NTNU

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# Results from Element Matching

**Project name:** Sognsveien 17

**Construction site located at:** 59.94161606, 10.72994518

## Summary of results

| Total score | Score without reuse | Savings | Substitutions |
|---|---|---|---|
| 6937.25 kg CO2 equivalents | 8100.33 kg CO2 equivalents | 14.36% | 40.0% |

The 'Greedy Algorithm Plural' algorithm yields the best results, substituting 4/10 demand elements (40.0%). Using 'GWP' as the optimization metric, a total score of 6937.25 kg CO2 equivalents is achieved. For comparison, a score of 8100.33 kg CO2 equivalents would have been obtained by employing exclusively new materials. This results in a total saving of 14.36%. Note that impacts of transporting the materials to the construction site is accounted for and contributes to 34.04% of the total score. Open the CSV file with the file path './Results/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 C02 equivalents |
| GWP reused timber | 2.25 | kg C02 equivalents |
| GWP new steel | 800 | kg C02 equivalents |
| GWP reused steel | 4 | kg C02 equivalents |
| GWP transportation | 96.0 | kg/m^3 per tonne |

# Information about datasets

| Elements | Filename | Number of elements |
|---|---|---|
| Reused | pdf_supply.csv | 10 |
| Demand | pdf_demand.csv | 10 |

## Impact of transportation

| Transportation score | Percentage of total score | Transportation all new |
|---|---|---|
| 2361.33 kg CO2 equivalents | 34.04% | 2603.13 kg CO2 equivalents |

All calculations in this report take impacts of transportation of the materials to the construction site into consideration. Transportation itself is responsible for 2361.33 kg CO2 equivalents. This accounts for 34.04% of the total score of 6937.25 kg CO2 equivalents. For comparison, the transportation impact for exclusively using new materials would have been 2603.13 kg CO2 equivalents.

## Performance of algorithms

| Name | Total score | Substitutions | Time |
|---|---|---|---|
| Greedy Algorithm Plural | 6937.25 kg CO2 equivalents | 40.0% | 0.048s |
| Maximum Bipartite Matching | 6946.47 kg CO2 equivalents | 40.0% | 0.033s |

The design tool is runned with 2 algorithms, namely: Greedy Algorithm Plural, and Maximum Bipartite Matching. The Greedy Algorithm Plural yields the lowest score, as shown in the table. The substitutions by this algorithm are completed in 0.048 seconds.