mpa The Concrete Centre	Project details **G2.1 Actions for a continuous beam in a domestic structure**	Calculated by	**MM**	Job no.	**G2**
		Checked by	**CIEG**	Sheet no.	**1/3**
		Client	**TCC**	Date	**Nov 2026**

Example

Determine the appropriate load combination and ultimate load for a continuous beam of four 6 m spans in a domestic structure supporting a 200 mm slab at 6 m centres. The slab is simply supported between the beams.

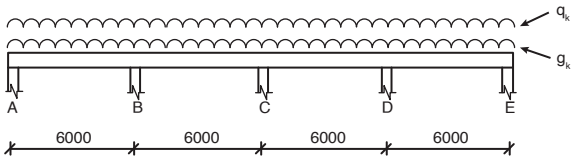


Figure G2.1.1: Continuous beam in a domestic structure

General notes:

This calculation is intended to show an example of loading on a continuous beam in a residential building. It demonstrates how to assess permanent actions using Eurocode 1 and compares the two formulae for load combinations given in Eurocode 0 for the structural resistance at the ultimate limit state.

All calculations are carried out in a spreadsheet format where the outcome is not rounded and it is the unrounded value that is used in any further calculation.

This worked example is based on the versions of the codes of practice, guidance documents and publications as noted in the List of References. The user is responsible for ensuring that they use the latest version of the documents.

Abbreviations

General:	Cl.	Clause
	F.	Formula
	WE	Worked example
Codes of practice:	EC0-1	BS EN 1990-1:2023+A1:2026 [1]
	EC1-1-1	BS EN 1991-1-1:2025 [2]
	NA EC0-1	NA to BS EN 1990-1:2023+A1:2026 [3]
	NA EC1-1-1	NA to BS EN 1991-1-1:2025 [4]
Guidance documents:	G2. How to	G2 - How to: Actions (2026) [5]

mpa The Concrete Centre	Project details **G2.1 Actions for a continuous beam in a domestic structure**	Calculated by **MM**	Job no. **G2**
		Checked by **CIEG**	Sheet no. **2/3**
		Client **TCC**	Date **Nov 2026**

G2.1.1 Actions

Permanent action, g_k:			**kN/m**	
Slab self-weight	= 0.2 x 25 x 6	=	30.0	EC1-1-1: Table A.1
(Alternatively, use How to look-up table)				G2. How to: Table G2.4
Beam self-weight, assuming downstand is 800 x 225				
	= 0.8 x 0.225 x 25	=	4.5	EC1-1-1: Table A.1
Screed weight, assuming 50 mm screed at 22 kN/m^3				EC1-1-1: Table A.1
	= 0.05 x 22 x 6	=	6.6	
Finishes and services	= 0.5 x 6	=	3.0	
Dividing wall weight, assuming wall is 2.4 m high and consists of 200 mm dense blockwork with plaster on both sides				
	= 2.4 x 4.42	=	10.6	
	Total	g_k =	**54.7 kN/m**	
Variable action, q_k:			**kN/m**	
Residential (category A1)				
	= 1.5 x 6	=	9.0	NA EC1-1-1: Table NA.1
	Total	q_k =	**9.0 kN/m**	

G2.1.2 Load combinations (and arrangement)

Assuming consequence class CC2a (normal lower class),			NA EC0-1: Table NA.1
Consequence factor, k_F	=	1.0	NA EC0-1: Table NA.4
ψ_0 for category A: domestic, residential areas	=	0.7	NA EC0-1: Table NA.2

> *Note:*
>
> *According to EC0-1, for the structural resistance of a structure at ULS, verification case VC1 should be used with either F. (8.12) or the more adverse of the upper and lower parts of F. (8.13). In general, load values calculated to F. (8.12) are more conservative than those calculated to F. (8.13), as shown in this example.*

EC0-1: Cl. 8.3.4.2 (2) & A.1.7 (4)

a) Using F. (8.12)

Ultimate load, n:

Using EC0-1 F. (8.12) with verification case VC1:

$n = \gamma_G g_k + \gamma_{Q,1} q_{k,1}$			EC0-1: Table A.1.3
$n = 1.35 k_F g_k + 1.5 k_F q_{k,1}$			NA EC0-1: Table NA.3
(Alternatively, use How to look-up table)			G2. How to: Table G2.8
n = (1.35 x 1 x 54.7) + (1.5 x 1 x 9)	=	**87.4 kN/m**	
∴ Ultimate load, n	=	**87.4 kN/m**	

b) Using F. (8.13) upper and lower parts

Ultimate load, n:

Using EC0-1 F. (8.13) upper part with verification case VC1:

$n = \gamma_G g_k + \gamma_{Q,1} \psi_{0,1} q_{k,1}$			EC0-1: Table A.1.4
$n = 1.35 k_F g_k + 1.5 k_F \psi_{0,1} q_{k,1}$			NA EC0-1: Table NA.3
(Alternatively, use How to look-up table)			G2. How to: Table G2.8
n = (1.35 x 1 x 54.7) + (1.5 x 1 x 0.7 x 9)	=	**83.3 kN/m**	

mpa The Concrete Centre	Project details **G2.1 Actions for a continuous beam in a domestic structure**	Calculated by **MM**	Job no. **G2**
		Checked by **CIEG**	Sheet no. **3/3**
		Client **TCC**	Date **Nov 2026**

Using EC0-1 F. (8.13) lower part and verification case VC1:

$n = \xi\gamma_G g_k + \gamma_{Q,1} q_{k,1}$

$n = \xi 1.35 k_F g_k + 1.5 k_F q_{k,1}$

where:

ξ = 0.925

EC0-1: Table A.1.4
NA EC0-1: Table NA.3

NA EC0-1: Cl. NA.2.2.4

(Alternatively, use How to look-up table)

G2. How to: Table G2.8

$\therefore$ n = (0.925 x 1.35 x 1 x 54.7) + (1.5 x 1 x 9) = **81.8 kN/m**

$\therefore$ F. (8.13) upper part governs*

$\therefore$ **Ultimate load, n** = **83.3 kN/m**

Note:

In this WE, the ultimate load calculated in F. (8.12) is 5% larger than that calculated to F. (8.13).

List of references

[1] British Standards Institution. (2026) BS EN 1990-1:2023+A1:2026 Eurocode – Basis of structural and geotechnical design. Part 1: New structures. London, BSI.

[2] British Standards Institution. (2025) BS EN 1991-1-1:2025 Eurocode 1 – Actions on structures. Part 1-1: Specific weight of materials, self-weight of construction works and imposed loads for buildings. London, BSI.

[3] British Standards Institution. (2026) NA to BS EN 1990-1:2023+A1:2026 UK National Annex to Eurocode – Basis of structural and geotechnical design – Part 1: New structures. London, BSI.

[4] British Standards Institution. (2026) NA to BS EN 1991-1-1:2025 UK National Annex to Eurocode 1 – Actions on structures. Part 1-1: Specific weight of materials, self-weight of construction works and imposed loads for buildings. London, BSI. London, BSI.

[5] MPA The Concrete Centre. (2026) How to design concrete structures using Eurocode 2 (second generation). G2 – Actions. London, TCC.

* This could also be determined by checking that $g_k > 4.5\ q_k$ i.e. for residential use: 54.7 > 4.5 x 9 = 40.5
$\therefore$ the upper part of F. (8.13) governs.

Revision number	Revision date	Notes
1.0	Nov 2026	First publication

At the time of publication, work on the second generation of Eurocodes and supporting documents is ongoing. Where possible, this worked example has been developed based on the standards that have been published to date, but in some instances, the relevant documents have not yet been finalised and so anticipated values are included and clearly noted as such. Amendments are planned for all of the Eurocodes ahead of the March 2028 date of adoption and users are advised to ensure they are referring to the latest version of a standard or publication.

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