CAN MATERIAL PASSPORTS LOWER FINANCIAL BARRIERS FOR STRUCTURAL STEEL RE-USE?

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Material Passports

What is it?
Sets of data describing defined characteristics of materials in (building) products that give them value for recovery and reuse.

Target user groups?
Diverse groups along the value chain

But how much does the data worth, and which user groups may be willing to pay for it?
→ business case study: Structural steel re-use
Structural steel re-use sounds very logical

Reduce & Reuse Vs Recycle

It’s better for the environment

It’s technically feasible

And it can be economically attractive

Source: Cullen & Drewniok, Univ. Cambridge (2016)
But it’s not happening yet...

Less than 10% gets re-used, and rates are falling

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Reuse</th>
<th>Recycle</th>
<th>Landfill</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Steel Construction</td>
<td>12%</td>
<td>93%</td>
<td>5%</td>
<td>Heavy sections</td>
</tr>
<tr>
<td></td>
<td>Institute</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Gorgolewski et al.</td>
<td>10%</td>
<td>90%</td>
<td>nil</td>
<td>Sections, Canada</td>
</tr>
<tr>
<td>2012</td>
<td>EUROFER</td>
<td>7%</td>
<td>96%</td>
<td>2%</td>
<td>Heavy sections</td>
</tr>
</tbody>
</table>

Source: Cullen & Drewniok, Univ. Cambridge (2016)
Why?

AMONG MANY REASONS...

- Liability
- Lack of demand
- Traceability
- Sourcing
- Old/new perception

RE-USE IS OFTEN MORE EXPENSIVE THAN NEW!

Sources: Dunant et.al. (2018); Tingley, Cooper & Cullen (2017)
Can we make it cheaper and easier...

... by making the right data available?
Can we make it cheaper and easier...

... by making the right data available?

Numbers based on: Dunant et.al. (2018)
Can we make it cheaper and easier... 

... by making the **right** data available?

- Source mill
- Production date
- Material properties
- Section sizes
- Building purpose
- Beam location
- Connections
- Loading history
- Fire exposure
- Coatings
- Building AS MATERIAL BANKS
Can we make it cheaper and easier...
... by making the right data available?

Testing
Reconditioning (shotblasting)
→ 150-250 £/t

Numbers based on: Dunant et.al. (2018)
Can we make it cheaper and easier... 
... by making the right data available?

Testing
Reconditioning (shotblasting, removing welds and end plates)
Fabrication (bolts/primer, cuts/welds/drills/shot blasting)

→ Up to 800 £/t

Numbers based on: Dunant et.al. (2018)
Can we make it cheaper and easier...

... by making the right data available?

Testing
Reconditioning (shotblasting, removing welds and end plates)
Fabrication (bolts/primer, erection, cuts/welds/drills/shot blasting)

→ Up to 1,000 £/t

Numbers based on: Dunant et.al. (2018)
Can we make it cheaper and easier...

... by making the right data available?

<table>
<thead>
<tr>
<th>Use case</th>
<th>Customer group</th>
<th>Value proposition of data</th>
<th>Added value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct re-use of structures</td>
<td>General contractors</td>
<td>Sourcing advantage</td>
<td>Up to 1000 £/tonne</td>
</tr>
<tr>
<td>Direct re-use of elements</td>
<td>Fabricators</td>
<td>1. Sourcing advantage&lt;br&gt;2. Cost reductions (lower testing and reconditioning costs enabled by technical/usage data)</td>
<td>Up to 800 £/tonne</td>
</tr>
<tr>
<td>Remanufacturing (re-fabrication)</td>
<td>Stockists</td>
<td>Cost reductions (lower testing and reconditioning costs enabled by technical/usage data)</td>
<td>150 - 250 £/tonne</td>
</tr>
</tbody>
</table>

Material Passports can help to lower financial barriers of structural steel re-use
Data alone may not be sufficient

Stronger business case if...

Value redistribution across the value chain
Shorter value chain/vertical integration

Standardization of dimensions and reversible design
Thank you!

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