Nudura

REBAR TABLES

Insulated Concrete Forms by Nudura

Construction Products Group Europe

Rebar Tables

BASIS OF DESIGN & GENERAL USAGE

Nudura is an Insulated Concrete Formwork (ICF) system which comprises of prefabricated polystyrene form work blocks reinforced with plastic webs with notches for placing reinforcement. Nudura has commissioned JMS Engineers to provide design tables and typical details with a focus on structures falling within Class 1 disproportionate collapse requirements and a particular focus on build-ability, to properly utilize Nudura's ability to reduce construction time on site.

It is important to note that the tables are only intended to illustrate the capabilities and limitations of the Nudura ICF product and do not replace full structural calculations by a suitably qualified structural engineer.

Lintels:

- Lintels for various reinforcement and geometric arrangements were designed in accordance with Eurocode 2 and the corresponding UK National Annex.
- The ultimate shear resistance is calculated for lintels not requiring shear reinforcement (links/stirrups). The ultimate bending moment resistance is calculated for lintels not requiring compression reinforcement (top bars).
- Triangulation to load on lintel should not be used for ICF walls.
- Concrete grade is taken to be C20/25 (fck = 20N/mm2) and maximum aggregate size is taken to be 12mm.
- Reinforcement grade is 500H (fyk = 500N/mm2) and cover to bottom and sides is taken to be 20mm.
- For practicality and ease of construction the number of bars are limited to 1No. for the 4" (100mm) and 6" (150mm) cores.
- Reinforcement bar sizes range from H10s to H20s to represent commonly stocked rebar sizes.
- Maximum safe working loads for common door and window spans were calculated for each reinforcement, core and depth combination. A blanket factor of safety of 2 was used to calculate these values derived from the smaller of the ultimate bending and ultimate shear reinforcement.

Maximum Wall Heights

Maximum achievable wall heights are calculated based on slenderness limits for unreinforced concrete walls as described in Eurocode 2. To provide realistically achievable heights the following nominal loads (based on the ground floor of a typical 2 storey residential building with timber floors and trussed rafters) were also applied:

- Wind Pressure = 0.75kN/m
- Dead Load = 15kN/m
- Live Load = 10kN/m

It is important to note that the maximum unreinforced wall height check represents the first step in checking if a certain height of wall is acceptable to be unreinforced for a given core thickness. Achievable wall heights quoted may be further limited if heavier or more eccentric loads are present.

Core thicknesses were limited to 4-8" (100-200mm) which are what would be realistically used for structures falling within Class 1 disproportionate collapse requirements.

Where large openings, which are greater than 1/3 of the wall height and 10% of the total area, are present, then the walls either side of and between the openings should be checked separately.

Walls with chases or recesses were not considered.

BASIS OF DESIGN & GENERAL USAGE

Retaining Walls:

- Only cantilevered, straight-backed retaining walls were considered for the tables and details provided. Propped, stepped or tapered retaining walls were not considered.
- Only the design of the stem was carried out, as this is the part of the retaining wall formed of the Nudura ICF product. Additionally, the design of the base was deemed to be too influenced by site specific conditions and should be designed by a suitably qualified structural engineer. The following loads/soil parameters were considered for the design of the stem:
    - Soil density =18kN/m3
    - Nominal surcharge =10kN/m2
    - Angle of repose =30°

  Groundwater was not considered. If a high water table is present then the retaining wall falls outside the scope of these tables.

  Maximum wall heights were based on a basic l/d check as per Eurocode 2. Higher wall heights may be achievable by introducing props or lower surcharges.

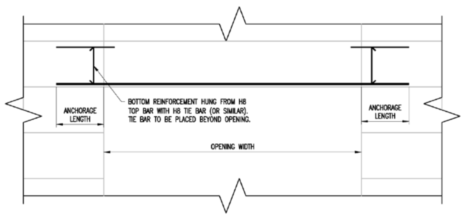
  Reinforcement was placed at fixed spacings according to the geometric properties of the form work blocks (203mm c/c for vertical bars and 457mm c/c for horizontal bars) to maximize speed and ease of construction. Corresponding ultimate shear and moment capacities were calculated and tabulated for each wall core and reinforcement combination. Closer spacings, albeit more difficult to construct, can be used to improve the performance of the retaining wall.

  Concrete grade used was C25/30, a maximum aggregate size of 12mm and reinforcement cover was determined by the placement and size of horizontal reinforcement.

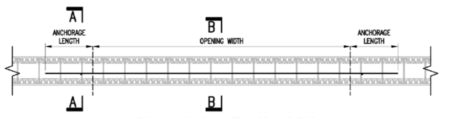
  In addition to the typical detail and corresponding maximum wall height and resistance table, a full conservative design for a typical 1m high retaining wall was also provided. The design was based on the same soil and load parameters described above.

CORE WIDTH (mm)	LINTEL DEPTH (mm)	REINFORCEMENT	ULTIMATE MOMENT CAPACITY (kNm)	ULTIMATE SHEAR CAPACITY (kN)	MAXIMUM SAFE WORKING LOAD (kN/m) FOR CLEAR SPAN (mm)								
					600	900	1200	1500	1800	2100	2400	2700	3000
100	200	1H10	5.4	8.7	14.5	9.6	7.2	5.8	4.8	4.1	3.6	2.9	2.4
		1H12	7.4	9.8	16.3	10.8	8.1	6.5	5.4	4.6	4.0	3.6	3.2
		1H16	9.9	11.8	19.6	13.1	9.8	7.8	6.5	5.6	4.9	4.3	3.9
		1H20	9.7	13.5	22.5	15.0	11.2	9.0	7.5	6.4	5.6	5.0	4.3
	250	1H10	7.2	10.0	16.6	11.1	8.3	6.6	5.5	4.7	4.1	3.7	3.2
		1H12	9.9	11.2	18.6	12.4	9.3	7.4	6.2	5.3	4.6	4.1	3.7
		1H16	16.0	13.6	22.6	15.1	11.3	9.0	7.5	6.4	5.6	5.0	4.5
		1H20	16.2	15.7	26.1	17.4	13.0	10.4	8.7	7.4	6.5	5.8	5.2
	300	1H10	8.9	10.9	18.1	12.1	9.0	7.2	6.0	5.1	4.5	4.0	3.6
		1H12	12.4	12.3	20.5	13.6	10.2	8.2	6.8	5.8	5.1	4.5	4.1
		1H16	20.4	14.8	24.6	16.4	12.3	9.8	8.2	7.0	6.1	5.4	4.9
		1H20	24.4	17.2	28.6	19.1	14.3	11.4	9.5	8.1	7.1	6.3	5.7
	350	1H10	10.6	11.7	19.5	13.0	9.7	7.8	6.5	5.5	4.8	4.3	3.9
		1H12	14.8	13.2	22.0	14.6	11.0	8.8	7.3	6.2	5.5	4.8	4.4
		1H16	24.7	16.0	26.6	17.7	13.3	10.6	8.8	7.6	6.6	5.9	5.3
		1H20	34.4	18.5	30.8	20.5	15.4	12.3	10.2	8.8	7.7	6.8	6.1
	400	1H10	12.2	12.5	20.8	13.8	10.4	8.3	6.9	5.9	5.2	4.6	4.1
		1H12	17.3	14.1	23.5	15.6	11.7	9.4	7.8	6.7	5.8	5.2	4.7
		1H16	29.1	17.1	28.5	19.0	14.2	11.4	9.5	8.1	7.1	6.3	5.7
		1H20	42.3	19.7	32.8	21.8	16.4	13.1	10.9	9.3	8.2	7.2	6.5
	450	1H10	13.8	13.3	22.1	14.7	11.0	8.8	7.3	6.3	5.5	4.9	4.4
		1H12	19.7	14.9	24.8	16.5	12.4	9.9	8.2	7.0	6.2	5.5	4.9
		1H16	33.5	18.1	30.1	20.1	15.0	12.0	10.0	8.6	7.5	6.7	6.0
		1H20	49.1	20.9	34.8	23.2	17.4	13.9	11.6	9.9	8.7	7.7	6.9
150	200	1H10	5.6	11.4	19.0	12.6	9.5	7.6	6.3	5.0	3.8	3.0	2.4
		1H12	7.8	12.8	21.3	14.2	10.6	8.5	7.1	6.0	5.3	4.2	3.4
		1H16	12.7	15.4	25.6	17.1	12.8	10.2	8.5	7.3	6.4	5.7	5.1
		1H20	14.5	17.8	29.6	19.7	14.8	11.8	9.8	8.4	7.4	6.5	5.9
	250	1H10	7.3	13.1	21.8	14.5	10.9	8.7	7.2	6.2	5.0	4.0	3.2
		1H12	10.2	14.8	24.6	16.4	12.3	9.8	8.2	7.0	6.1	5.4	4.5
		1H16	17.1	17.8	29.6	19.7	14.8	11.8	9.8	8.4	7.4	6.5	5.9
		1H20	24.3	20.6	34.3	22.8	17.1	13.7	11.4	9.8	8.5	7.6	6.8
	300	1H10	8.9	14.3	23.8	15.8	11.9	9.5	7.9	6.8	5.9	4.8	3.9
		1H12	12.7	16.1	26.8	17.8	13.4	10.7	8.9	7.6	6.7	5.9	5.3
		1H16	21.5	19.4	32.3	21.5	16.1	12.9	10.7	9.2	8.0	7.1	6.4
		1H20	31.3	22.5	37.5	25.0	18.7	15.0	12.5	10.7	9.3	8.3	7.5
	350	1H10	10.6	15.4	25.6	17.1	12.8	10.2	8.5	7.3	6.4	5.7	4.7
		1H12	15.1	17.3	28.8	19.2	14.4	11.5	9.6	8.2	7.2	6.4	5.7
		1H16	25.9	21.0	35.0	23.3	17.5	14.0	11.6	10.0	8.7	7.7	7.0
		1H20	38.2	24.3	40.5	27.0	20.2	16.2	13.5	11.5	10.1	9.0	8.1
	400	1H10	12.2	16.4	27.3	18.2	13.6	10.9	9.1	7.8	6.8	6.0	5.4
		1H12	17.4	18.5	30.8	20.5	15.4	12.3	10.2	8.8	7.7	6.8	6.1
		1H16	30.2	22.4	37.3	24.8	18.6	14.9	12.4	10.6	9.3	8.2	7.4
		1H20	45.0	25.9	43.1	28.7	21.5	17.2	14.3	12.3	10.7	9.5	8.6
	450	1H10	N/A										
		1H12	19.7	19.6	32.6	21.7	16.3	13.0	10.8	9.3	8.1	7.2	6.5
		1H16	34.6	23.7	39.5	26.3	19.7	15.8	13.1	11.2	9.8	8.7	7.9
		1H20	51.8	27.4	45.6	30.4	22.8	18.2	15.2	13.0	11.4	10.1	9.1
200	200	1H10	5.7	13.8	23.0	15.3	11.5	9.2	7.0	5.1	3.9	3.1	2.5
		1H12	8.0	15.5	25.8	17.2	12.9	10.3	8.6	7.2	5.5	4.3	3.5
		1H16	13.3	18.7	31.1	20.7	15.5	12.4	10.3	8.9	7.7	6.9	5.9
		1H20	19.1	21.5	35.8	23.8	17.9	14.3	11.9	10.2	8.9	7.9	7.1
	250	1H10	7.3	15.9	26.5	17.6	13.2	10.6	8.8	6.6	5.0	4.0	3.2
		1H12	10.4	17.9	29.8	19.8	14.9	11.9	9.9	8.5	7.2	5.7	4.6
		1H16	17.7	21.6	36.0	24.0	18.0	14.4	12.0	10.2	9.0	8.0	7.2
		1H20	25.9	25.0	41.6	27.7	20.8	16.6	13.8	11.9	10.4	9.2	8.3
	300	1H10	8.9	17.3	28.8	19.2	14.4	11.5	9.6	8.0	6.1	4.8	3.9
		1H12	12.7	19.5	32.5	21.6	16.2	13.0	10.8	9.2	8.1	6.9	5.6
		1H16	22.0	23.6	39.3	26.2	19.6	15.7	13.1	11.2	9.8	8.7	7.8
		1H20	32.7	27.3	45.5	30.3	22.7	18.2	15.1	13.0	11.3	10.1	9.1
	350	1H10	N/A										
		1H12	15.1	21.0	35.0	23.3	17.5	14.0	11.6	10.0	8.7	7.7	6.7
		1H16	26.4	25.4	42.3	28.2	21.1	16.9	14.1	12.0	10.5	9.4	8.4
		1H20	39.5	29.4	49.0	32.6	24.5	19.6	16.3	14.0	12.2	10.8	9.8
	400	1H10	N/A										
		1H12	17.4	22.4	37.3	24.8	18.6	14.9	12.4	10.6	9.3	8.2	7.4
		1H16	30.8	27.1	45.1	30.1	22.5	18.0	15.0	12.9	11.2	10.0	9.0
		1H20	46.4	31.4	52.3	34.8	26.1	20.9	17.4	14.9	13.0	11.6	10.4
	450	1H10	N/A										
		1H12											
		1H16	35.0	28.7	47.8	31.8	23.9	19.1	15.9	13.6	11.9	10.6	9.5
		1H20	53.2	33.3	55.5	37.0	27.7	22.2	18.5	15.8	13.8	12.3	11.1
250	200	1H10	5.7	16.1	26.8	17.8	13.4	10.1	7.0	5.1	3.9	3.1	2.5
		1H12	8.1	18.0	30.0	20.0	15.0	12.0	10.0	7.3	5.6	4.4	3.6
		1H16	13.6	21.7	36.1	24.1	18.0	14.4	12.0	10.3	9.0	7.4	6.0
		1H20	19.9	25.0	41.6	27.7	20.8	16.6	13.8	11.9	10.4	9.2	8.3
	250	1H10	N/A										
		1H12	10.4	20.8	34.6	23.1	17.3	13.8	11.5	9.4	7.2	5.7	4.6
		1H16	18.0	25.1	41.8	27.8	20.9	16.7	13.9	11.9	10.4	9.2	8.0
		1H20	26.7	29.0	48.3	32.2	24.1	19.3	16.1	13.8	12.0	10.7	9.6
	300	1H10	N/A										
		1H12	12.7	22.6	37.6	25.1	18.8	15.0	12.5	10.7	8.8	6.9	5.6
		1H16	22.4	27.4	45.6	30.4	22.8	18.2	15.2	13.0	11.4	10.1	9.1
		1H20	33.5	31.6	52.6	35.1	26.3	21.0	17.5	15.0	13.1	11.7	10.5
	350	1H10	N/A										
		1H12											
		1H16	26.7	29.5	49.1	32.7	24.5	19.6	16.3	14.0	12.2	10.9	9.8
		1H20	40.4	34.1	56.8	37.8	28.4	22.7	18.9	16.2	14.2	12.6	11.3
	400	1H10	N/A										
		1H12											
		1H16	30.8	31.5	52.5	35.0	26.2	21.0	17.5	15.0	13.1	11.6	10.5
		1H20	47.2	36.4	60.6	40.4	30.3	24.2	20.2	17.3	15.1	13.4	12.1
	450	1H10	N/A										
		1H12											
		1H16	35.0	33.3	55.5	37.0	27.7	22.2	18.5	15.8	13.8	12.3	11.1
		1H20	54.0	38.6	64.3	42.8	32.1	25.7	21.4	18.3	16.0	14.2	12.8

CORE WIDTH (mm)	LINTEL DEPTH (mm)	REINFORCEMENT	ULTIMATE MOMENT CAPACITY (kNm)	ULTIMATE SHEAR CAPACITY (kN)	MAXIMUM SAFE WORKING LOAD (kN/m) FOR CLEAR SPAN (mm)								
					600	900	1200	1500	1800	2100	2400	2700	3000
300	200	1H10	5.7	18.1	30.1	20.1	15.0	10.1	7.0	5.1	3.9	3.1	2.5
		1H12	8.1	20.4	34.0	22.6	17.0	13.6	10.0	7.3	5.6	4.4	3.6
		1H16	13.9	24.5	40.8	27.2	20.4	16.3	13.6	11.6	9.6	7.6	6.1
		1H20	20.4	28.2	47.0	31.3	23.5	18.8	15.6	13.4	11.7	10.4	9.0
	250	1H10	N/A										
		1H12	10.4	23.4	39.0	26.0	19.5	15.6	12.8	9.4	7.2	5.7	4.6
		1H16	18.2	28.3	47.1	31.4	23.5	18.8	15.7	13.4	11.7	9.9	8.0
		1H20	27.3	32.7	54.5	36.3	27.2	21.8	18.1	15.5	13.6	12.1	10.9
	300	1H10	N/A										
		1H12											
		1H16	22.5	30.9	51.5	34.3	25.7	20.6	17.1	14.7	12.8	11.4	10.0
		1H20	34.1	35.7	59.5	39.6	29.7	23.8	19.8	17.0	14.8	13.2	11.9
	350	1H10	N/A										
		1H12											
		1H16	26.7	33.3	55.5	37.0	27.7	22.2	18.5	15.8	13.8	12.3	11.1
		1H20	40.9	38.5	64.1	42.7	32.0	25.6	21.3	18.3	16.0	14.2	12.8
	400	1H10	N/A										
		1H12											
		1H16	30.8	35.5	59.1	39.4	29.5	23.6	19.7	16.9	14.7	13.1	11.8
		1H20	47.7	41.1	68.5	45.6	34.2	27.4	22.8	19.5	17.1	15.2	13.7
	450	1H10	N/A										
		1H12											
		1H16	35.0	37.7	62.8	41.8	31.4	25.1	20.9	17.9	15.7	13.9	12.5
		1H20	54.4	43.6	72.6	48.4	36.3	29.0	24.2	20.7	18.1	16.1	14.5

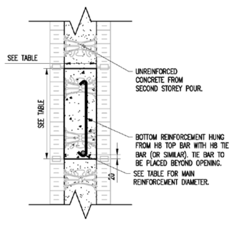


TYPICAL NUDURA LINTEL ARRANGEMENT
ELEVATION – INDICATIVE ONLY
SCALE 1:20

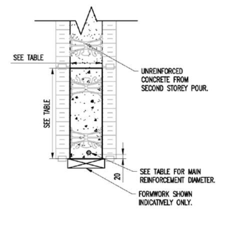


TYPICAL NUDURA LINTEL ARRANGEMENT
PLAN (1 BAR)
SCALE 1:20

BAR SIZE (mm)	INDICATIVE ANCHORAGE LENGTH (mm)
H10	450
H12	525
H16	750
H20	975



SECTION A–A
SCALE 1:10



SECTION B–B
SCALE 1:10

GENERAL NOTES:
1. DO NOT SCALE THIS DRAWING OR MODEL. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THESE TABLES ARE ONLY INTENDED TO ILLUSTRATE THE CAPABILITIES AND LIMITATIONS OF THE NUDURA ICF PRODUCT. THEY ARE NOT A REPLACEMENT FOR FULL STRUCTURAL CALCULATIONS BY A SUITABLY QUALIFIED ENGINEER.
3. THE ULTIMATE MOMENT CAPACITY AND ULTIMATE SHEAR RESISTANCE ARE CALCULATED TO BS EN 1992–1–1:2004.
4. THE ULTIMATE SHEAR RESISTANCE IS CALCULATED FOR LINTELS NOT REQUIRING SHEAR REINFORCEMENT (STIRRUPS/LINKS). LINTELS REQUIRING SHEAR REINFORCEMENT FALL OUTSIDE THE SCOPE OF THESE TABLES.
5. COMPRESSION REINFORCEMENT IS NOT CONSIDERED. LINTELS REQUIRING COMPRESSION REINFORCEMENT FALL OUTSIDE THE SCOPE OF THESE TABLES.
6. MINIMUM CONCRETE GRADE IS TAKEN TO BE C20/25 (f_{ck} = 20N/mm^2)
7. REINFORCEMENT GRADE IS TAKEN TO BE 500H (f_{yk} = 500N/mm^2)
8. MAXIMUM AGGREGATE SIZE IS TAKEN TO BE 12mm.
9. COVER IS TAKEN TO BE 20mm FROM THE BOTTOM AND SIDES.
10. MAXIMUM DIAMETER OF REINFORCEMENT BARS IS TAKEN TO BE 20mm.
11. N/A INDICATES REINFORCEMENT AREA LIMITED BY MINIMUM REINFORCEMENT REQUIREMENTS.
12. 100–150mm (4–6") LINTELS ARE LIMITED TO 1No. REINFORCEMENT BARS AND 200–300mm (8–12") LINTELS ARE LIMITED TO 2No. BARS FOR SIMPLICITY AND PRACTICALITY OF INSTALLATION.
13. TRIANGULATIONS TO LOAD ON LINTEL SHOULD NOT BE USED FOR NUDURA.
14. MAXIMUM SAFE WORKING LOAD BASED ON A FACTOR OF SAFETY OF 2.

Scale
As Shown

Issue	Notes	Drawn	Approved	Date
P2	Updated to comments	HN	MF	26.01.2023
P1	Preliminary issue	HN	MF	19.12.2022

Engineering That Brings Design To Life.

Issuing Office:
JMS London (Reading): The Courtyard, Edinburgh Road
Reading, Berkshire, United Kingdom, RG30 2UA. Tel: 01183 801644

Project
NUDURA ICF

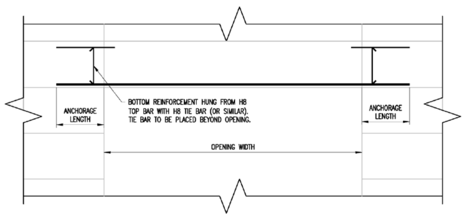
Drawing Title
Ultimate Moment and Shear Capacities For Nudura Lintels With 1No. Bars

Project No. LR22/075/07
Drawing No. 501
Issue P2

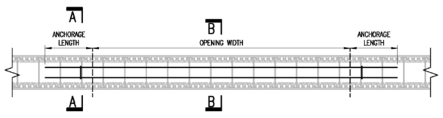
PRELIMINARY

Original Sheet Size: A1

CORE WIDTH (mm)	LINTEL DEPTH (mm)	REINFORCEMENT	ULTIMATE MOMENT CAPACITY (kNm)	ULTIMATE SHEAR CAPACITY (kN)	MAXIMUM SAFE WORKING LOAD (kN/m) FOR CLEAR SPAN (mm)								
					600	900	1200	1500	1800	2100	2400	2700	3000
150	200	2H10	10.5	14.4	24.0	16.0	12.0	9.6	8.0	6.8	6.0	5.3	4.6
		2H12	14.2	16.2	27.0	18.0	13.5	10.8	9.0	7.7	6.7	6.0	5.4
		2H16	14.9	19.4	32.3	21.5	16.1	12.9	10.7	9.2	8.0	7.1	6.4
		2H20	14.5	20.9	34.8	23.2	17.4	13.9	11.6	9.9	8.7	7.7	6.4
	250	2H10	13.9	16.5	27.5	18.3	13.7	11.0	9.1	7.8	6.8	6.1	5.5
		2H12	19.1	18.6	31.0	20.6	15.5	12.4	10.3	8.8	7.7	6.8	6.2
		2H16	24.8	22.5	37.5	25.0	18.7	15.0	12.5	10.7	9.3	8.3	7.5
		2H20	24.3	26.0	43.3	28.8	21.6	17.3	14.4	12.3	10.8	9.6	8.6
	300	2H10	17.4	18.0	30.0	20.0	15.0	12.0	10.0	8.5	7.5	6.6	6.0
		2H12	24.0	20.3	33.8	22.5	16.9	13.5	11.2	9.6	8.4	7.5	6.7
		2H16	37.2	24.5	40.8	27.2	20.4	16.3	13.6	11.6	10.2	9.0	8.1
		2H20	36.7	28.4	47.3	31.5	23.6	18.9	15.7	13.5	11.8	10.5	9.4
	350	2H10	20.8	19.4	32.3	21.5	16.1	12.9	10.7	9.2	8.0	7.1	6.4
		2H12	29.0	21.9	36.5	24.3	18.2	14.6	12.1	10.4	9.1	8.1	7.3
		2H16	47.3	26.4	44.0	29.3	22.0	17.6	14.6	12.5	11.0	9.7	8.8
		2H20	51.6	30.6	51.0	34.0	25.5	20.4	17.0	14.5	12.7	11.3	10.2
	400	2H10	24.2	20.7	34.5	23.0	17.2	13.8	11.5	9.8	8.6	7.6	6.9
		2H12	33.9	23.3	38.8	25.8	19.4	15.5	12.9	11.0	9.7	8.6	7.7
		2H16	56.0	28.2	47.0	31.3	23.5	18.8	15.6	13.4	11.7	10.4	9.4
		2H20	68.9	32.6	54.3	36.2	27.1	21.7	18.1	15.5	13.5	12.0	10.8
	450	2H10	27.5	21.9	36.5	24.3	18.2	14.6	12.1	10.4	9.1	8.1	7.3
		2H12	38.8	24.7	41.1	27.4	20.5	16.4	13.7	11.7	10.2	9.1	8.2
		2H16	64.7	29.9	49.8	33.2	24.9	19.9	16.6	14.2	12.4	11.0	9.9
		2H20	88.9	34.6	57.6	38.4	28.8	23.0	19.2	16.4	14.4	12.8	11.5
200	200	2H10	10.9	17.4	29.0	19.3	14.5	11.6	9.6	8.2	7.2	5.9	4.8
		2H12	14.9	19.6	32.6	21.7	16.3	13.0	10.8	9.3	8.1	7.2	6.5
		2H16	19.8	23.6	39.3	26.2	19.6	15.7	13.1	11.2	9.8	8.7	7.8
		2H20	19.4	27.1	45.1	30.1	22.5	18.0	15.0	12.9	11.2	10.0	8.6
	250	2H10	14.3	20.0	33.3	22.2	16.6	13.3	11.1	9.5	8.3	7.4	6.3
		2H12	19.8	22.5	37.5	25.0	18.7	15.0	12.5	10.7	9.3	8.3	7.5
		2H16	32.0	27.2	45.3	30.2	22.6	18.1	15.1	12.9	11.3	10.0	9.0
		2H20	32.5	31.5	52.5	35.0	26.2	21.0	17.5	15.0	13.1	11.6	10.5
	300	2H10	17.7	21.8	36.3	24.2	18.1	14.5	12.1	10.3	9.0	8.0	7.2
		2H12	24.8	24.6	41.0	27.3	20.5	16.4	13.6	11.7	10.2	9.1	8.2
		2H16	40.8	29.7	49.5	33.0	24.7	19.8	16.5	14.1	12.3	11.0	9.9
		2H20	48.9	34.4	57.3	38.2	28.6	22.9	19.1	16.3	14.3	12.7	11.4
	350	2H10	21.0	23.5	39.1	26.1	19.5	15.6	13.0	11.1	9.7	8.7	7.8
		2H12	29.7	26.5	44.1	29.4	22.0	17.6	14.7	12.6	11.0	9.8	8.8
		2H16	49.5	32.0	53.3	35.5	26.6	21.3	17.7	15.2	13.3	11.8	10.6
		2H20	68.8	37.0	61.6	41.1	30.8	24.6	20.5	17.6	15.4	13.7	12.3
	400	2H10	24.3	25.1	41.8	27.8	20.9	16.7	13.9	11.9	10.4	9.2	8.3
		2H12	34.6	28.3	47.1	31.4	23.5	18.8	15.7	13.4	11.7	10.4	9.4
		2H16	58.3	34.2	57.0	38.0	28.5	22.8	19.0	16.2	14.2	12.6	11.4
		2H20	84.6	39.6	66.0	44.0	33.0	26.4	22.0	18.8	16.5	14.6	13.2
	450	2H10	27.5	26.5	44.1	29.4	22.0	17.6	14.7	12.6	11.0	9.8	8.8
		2H12	39.5	29.9	49.8	33.2	24.9	19.9	16.6	14.2	12.4	11.0	9.9
		2H16	67.0	36.2	60.3	40.2	30.1	24.1	20.1	17.2	15.0	13.4	12.0
		2H20	98.2	41.9	69.8	46.5	34.9	27.9	23.2	19.9	17.4	15.5	13.9
250	200	2H10	11.1	20.2	33.6	22.4	16.8	13.4	11.2	9.6	7.7	6.0	4.9
		2H12	15.4	22.7	37.8	25.2	18.9	15.1	12.6	10.8	9.4	8.4	6.8
		2H16	24.6	27.3	45.5	30.3	22.7	18.2	15.1	13.0	11.3	10.1	9.1
		2H20	24.2	31.5	52.5	35.0	26.2	21.0	17.5	15.0	13.1	11.6	10.5
	250	2H10	14.5	23.2	38.6	25.7	19.3	15.4	12.8	11.0	9.6	7.9	6.4
		2H12	20.3	26.2	43.6	29.1	21.8	17.4	14.5	12.4	10.9	9.7	8.7
		2H16	33.4	31.6	52.6	35.1	26.3	21.0	17.5	15.0	13.1	11.7	10.5
		2H20	40.6	36.5	60.8	40.5	30.4	24.3	20.2	17.3	15.2	13.5	12.1
	300	2H10	17.8	25.3	42.1	28.1	21.0	16.8	14.0	12.0	10.5	9.3	7.9
		2H12	25.2	28.5	47.5	31.6	23.7	19.0	15.8	13.5	11.8	10.5	9.5
		2H16	42.1	34.5	57.5	38.3	28.7	23.0	19.1	16.4	14.3	12.7	11.5
		2H20	60.5	39.9	66.5	44.3	33.2	26.6	22.1	19.0	16.6	14.7	13.3
	350	2H10	21.0	27.3	45.5	30.3	22.7	18.2	15.1	13.0	11.3	10.1	9.1
		2H12	30.1	30.7	51.1	34.1	25.5	20.4	17.0	14.6	12.7	11.3	10.2
		2H16	50.9	37.2	62.0	41.3	31.0	24.8	20.6	17.7	15.5	13.7	12.4
		2H20	74.2	43.0	71.6	47.7	35.8	28.6	23.8	20.4	17.9	15.9	14.3
	400	2H10	24.3	29.1	48.5	32.3	24.2	19.4	16.1	13.8	12.1	10.7	9.7
		2H12	34.9	32.8	54.6	36.4	27.3	21.8	18.2	15.6	13.6	12.1	10.9
		2H16	59.6	39.7	66.1	44.1	33.0	26.4	22.0	18.9	16.5	14.7	13.2
		2H20	87.9	45.9	76.5	51.0	38.2	30.6	25.5	21.8	19.1	17.0	15.3
	450	2H10	27.5	30.8	51.3	34.2	25.6	20.5	17.1	14.6	12.8	11.4	10.2
		2H12	39.5	34.8	58.0	38.6	29.0	23.2	19.3	16.5	14.5	12.8	11.6
		2H16	68.3	42.0	70.0	46.6	35.0	28.0	23.3	20.0	17.5	15.5	14.0
		2H20	101.5	48.7	81.1	54.1	40.5	32.4	27.0	23.1	20.2	18.0	16.2
300	200	2H10	11.2	22.8	38.0	25.3	19.0	15.2	12.6	10.1	7.7	6.1	4.9
		2H12	15.6	25.7	42.8	28.5	21.4	17.1	14.2	12.2	10.7	8.5	6.9
		2H16	25.5	30.9	51.5	34.3	25.7	20.6	17.1	14.7	12.8	11.4	10.3
		2H20	29.1	35.6	59.3	39.5	29.6	23.7	19.7	16.9	14.8	13.1	11.8
	250	2H10	14.5	26.2	43.6	29.1	21.8	17.4	14.5	12.4	10.0	7.9	6.4
		2H12	20.5	29.6	49.3	32.8	24.6	19.7	16.4	14.0	12.3	10.9	9.1
		2H16	34.3	35.7	59.5	39.6	29.7	23.8	19.8	17.0	14.8	13.2	11.9
		2H20	48.7	41.3	68.8	45.8	34.4	27.5	22.9	19.6	17.2	15.2	13.7
	300	2H10	17.8	28.6	47.6	31.7	23.8	19.0	15.8	13.6	11.9	9.7	7.9
		2H12	25.5	32.2	53.6	35.7	26.8	21.4	17.8	15.3	13.4	11.9	10.7
		2H16	43.0	38.9	64.8	43.2	32.4	25.9	21.6	18.5	16.2	14.4	12.9
		2H20	62.7	45.1	75.1	50.1	37.5	30.0	25.0	21.4	18.7	16.7	15.0
	350	2H10	21.0	30.8	51.3	34.2	25.6	20.5	17.1	14.6	12.8	11.4	9.3
		2H12	30.2	34.7	57.8	38.5	28.9	23.1	19.2	16.5	14.4	12.8	11.5
		2H16	51.8	42.0	70.0	46.6	35.0	28.0	23.3	20.0	17.5	15.5	14.0
		2H20	76.4	48.6	81.0	54.0	40.5	32.4	27.0	23.1	20.2	18.0	16.2
	400	2H10	24.3	32.8	54.6	36.4	27.3	21.8	18.2	15.6	13.6	12.1	10.8
		2H12	34.9	37.1	61.8	41.2	30.9	24.7	20.6	17.6	15.4	13.7	12.3
		2H16	60.5	44.8	74.6	49.7	37.3	29.8	24.8	21.3	18.6	16.5	14.9
		2H20	90.1	51.8	86.3	57.5	43.1	34.5	28.7	24.6	21.5	19.1	17.2
	450	2H10	N/A										
		2H12	39.5	39.3	65.5	43.6	32.7	26.2	21.8	18.7	16.3	14.5	13.1
		2H16	69.2	47.5	79.1	52.7	39.5	31.6	26.3	22.6	19.7	17.5	15.8
		2H20	103.7	55.0	91.6	61.1	45.8	36.6	30.5	26.1	22.9	20.3	18.3

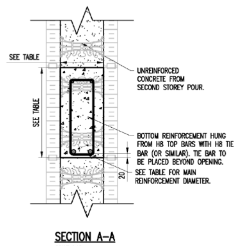


TYPICAL NUDURA LINTEL ARRANGEMENT
ELEVATION – INDICATIVE ONLY
SCALE 1:20

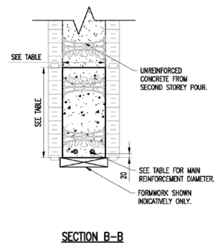


TYPICAL NUDURA LINTEL ARRANGEMENT
PLAN (2 BARS)
SCALE 1:20

BAR SIZE (mm)	INDICATIVE ANCHORAGE LENGTH (mm)
2H10	500
2H12	600
2H16	775
2H20	975



SECTION A–A
SCALE 1:10



SECTION B–B
SCALE 1:10

GENERAL NOTES:
1. DO NOT SCALE THIS DRAWING OR MODEL. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THESE TABLES ARE ONLY INTENDED TO ILLUSTRATE THE CAPABILITIES AND LIMITATIONS OF THE NUDURA ICF PRODUCT. THEY ARE NOT A REPLACEMENT FOR FULL STRUCTURAL CALCULATIONS BY A SUITABLY QUALIFIED ENGINEER.
3. THE ULTIMATE MOMENT CAPACITY AND ULTIMATE SHEAR RESISTANCE ARE CALCULATED TO BS EN 1992–1–1:2004.
4. THE ULTIMATE SHEAR RESISTANCE IS CALCULATED FOR LINTELS NOT REQUIRING SHEAR REINFORCEMENT (STIRRUPS/LINKS). LINTELS REQUIRING SHEAR REINFORCEMENT FALL OUTSIDE THE SCOPE OF THESE TABLES.
5. COMPRESSION REINFORCEMENT IS NOT CONSIDERED. LINTELS REQUIRING COMPRESSION REINFORCEMENT FALL OUTSIDE THE SCOPE OF THESE TABLES.
6. MINIMUM CONCRETE GRADE IS TAKEN TO BE C20/25 (f_{ck} = 20N/mm^2)
7. REINFORCEMENT GRADE IS TAKEN TO BE 500H (f_{yk} = 500N/mm^2)
8. MAXIMUM AGGREGATE SIZE IS TAKEN TO BE 12mm.
9. COVER IS TAKEN TO BE 20mm FROM THE BOTTOM AND SIDES.
10. MAXIMUM DIAMETER OF REINFORCEMENT BARS IS TAKEN TO BE 20mm.
11. N/A INDICATES REINFORCEMENT AREA LIMITED BY MINIMUM REINFORCEMENT REQUIREMENTS.
12. 100–150mm (4–6") LINTELS ARE LIMITED TO 1No. REINFORCEMENT BARS AND 200–300mm (8–12") LINTELS ARE LIMITED TO 2No. BARS FOR SIMPLICITY AND PRACTICALITY OF INSTALLATION.
13. TRIANGULATIONS TO LOAD ON LINTEL SHOULD NOT BE USED FOR NUDURA.
14. MAXIMUM SAFE WORKING LOAD BASED ON A FACTOR OF SAFETY OF 2.

Scale
As Shown

Issue	Notes	Drawn	Approved	Date
P2	Updated to comments	HN	MF	26.01.2023
P1	Preliminary issue	HN	MF	19.12.2022

Engineering That Brings Design To Life.

Issuing Office:
JMS London (Reading): The Courtyard, Edinburgh Road
Reading, Berkshire, United Kingdom, RG30 2UA. Tel: 01183 801644

Project
NUDURA ICF

Drawing Title
Ultimate Moment and Shear Capacities For Nudura Lintels With 2No. Bars

Project No. LR22/075/07
Drawing No. 502
Issue P2

PRELIMINARY

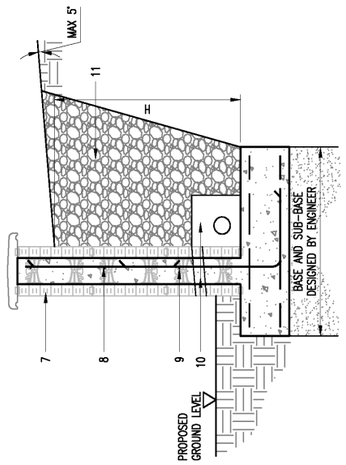
Original Sheet Size: A1

Rebar Tables

NUDURA RETAINING WALL NOTES:

1. DO NOT SCALE THIS DRAWING OR MODEL. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THESE TABLES ARE ONLY INTENDED TO ILLUSTRATE THE CAPABILITIES AND LIMITATIONS OF THE NUDURA ICF PRODUCT. THEY ARE NOT A REPLACEMENT FOR FULL STRUCTURAL CALCULATIONS BY A SUITABLY QUALIFIED ENGINEER.
3. THESE TABLES ARE BASED ON RETAINING WALL DESIGNS TO BS EN 1992:2004 AND BS EN 1997:2004. MAXIMUM HEIGHTS ARE CALCULATED BASED ON A CONSERVATIVE BASIC 1/4 CHECK AS PER BS EN 1992:2004.
4. THESE TABLES PROVIDE A MAXIMUM ACHIEVABLE HEIGHT AS WELL AS ULTIMATE MOMENT CAPACITY AND ULTIMATE SHEAR CAPACITY FOR THE VARIOUS COMBINATIONS OF CONCRETE CORE AND REINFORCEMENT (AT FIXED SPACINGS) BASED ON PRACTICALITY OF INSTALLATION WHILST USING NUDURA ICF PRODUCTS.
5. THE MAXIMUM ACHIEVABLE HEIGHT IS BASED ON A CANTILEVER RETAINING WALL. MAXIMUM WALL HEIGHTS MAY NOT BE ACHIEVABLE FOR SMALLER BAR DIAMETERS DUE TO DETAILING REQUIREMENTS. LARGER HEIGHTS MAY BE ACHIEVABLE WITH LOWER SURCHARGES OR PROPS DESIGNED BY A SUITABLY QUALIFIED ENGINEER.
6. DESIGN IS BASED ON ACTIVE EARTH PRESSURE. WHERE, A DESIGN BASED ON AT REST EARTH PRESSURE IS REQUIRED, THESE HEIGHTS MAY NOT BE ACHIEVABLE.
7. NUDURA BLOCKS FILLED WITH MINIMUM RC25/30 CONCRETE WITH 12mm AGGREGATE.
8. VERTICAL BARS PLACED AT 203mm C/C OR AT EVERY WEB. COVER DETERMINED BY PLACEMENT OF HORIZONTAL REINFORCEMENT (MINIMUM COVER TO SIDES = 30mm).
9. HORIZONTAL REINFORCEMENT TO BE PLACED IN SECOND NOTCH Ø457mm C/C OR EVERY OTHER WEB.
10. IT IS PRESUMED THAT AN ADEQUATE DRAINAGE SYSTEM WILL BE PROVIDED. THE PRESENCE OF GROUNDWATER HAS NOT BEEN CONSIDERED.
11. SELECTED GRANULAR BACKFILL.
12. ALL REINFORCEMENT DETAILING IS TO BE CARRIED OUT BY A SUITABLY QUALIFIED PROFESSIONAL.

TYPICAL NUDURA RETAINING WALL REINFORCEMENT PLACEMENT DETAIL
SCALE 1:10



TYPICAL SECTION THROUGH NUDURA RETAINING WALL
BASED ON NOMINAL SURCHARGE=10kN/m²
SCALE 1:20

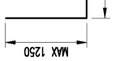
CORE (mm)	MAX H (mm)	MAX H IN COURSES (COURSES - H IN mm)	VERTICAL REINFORCEMENT	HORIZONTAL REINFORCEMENT	ULTIMATE MOMENT CAPACITY (kNm/m)	ULTIMATE SHEAR CAPACITY (kN/m)
150	1500	3 – 1371	H10	H8	16.0	51.5
			H12	H8	22.2	57.7
			H16	H12	35.7	69.0
			H20	H16	47.6	79.0
200	2200	4 – 1828	H10	H8	24.3	75.2
			H12	H8	34.5	76.0
			H16	H12	57.6	91.3
			H20	H16	82.9	104.9
250	2800	6 – 2742	H10	H8	30.4	94.0
			H12	H8	43.5	93.6
			H16	H12	74.0	106.2
			H20	H20	108.5	122.3
300	3400	7 – 3199	H10	H8	40.1	114.4
			H12	H8	57.5	114.1
			H16	H12	100.3	121.6
			H20	H16	149.5	140.6

MAXIMUM WALL HEIGHTS MAY NOT BE ACHIEVABLE FOR SMALLER BAR DIAMETERS DUE TO DETAILING REQUIREMENTS.

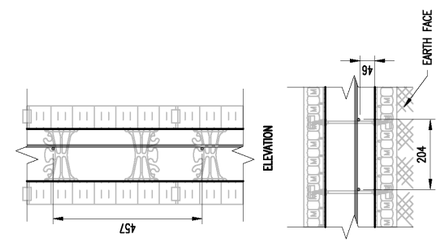
Nudura
jms GROUP
Engineering Their Design Design Their
Jenny Office
Kelvin Avenue Deadalle The Courtyard Edinburgh Road
Barking Berkshire United Kingdom IG10 3TQ, Tel +0163 8816 44
Project
NUDURA ICF
Drawing Title
Typical Nudura
Retaining Wall Detail
Drawing No. LR22075/07 701
Issue P2
PRELIMINARY
Original Sheet Size A3

NUDURA RETAINING WALL NOTES:

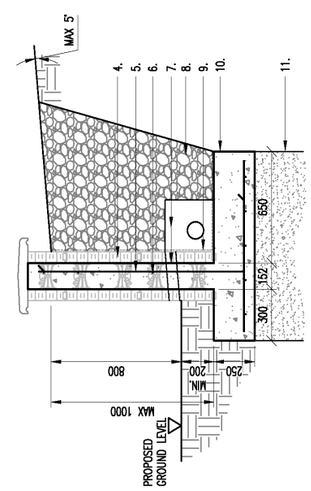
1. DO NOT SCALE THIS DRAWING OR MODEL. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. RETAINING WALL IS DESIGNED TO BS EN 1992:2004 AND BS EN 1997:2004.
3. THIS DESIGN IS ONLY INTENDED FOR LANDSCAPING USE. WHERE A RETAINING WALL IS REQUIRED AS PART OF A PERMANENT STRUCTURE, THIS DETAIL DOES NOT APPLY.
4. NUDURA BLOCKS FILLED WITH MINIMUM RC25/30 CONCRETE WITH 12mm AGGREGATE.
5. H8 L-BARS PLACED AT 203mm C/C OR AT EVERY WEB. COVER 50mm BOTTOM AND 46mm SIDE.



6. H8 HORIZONTAL BARS TO BE PLACED IN SECOND NOTCH Ø457mm C/C OR EVERY OTHER WEB.
7. 65mm SQUARE WEEP HOLES AT 1m C/C WITH A 25mm FALL TO THE FRONT. PERFORATED LAND DRAIN, 100mm DIAMETER WITH 20mm SINGLE SIZE AGGREGATE BACKFILLING, LAID WITH A MIN 1:80 FALL TO SUITABLE OUTFALL VIA A CATCH PIT.
8. SELECTED GRANULAR BACKFILL (30° ANGLE OF REPOSE).
9. DPM AND PROTECTION BOARD (IF REQUIRED).
10. RC25/30 BASE WITH A393 MESH, BOTTOM, 50mm COVER.
11. FOUNDATION SUB-BASE TO CONSIST OF ST1 CONCRETE (LEAN MIX). SUB BASE DEPTH TO BE DETERMINED ON SITE BASED ON PROXIMITY TO TREES AND VOLUME POTENTIAL OF SOIL.
12. BLINDING CONCRETE TO BE PROVIDED IF REQUIRED BY SITE CONDITIONS, IN ORDER TO ENSURE ALL STEEL IS KEPT CLEAN AND ADEQUATELY SUPPORTED.
13. THE PRESENCE OF GROUND WATER HAS NOT BEEN CONSIDERED. WHERE GROUND WATER IS PRESENT, THE RETAINING WALL SHOULD BE DESIGNED BY A SUITABLY QUALIFIED ENGINEER.
14. A SIGNIFICANT UPSTAND, HANDRAIL OR FENCE HAS NOT BEEN CONSIDERED IN THIS DESIGN.
15. THIS RETAINING WALL HAS BEEN DESIGNED FOR THE FOLLOWING SOIL CONDITIONS:
    - 15.1. ALLOWABLE BEARING PRESSURE =100kN/m²
    - 15.2. ANGLE OF REPOSE =30°
    - 15.3. NOMINAL SURCHARGE =10kN/m²

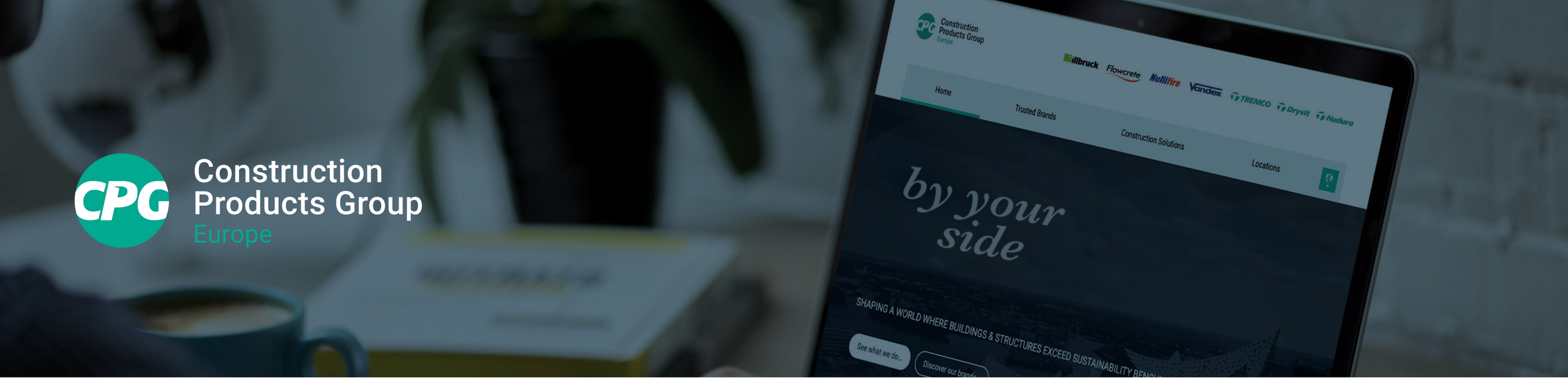


TYPICAL NUDURA RETAINING WALL REINFORCEMENT PLACEMENT DETAIL
SCALE 1:10



TYPICAL SECTION THROUGH 1m NUDURA RETAINING WALL
BASED ON NOMINAL SURCHARGE=10kN/m²
SCALE 1:20

Nudura
jms GROUP
Engineering Their Design Design Their
Jenny Office
Kelvin Avenue Deadalle The Courtyard Edinburgh Road
Barking Berkshire United Kingdom IG10 3TQ, Tel +0163 8816 44
Project
NUDURA ICF
Drawing Title
Typical Nudura
Retaining Wall Detail
Drawing No. LR22075/07 702
Issue P1
PRELIMINARY
Original Sheet Size A3



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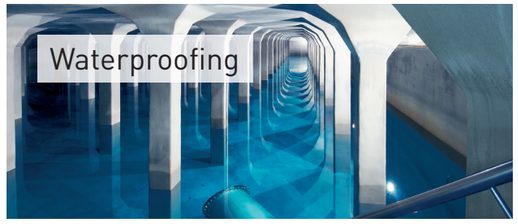
Seamless Resin Flooring, Subfloor Preparation, Car Parking Structures



Potable & Waste Water Industry, Balconies and Podia, Terraces, Basements & Foundations

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Construction
Products Group
Europe

Tremco CPG UK Ltd
Coupland Road, Hindley Green
Wigan
WN2 4HT UK

+44 (0) 1942 251400
hello@cpg-europe.com
www.cpg-europe.com