German Institute for Sustainability & Economy

Certification Office

Münster, 01.07.2020

Report on "CO2 balance regarding the product system "floor remake" and the replacement, production and new installation of a floor"

in accordance with

di-no. – procedural regulation D-20/400780

for the company

Dr. Schutz GmbH
Holbeinstraße 17
D – 53175 Bonn

Report
of the German Institute
for Sustainability & Economy

Client	Standard	Procedural Number	Type of Audit
Dr. Schutz GmbH Holbeinstraße 17 D – 53175 Bonn	di-no.- procedural regulation D-20/400780	2020/06-12227	Analytical procedure

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1.
This report shall document the scope of the task described below, as well as its development and results/findings. In the report the scope of the task, the procedures and results will be described in a summary.
This work is based on comprehensive research, analyses, elaborations and refers to investigations and evaluations carried out at universities of applied sciences.

1.01
Definition of Task:

Performance comparison of the carbon footprint of the product system "floor remake" compared to the replacement, production and new laying of a floor

1.011
Environmental friendliness regarding: carbon footprint, optimised logistics and savings, or the avoidance of production and recycling cycles.

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2.
Analytical Procedure:

At first the Institute was provided with diverse process descriptions, performance indicators and a filled-in questionnaire by the client. These and the data ascertained by the Institute are listed below with their parameters:

Article:	**Product System „floor remake“**
Dimensions:	The conversions were based on 10 m² area/70 µ thickness
Weight:	0,07 kg / m² = 0,70 kg / 10 m²
Provenance of Article:	Germany
Recycling:	not applicable
HGV Logistics:	logistics within Germany of raw material suppliers up to the finished product from the working service provider
Small Van Logistics:	delivery of service provider to final consumer, on average approx. 80 km

CO2 Emissions	
Recycling:	CO2 per kilometer and metric tonne does not apply
Manufacture:	114kg CO2 per metric tonne
HGV:	238,3g CO2 per kilometer and tonne of product weight
Small Van:	194g CO2 per kilometer and total weight
Service Provider Vehicle:	160g CO2 per kilometer and total weight

Comparative Article: Installation of a new floor, incl. removal, disposal and recycling of the old floor - here resilient floor/PVC etc., with residual adhesive.

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Article:	Resilient floor with adhesive and cement filler 2 mm
Dimensions:	10 m² area/4mm resilient floor + adhesive
Weight:	4 kg / m² = 40 kg / 10m²
Provenance of Article:	Approx. 90 % parts from Europe per HGV and by train
Sea Route:	Approx. 10% parts from overseas
HGV Logistics:	Raw materials to the place of manufacture approx. 320 km on average Delivery of raw materials for further processing - 80 km on average
Small Van Logistics**:**	Delivery from the manufacturer to final consumer - 80km on average

<u>CO2 Emissions of the New Goods from Europe</u>

Container Ship:	not applicable
HGV:	238,3g CO2 per kilometer and metric tonne
Production:	195kg CO2 per tonne of resilient floor
Small Van:	194g CO2 per kilometer and total weight
Service Provider Vehicle:	160g CO2 per kilometer and total weight

<u>CO2 Emission of the Recycling Process and Disposal of old Materials:</u>

Removal of floor:	121g CO2 per tonne of old materials
Logistics:	238,3g CO2 per kilometer and metric tonne
Recycling:	8,1kg CO2 per tonne of resilient floor and accompanying materials

EPD-Data of resilient floors in accordance with ERFMI (European Resilient Flooring Manufacturers‘ Institute)

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The ascertained data and values from pages 4 and 5 were adduced for further analysis. Thereby it was also taken into account that for the exchange of defective floors, removed for a new product, additional costs of disposal or diverse recycling processes will accrue. It was also borne in mind that when old floors are recycled, this takes place by dividing them into diverse usable and non-usable fractions. Non-usable materials must be disposed of properly, incurring further costs.

2.01
Ascertaining the CO2 values per 10 m2 “floor remake“ compared with the logistics, production and installation of a new product, including the disposal of old materials.

For further calculation the corresponding values were then ascertained:

One HGV emits per metric tonne and kilometer up to 238,3 grams.
Converted for the distance driven, this results in the following:

HGV:	238,3 g CO2/ km per tonne = 76,256 kg CO2 / t for 320 km
	238,3 g CO2/ km per tonne = 19,064 kg CO2 / t for 80 km
Small Van and Car Logistics:	194,0 g CO2 / km per tonne = 15,520 kg CO2 / t for 80 km
Total emissions:	110,840 kg CO2 per tonne. Transported from the place of extraction of raw materials via the production of finished goods to the place of use in Germany.

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Review of the logistics expense and energy with regard to shipping the finished product of resilient floors from the far east.

Calculation of pure CO2 – emissions from transport by sea route:

Transport route:	Shanghai to Hamburg
Distance:	10.778 nautical miles = 19.961 km
Means of transport:	Container ship 8.000 containers and more
Speed:	Average V_{md} 22 knots = 40,74 km/h ⇨ EV_{md} = 5,3g / tkm (tonnes per kilometer) Normal V_{nor} 23,3 knots = 43,15 km/h
Fuel: (CO2/ heavy fuel oil)	Heavy fuel oil: CO2- factor of 3,114g/g
Shipment weight:	7 t in one 20-foot container

Formula 1: $EV_{md} = 5,3 \times (22/23,3)^2$ = **4,7 g heavy fuel oil per tkm (tonnes per kilometer)**

Formula 2: CO2- emissions = 4,7 x 3,114 = **14,6 g CO2 per tkm**

Multiplying the 14,6 grams CO2 per tonnes per kilometer (tkm) by the 19.961 km and the 7t results in a CO2-emission for the transport of the container, from Shanghai to Hamburg at 22 knots average speed, of 2.040.0 kg. This results in a value of 291,4 kg CO2-emissions per product-tonne for resilient floors.
Here this is a case of purely additional emissions arising only from the sea route. All the other emissions from raw material extraction, processing and the land route logistics are in addition.

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The emissions from energy and logistics of “floor remake“, for its manufacture and installation were considered together. The result was as follows:

Floor remake CO2-Emission: 346,40 kg CO2 / t product

Therefore it follows that for the repair-refurbishment of **10 m² of floor** with floor remake **0,242 kg CO2** emissions result.

Calculation of the CO2 emissions for the removal, disposal and recycling of the old floor and the manufacture, logistics and installation of a new floor. The result was as follows:

Construction of new floor Emission: 314,06 kg CO2 / t product
Therefore it follows that for the completely new construction of **10 m2 old floor approx. 12,65 kg CO2 emissions** result.
This corresponds to a factor of 52,3 in relation to “floor remake“ and means that with a floor remake renovation, compared with a new floor from Europe, 98,08 % CO2 emissions are saved.

If the new floor comes from overseas, then an additional 291,4kg CO2-emissions per tonne new floor must be added to the calculation. The total pollution-debit per t new floor rises to 605,46kg CO2/t product. On 10m² of an old floor 24,22kg CO2-emissions accrue.
This corresponds to a factor of 100,1 with regard to floor remake and means that with a floor remake renovation, compared with a new floor from overseas, even 99,00% CO2-emissions can be saved.

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2.11

Summary / Conclusion:

If the CO2 comparative calculations are taken into account, the client saves considerable CO2 emissions by renovating the old floor with the floor remake System. With a new floor the emissions ensuing from internal logistics routes in Germany alone account for more than the total emissions from such a refurbishment !

An Overview of the CO2-Emissions:

New floor from Europe: 12,65kg CO2
New floor from overseas: 24,22kg CO2
Renovation with floor remake: 0,242kg CO2

The saving of CO2 emissions of floor remake compared with a new floor:

From Europe: 98,08%
From overseas: 99,00 %

There is little demand for the different fractions of old floor materials by the recycling industry. Numerous processes must take place, residues (adhesive, lacquer) must be treated as hazardous waste and the earnings on recycled screed concrete are low.

Münster, 01.07.2020
Signed by Institute Director Stefan Dissel