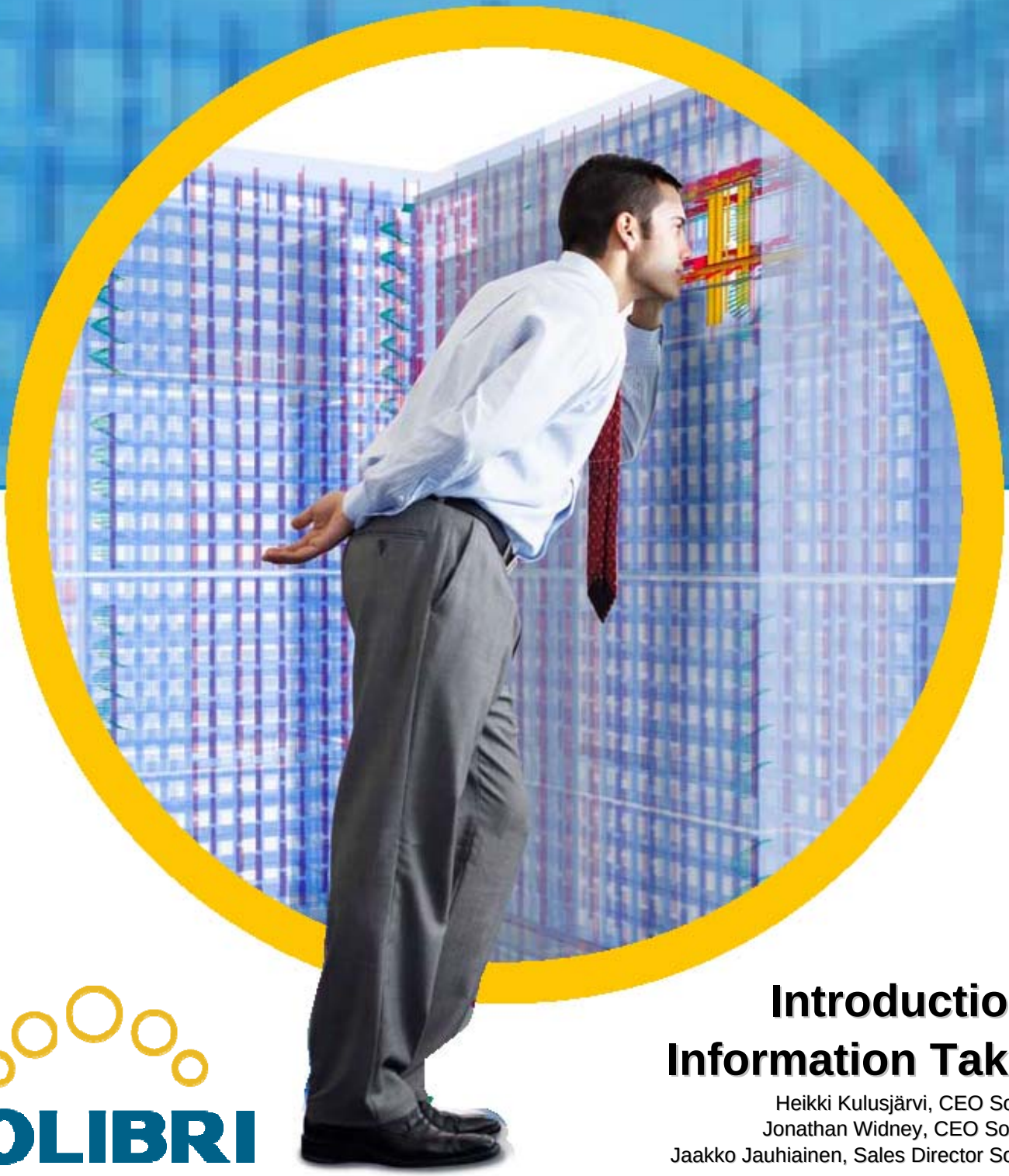
Solibri Model Checker

for Better Quality & Higher Accuracy



SOLIBRI

Introduction to Information Takeoff

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Introducing Information Takeoff

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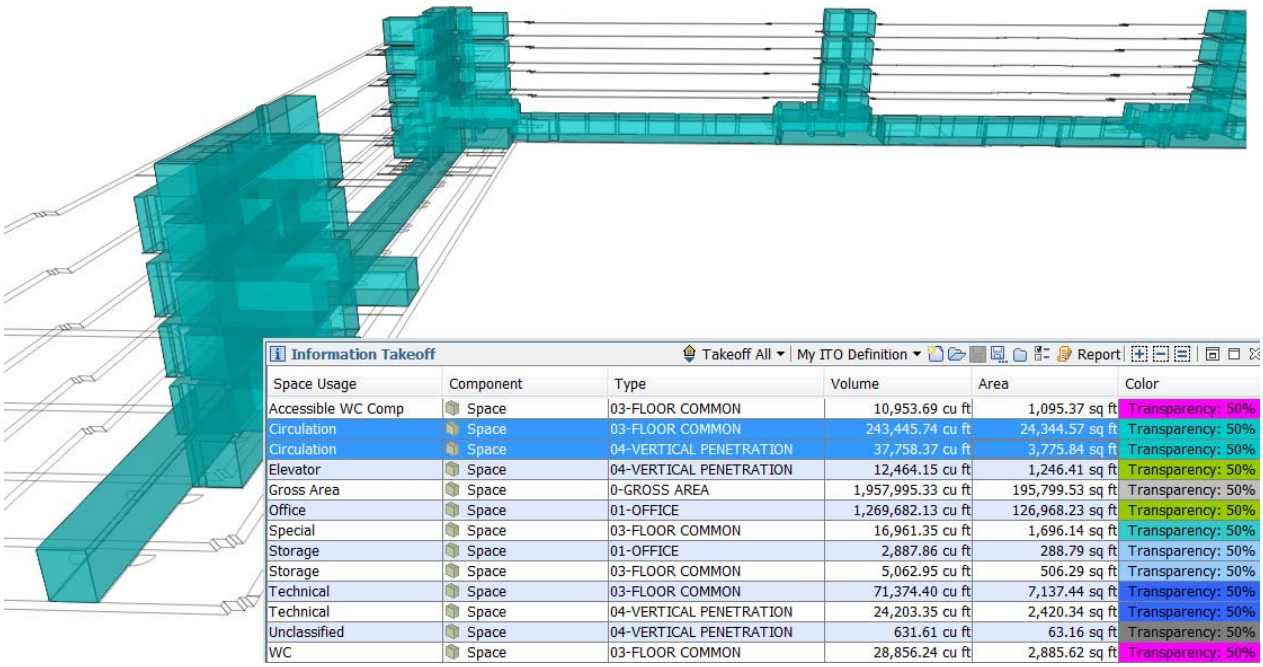
Information takeoff (ITO) - The latest innovation from Solibri

Solibri's main focus is Quality assurance and control. To be more precise, we want to make sure the required information is available, can be trusted, and follows set criteria and guidelines (e.g. building code). To achieve this, we use rules to analyze information in, and various aspects of the model. Additionally, we have discovered innovative ways to verify information.

Typically, BIM information is fragmented on the component level into many thousand elements. "You can't see the forest for the trees" - is a saying that applies here. Some things are easier to see than others. For example, we visualize geometrical information and by looking at it we can discover some problems. Through this process we have elevated detailed geometrical information to a level more understandable, and usable, for all. A similar result is achieved when we generate quantity takeoffs from the BIM file, as the "total numbers" give us more understanding about the building or structure.

Combining the idea behind these two examples, we have developed an innovative capability called Information Takeoff (ITO). In brief, ITO allows users to collect information from the BIM file, organize it, visualize it, and report it - ***instantly***. This information can include spatial areas for area calculations, envelope of the building (e.g. exterior wall areas) for energy calculations, volumes, quantity takeoff and much more.



Space Usage	Component	Type	Volume	Area	Color
Accessible WC Comp	Space	03-FLOOR COMMON	10,953.69 cu ft	1,095.37 sq ft	Transparency: 50%
Circulation	Space	03-FLOOR COMMON	243,445.74 cu ft	24,344.57 sq ft	Transparency: 50%
Circulation	Space	04-VERTICAL PENETRATION	37,758.37 cu ft	3,775.84 sq ft	Transparency: 50%
Elevator	Space	04-VERTICAL PENETRATION	12,464.15 cu ft	1,246.41 sq ft	Transparency: 50%
Gross Area	Space	0-GROSS AREA	1,957,995.33 cu ft	195,799.53 sq ft	Transparency: 50%
Office	Space	01-OFFICE	1,269,682.13 cu ft	126,968.23 sq ft	Transparency: 50%
Special	Space	03-FLOOR COMMON	16,961.35 cu ft	1,696.14 sq ft	Transparency: 50%
Storage	Space	01-OFFICE	2,887.86 cu ft	288.79 sq ft	Transparency: 50%
Storage	Space	03-FLOOR COMMON	5,062.95 cu ft	506.29 sq ft	Transparency: 50%
Technical	Space	03-FLOOR COMMON	71,374.40 cu ft	7,137.44 sq ft	Transparency: 50%
Technical	Space	04-VERTICAL PENETRATION	24,203.35 cu ft	2,420.34 sq ft	Transparency: 50%
Unclassified	Space	04-VERTICAL PENETRATION	631.61 cu ft	63.16 sq ft	Transparency: 50%
WC	Space	03-FLOOR COMMON	28,856.24 cu ft	2,885.62 sq ft	Transparency: 50%

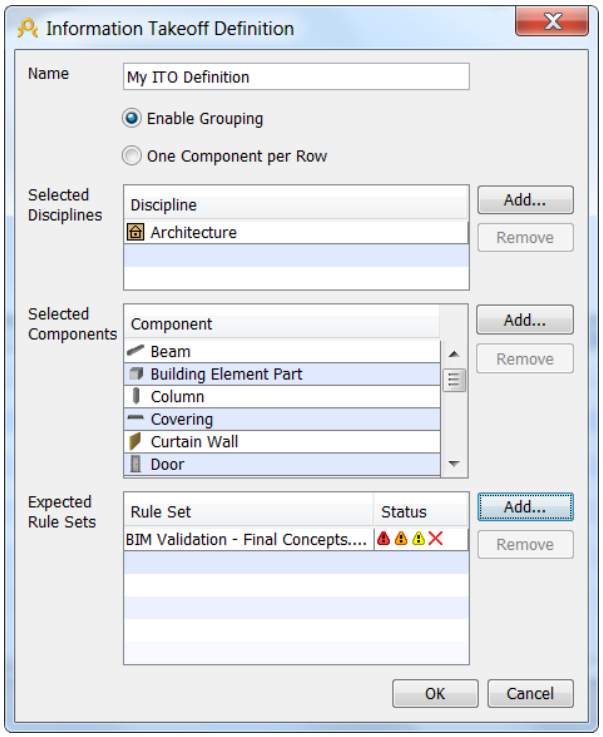
Solibri has always been focused on the "**I**" (information) in BIM. We are now bringing the capability, and power, to 'mine the model' for extensive types of information to your desktop. We believe this will fundamentally change the way models are used. Once the data is in the model, the user will be able to capture it in whatever structure best suits the project requirements.

How to Use ITO?

We have built ITO functionality to be easy to use at the design office, the worksite, or wherever you have needs to rapidly get information out of the BIM file. You can make pre-planned calculations to coordinate design process or ad-hoc queries to identify material to be sent to the second floor at the worksite. Following are some of the key concepts to get the most out of ITO.

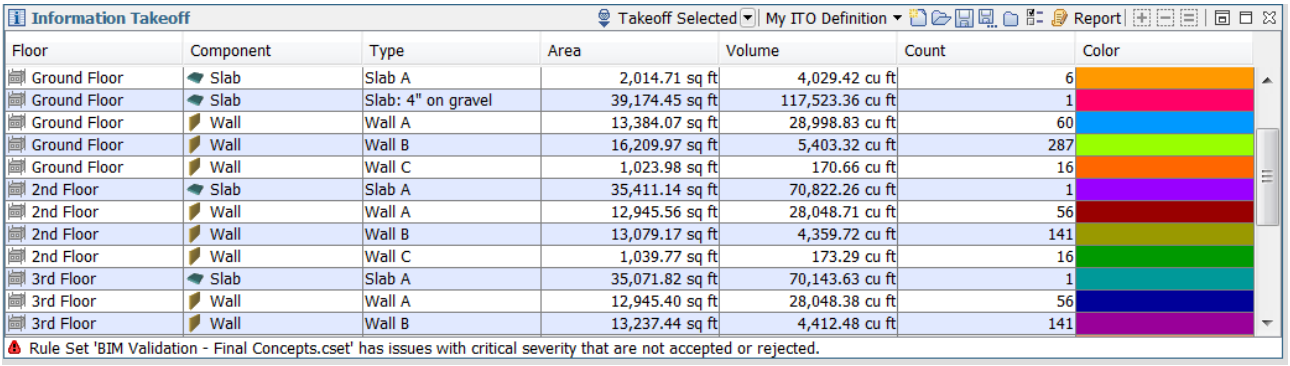
ITO description

ITO Description is the starting point. First, you select the discipline(s) you want to work with, as there may be several models from different disciplines loaded in the Solibri Model Checker. Then you define what components you want to get information from and what properties are of interest. You can also define what rule sets should be checked to generate accurate results.



Creating an Information Takeoff Definition Is The First Step in Mining Information From BIM Models. It Is Also Possible to Select Rule Sets That Should be Used For Model Checking. ITO Will Warn the User If Expected Rule Sets Have Not Been Loaded or Fully Checked.

Next, you define how this information should be organized (e.g. by floor, space or system). It is also possible to enable information grouping and reflect total sums. Different colors can be assigned to indicate different wall types (in this example).



Information Takeoff — Takeoff Selected | My ITO Definition | Report

Floor	Component	Type	Area	Volume	Count	Color
Ground Floor	Slab	Slab A	2,014.71 sq ft	4,029.42 cu ft	6	
Ground Floor	Slab	Slab: 4" on gravel	39,174.45 sq ft	117,523.36 cu ft	1	
Ground Floor	Wall	Wall A	13,384.07 sq ft	28,998.83 cu ft	60	
Ground Floor	Wall	Wall B	16,209.97 sq ft	5,403.32 cu ft	287	
Ground Floor	Wall	Wall C	1,023.98 sq ft	170.66 cu ft	16	
2nd Floor	Slab	Slab A	35,411.14 sq ft	70,822.26 cu ft	1	
2nd Floor	Wall	Wall A	12,945.56 sq ft	28,048.71 cu ft	56	
2nd Floor	Wall	Wall B	13,079.17 sq ft	4,359.72 cu ft	141	
2nd Floor	Wall	Wall C	1,039.77 sq ft	173.29 cu ft	16	
3rd Floor	Slab	Slab A	35,071.82 sq ft	70,143.63 cu ft	1	
3rd Floor	Wall	Wall A	12,945.40 sq ft	28,048.38 cu ft	56	
3rd Floor	Wall	Wall B	13,237.44 sq ft	4,412.48 cu ft	141	

Rule Set 'BIM Validation - Final Concepts.cset' has issues with critical severity that are not accepted or rejected.

Once you have finished the ITO description, you can takeoff the information of the whole model or make a partial takeoff (selection) using Model Tree, Classification, Sectioning, Filtering, or even individually picking the components that are of interest.

ITO Templates

ITO descriptions can be saved for sharing with other members of the project team or for further use with other BIM files. These are saved as ITO templates which can be effectively used to ensure consistency when extracting information from the model. If, for example you have created an ITO description for creating a bill of quantities of all doors and windows in your current project, the same ITO template can be used on other projects. Thus, ITO automates data extraction from models. ITO templates can also be shared between users.

ITO Reports and Report Templates

All the information that has been collected can be exported to spreadsheets for further reporting and analysis. These are called ITO Reports, and can be easily customized by the user. Once it is determined which information from the associated ITO description will be used, it is then possible to create formulas, etc. as necessary to further utilize that BIM information.

Solibri Inc. 11.5.2010 0:00

Cost Estimate for Slabs

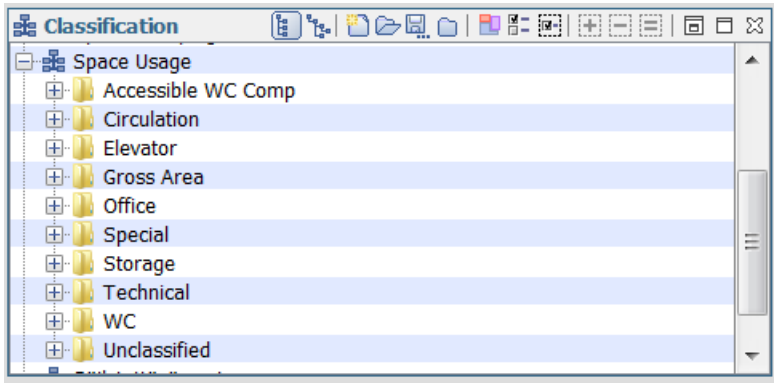
Floor	Type	Quantity	Description	Unit	Unit Cost	Total Cost
Ground floor	FS-1	187,84	**Ventilated Hollow Core Slab 265 mm** Polystyrene insulation 190 mm, concrete screed 40 mm, hollow core slab 265 mm	m2	77,50	14 557,19
First floor	FS-2	156	**Hollow Core Floor Slab 265 mm** Concrete screed 40 mm, hollow core slab 265 mm	m2	59,00	9 203,50
Second floor	FS-2	147,86	**Hollow Core Floor Slab 265 mm** Concrete screed 40 mm, hollow core slab 265 mm	m2	59,00	8 723,27
Second floor	FS-1	3,23	**Ventilated Hollow Core Slab 265 mm** Polystyrene insulation 190 mm, concrete screed 40 mm, hollow core slab 265 mm	m2	77,50	250,32
Roof	FS-2	8,89	**Hollow Core Floor Slab 265 mm** Concrete screed 40 mm, hollow core slab 265 mm	m2	59,00	524,48
Roof	RS-1	190,12	**Hollow Core Roof 200 mm** Concrete screed 40 mm, lightweight aggregate 520 mm, hollow core slab	m2	83,85	15 941,64
Roof	RS-3	15,27	**Hollow Core Roof 160 mm** Concrete screed 40 mm, lightweight aggregate 520 mm, hollow core slab	m2	64,54	985,53
Total Cost		709,21	m2			50 185,93 €

Information from Building Information Models can be Reported Using Customized Standard Templates. Templates can Include Additional Information Such as Cost Information.

Useful Tips

Classification

Classification is a very powerful way to organize BIM information. This also makes it possible to add reasoning to the information in the BIM file. Typical classifications would include space types, as space of certain types (e.g. vertical circulation) is important for performing accessibility analysis.



Structural components should be classified (e.g. according to Uniformat II) to be more useful for quantity takeoff and cost estimation. You can have component status information such as Existing, Finished, Phase 1,

Phase 2, etc. for design coordination. On a component level, you can separate blocks A, B, C and D of the building and reflect that in your reports.

Saving Selections

Solibri Model Checker v6 new capabilities include the possibility to save Selection Basket contents with a meaningful name such as “Hollow Core Slabs”. This selection can be applied to the same model over and over, once it has been defined.

ITO Samples Delivered with Solibri Model Checker

There are numerous ways to utilize BIM information and there are sample ITO templates and Reports delivered with the Solibri Model Checker. Included are:

- Building Components by Blocks
- Building Element Quantities
- Component Status
- Detailed Building Component Quantities
- Flow Terminals and Valves
- Pipes and Ducts
- Spaces
- Walls by Height
- ITO and Carbon Footprint Calculations
- Building Project Hollow Core Slab Structure Cost Estimate
- Space Based Target Price Calculation

ITO and Carbon Footprint Calculations

With ITO it is possible to very easily produce a carbon footprint calculation describing a partial product life-cycle, reflecting the total levels of the GHG emissions caused by manufacturing the materials of the building. It is also relatively straightforward to expand the calculation to include the GHG emissions during the construction phase.

The partial product lifecycle carbon footprint is calculated with ITO by combining the following information:

- Component types and their quantities
- Structural types of the components and their material consumption
- The carbon dioxide equivalents of the materials

The calculation is carried out in the following way:

- An ITO template is created which automatically generates a full bill of quantities (BQ) on the component level, directly from the model
- A report template is created, using the Solibri Model Checker v6 ITO functionality which combines BQ and component specific CO2es in a report

Information for calculating CO2e values can be obtained from different sources, including environmental product declarations published by manufacturers. For example, CO2e value for a hollow core slab can be calculated based on the information provided by the manufacturer describing the emissions when producing 1 kg of slab:

- CO2 emission 140 g
- CH4 emission 0.22 g with a GWP of 21 (CO2e of 4.62)
- NO2 emission 0.34 g with a GWP of 310 (CO2e of 105.40)

The carbon footprint for one kilogram of hollow core slab is 0.00025002 tons. The weight of 265 mm thick hollow core slab is 360 kg/m2. Thus the carbon footprint for manufacturing one square meter of hollow core slab is about 0.09 tons.

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CO2 Foot Print For Hollow Core Slabs

Floor	Type	Quantity	Unit	Description	CO2 Equivalent [kg/Unit]	CO2 Total [kg]
Ground floor	FS-1	187,84	m2	Ventilated Hollow Core Slab 265 mm Polystyrene insulation 190 mm, concrete screed 40 mm, hollow core slab 265 mm	252,44	47 418,33
First floor	FS-2	156	m2	Hollow Core Floor Slab 265 mm Concrete screed 40 mm, hollow core slab 265 mm	324,59	50 636,04
Second floor	FS-2	147,86	m2	Hollow Core Floor Slab 265 mm Concrete screed 40 mm, hollow core slab 265 mm	324,59	47 993,88
Second floor	FS-1	3,23	m2	Ventilated Hollow Core Slab 265 mm Polystyrene insulation 190 mm, concrete screed 40 mm, hollow core slab 265 mm	252,44	815,38
Roof	FS-2	8,89	m2	Hollow Core Floor Slab 265 mm Concrete screed 40 mm, hollow core slab 265 mm	324,59	2 885,61
Roof	RS-1	190,12	m2	Hollow Core Roof 200 mm Concrete screed 40 mm, lightweight aggregate 520 mm, holllow core slab	301,22	57 267,95
Roof	RS-3	15,27	m2	Hollow Core Roof 160 mm Concrete screed 40 mm, lightweight aggregate 520 mm, hollow core slab	421,98	6 443,63
Total	Quantity	709,21	m2		CO2 Total [kg]	213 460,81

Carbon Footprint Calculation Generated by ITO Combining Hollow Core Slab Structure Quantity Information and CO_2e (CO_2Equivalent) Values.