

Background report – transportation of building products (kg CO₂e/m²)

Updated: 10.12.2024 (version 1.01.005) (transportations in life-cycle sections A4, A5, B4 and C2 considered)

Background data

The following background data was made use of in the assessment of the conservative value for transportation (A4).

- Transportation distance
- Average transportation distance and load in domestic traffic for building materials in accordance with the Finnish statistics
- Average transportation distance (km) and load (%):
- Class 24: concrete, bricks, elements, cement, lime and other building materials
 - distance 78 km (2022 average)
 - load 78 % (2022 average)

Table 1. Average length of journey and loading ratio for category ‘Concrete, tiles, elements, cement, chalk and other such building materials’ for the years 2017-2022.

Year	Average length of journey (km)	Loading ratio (%)
2017	102	75
2018	104	76
2019	116	78
2020	105	73
2021	102	70
2022	78	78

Source: Official Statistics of Finland (OSF). 2023: Goods transport by road [online publication]. ISSN=2342-3617. Helsinki: Statistics Finland [Referenced: 19.1.2024]. 119b -- Volume of goods, vehicle mileage and transport performance of domestic road transport by type of goods, 2011-2022. https://pxdata.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kttav/statfin_kttav_pxt_119b.px

Main building materials

Table 2. Share of different materials for load bearing structures (based on 5-year average) (%)

Load bearing structures	Year	Concrete	Timber	Steel	Brick	Other
Detached buildings and terrace houses	2011-2015	14	83	0	1	1
	2016-2020	12	85	0	1	1
Blocks of flats	2011-2015	94	4	0	1	0
	2016-2020	94	5	0	1	0
Service buildings	2011-2015	65	18	14	2	1
	2016-2020	66	20	12	1	2

Table 3. Share of different materials for building façades (based on 5-year average) (%)

Building façades	Year	Concrete	Timber	Steel	Brick	Stone	Glass	Other
Detached buildings and terrace houses	2011-2015	6	77	0	10	1	0	6
	2016-2020	5	83	0	5	2	0	5
Blocks of flats	2011-2015	21	6	0	45	1	0	27
	2016-2020	25	7	0	40	2	0	24
Service buildings	2011-2015	19	13	30	19	1	2	15
	2016-2020	23	16	27	16	2	3	14

Source:

<https://www.stat.fi/tietotrendit/artikkelit/2021/rakentamisen-trendit-ja-muutokset-huomioidaan-rakennuskustannusindeksin-uudistamisessa/> (Original source Finnish statistics Construction and residential buildings):

Weight per net area

Source: Sara Tikka / Bionova, Emission assessments for different types of buildings, 2021 (task commissioned by the Ministry of the Environment)

- In each case gross area converted to net area by factor 0,95:
- 10 blocks of flats (load bearing structure concrete in most cases studied)
 - o average weight 2223 kg/krs-m².
- 10 retail building (load bearing structure concrete in most cases studied)
 - o average weight 2626 kg/krs-m².
- 10 educational buildings (load bearing structure concrete in roughly half of the studied cases)
 - o average weight 1849 kg/krs-m²
- 10 office buildings (load bearing structure concrete in most studied cases)
 - o average weight 1844 kg/krs-m².

Note: There is no evidence if the results indicate real typical differences between the different building types.

Simplified calculation method of transportation of building materials for full life cycle of building (kg/m²)

CO₂-emissions from transportation of building materials in life cycle section A4 are calculated using the average emission factors in co2data.fi that include diesel acquisition (JEC WTT 5a).

The following values were used in calculation:

- Weight 2500 kg / m²
- Transportation with semitrailer truck, 40 % load (=80 % / 0 %), highway driving.
 - o *(Based on Statistics Finland's 80 % (78 % ~ 80 % load) load with return empty (0 % load) (Official Statistics of Finland, 2023)*
- Emission factor, highway driving 0.0983 (kg CO₂e /tkm)
- Emission factor, urban driving, 0.1604 (kg CO₂e /tkm)
- Transportation distance 78 km.
- 90 % highway driving, 10 % urban driving (estimate)

Emission factor for transportation of building products in A4:

*[Emission factor * transportation distance * weight]*

$$- \quad ((0.0983 \text{ (kg CO}_2\text{e /tkm)} * 70.2 \text{ (km)}) + (0.1604 \text{ (kg CO}_2\text{e /tkm)} * 7.8 \text{ (km)})) * 2.5 \text{ (t)/ m}^2 = \underline{20.38 \text{ (kg CO}_2\text{e /m}^2\text{)}}$$

It is assumed that the emission factor calculated for life cycle section A4 can be utilized in section C2 as well as no major difference in the value is expected.

Moreover, when utilizing this calculation method of transportation of building materials for full life cycle of building, any transportation emissions in life cycle sections A5 (transportations to waste processing) and B4 (transportation of building materials to the site & transportations to waste processing) are considered so minor in overall picture that they are calculated as zero.

Selected items and values for database:

Item	Unit	Emission Factor (A4)	Emission Factor (C2)
Transportation of building materials (m2)	kg CO ₂ e /m ²	20.4	20.4