

Results from Element Matching

Project name: Bod nidarosdomen

Construction site located at: 63.4281, 10.4043

Summary of results

Total score	Score without reuse	Savings	Substitutions
459.32 kg CO2 equivalents	2114.16 kg CO2 equivalents	78.27%	81.58%

The 'Maximum Bipartite Matching' algorithm yields the best results, substituting 31/38 demand elements (81.58%). Using 'GWP' as the optimization metric, a total score of 459.32 kg CO2 equivalents is achieved. For comparison, a score of 2114.16 kg CO2 equivalents would have been obtained by employing exclusively new materials. This results in a total saving of 78.27%. Note that impacts of transporting the materials to the construction site is not accounted for. Open the CSV-file "Bod_nidarosdomen_substitutions.csv" to examine the substitutions.

Constants used in calculations

Constant	Value	Unit
Density timber	491.0	kg/m ³
Density steel	7850	kg/m ³
GWP new timber	28.9	kg CO2 equivalents
GWP reused timber	2.25	kg CO2 equivalents
GWP new steel	800.0	kg CO2 equivalents
GWP reused steel	4.0	kg CO2 equivalents

Information about datasets

Elements	Filename	Number of elements
Reused	SUPPLY_DATAFRAME_SVERRE.xlsx	109
Demand	DEMAND_DATAFRAME_SVERRE.xlsx	38

Performance of algorithms

Name	Total score	Substitutions	Time
Maximum Bipartite Matching	459.32 kg CO2 equivalents	81.58%	0.011s
Greedy Algorithm Plural	459.32 kg CO2 equivalents	81.58%	0.025s

The design tool is runned with 2 algorithms, namely: Maximum Bipartite Matching, and Greedy Algorithm Plural. The Maximum Bipartite Matching yields the lowest score, as shown in the table. The substitutions by this algorithm are completed in 0.011 seconds.