of the house appears to be the oldest. The wall looks to have been recently plastered, which suggests the movement is active.	

Location Key with Comments	Photographs
 Diagonal cracks in the first floor internal wall adjacent to the shower cubicle. Crack width in the order of 0.5mm. No signs of movement on the opposite side of the wall which is tiled.	

Location Key with Comments	Photographs
Series of diagonal cracks to the top corner of the internal wall at second floor. Largest diagonal crack in corner of room extends down side of wall panel. Crack width in the order of 0.8mm. Opening in plaster exposes brickwork behind.	

4.3 Potential Causes

4.3.1 First Floor Shower Room and Bathroom

The arrangement of cracks within the first floor shower room and bathroom suggest minor localised settlement of the external corner wall. The wall appears to have been recently plastered which suggests that the movement is active. The plaster is less accommodating of movement compared to the external brickwork with lime mortar.

Externally there are trees in the vicinity that will cause changes in the soil moisture content through the seasons. British Geological Society maps indicate the site contains Tidal Flat Deposits (clay and silt) over West Walton Formation (mudstone and siltstone). If the foundations supporting this section of the house are shallow and bearing in the clay strata, they would be susceptible to movement from soil volume change.

Another potential cause of movement could be related to the foul water drainage system. If the drainage serving the shower room and bathroom is leaking, this may have caused softening of the supporting ground and foundation settlement.

4.3.2 Second Floor Room

The arrangement of cracks in the second floor bedroom / proposed cinema room suggest localised settlement to the side of the wall. This wall extends down to the bedroom below and is supported on a beam over the kitchen / breakfast room. The cracks may have first appeared when this beam was installed, or at a later date due to deflection of the beam. At ground floor the wall is supported on a chimney breast, and the increase in load from installation of the beam may have caused the foundation to settle.

As mentioned previously, another potential cause is leaking of the drainage system causing softening of the ground supporting foundations.

4.4 Further Investigation

The likelihood of future movement occurring should be assessed with further investigation.

Installation of crack gauges with regular monitoring will establish whether the movement causing cracks in the walls is ongoing or has stopped.

We recommend that trial holes are excavated to determine the foundation type and geological conditions where settlement has occurred. The bearing strata can then be assessed with soil laboratory testing to determine volume change potential. This would then be evaluated with the proximity of trees and their water demand to establish whether the foundations meet modern design standards. The locations of proposed trial holes has been marked on the ground floor plan in Appendix A.

Another potential cause of settlement is faulty drainage. In old properties, it is common for the rain water pipes and soakaways to become blocked with debris. The property contains many bathrooms and an extensive foul water drainage system. The location and depth of external drainage runs, relative to the walls affected by movement, should be determined. A CCTV drainage survey of the foul water and rain water systems is recommended to establish the condition of pipes and any potential blockages or pipe leaks.

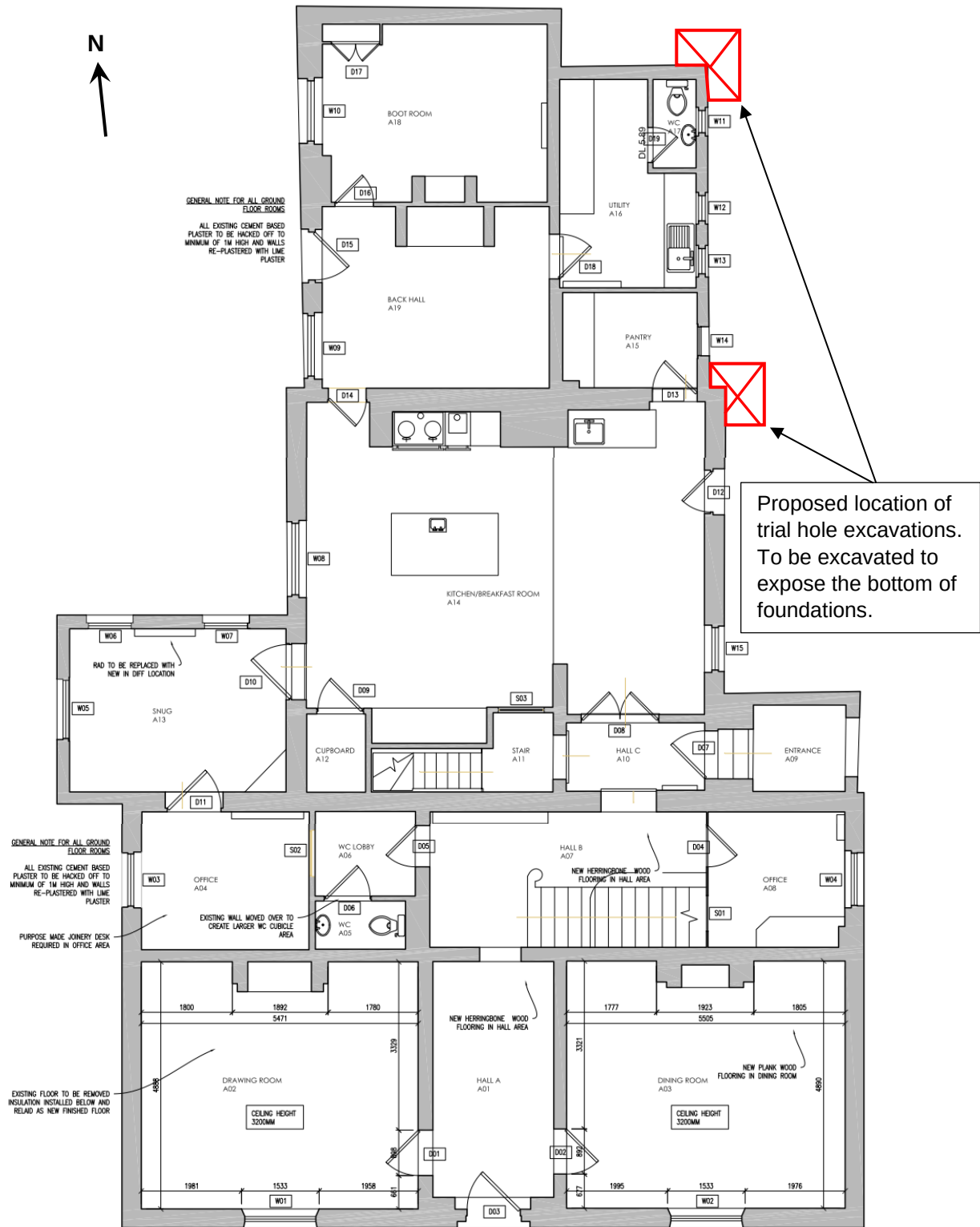
5 Conclusion

The property is large and has been developed over time with a mix of various construction materials. Given the age of the property, from a visual inspection it appears to be in relatively good condition. The presence of structural lintels over the windows is unknown and should be investigated.

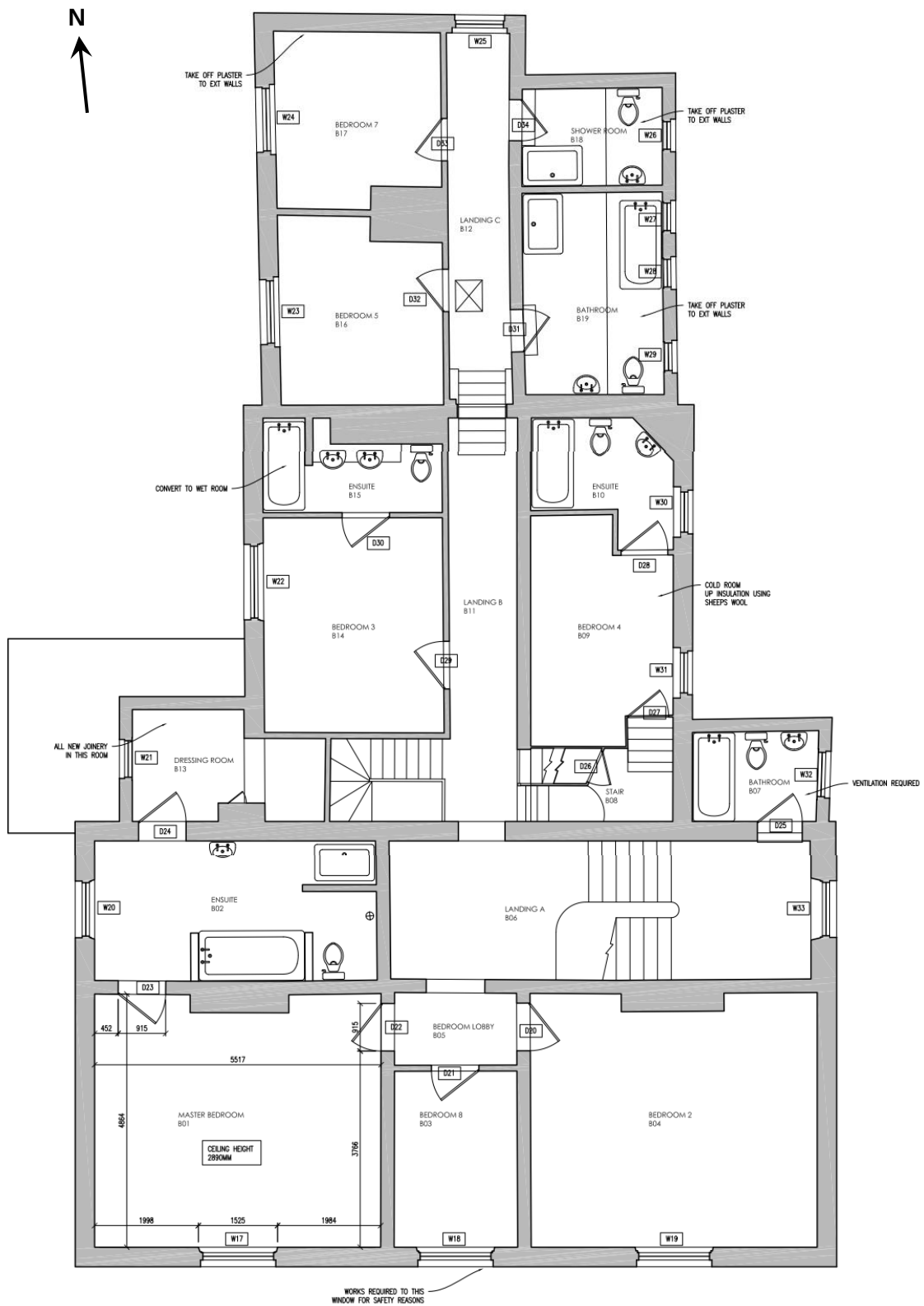
The basement contains brickwork walls supporting the floor above, which is partially timber joists supported on timber beams built into the masonry walls. One of the beams is lacking end support, which should be rectified by providing either a timber post or masonry to support the beam end. The brickwork walls are susceptible to rising damp, and a timber specialist should assess the extent of rot within the timber members. If there is significant timber section loss, then the member should be replaced with a steel beam for which the design is provided.

The cracking observed internal to the property is thought to be caused by minor settlement of the foundations. It is unknown whether the movement is ongoing or has stopped. The cause of cracking and likelihood of future movement should be further investigated with trial hole excavations, soil laboratory testing and a CCTV drainage survey.

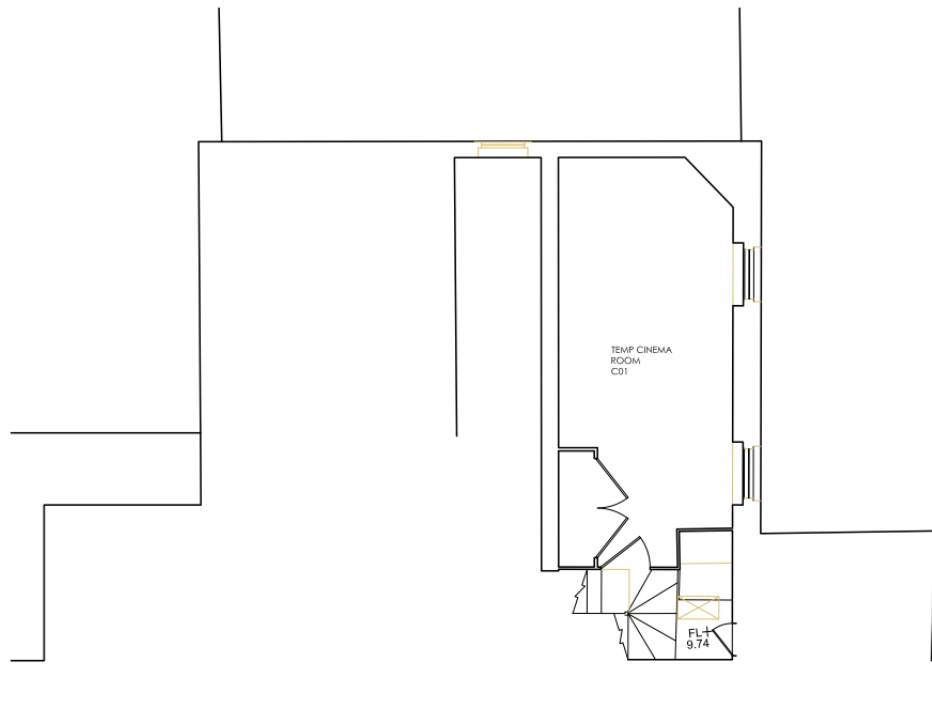
6 Appendix A – House Plans



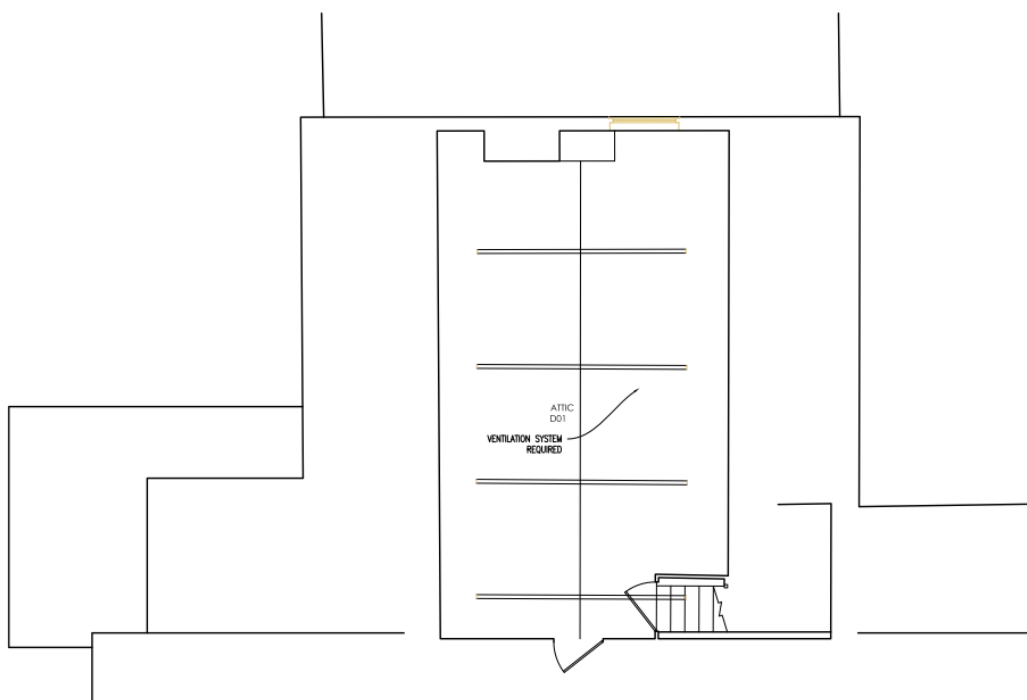
Ground Floor



First Floor



Second Floor



Loft Plan

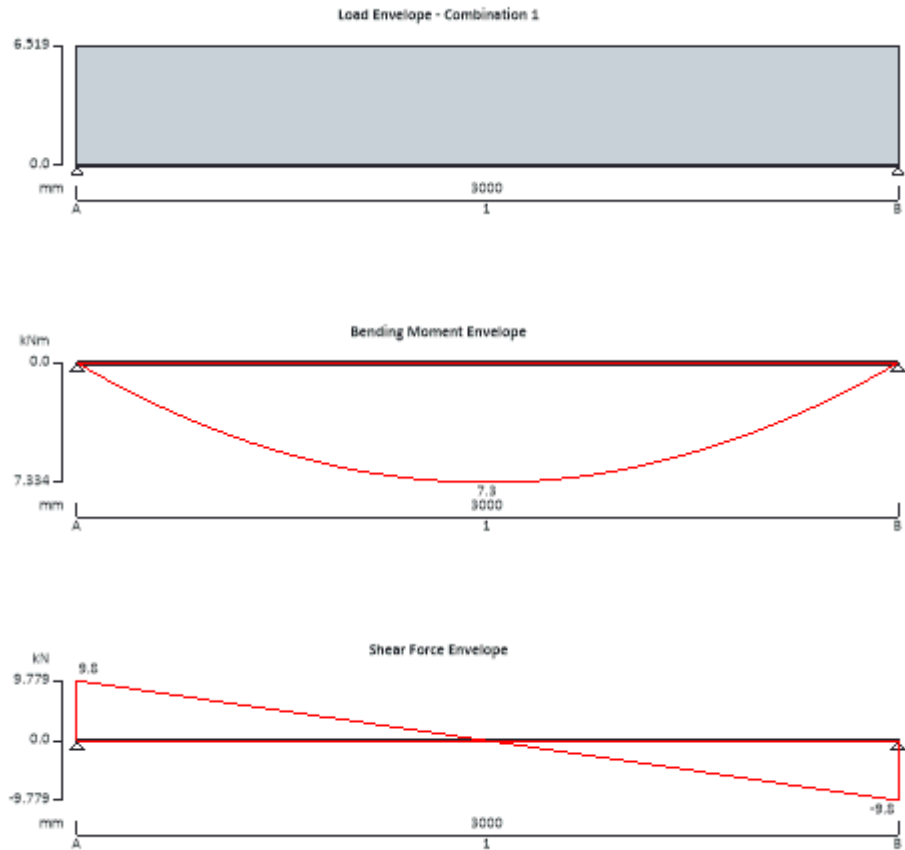
7 Appendix B – Basement Beam 1, 2, 3 Replacement Design

 Tellett Engineering Consultants Ltd Suite 1, Orchard House, Tebbutts Rd St Neots, Cambs - PE19 1AW 01480 570 067	Project Seas End Hall, Hall Lane, Spalding, PE12 6LB				Job no. J7238	
	Calcs for Basement Beam 2				Start page no./Revision 1	
	Calcs by MD	Calcs date 22/08/2024	Checked by JT	Checked date 23/08/2024	Approved by	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.08



Support conditions

Support A	Vertically restrained Rotationally free
Support B	Vertically restrained Rotationally free

Applied loading

Beam loads	Dead self weight of beam × 1 Dead full UDL 0.9 kN/m Imposed full UDL 3.15 kN/m
------------	--

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

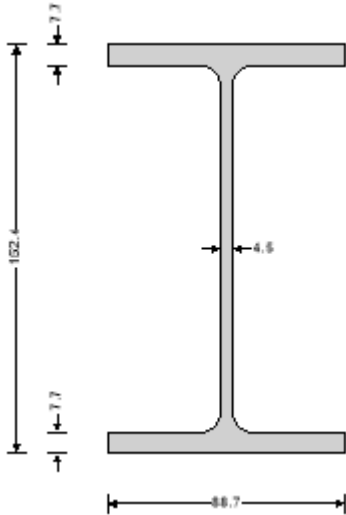
 Tellett Engineering Consultants Ltd Suite 1, Orchard House, Tebbutts Rd St Neots, Cambs - PE19 1AW 01480 570 067	Project Seas End Hall, Hall Lane, Spalding, PE12 6LB				Job no. J7238	
	Calcs for Basement Beam 2				Start page no./Revision 2	
	Calcs by MD	Calcs date 22/08/2024	Checked by JT	Checked date 23/08/2024	Approved by	Approved date

Analysis results

Maximum moment	$M_{max} = 7.3 \text{ kNm}$	$M_{min} = 0 \text{ kNm}$
Maximum shear	$V_{max} = 9.8 \text{ kN}$	$V_{min} = -9.8 \text{ kN}$
Deflection	$\delta_{max} = 2.6 \text{ mm}$	$\delta_{min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A_{max}} = 9.8 \text{ kN}$	$R_{A_{min}} = 9.8 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_{Dead}} = 1.6 \text{ kN}$	
Unfactored imposed load reaction at support A	$R_{A_{Imposed}} = 4.7 \text{ kN}$	
Maximum reaction at support B	$R_{B_{max}} = 9.8 \text{ kN}$	$R_{B_{min}} = 9.8 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_{Dead}} = 1.6 \text{ kN}$	
Unfactored imposed load reaction at support B	$R_{B_{Imposed}} = 4.7 \text{ kN}$	

Section details

Section type	UKB 152x89x16 (Tata Steel Advance)	Steel grade	S275
--------------	------------------------------------	-------------	------



Classification of cross sections - Section 3.5

Tensile strain coefficient	$\varepsilon = 1.00$	Section classification	Plastic
----------------------------	----------------------	------------------------	---------

Shear capacity - Section 4.2.3

Design shear force	$F_v = 9.8 \text{ kN}$	Design shear resistance	$P_v = 113.2 \text{ kN}$
PASS - Design shear resistance exceeds design shear force			

Moment capacity - Section 4.2.5

Design bending moment	$M = 7.3 \text{ kNm}$	Moment capacity low shear	$M_c = 33.9 \text{ kNm}$
-----------------------	-----------------------	---------------------------	--------------------------

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment	$M_b = 13.8 \text{ kNm}$	$M_b / m_{LT} = 14.9 \text{ kNm}$
PASS - Buckling resistance moment exceeds design bending moment		

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection	$\delta_{lim} = 8.333 \text{ mm}$	Maximum deflection	$\delta = 2.594 \text{ mm}$
PASS - Maximum deflection does not exceed deflection limit			

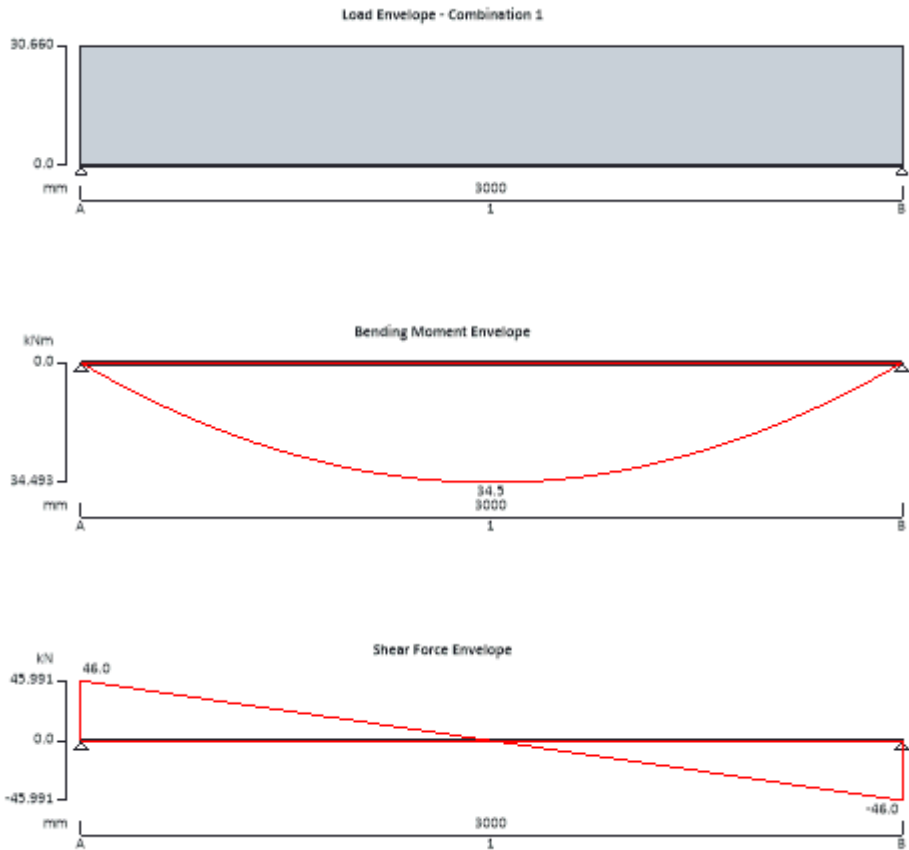
8 Appendix C – Basement Beam 4 Replacement Design

 Tellett Engineering Consultants Ltd Suite 1, Orchard House, Tebbutts Rd St Neots, Cambs - PE19 1AW 01480 570 067	Project Seas End Hall, Hall Lane, Spalding, PE12 6LB				Job no. J7238	
	Calcs for Basement Beam 4				Start page no./Revision 1	
	Calcs by MD	Calcs date 22/08/2024	Checked by JT	Checked date 23/08/2024	Approved by	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3.0.08



Support conditions

Support A	Vertically restrained Rotationally free
Support B	Vertically restrained Rotationally free

Applied loading

Beam loads	Dead self weight of beam × 1 Dead full UDL 0.45 kN/m Dead full UDL 19.35 kN/m Imposed full UDL 1.58 kN/m
------------	---

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

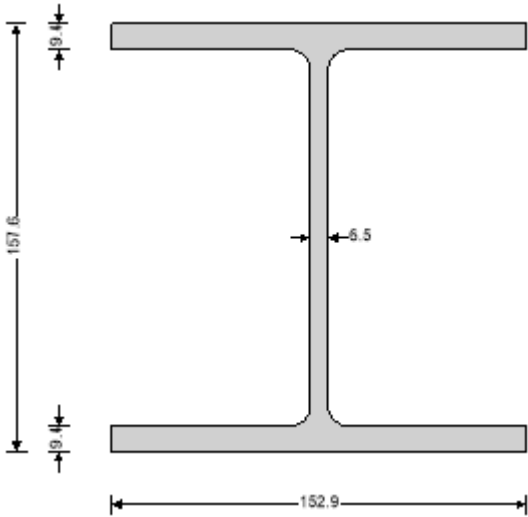
 Tellett Engineering Consultants Ltd Suite 1, Orchard House, Tebbutts Rd St Neots, Cambs - PE19 1AW 01480 570 067	Project Seas End Hall, Hall Lane, Spalding, PE12 6LB				Job no. J7238	
	Calcs for Basement Beam 4				Start page no./Revision 2	
	Calcs by MD	Calcs date 22/08/2024	Checked by JT	Checked date 23/08/2024	Approved by	Approved date

Analysis results

Maximum moment	$M_{max} = 34.5 \text{ kNm}$	$M_{min} = 0 \text{ kNm}$
Maximum shear	$V_{max} = 46 \text{ kN}$	$V_{min} = -46 \text{ kN}$
Deflection	$\delta_{max} = 6.4 \text{ mm}$	$\delta_{min} = 0 \text{ mm}$
Maximum reaction at support A	$R_{A_max} = 46 \text{ kN}$	$R_{A_min} = 46 \text{ kN}$
Unfactored dead load reaction at support A	$R_{A_Dead} = 30.1 \text{ kN}$	
Unfactored imposed load reaction at support A	$R_{A_Imposed} = 2.4 \text{ kN}$	
Maximum reaction at support B	$R_{B_max} = 46 \text{ kN}$	$R_{B_min} = 46 \text{ kN}$
Unfactored dead load reaction at support B	$R_{B_Dead} = 30.1 \text{ kN}$	
Unfactored imposed load reaction at support B	$R_{B_Imposed} = 2.4 \text{ kN}$	

Section details

Section type UC 152x152x30 (British Steel Section Range 2022 (BS4-1)) Steel grade S275



Classification of cross sections - Section 3.5

Tensile strain coefficient $\epsilon = 1.00$ Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force $F_v = 46 \text{ kN}$ Design shear resistance $P_v = 169 \text{ kN}$
PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment $M = 34.5 \text{ kNm}$ Moment capacity low shear $M_c = 68.1 \text{ kNm}$

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment $M_b = 49.3 \text{ kNm}$ $M_b / m_{LT} = 53.3 \text{ kNm}$
PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection $\delta_{lim} = 8.333 \text{ mm}$ Maximum deflection $\delta = 6.379 \text{ mm}$
PASS - Maximum deflection does not exceed deflection limit