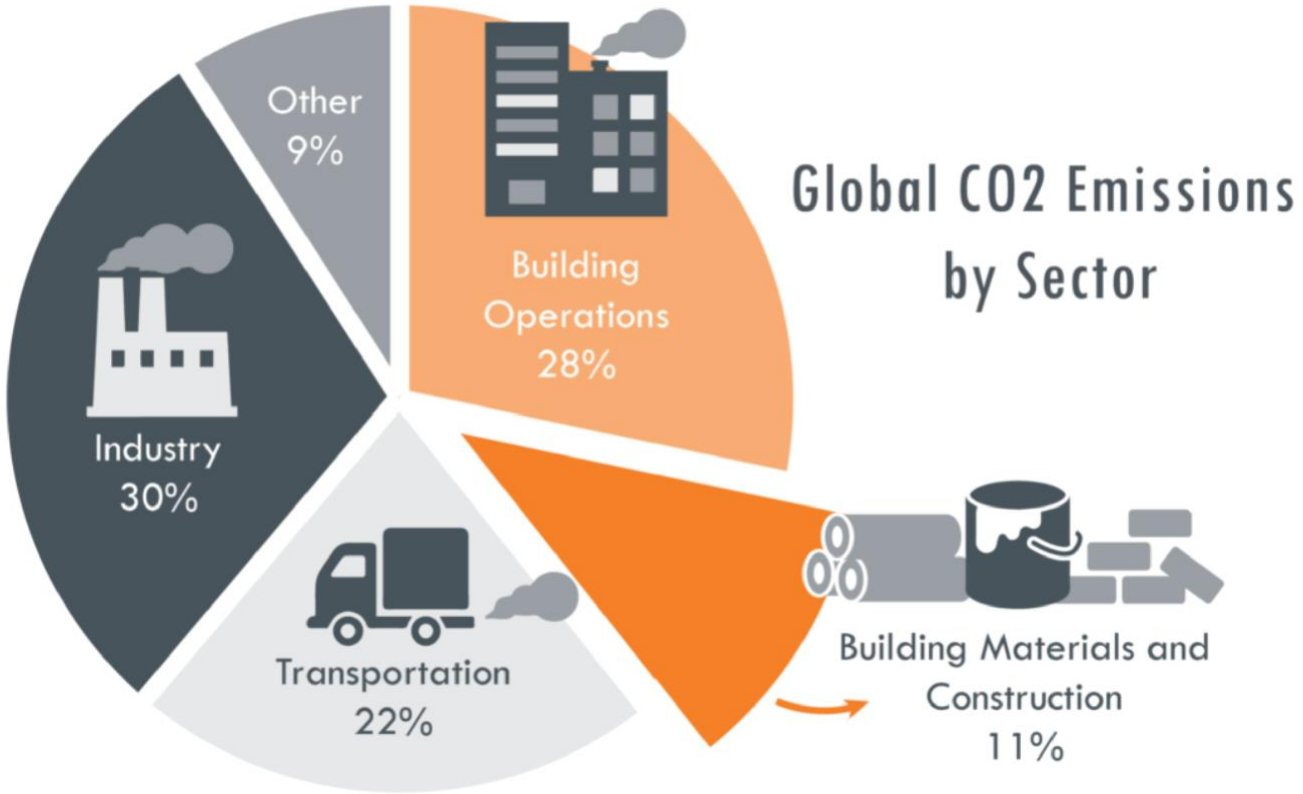
INTEGRATED DESIGN WITH RECLAIMED STEEL

Daniela Martinez Palacio - Masters Thesis - Final Presentation

Content

Problem Statement



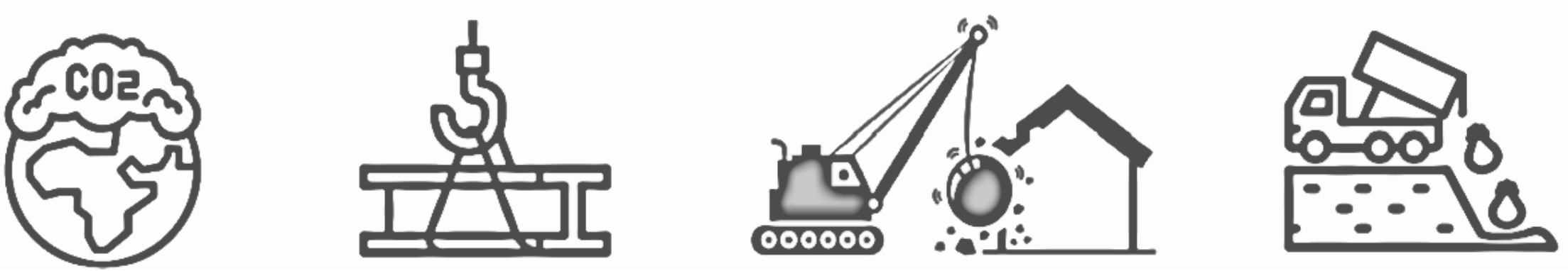
Source: UN Environmental Global Status Report 2018

The building industry is responsible for 39% of the total greenhouse gas emissions in the world, of which 11% are embodied carbon emissions from material production and construction. 6-7% of that is produced by the steel sector.

Source: World Green Building Council & International Energy Agency

Problem Statement

“Take – Make – Dispose” Linear Model



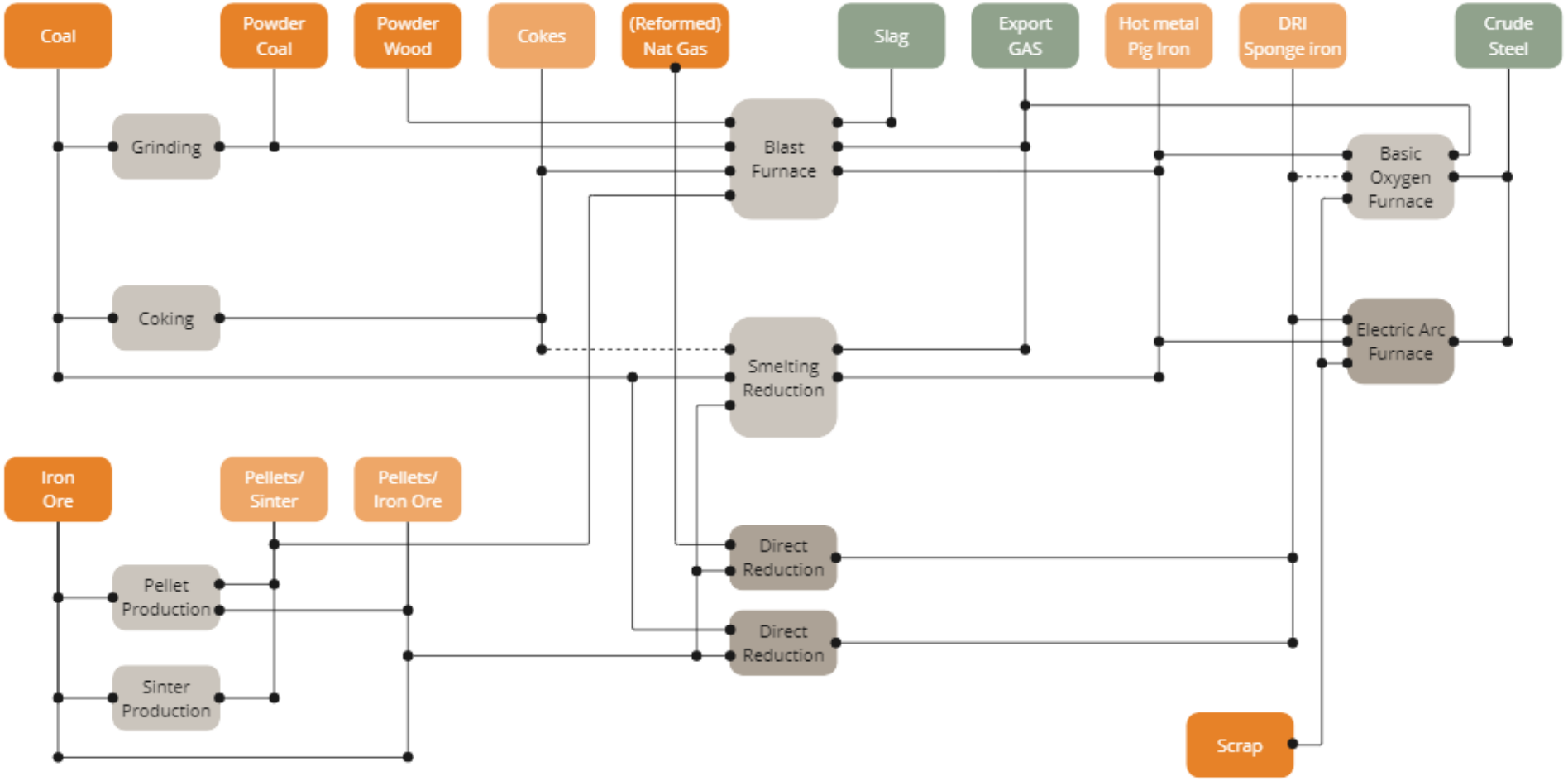
CO2 Emissions

Material Scarcity

Single-Use Buildings

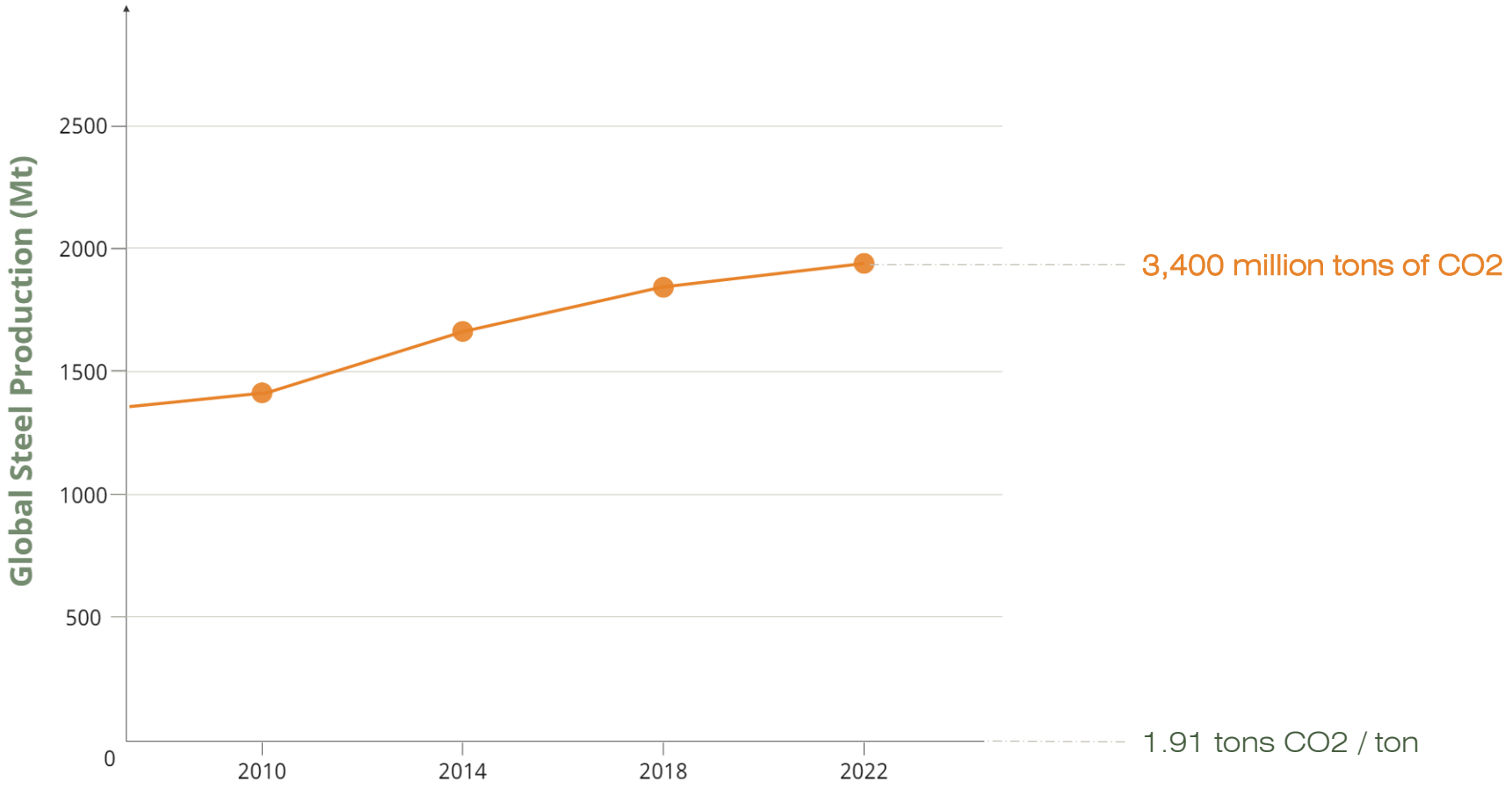
Waste Production

Steel Production



Material Flow for the Production of Steel
Source: Van Wortswinkel, L – Energy Technology Systems Analysis Program: Iron & Steel

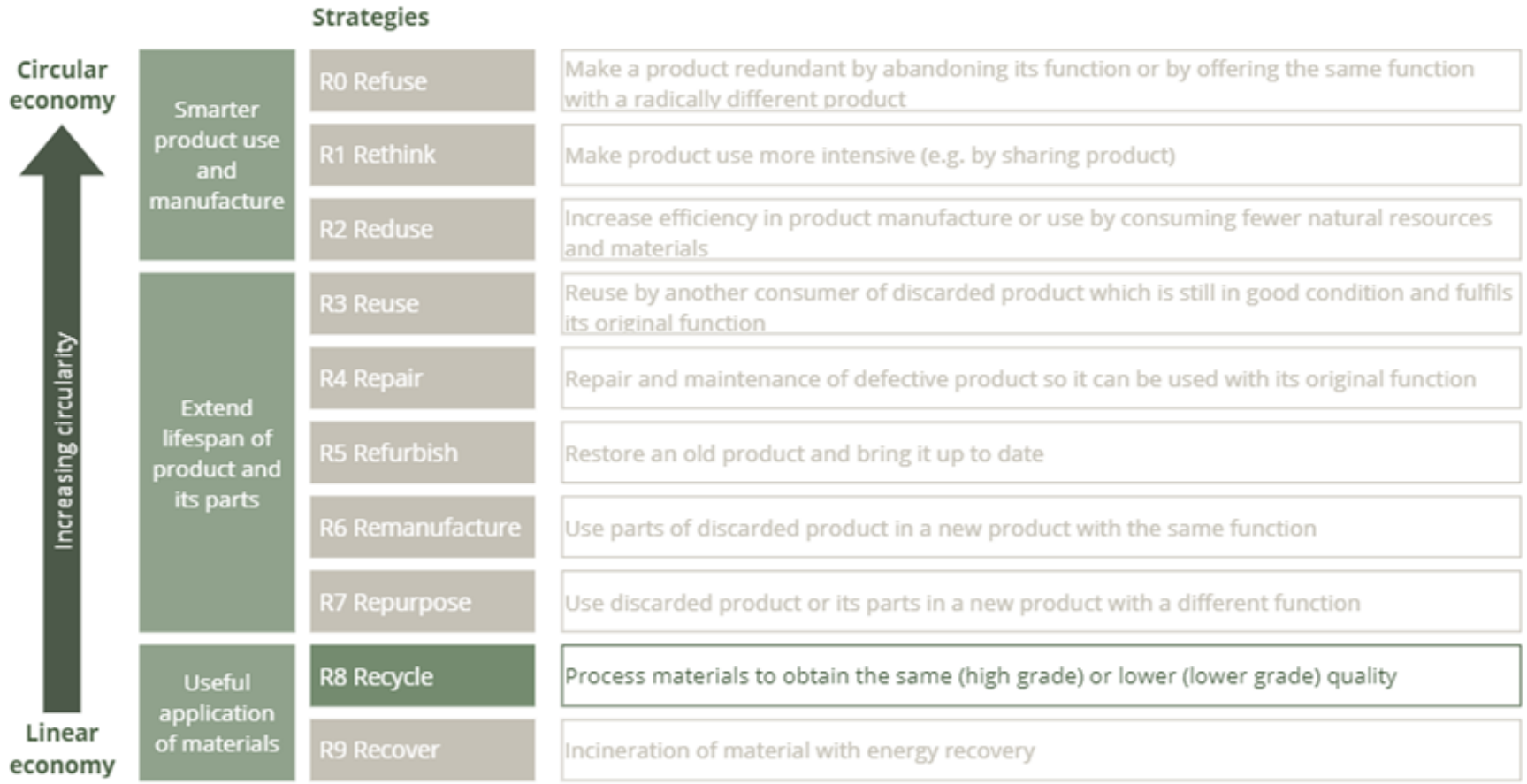
CO2 Emissions



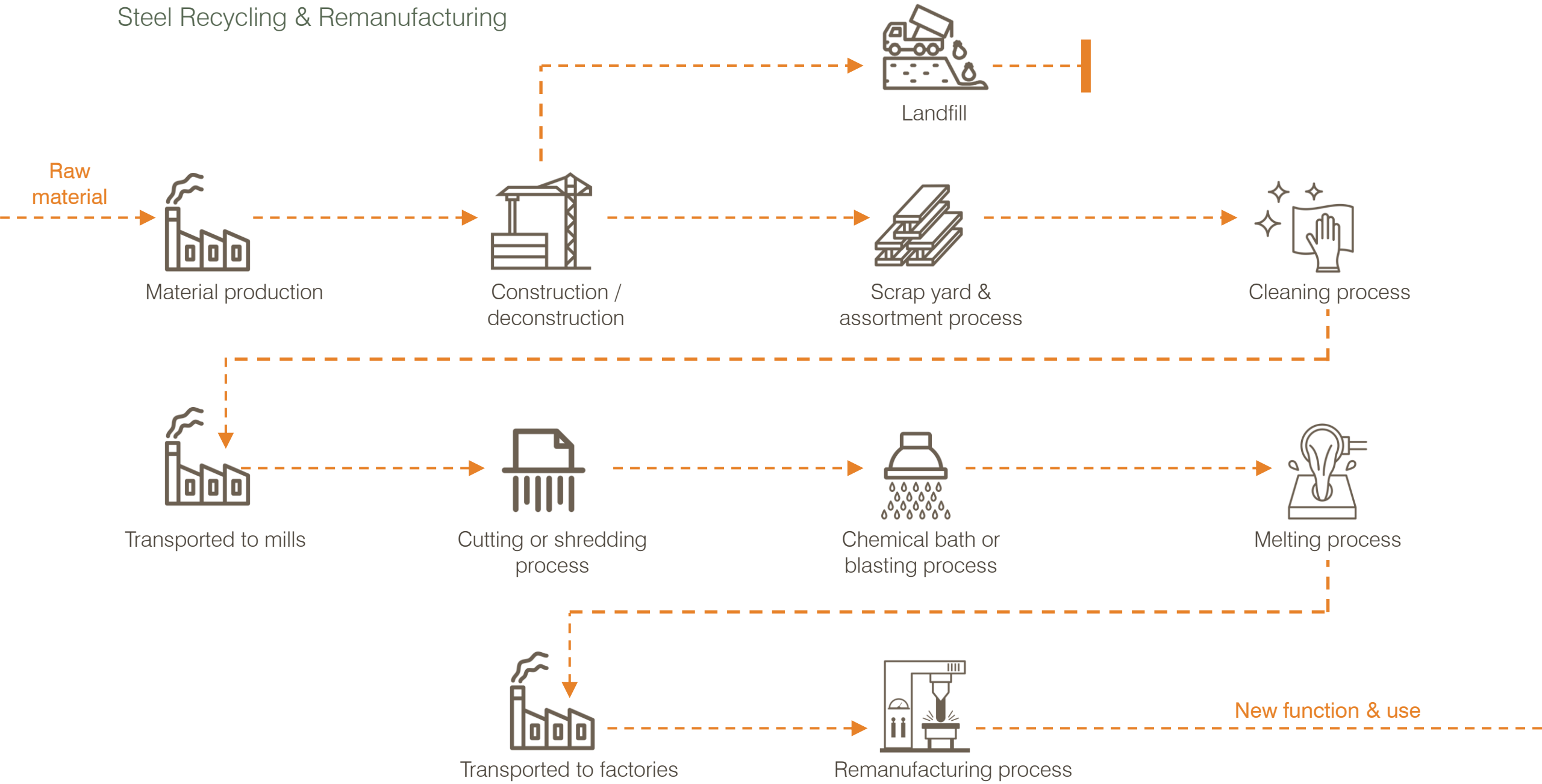
Source: World Steel Association

Circular Economy: 10R Framework

Circular Economy: 10R Framework

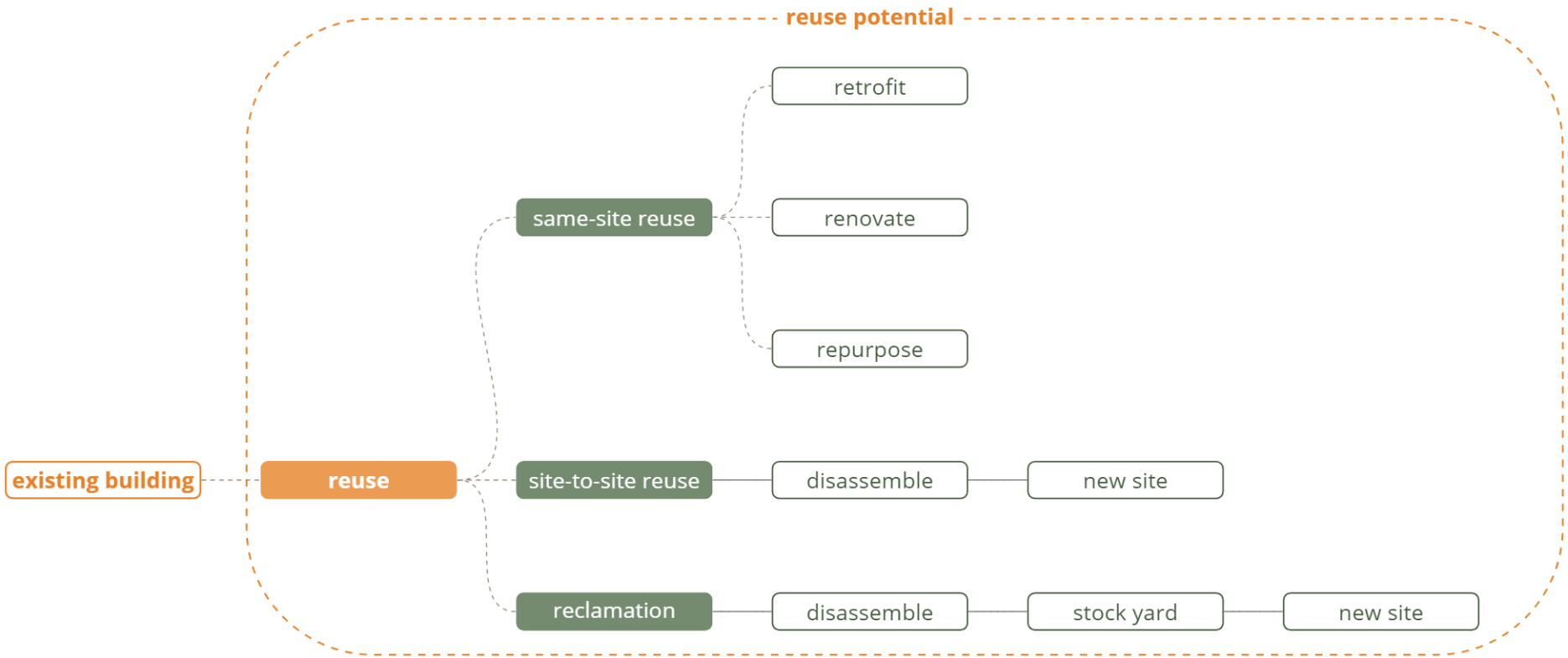


Steel Recycling & Remanufacturing



Circular Economy: 10R Framework

Steel Reuse

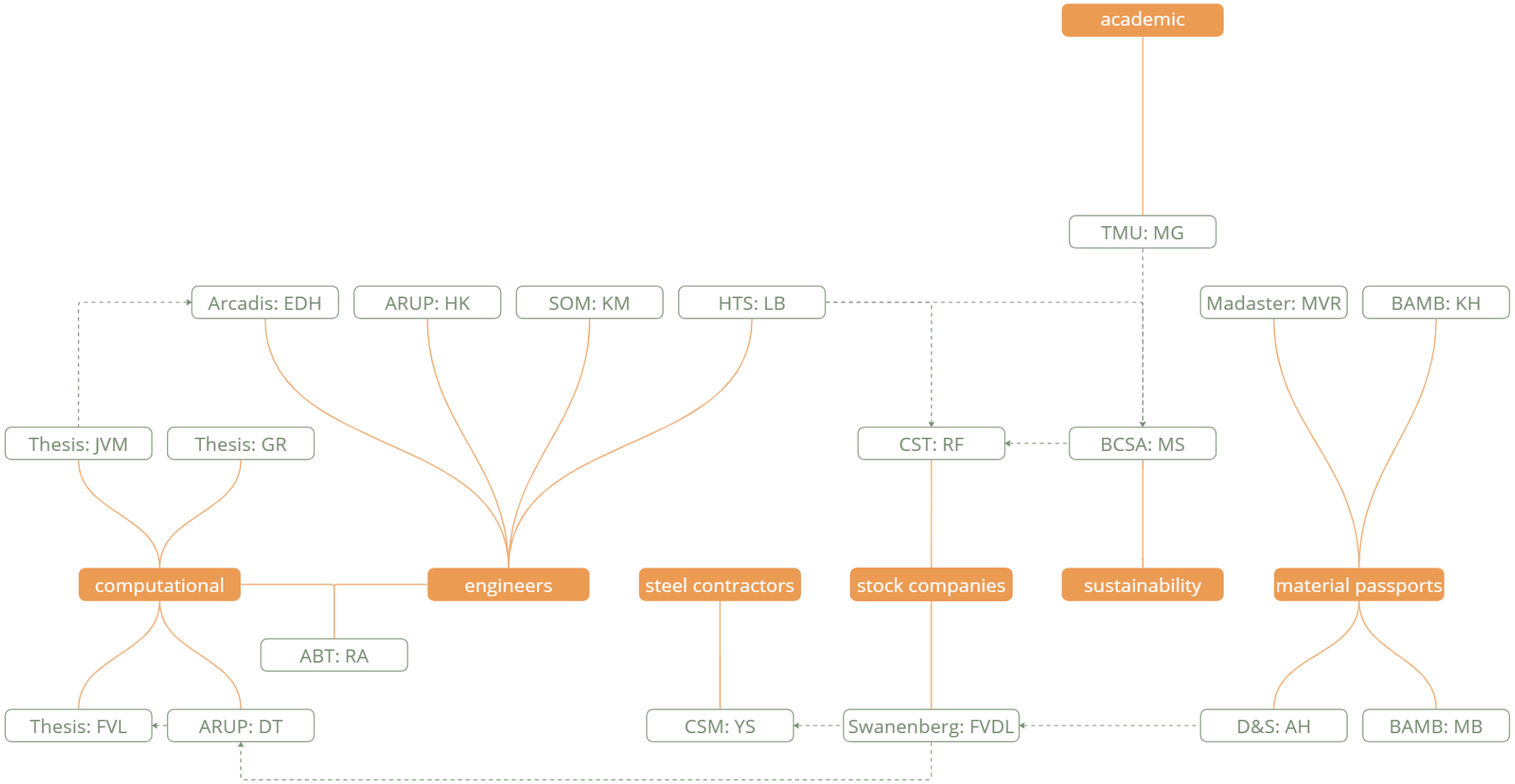

reuse potential
existing building
reuse
same-site reuse
retrofit
renovate
repurpose
site-to-site reuse
disassemble
new site
reclamation
disassemble
stock yard
new site

Research Question

How to facilitate the design process when integrating reclaimed steel sections in new construction with the use of computational tools?

Research Process

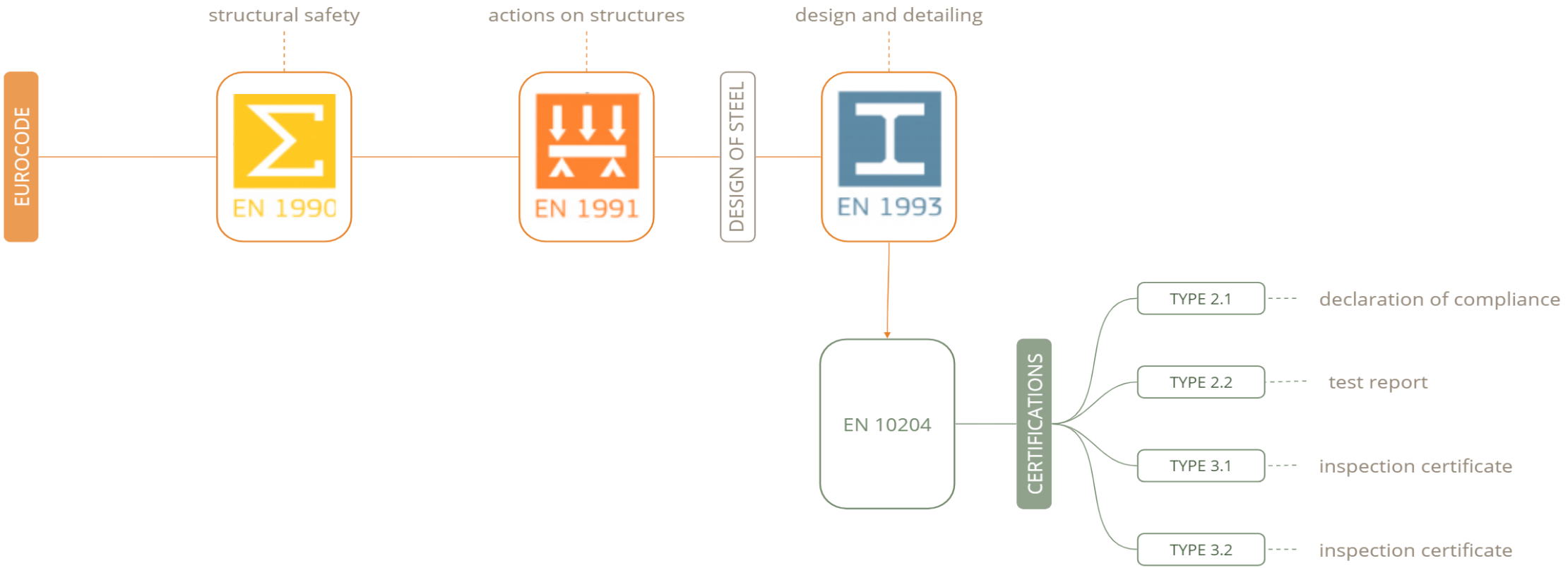
Conducted Interviews with Professionals in the Industry



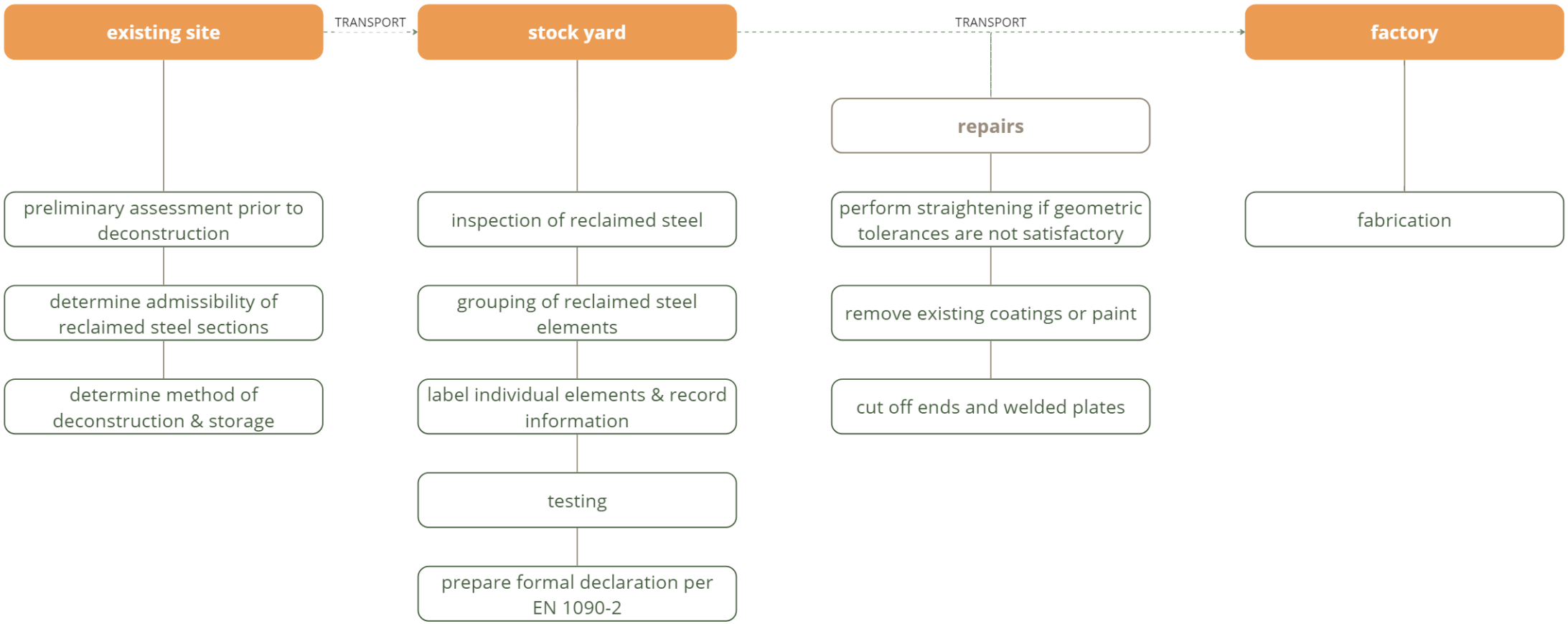
Research Process

CURRENT REGULATIONS

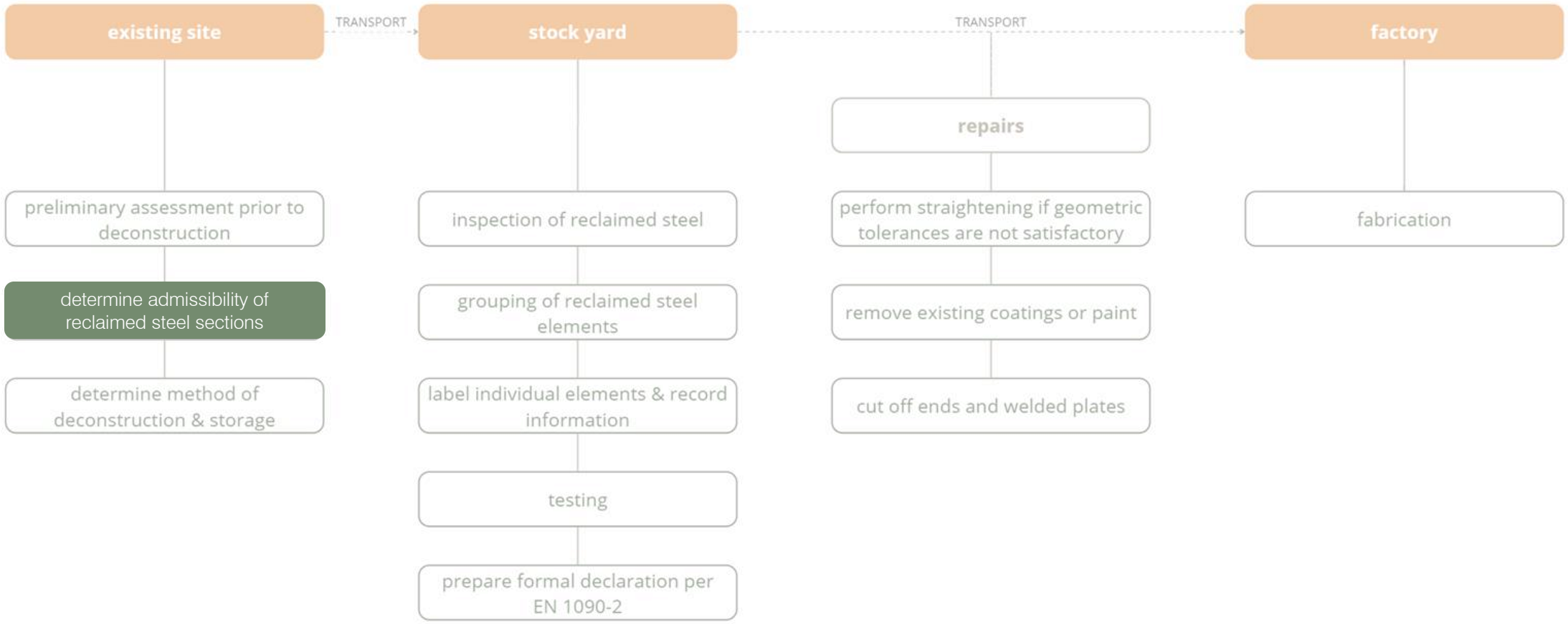
European Standards



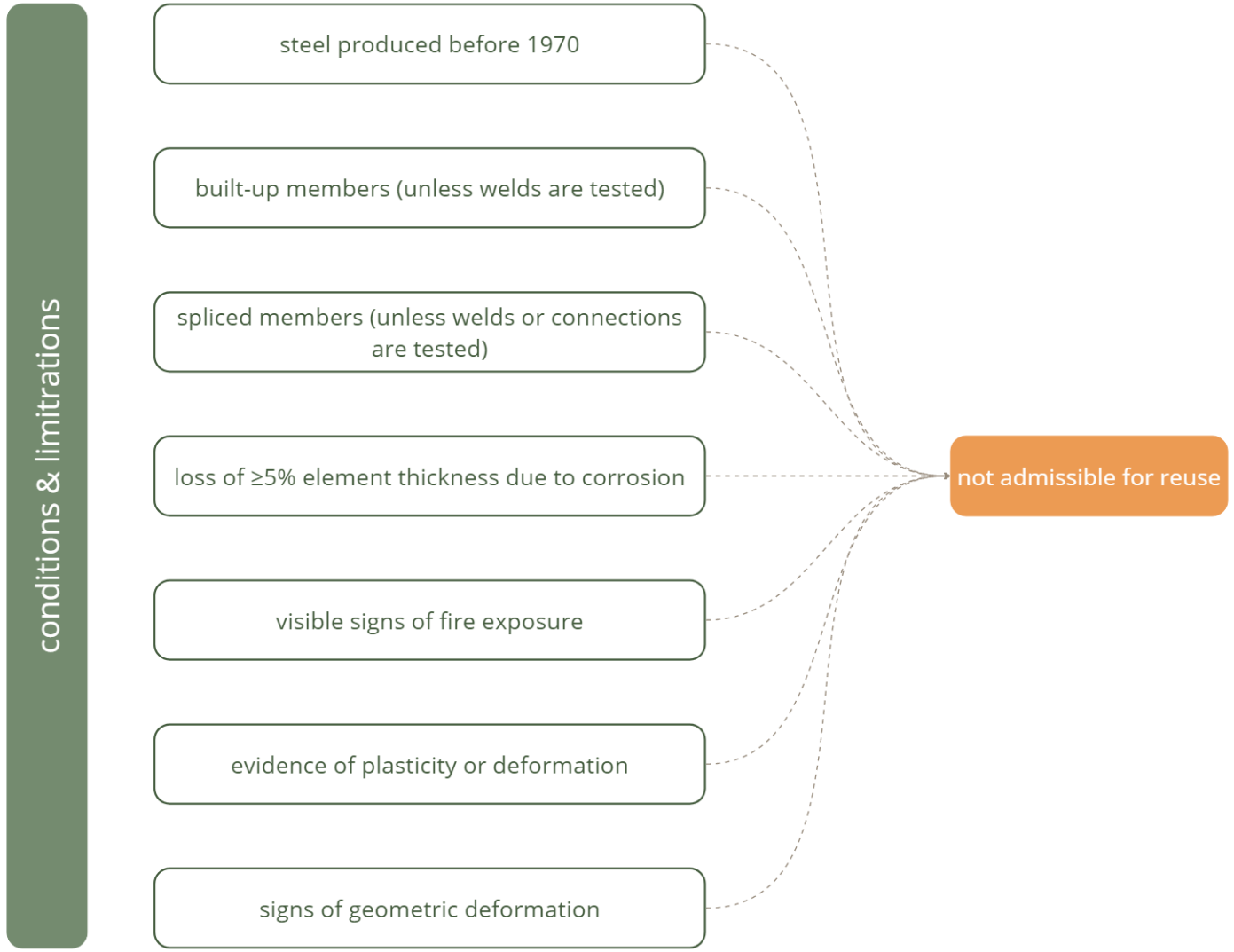
Evaluating Reclaimed Steel: P427



Current Process for Analyzing & Evaluating Reclaimed Steel



Determining Admissibility of Reclaimed Steel: P427

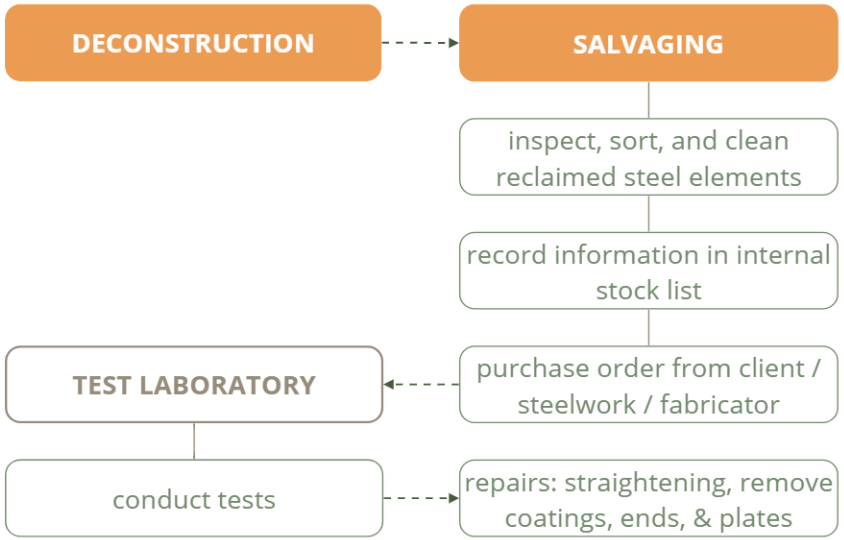


CURRENT PROCESS

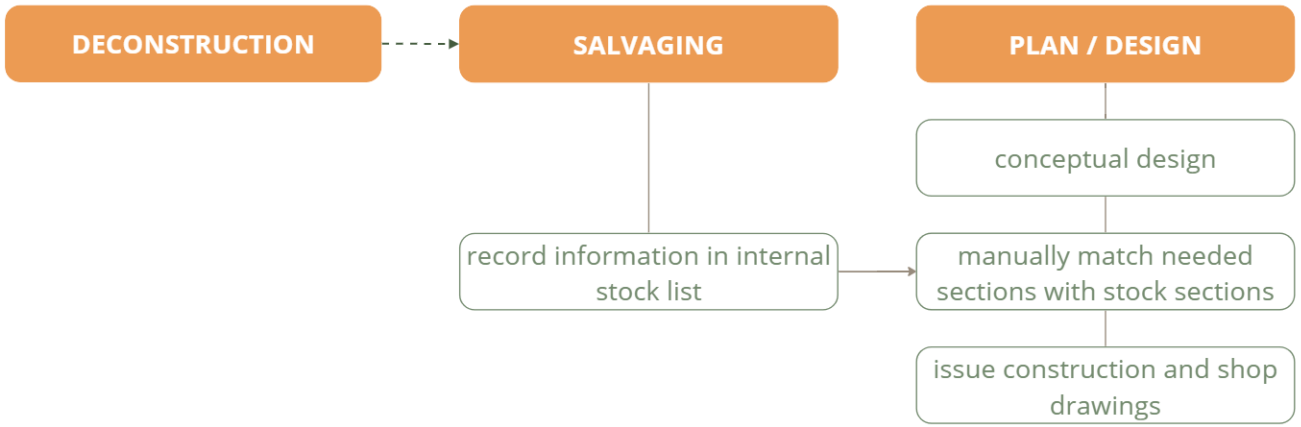
Current Process: Project Stages

Current Process: Deconstruction Stage

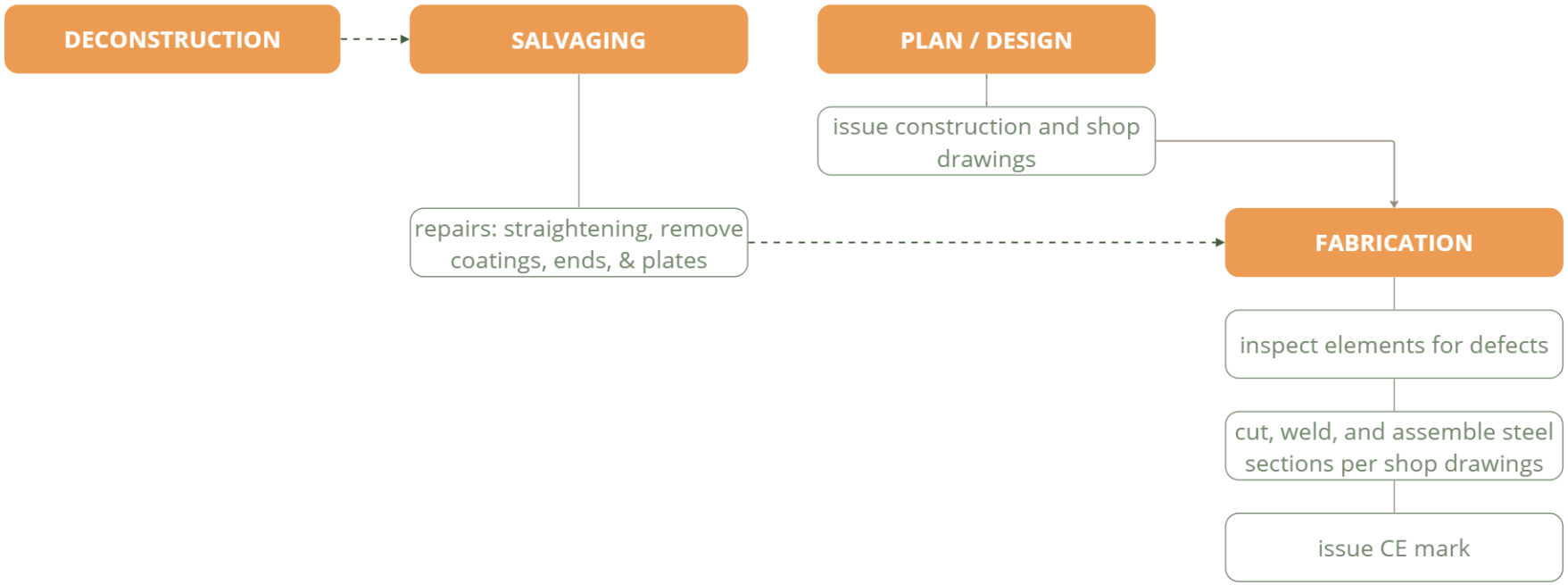
Current Process: Salvaging Stage



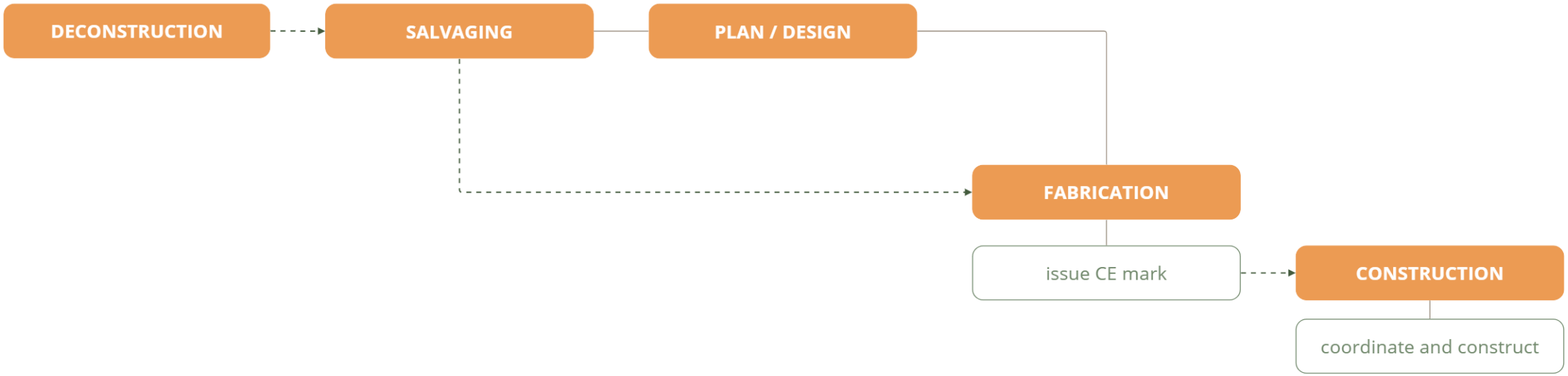
Current Process: Design Stage



Current Process: Fabrication Stage



Current Process: Construction Stage



CURRENT CHALLENGES

Current Challenges

damaged elements during deconstruction

lack of knowledge and expertise

sales are unreliable during design phase

steel prices are constantly changing

additional inspections

need for professional expertise

additional testing of steel elements

change of ownership through reclamation

no established workflow

lack of historical database

additional transportation

coordination of structural connections

quality and condition is unknown

imperfections on reclaimed steel

lack of commitment

steel grade is typically unknown until testing

unclear exchange of information

lack of regulations

stock list data not detailed

stock list data is not live

lack of storage yards

additional liability and responsibility

difficulty to find available stock

unestablished insurance and warranty

discrepancies in "as built" drawings

additional repairs necessary

additional coordination

recalculation of structural loads

unestablished project contracts

lack of material traceability

unreliable stock data

additional time, labor and cost

Current Challenges per Project Phase

GENERAL

- additional liability and responsibility
- lack of regulations
- additional transportation
- lack of knowledge and expertise
- lack of commitment
- no established workflow
- unclear exchange of information
- additional project cost
- unestablished project contracts
- unestablished insurance and warranty
- lack of historical database

DECONSTRUCTION

- additional time and labor to deconstruct
- additional inspections
- recalculation of structural loads
- need for professional expertise
- additional coordination
- damaged elements during deconstruction

SALVAGING

- steel prices are constantly changing
- sales are unreliable during design phase
- additional testing of steel elements
- designers are trying to source materials
- steel grade is typically unknown until testing
- stock list data is manually input
- stock list data is not live
- stock list data not detailed
- inspecting and sorting elements is tedious
- lack of traceability of material history data
- lack of storage yards
- lack of material identification
- lack of supply chain integration
- additional cost and labor of repairs
- difficulty to find available stock

PLAN / DESIGN

- additional design fees
- additional time and coordination
- change of ownership through reclamation
- coordination of structural connections
- steel grade is unknown
- discrepancies in "as built" drawings
- integration of skilled team members
- additional design changes
- change in standard project contracts
- additional repairs necessary
- lack of availability
- unreliable stock data
- oversizing of members

REPAIR / FABRICATE

- additional responsibilities
- additional inspections
- additional coordination
- additional labor and cost
- quality and condition is unknown
- accepting reclaimed steel elements

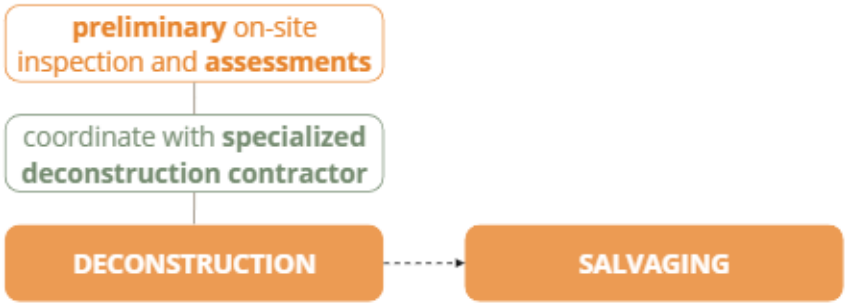
CONSTRUCTION

- additional time and labor to construct
- additional coordination
- need for professional expertise
- imperfections on reclaimed steel
- additional inspections

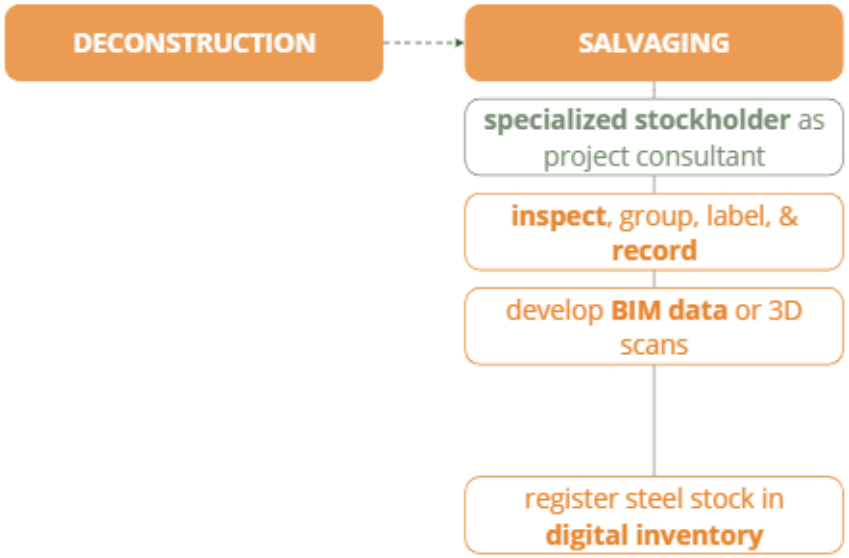
Research Process

DESIGN WORKFLOW

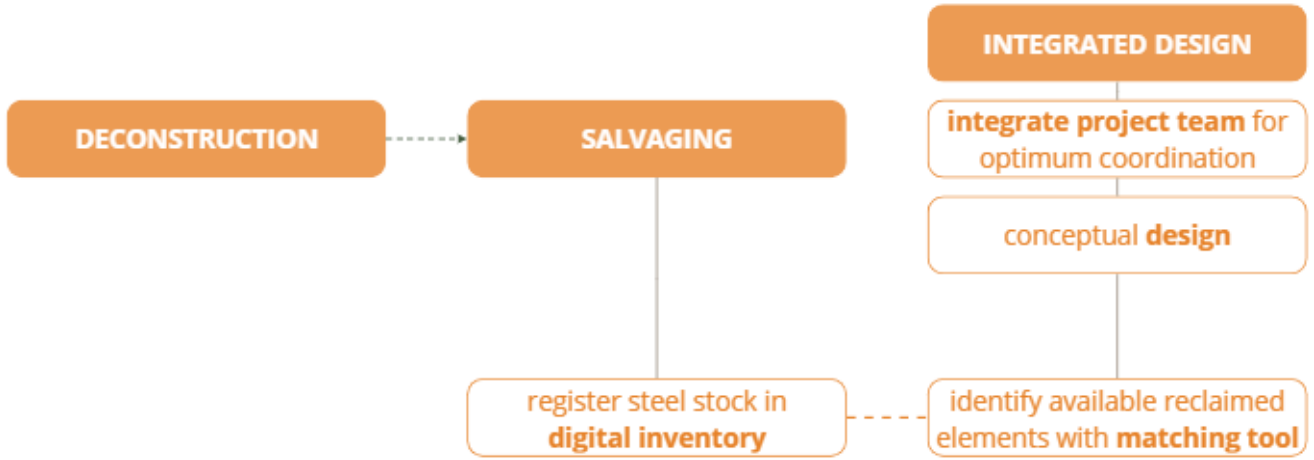
Design Workflow



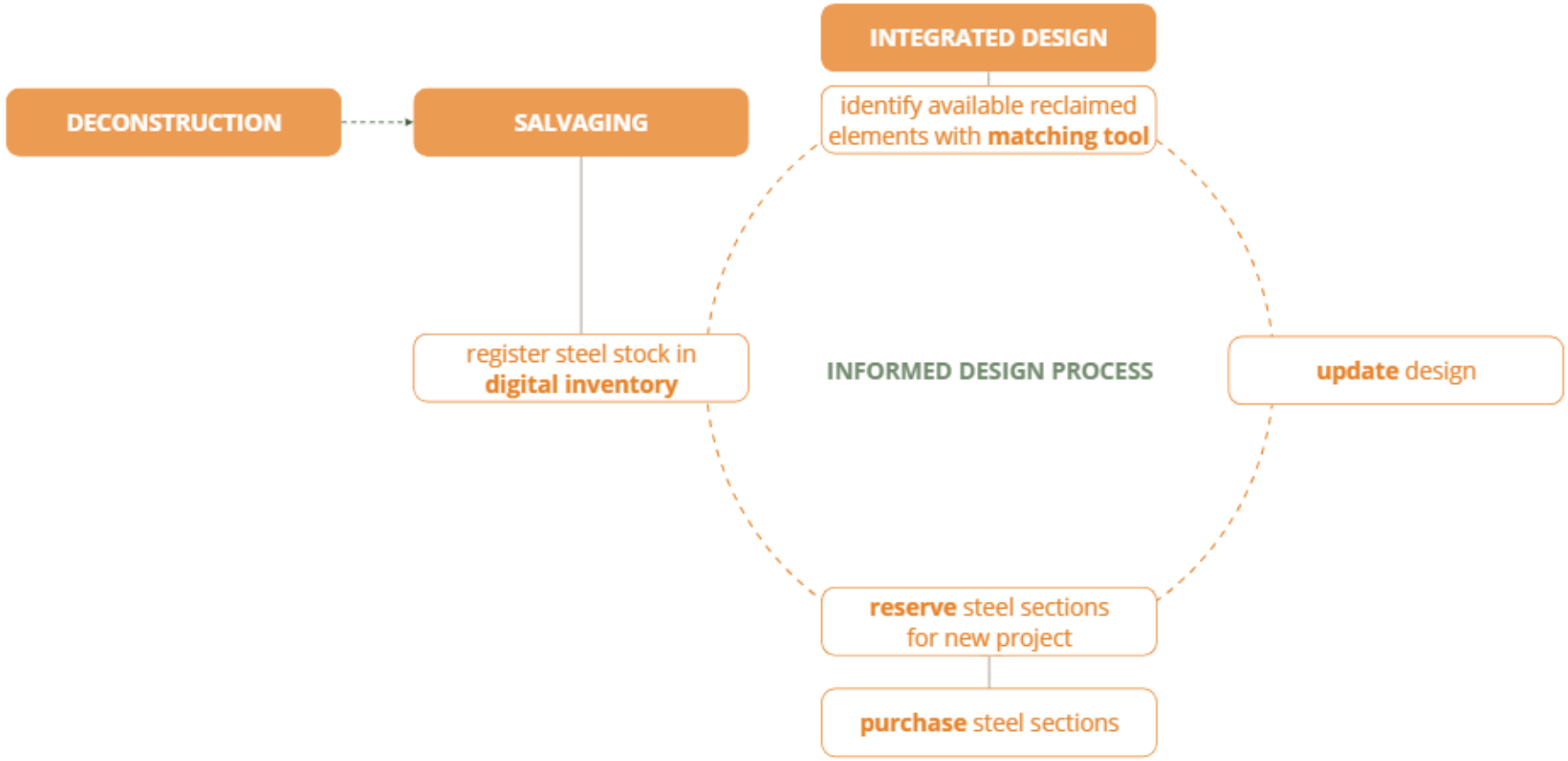
Design Workflow



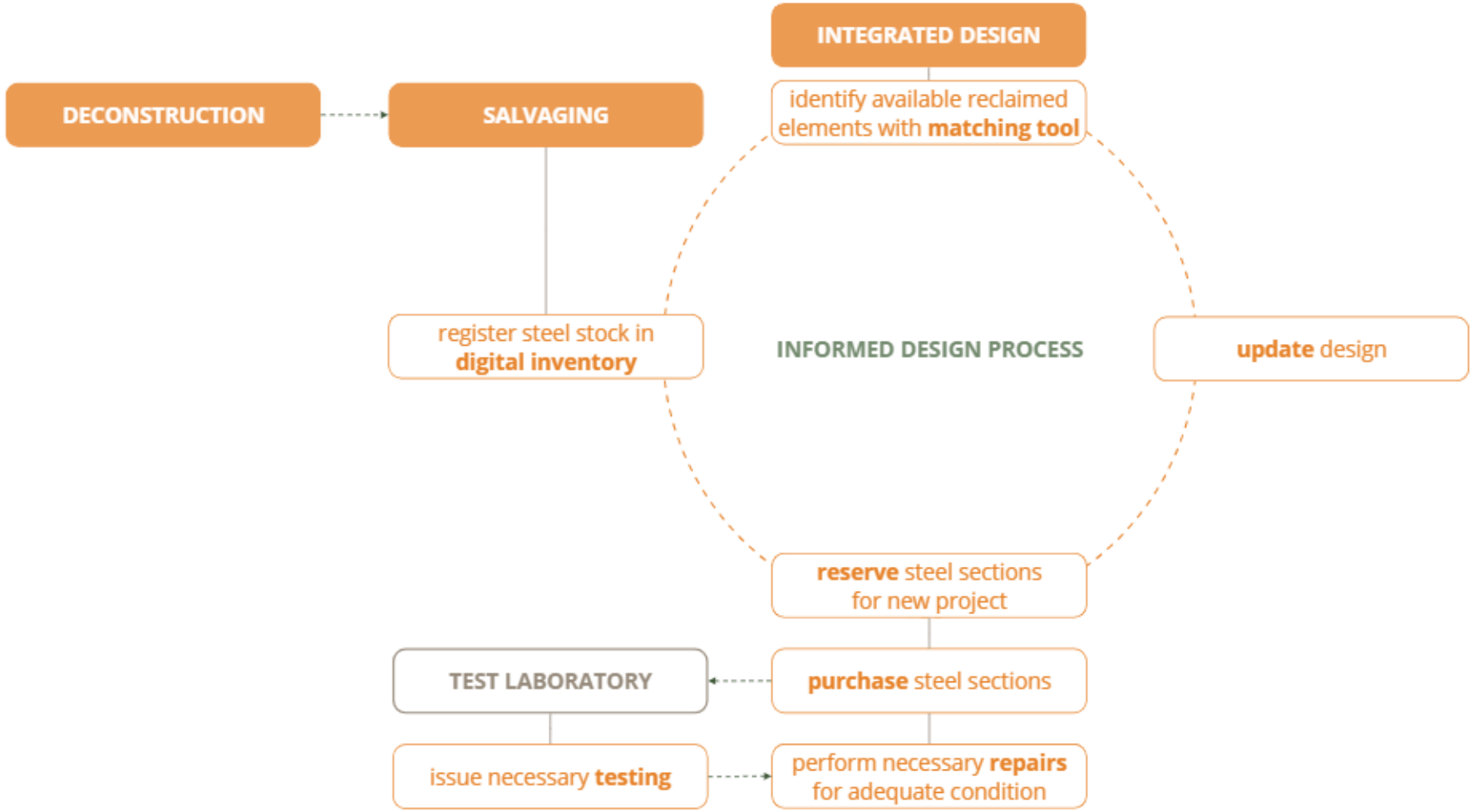
Design Workflow



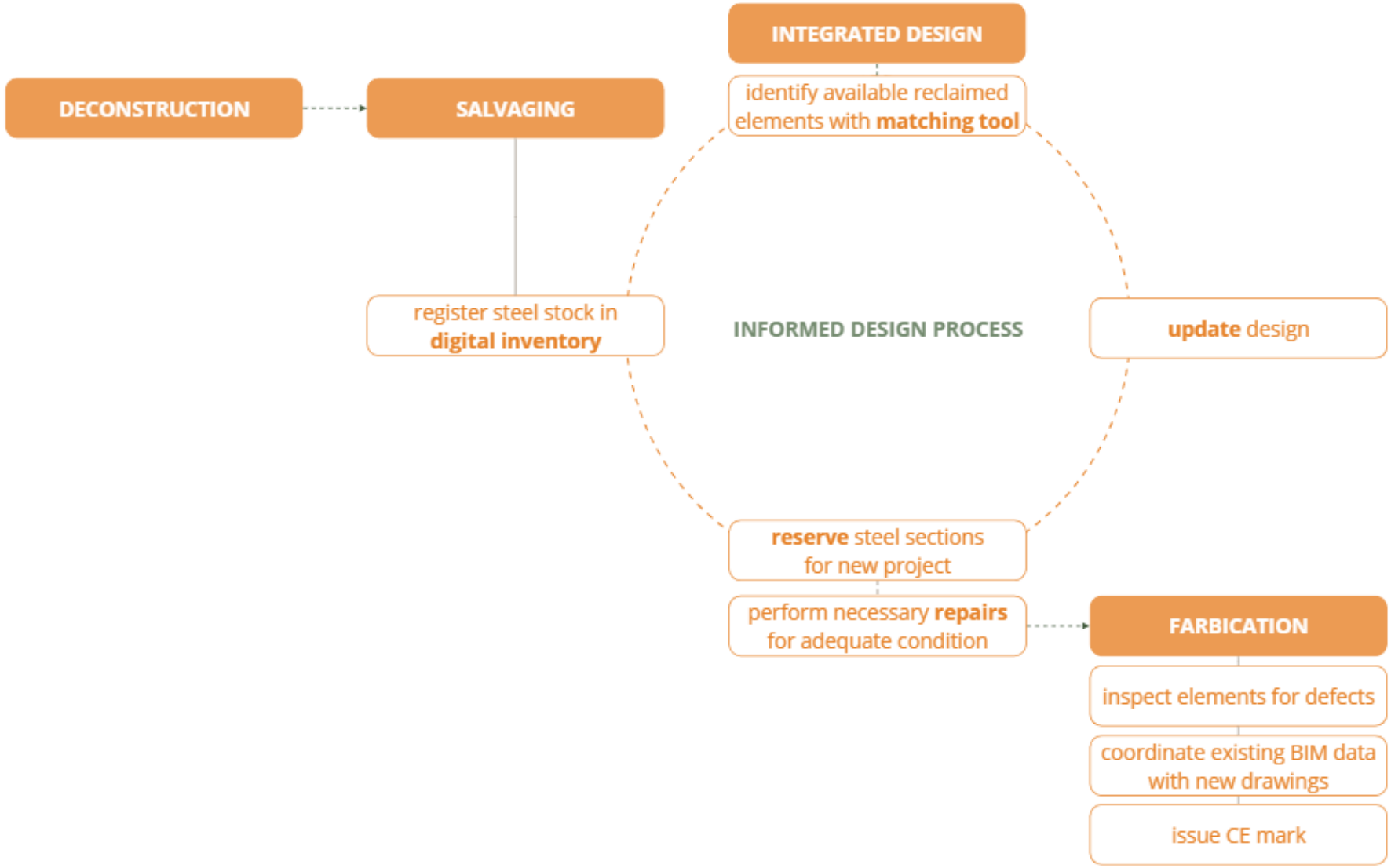
Design Workflow



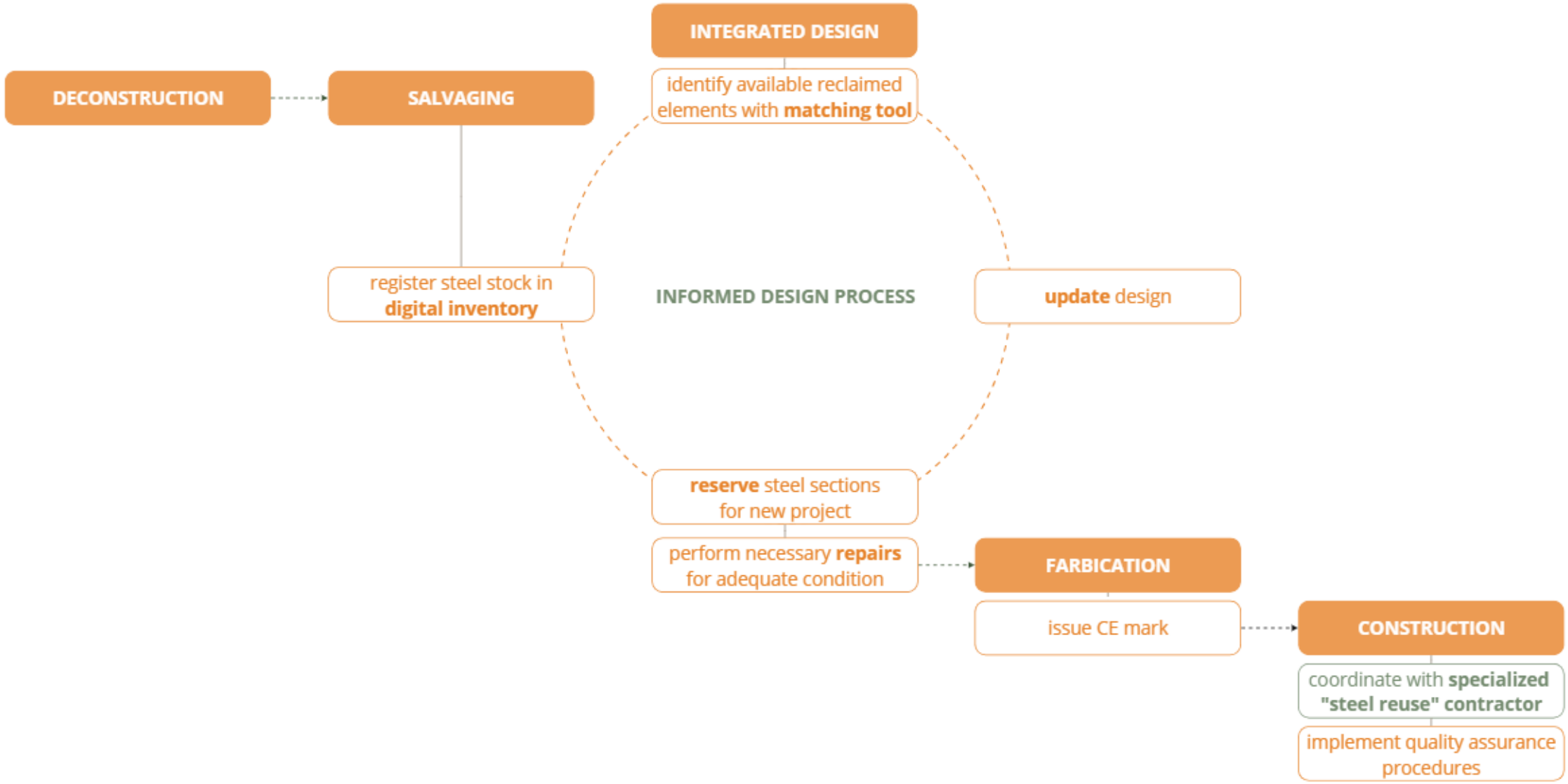
Design Workflow



Design Workflow

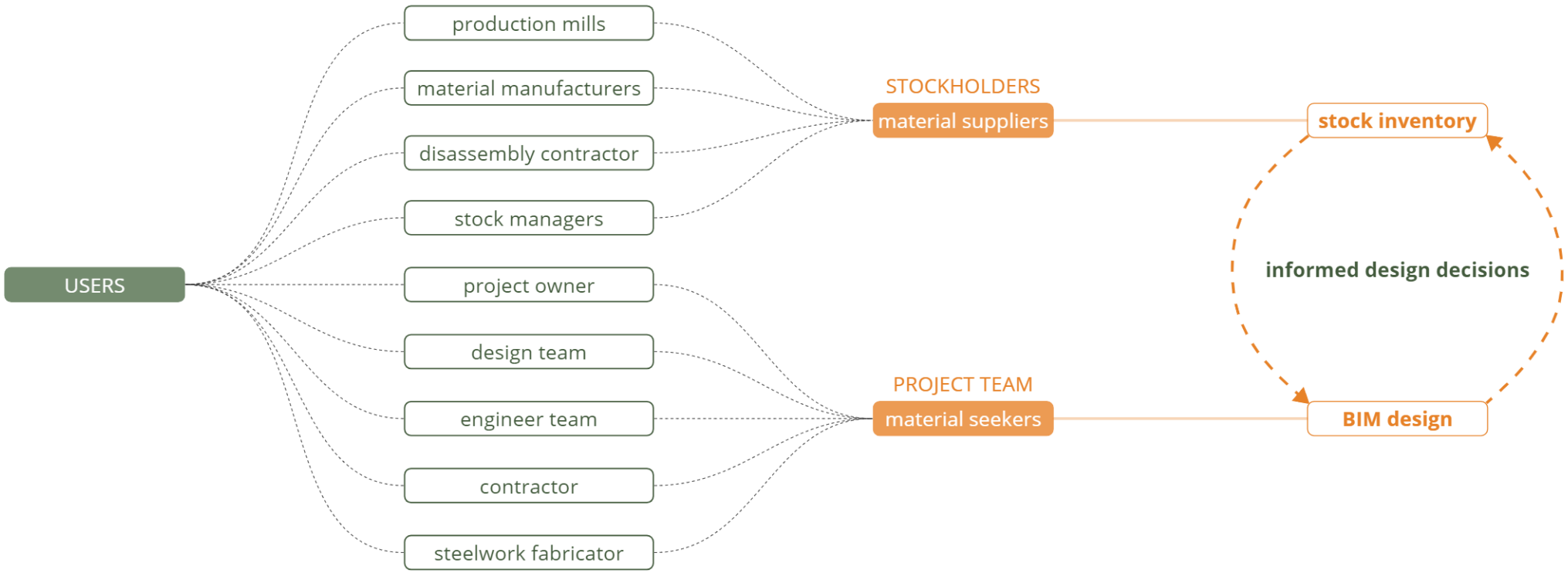


Design Workflow



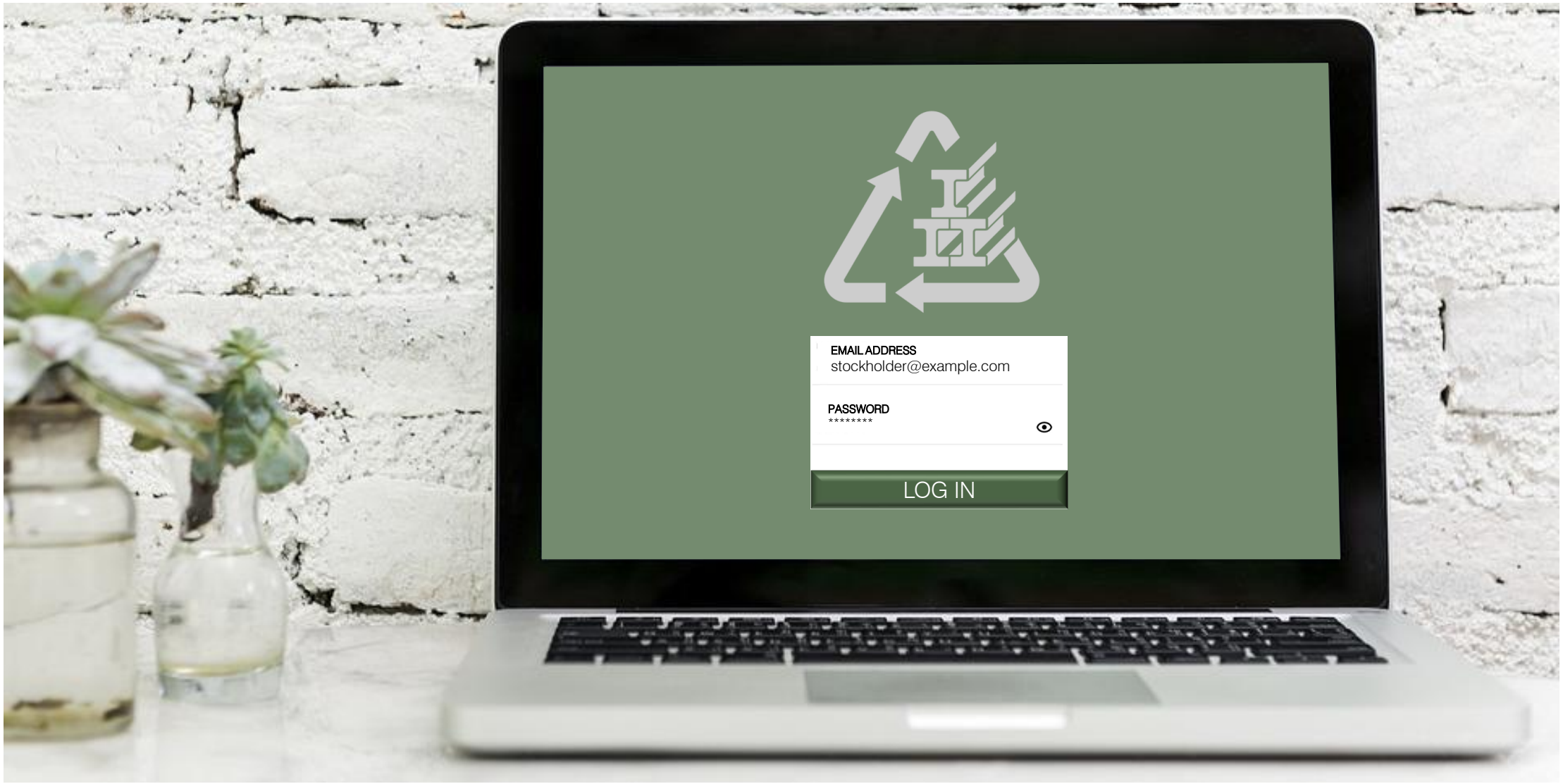
COMPUTATIONAL TOOL

User Case Scenario



WEB INTERFACE

User Interface



UPLOAD STOCK LIST

Stock Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

	A	B	C	D	E	F	G	I	J	K	L
1	RES	CDE	STG	CSP	QTY	LEN	WKG	PER	ARE	REP	LOC
2	Reservation	Identity code	Steel Grade	Cross Section	Quantity	Length (mm)	weight (kg/m)	CS perimeter (mm)	area (m2)	Repairs needed	stock yard location

STOCK LIST TEMPLATE

NEXT >

UPLOAD STOCK LIST

Stock Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

	A	B	C	D	E	F	G	H	I	J	K	L
1	RES	CDE	STG	CSP	QTY	LEN	WKG	WKG	PER	ARE	REP	LOC
2	Reservation	Identity code	Steel Grade	Cross Section	Quantity	Length (mm)	weight (kg/m)	total (kg)	CS perimeter (mm)	area (m2)	Repairs needed	stock yard location
3	0	SIG 01		HEA 100	1	2300	17.1	39.33	561	1290.3	1, 2	1
4	0	SIG 02		HEA 100	1	3750	17.1	64.125	561	2103.75	1, 2	1
5	0	SIG 03		HEA 100	1	3880	17.1	66.348	561	2176.68	1, 2	1
6	0	SIG 04		HEA 100	1	6000	17.1	102.6	561	3366	1, 2	1
7	0	SIG 05		HEA 100	12	6000	17.1	102.6	561	3366	1, 2	1
8	0	SIG 06		HEA 100	2	10000	17.1	171	561	5610	1, 2	1
9	0	SIG 07		HEA 100	11	10000	17.1	171	561	5610	1, 2	1
10	0	SIG 08		HEA 100	2	12000	17.1	205.2	561	6732	1, 2	1
11	0	SIG 09		HEA 100	3	12000	17.1	205.2	561	6732	1, 2	1
12	0	SIG 10		HEA 120	1	3400	20.3	69.02	677	2301.8	1, 2	1
13	0	SIG 11		HEA 120	42	4150	20.3	84.245	677	2809.55	1, 2	1
14	0	SIG 12		HEA 120	5	4150	20.3	84.245	677	2809.55	1, 2	1
15	0	SIG 13		HEA 120	6	12000	20.3	243.6	677	8124	1, 2	1
16	0	SIG 14		HEA 120	1	12000	20.3	243.6	677	8124	1, 2	1
17	0	SIG 15		HEA 120	9	12150	20.3	246.645	677	8225.55	1, 2	1
18	0	SIG 16		HEA 140	2	2100	25.2	52.92	794	1667.4	1, 2	1
19	0	SIG 17		HEA 140	1	2490	25.2	62.748	794	1977.06	1, 2	1
20	0	SIG 18		HEA 140	2	2500	25.2	63	794	1985	1, 2	1
21	0	SIG 19		HEA 140	1	2500	25.2	63	794	1985	1, 2	1
22	0	SIG 20		HEA 140	2	2750	25.2	69.3	794	2183.5	1, 2	1
23	0	SIG 21		HEA 140	3	5000	25.2	126	794	3970	1, 2	1
24	0	SIG 22		HEA 140	1	5430	25.2	136.836	794	4311.42	1, 2	1
25	0	SIG 23		HEA 140	1	5600	25.2	141.12	794	4446.4	1, 2	1
26	0	SIG 24		HEA 140	1	5730	25.2	144.396	794	4549.62	1, 2	1
27	0	SIG 25		HEA 140	4	5750	25.2	144.9	794	4565.5	1, 2	1
28	0	SIG 26		HEA 140	1	6000	25.2	151.2	794	4764	1, 2	1
29	0	SIG 27		HEA 140	7	6000	25.2	151.2	794	4764	1, 2	1
30	0	SIG 28		HEA 140	3	6100	25.2	153.72	794	4843.4	1, 2	1
31	0	SIG 29		HEA 140	1	6100	25.2	153.72	794	4843.4	1, 2	1
32	0	SIG 30		HEA 140	1	6950	25.2	175.14	794	5518.3	1, 2	1
33	0	SIG 31		HEA 140	2	6990	25.2	176.148	794	5550.06	1, 2	1
34	0	SIG 32		HEA 140	1	7300	25.2	183.96	794	5796.2	1, 2	1
35	0	SIG 33		HEA 140	1	7400	25.2	186.48	794	5875.6	1, 2	1
36	0	SIG 34		HEA 140	1	8000	25.2	201.6	794	6352	1, 2	1
37	0	SIG 35		HEA 140	33	11150	25.2	280.98	794	8853.1	1, 2	1
38	0	SIG 36		HEA 140	20	12000	25.2	302.4	794	9528	1, 2	1
39	0	SIG 37		HEA 140	1	12000	25.2	302.4	794	9528	1, 2	1
40	0	SIG 38		HEA 140	5	13100	25.2	330.12	794	10401.4	1, 2	1
41	0	SIG 39		HEA 140	3	13500	25.2	340.2	794	10719	1, 2	1
42	0	SIG 40		HEA 140	2	13850	25.2	349.02	794	10996.9	1, 2	1
43	0	SIG 41		HEA 160	1	1500	31.2	46.8	906	1359	1, 2	1
44	0	SIG 42		HEA 160	1	1630	31.2	50.856	906	1476.78	1, 2	1
45	0	SIG 43		HEA 160	1	1970	31.2	61.464	906	1784.82	1, 2	1
46	0	SIG 44		HEA 160	3	2520	31.2	78.624	906	2283.12	1. 2	1

STOCK LIST TEMPLATE

UPLOAD

Stock Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

PROJECT DECONSTRUCTION

COMMENT ☑ CLAIM

CSM 15	S235	HEA 180	12	3300	117.2		
CSM 16	S235	HEA 180	2	3325	118		
CSM 17	S235	HEA 180	1	3377	119.8		
CSM 18	S235	HEA 180	2	3382	120		
CSM 19	S235	HEA 180	1	3447	122.3		
CSM 20	S235	HEA 180	1	3447	122.3		
CSM 21	S235	HEA 180	1	5868	208.3		
CSM 22	S235	HEA 200	1	6700	283.3		
CSM 23	S235	HEA 200	1	6700	283.3		
CSM 24	S235	HEA 200	1	7006	296.3		
CSM 25	S235	HEA 200	1	7006	296.3		
CSM 26	S235	HEA 200	2	7006	296.3		
CSM 27	S235	HEA 240	1	1199	72.3		
CSM 28	S235	HEA 240	1	1212	73.1		
CSM 29	S235	HEA 240	1	1460	88		
CSM 30	S235	HEA 240	1	3788	228.4		
CSM 31	S235	HEA 240	1	5221	314.8		
CSM 32	S235	HEA 240	2	5512	332.4		
CSM 33	S235	HEA 240	2	5623	339.1		
CSM 34	S235	HEA 260	1	18000	1227.6		

BP Amoco – Ineos

3 Comments

Swanenberg Ijzer Groep — 1 days ago

Yes, next week, Tuesday, would work for us to do an on-site assessment of the steel structure.

CSM — 2 days ago

Thank you for your interest. Are you available next week to do a site visit?

Swanenberg Ijzer Groep — 4 days ago

PROJECT INFORMATION

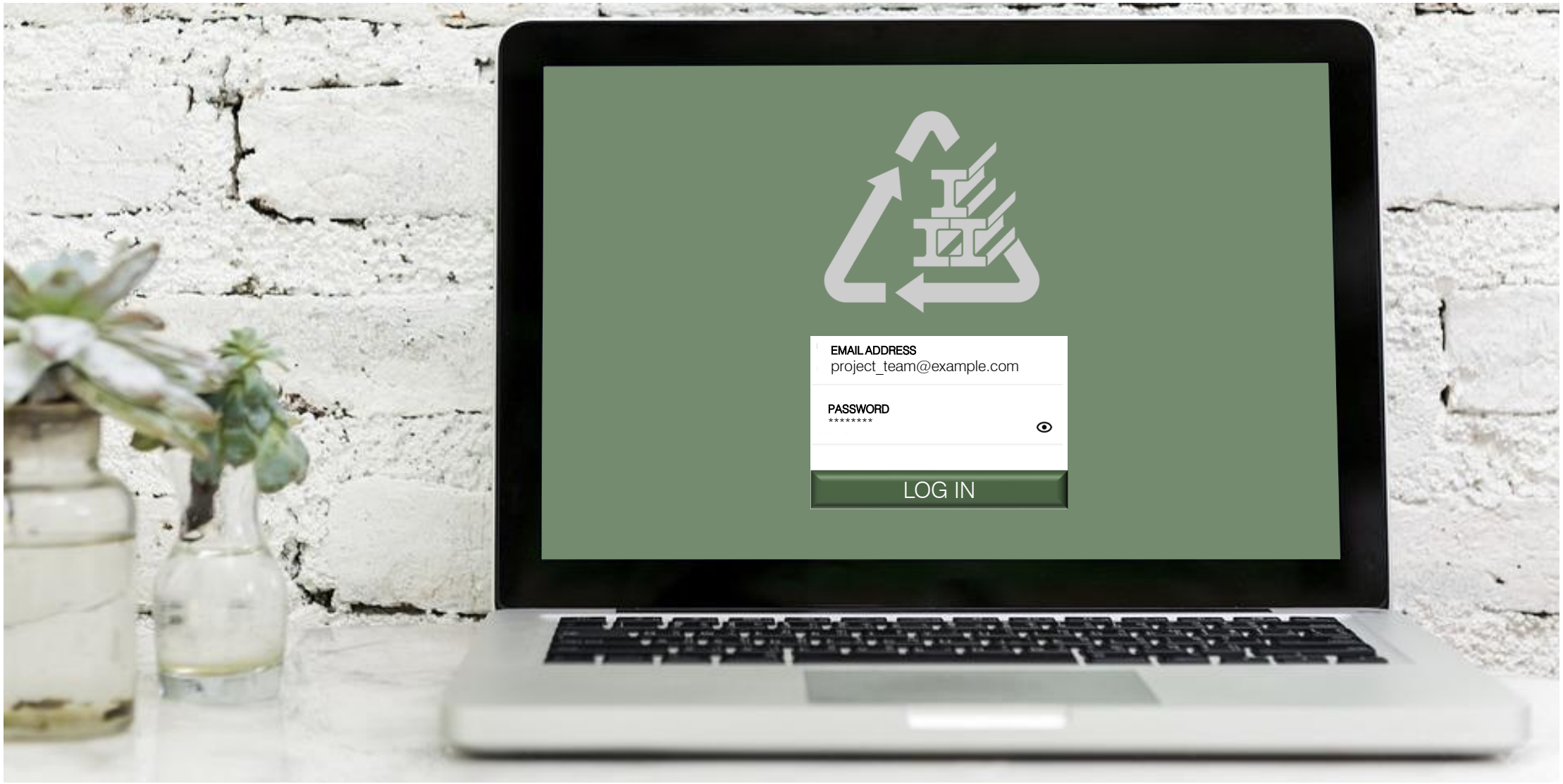
Building Function: Industrial

Performance: 1998-2004

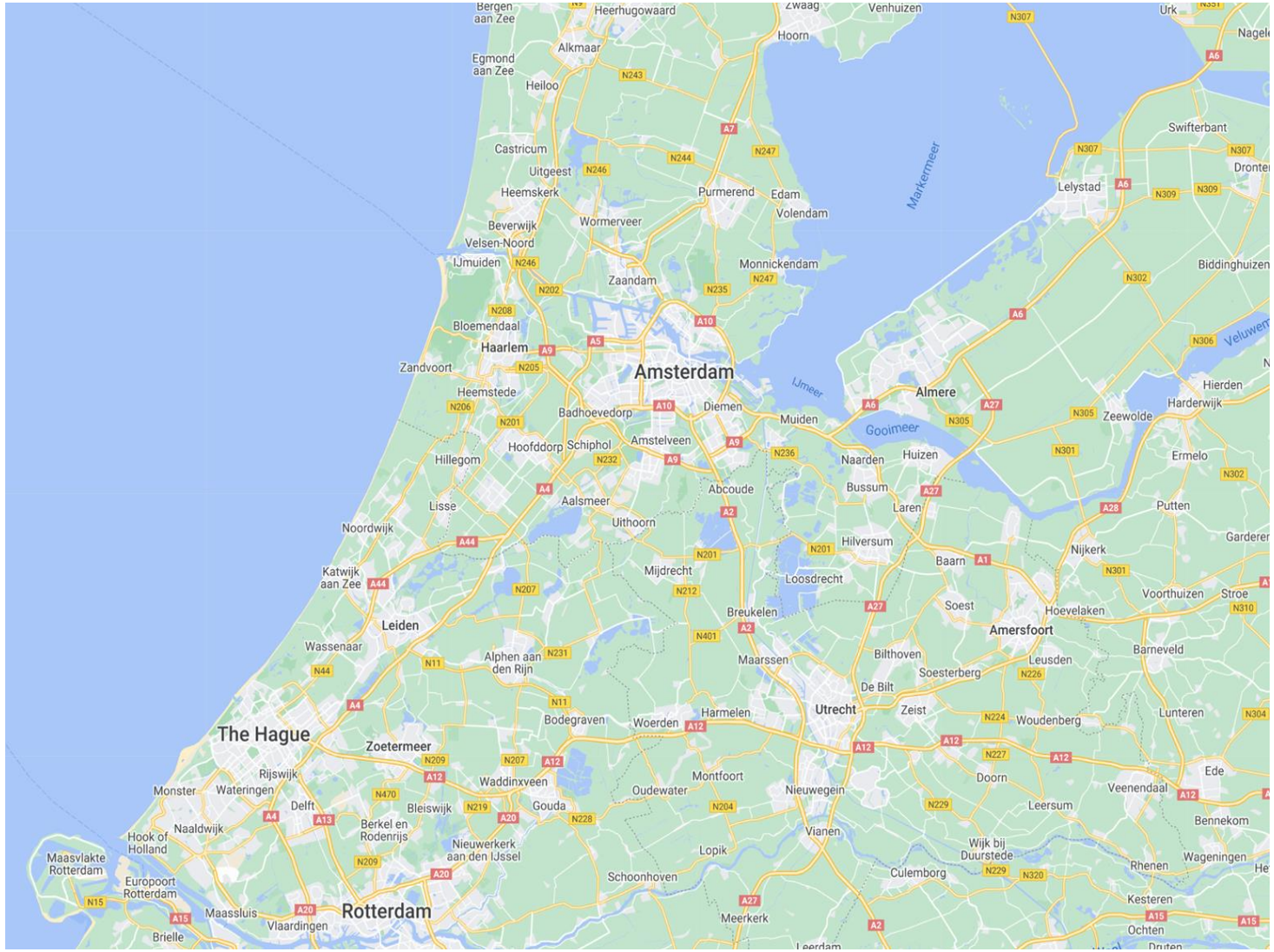
Total Weight: 1500 tons

Location: Yellow, Belgium

User Interface



Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



PROJECT INFORMATION

Title *

Location *

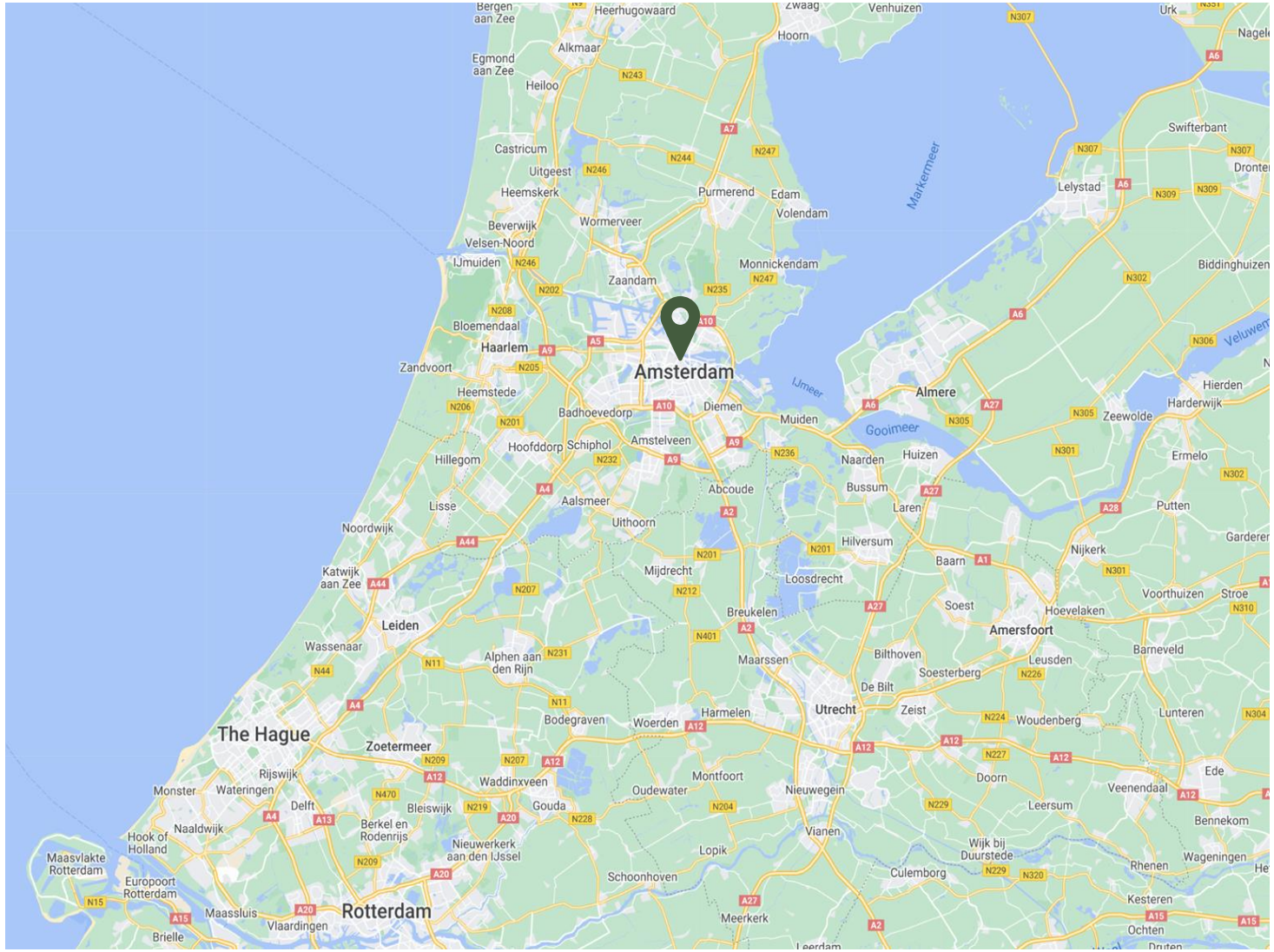
Category *

Scheduled start date *

Scheduled end date *

NEXT >

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



PROJECT INFORMATION

Title *

Dakopbouw - Willem Fenengastraat

Location *

Amsterdam

Category *

Commercial

Scheduled start date *

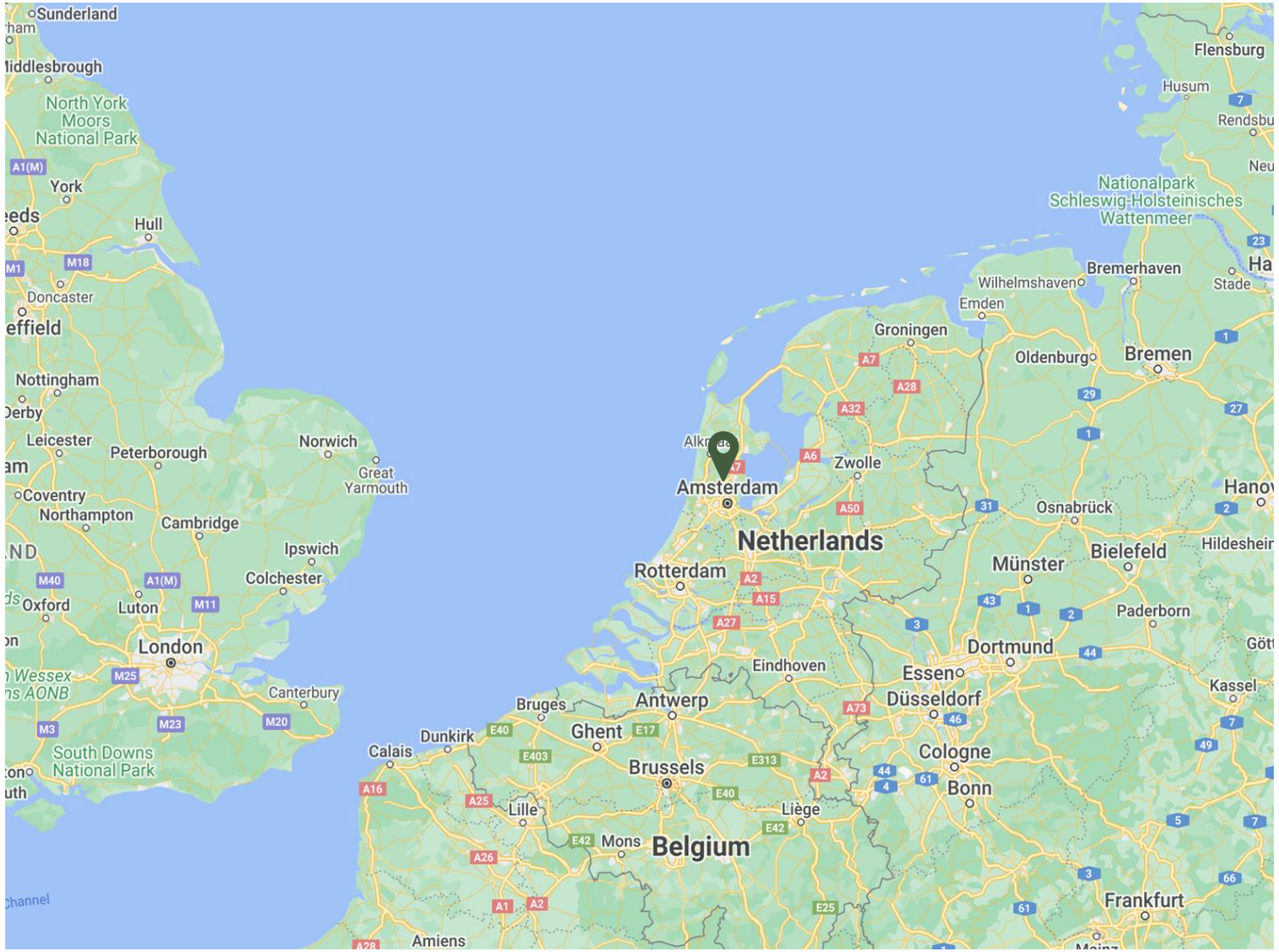
15/11/2022

Scheduled end date *

04/07/2023

NEXT >

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

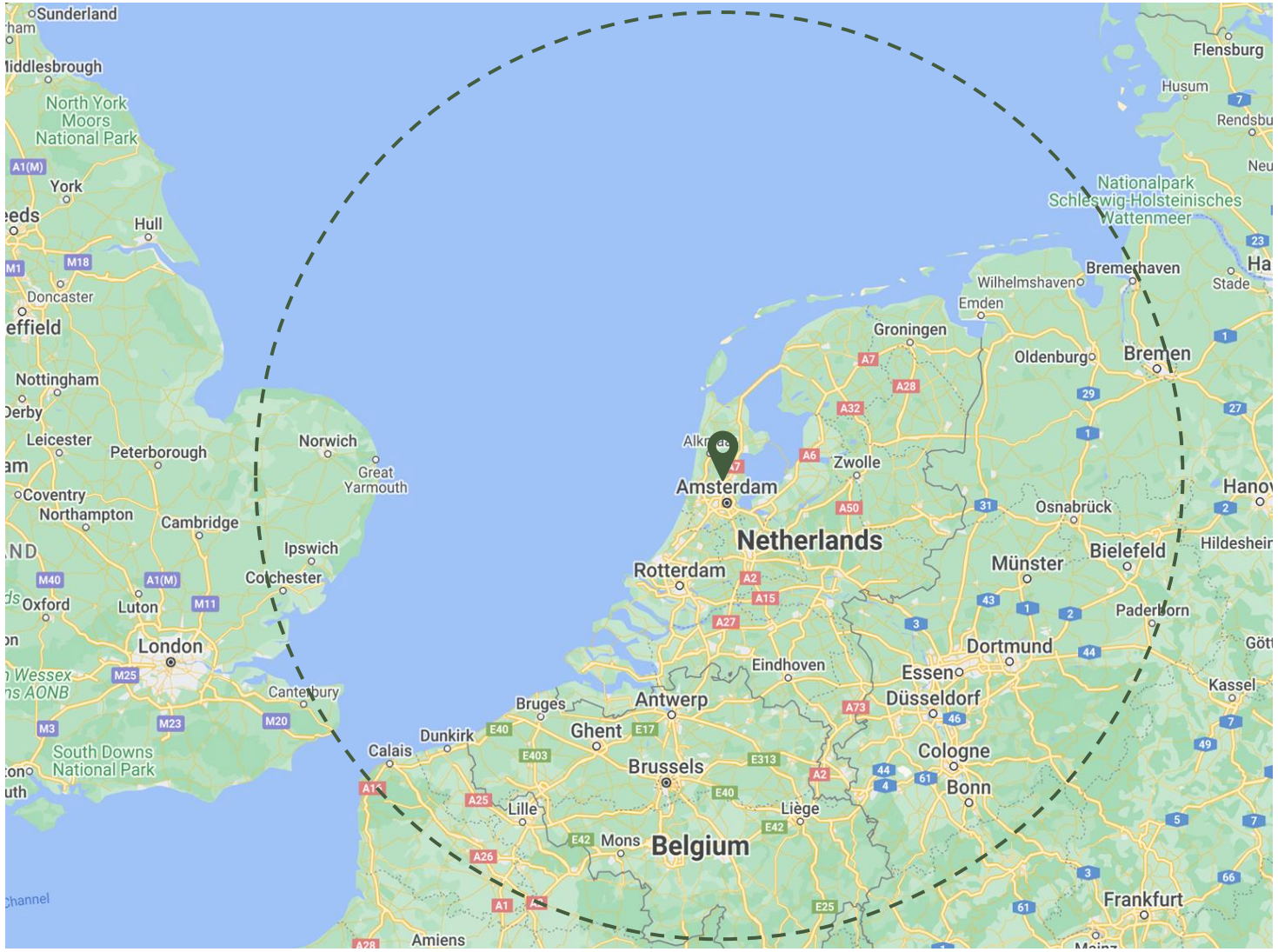


SEARCH DISTANCE

Distance Radius *

NEXT >

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



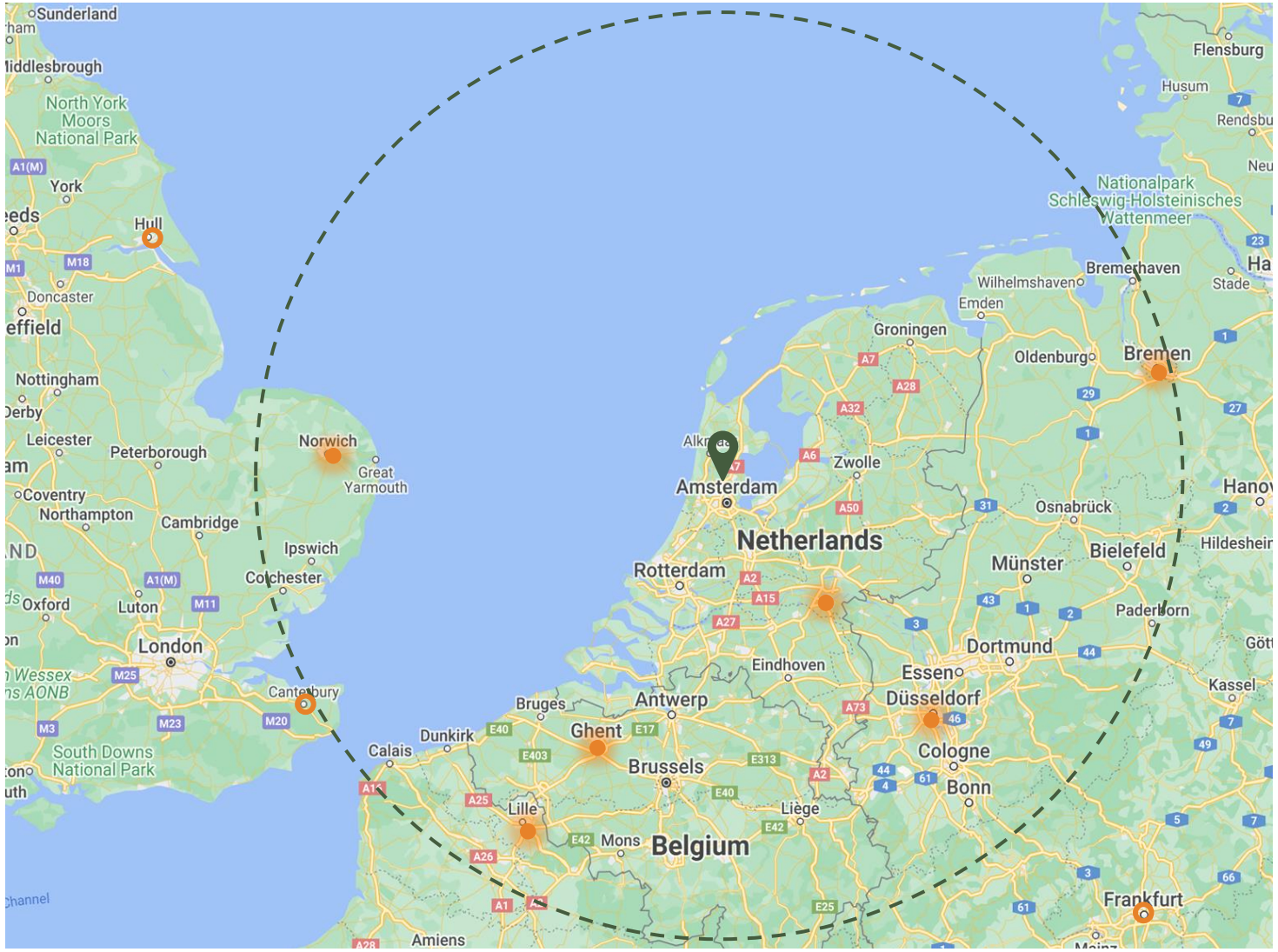
SEARCH DISTANCE

Distance Radius *

300 km

NEXT >

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



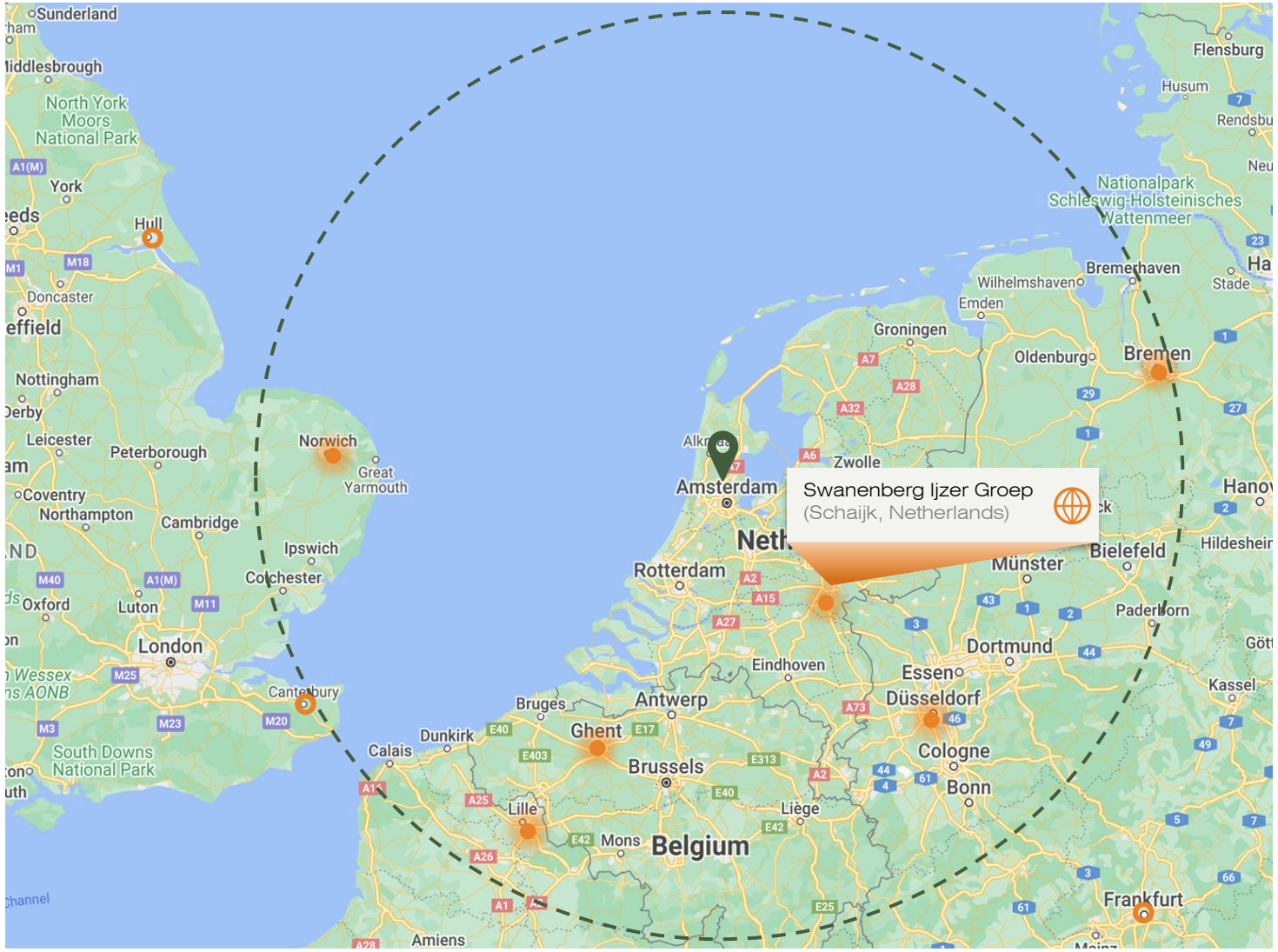
AVAILABLE STOCK YARDS

- [ ] Stock Yard 1: (City, Country) – km
- [ ] Stock Yard 2: (City, Country) – km
- [ ] Stock Yard 3: (City, Country) – km
- [ ] Stock Yard 4: (City, Country) – km
- [ ] Stock Yard 5: (City, Country) - km
- [ ] Stock Yard 6: (City, Country) - km

NEXT >

MAPPING OUT AVAILABLE STOCK

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



AVAILABLE STOCK YARDS

- Stock Yard 1: (Schaijk, NL) – 87km
- Stock Yard 2: (Ghent, BE) – 167km
- Stock Yard 3: (Dusseldorf, GE) – 182km
- Stock Yard 4: (Lille, FR) – 230km
- Stock Yard 5: (Norwich, UK) - 245km
- Stock Yard 6: (Bremen, GE) – 275km

NEXT >

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

PREVIEW

UPLOAD DESIGN LIST

drop file here

Browse..

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

DESIGN LIST

STOCK LIST

MATCHING PROGRESS

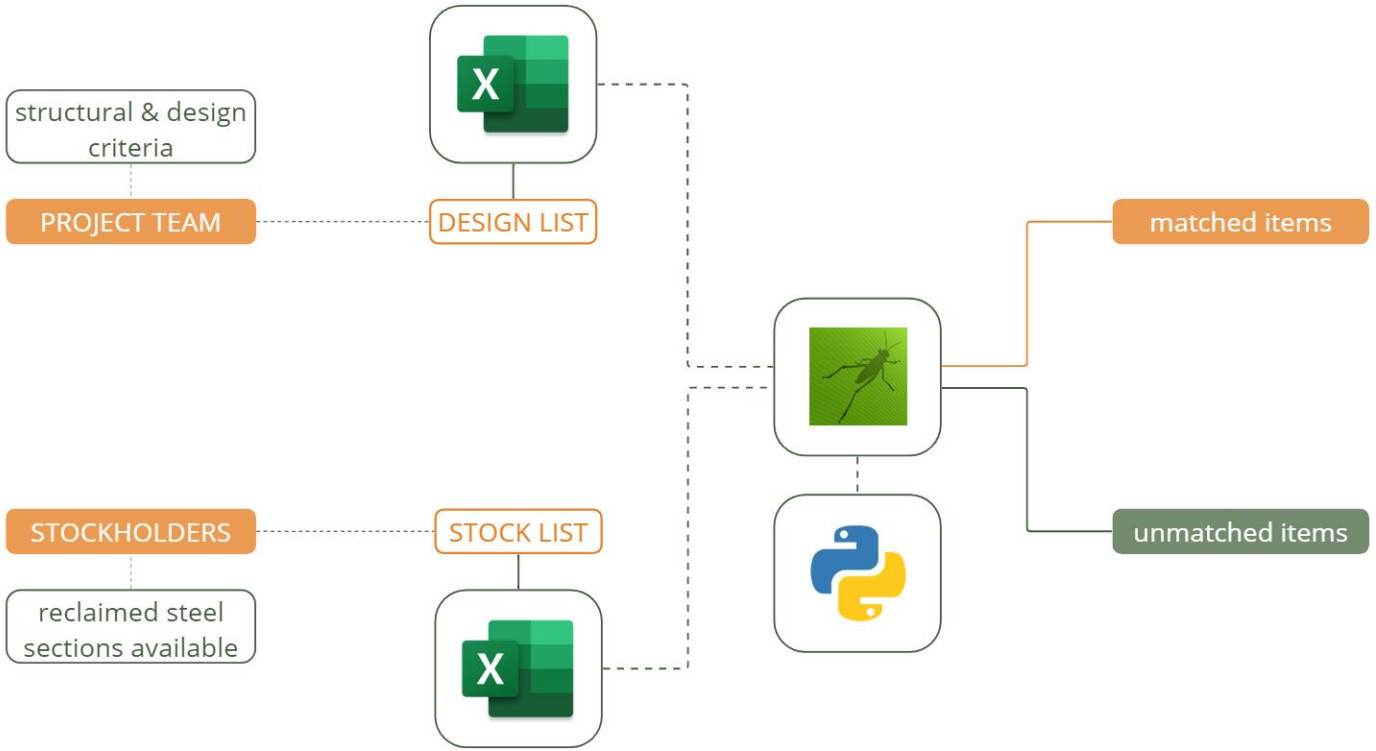
Loading...

64%

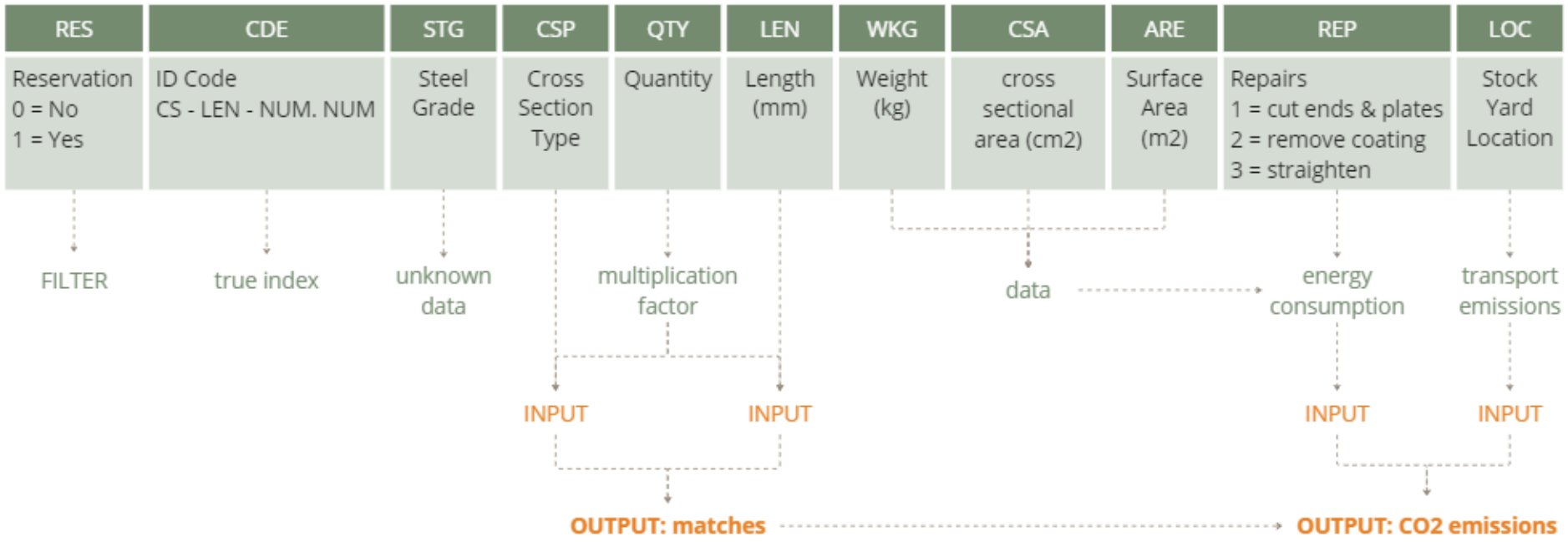
VIEW RESULTS

MATCHING ALGORITHM

Matching Algorithm: Inputs



Stock List Template



Stock List

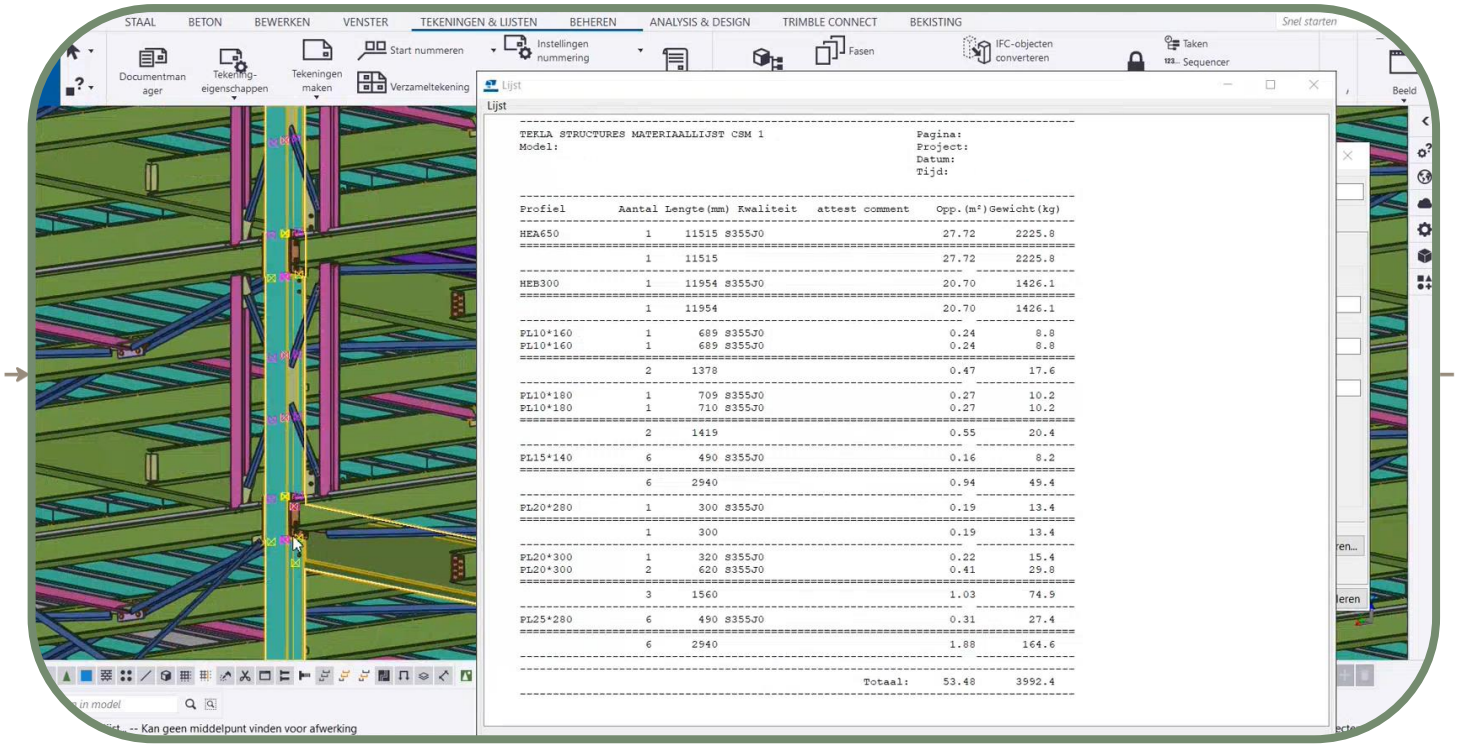
	A	B	C	D	E	F	G	H	I	J	K	L
1	RES	CDE	STG	CSP	QTY	LEN	WKG	WKG	PER	ARE	REP	LOC
2	Reservation	Identity code	Steel Grade	Cross Section	Quantity	Length (mm)	weight (kg/m)	total (kg)	CS area (cm2)	area (m2)	Repairs needed	stock yard location
3	0	SIG 01		HEA 100	1	2300	17.1	39.33	21.2	121.9	1, 2	1
4	0	SIG 02		HEA 100	1	3750	17.1	64.125	21.2	198.75	1, 2	1
5	0	SIG 03		HEA 100	1	3880	17.1	66.348	21.2	205.64	1, 2	1
6	0	SIG 04		HEA 100	1	6000	17.1	102.6	21.2	318	1, 2	1
7	0	SIG 05		HEA 100	12	6000	17.1	102.6	21.2	318	1, 2	1
8	0	SIG 06		HEA 100	2	10000	17.1	171	21.2	530	1, 2	1
9	0	SIG 07		HEA 100	11	10000	17.1	171	21.2	530	1, 2	1
10	0	SIG 08		HEA 100	2	12000	17.1	205.2	21.2	636	1, 2	1
11	0	SIG 09		HEA 100	3	12000	17.1	205.2	21.2	636	1, 2	1
12	0	SIG 10		HEA 120	1	3400	20.3	69.02	25.3	86.02	1, 2	1
13	0	SIG 11		HEA 120	42	4150	20.3	84.245	25.3	104.995	1, 2	1
14	0	SIG 12		HEA 120	5	4150	20.3	84.245	25.3	104.995	1, 2	1
15	0	SIG 13		HEA 120	6	12000	20.3	243.6	25.3	303.6	1, 2	1
16	0	SIG 14		HEA 120	1	12000	20.3	243.6	25.3	303.6	1, 2	1
17	0	SIG 15		HEA 120	9	12150	20.3	246.645	25.3	307.395	1, 2	1
18	0	SIG 16		HEA 140	2	2100	25.2	52.92	31.4	65.94	1, 2	1
19	0	SIG 17		HEA 140	1	2490	25.2	62.748	31.4	78.186	1, 2	1
20	0	SIG 18		HEA 140	2	2500	25.2	63	31.4	78.5	1, 2	1
21	0	SIG 19		HEA 140	1	2500	25.2	63	31.4	78.5	1, 2	1
22	0	SIG 20		HEA 140	2	2750	25.2	69.3	31.4	86.35	1, 2	1
23	0	SIG 21		HEA 140	3	5000	25.2	126	31.4	157	1, 2	1
24	0	SIG 22		HEA 140	1	5430	25.2	136.836	31.4	170.502	1, 2	1
25	0	SIG 23		HEA 140	1	5600	25.2	141.12	31.4	175.84	1, 2	1
26	0	SIG 24		HEA 140	1	5730	25.2	144.396	31.4	179.922	1, 2	1
27	0	SIG 25		HEA 140	4	5750	25.2	144.9	31.4	180.55	1, 2	1
28	0	SIG 26		HEA 140	1	6000	25.2	151.2	31.4	188.4	1, 2	1
29	0	SIG 27		HEA 140	7	6000	25.2	151.2	31.4	188.4	1, 2	1
30	0	SIG 28		HEA 140	3	6100	25.2	153.72	31.4	191.54	1, 2	1
31	0	SIG 29		HEA 140	1	6100	25.2	153.72	31.4	191.54	1, 2	1
32	0	SIG 30		HEA 140	1	6950	25.2	175.14	31.4	218.23	1, 2	1
33	0	SIG 31		HEA 140	2	6990	25.2	176.148	31.4	219.486	1, 2	1
34	0	SIG 32		HEA 140	1	7300	25.2	183.96	31.4	229.22	1, 2	1
35	0	SIG 33		HEA 140	1	7400	25.2	186.48	31.4	232.36	1, 2	1
36	0	SIG 34		HEA 140	1	8000	25.2	201.6	31.4	251.2	1, 2	1
37	0	SIG 35		HEA 140	33	11150	25.2	280.98	31.4	350.11	1, 2	1
38	0	SIG 36		HEA 140	20	12000	25.2	302.4	31.4	376.8	1, 2	1

Material List

TEKLA STRUCTURES - MATERIAL LIST

DESIGN

BIM
BUILDING INFORMATION MODELING

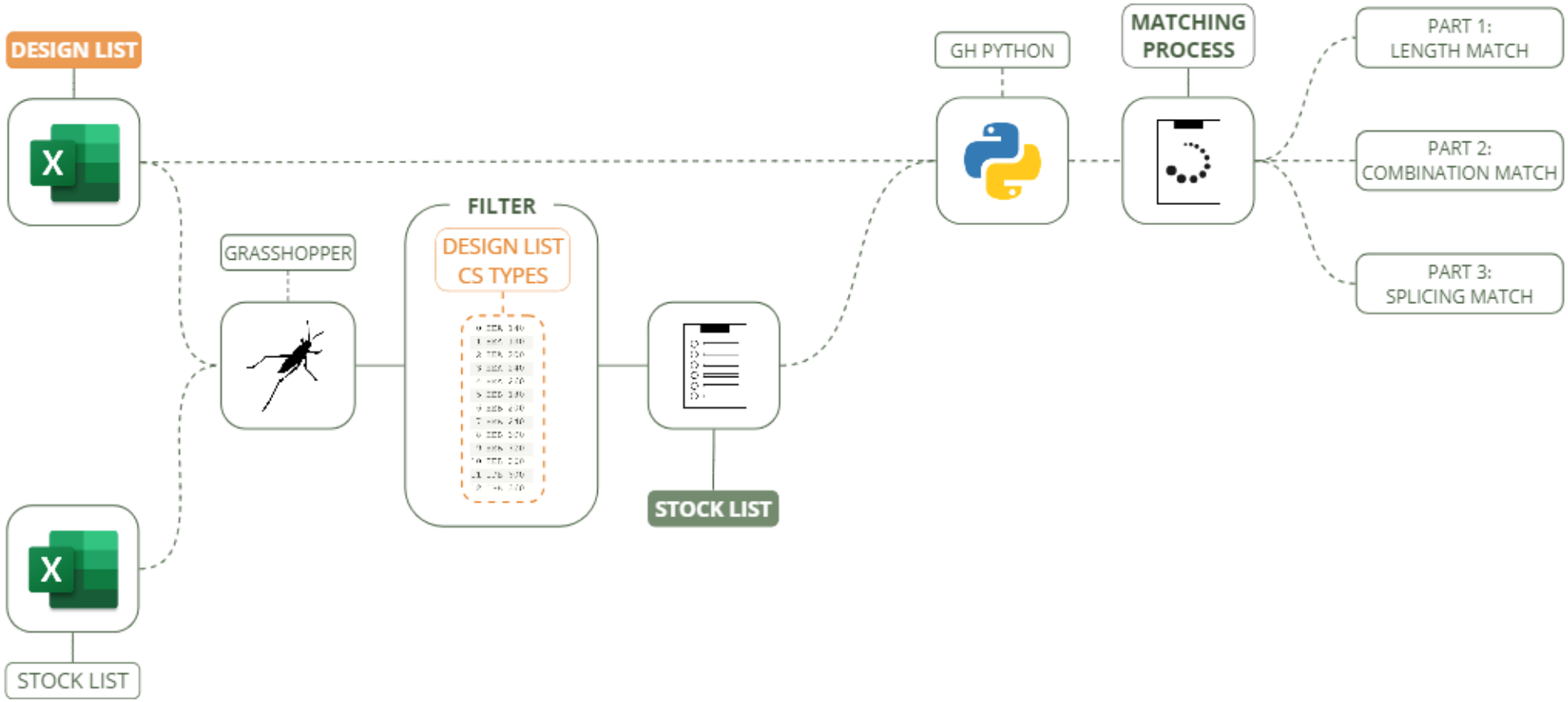


DESIGN LIST

Design List

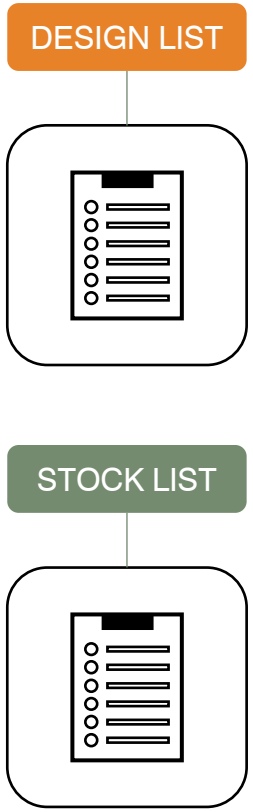
	B	C	D	E	F	G	H	I	J	K	L	M
1	CDE	STG	CSP	QTY	LEN	WKG	PER	ARE				
2	Identity code	Steel Grade	Cross Section	Quantity	Length mm	total (kg)	CS area (cm2)	area (m2)				
3	CSM 01	S235	HEA 140	18	530	13.1	31.4	41.605				
4	CSM 02	S235	HEA 180	2	1869	66.3	45.3	211.66425				
5	CSM 03	S235	HEA 180	1	3000	106.5	45.3	339.75				
6	CSM 04	S235	HEA 180	12	3012	106.9	45.3	341.109				
7	CSM 05	S235	HEA 180	2	3050	108.3	45.3	345.4125				
8	CSM 06	S235	HEA 180	2	3070	109	45.3	347.6775				
9	CSM 07	S235	HEA 180	6	3077	109.2	45.3	348.47025				
10	CSM 08	S235	HEA 180	6	3077	109.2	45.3	348.47025				
11	CSM 09	S235	HEA 180	1	3177	112.7	45.3	359.79525				
12	CSM 10	S235	HEA 180	2	3182	112.9	45.3	360.3615				
13	CSM 11	S235	HEA 180	1	3247	115.2	45.3	367.72275				
14	CSM 12	S235	HEA 180	1	3247	115.2	45.3	367.72275				
15	CSM 13	S235	HEA 180	12	3280	116.4	45.3	371.46				
16	CSM 14	S235	HEA 180	3	3285	116.6	45.3	372.02625				
17	CSM 15	S235	HEA 180	12	3300	117.2	45.3	373.725				
18	CSM 16	S235	HEA 180	2	3325	118	45.3	376.55625				
19	CSM 17	S235	HEA 180	1	3377	119.8	45.3	382.44525				
20	CSM 18	S235	HEA 180	2	3382	120	45.3	383.0115				
21	CSM 19	S235	HEA 180	1	3447	122.3	45.3	390.37275				
22	CSM 20	S235	HEA 180	1	3447	122.3	45.3	390.37275				
23	CSM 21	S235	HEA 180	1	5868	208.3	45.3	664.551				
24	CSM 22	S235	HEA 200	1	6700	283.3	53.8	901.15				
25	CSM 23	S235	HEA 200	1	6700	283.3	53.8	901.15				
26	CSM 24	S235	HEA 200	1	7006	296.3	53.8	942.307				
27	CSM 25	S235	HEA 200	1	7006	296.3	53.8	942.307				
28	CSM 26	S235	HEA 200	2	7006	296.3	53.8	942.307				
29	CSM 27	S235	HEA 240	1	1199	72.3	76.8	230.208				
30	CSM 28	S235	HEA 240	1	1212	73.1	76.8	232.704				
31	CSM 29	S235	HEA 240	1	1460	88	76.8	280.32				
32	CSM 30	S235	HEA 240	1	3788	228.4	76.8	727.296				
33	CSM 31	S235	HEA 240	1	5221	314.8	76.8	1002.432				
34	CSM 32	S235	HEA 240	2	5512	332.4	76.8	1058.304				
35	CSM 33	S235	HEA 240	2	5623	339.1	76.8	1079.616				
36	CSM 34	S235	HEA 260	1	18000	1227.6	86.8	3906				
37	CSM 35	S235	HEB 180	2	2658	136.1	62.25	413.65125				
38	CSM 36	S235	HEB 180	1	3408	174.5	62.25	530.37				
39	CSM 37	S235	HEB 180	2	6760	346.1	62.25	1052.025				

Matching Algorithm: Workflow

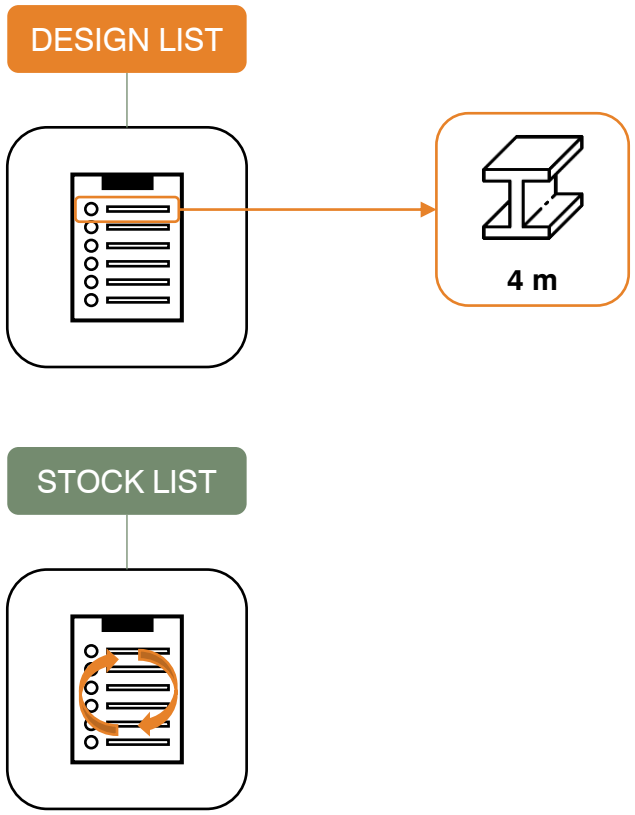


PART 1: LENGTH MATCH

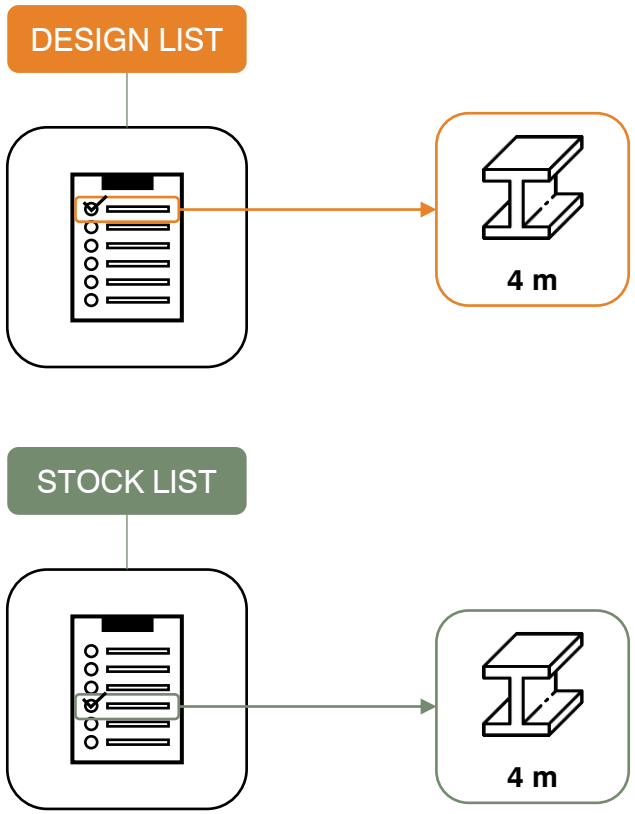
Matching Algorithm: Part 1



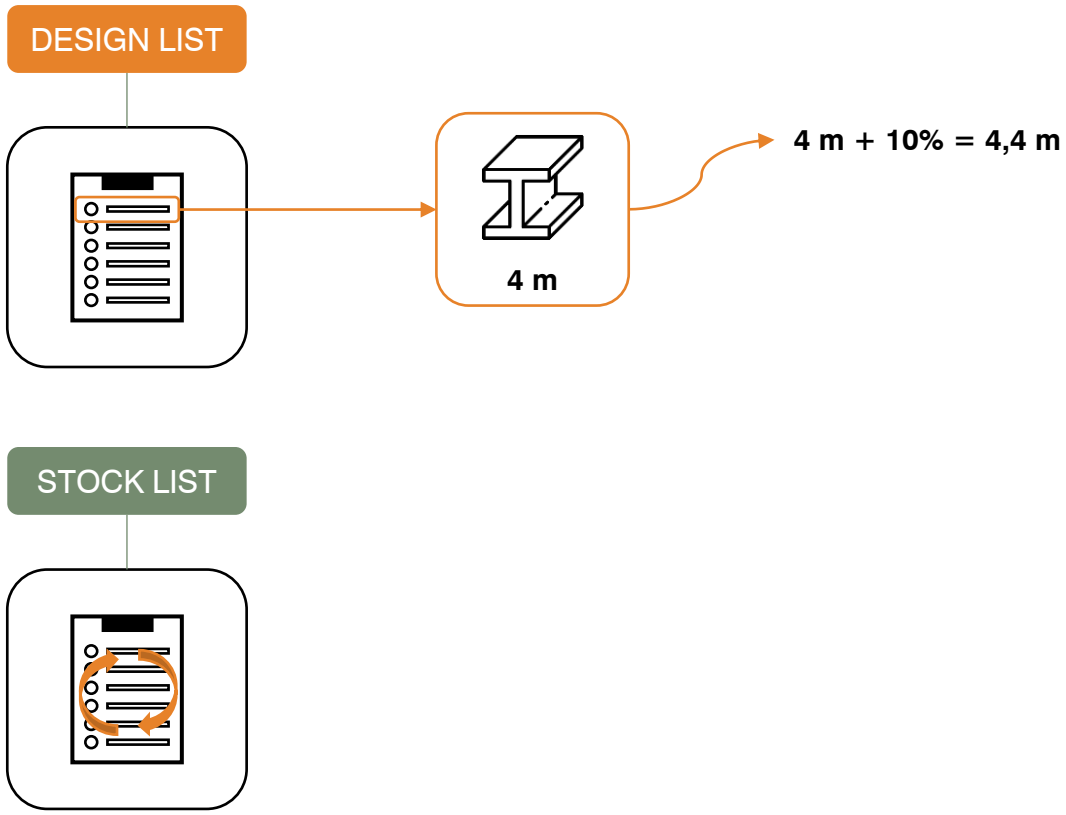
Matching Algorithm: Part 1



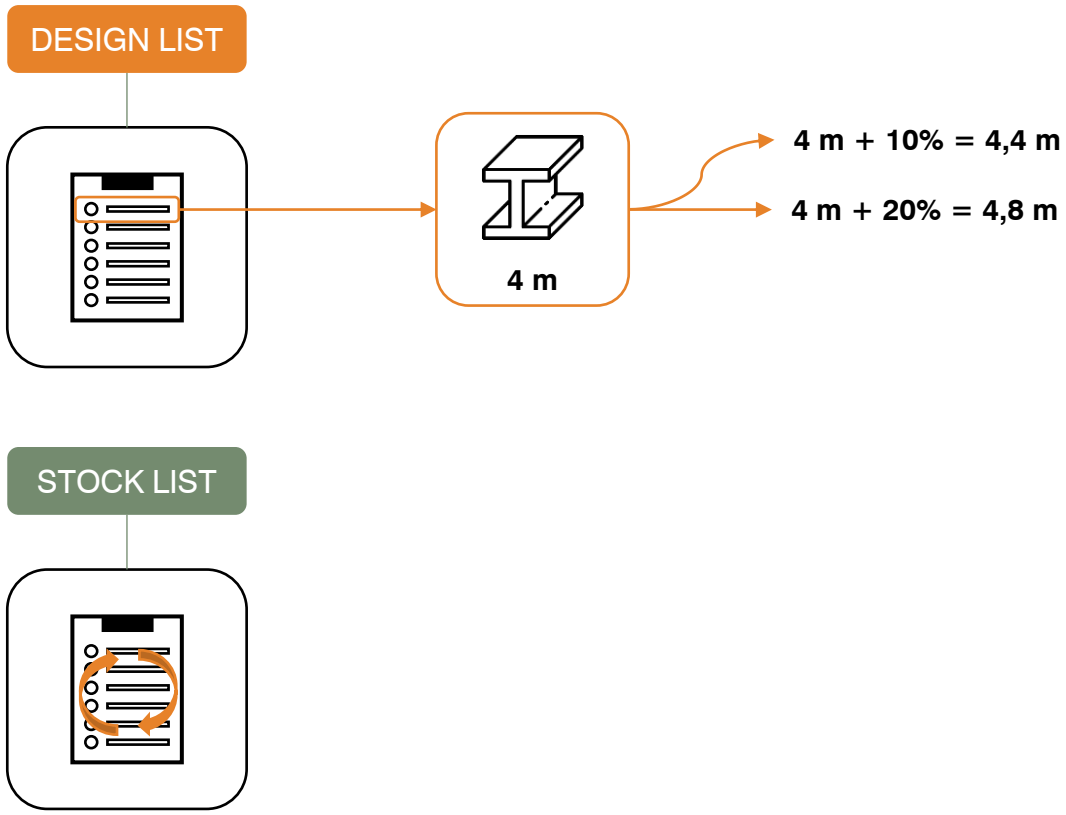
Matching Algorithm: Part 1



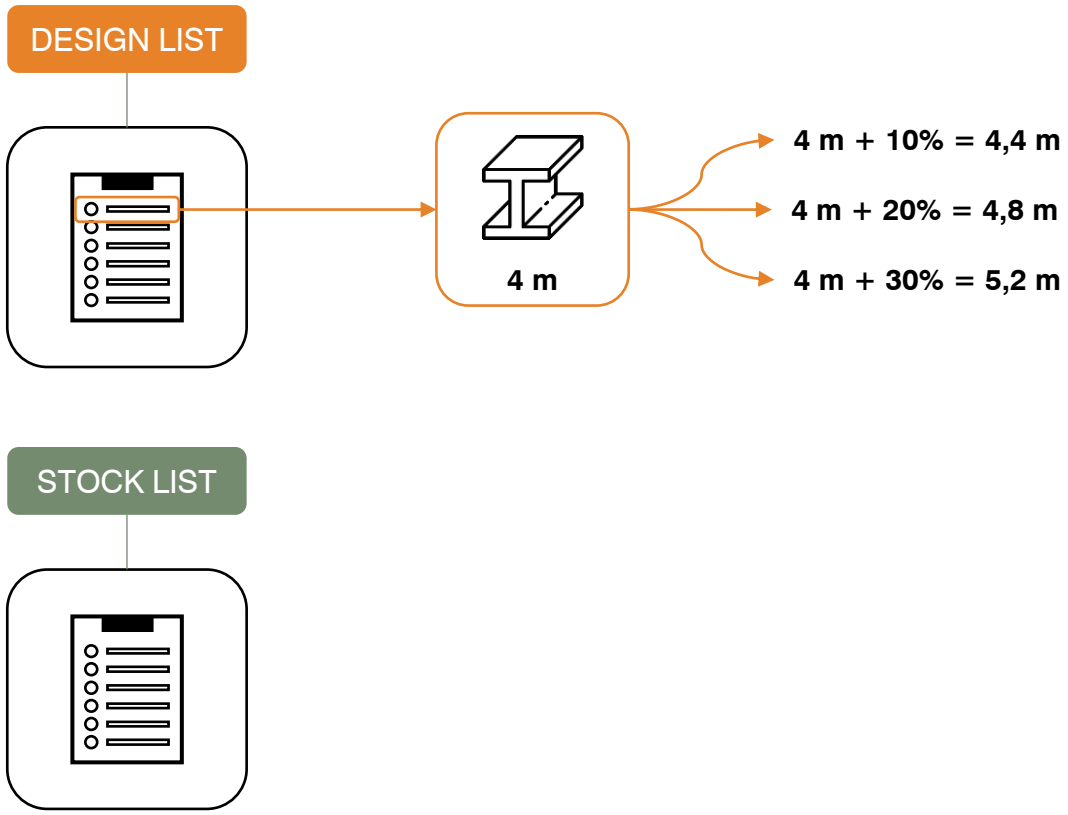
Matching Algorithm: Part 1



Matching Algorithm: Part 1

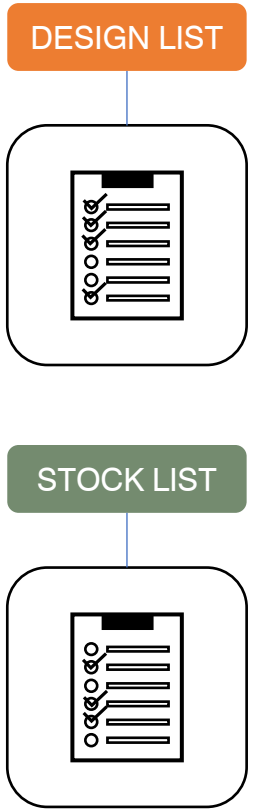


Matching Algorithm: Part 1

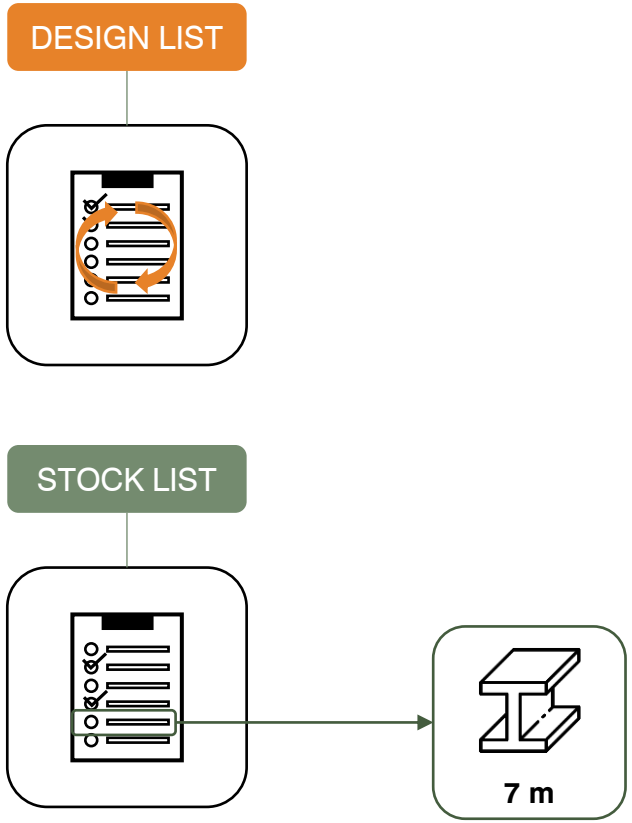


PART 2: COMBINATION MATCH

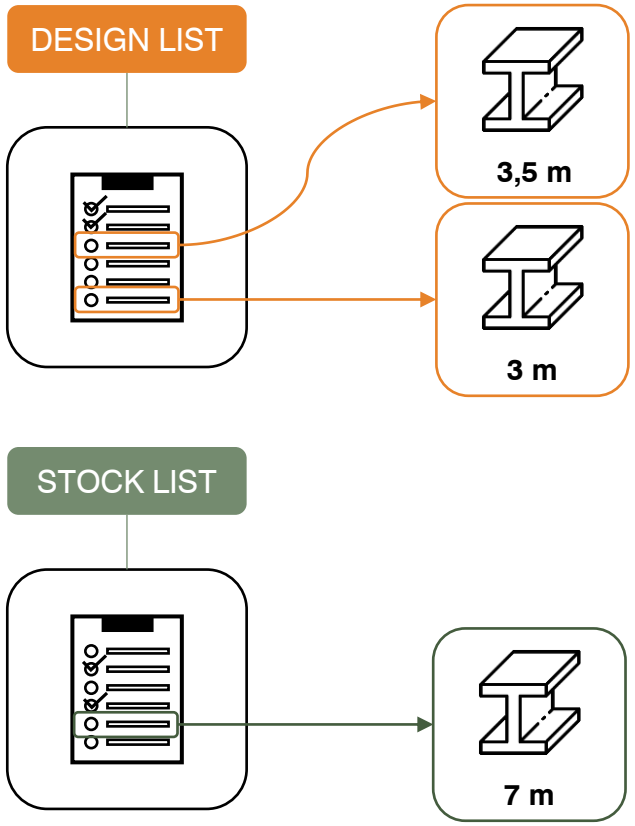
Matching Algorithm: Part 2



Matching Algorithm: Part 2

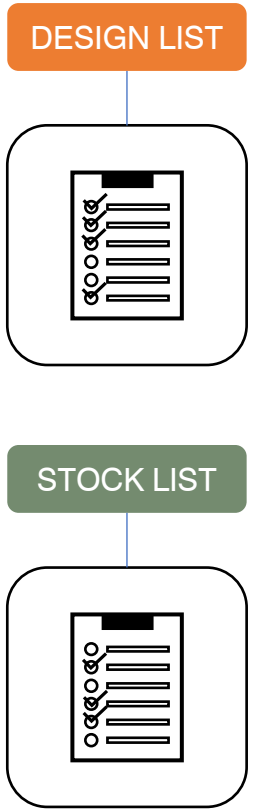


Matching Algorithm: Part 2

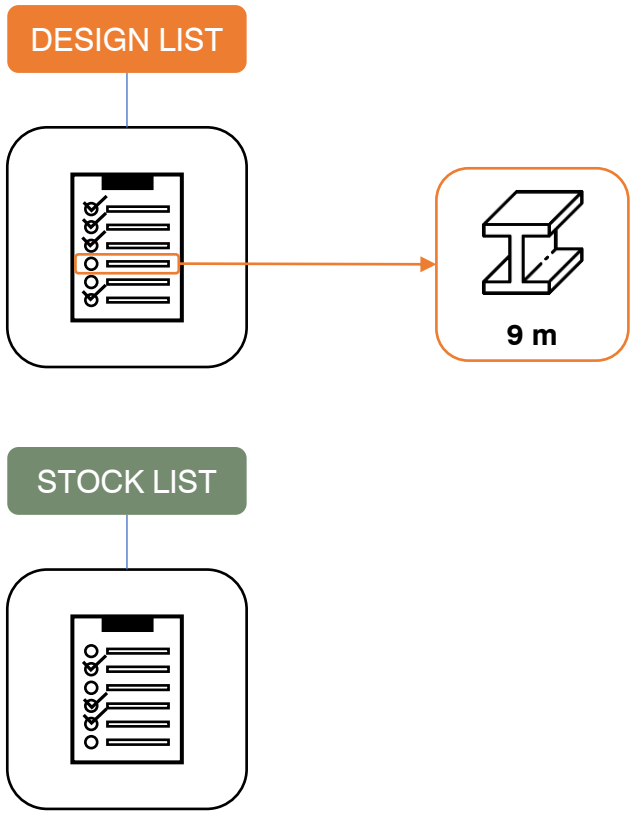


PART 3: SPLICING MATCH

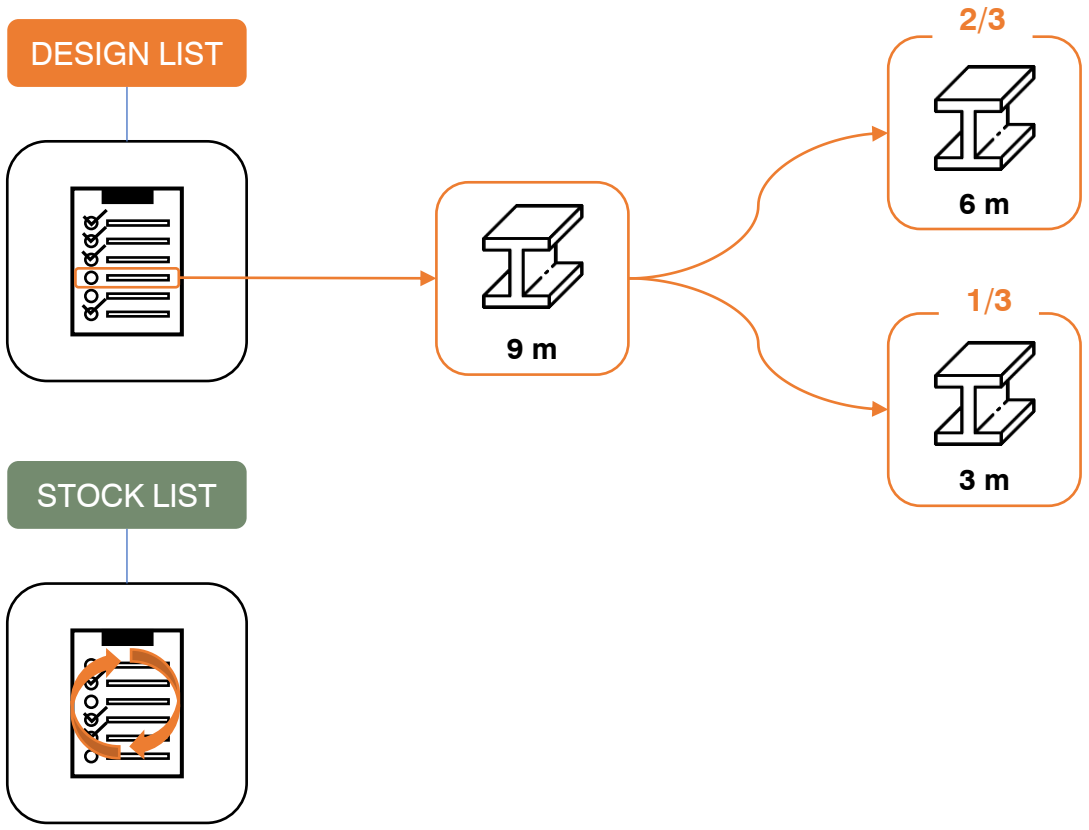
Matching Algorithm: Part 3



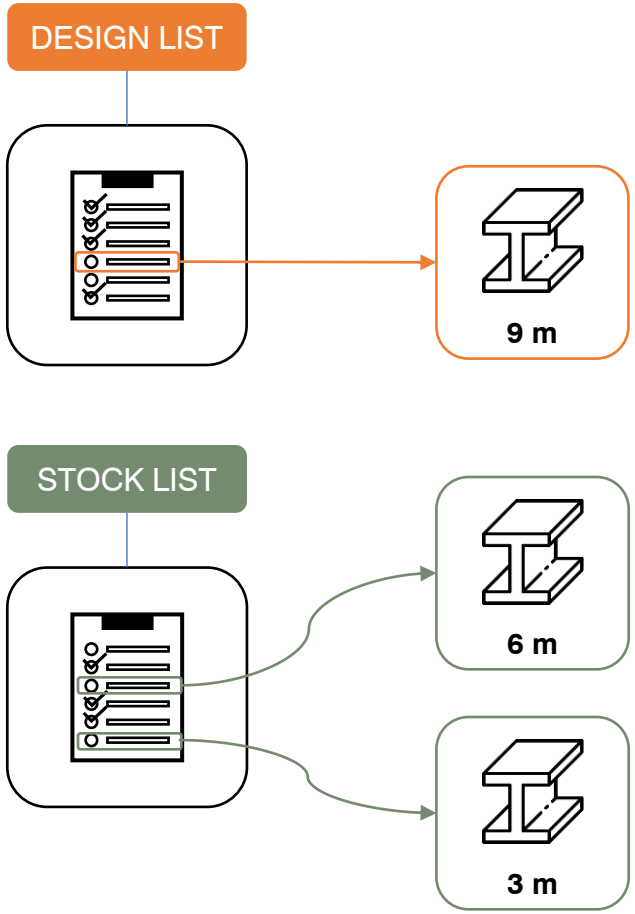
Matching Algorithm: Part 3



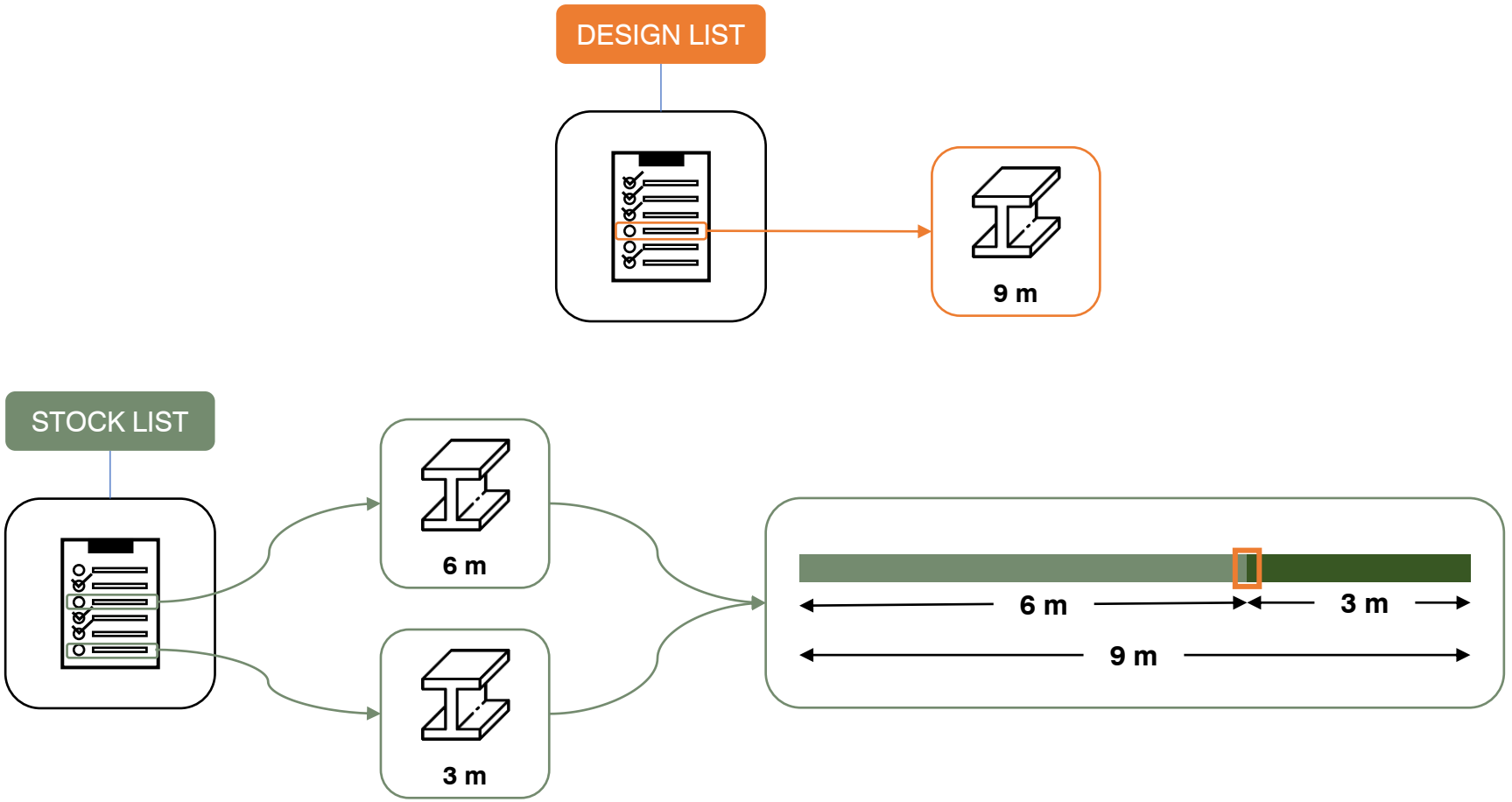
Matching Algorithm: Part 3



Matching Algorithm: Part 3

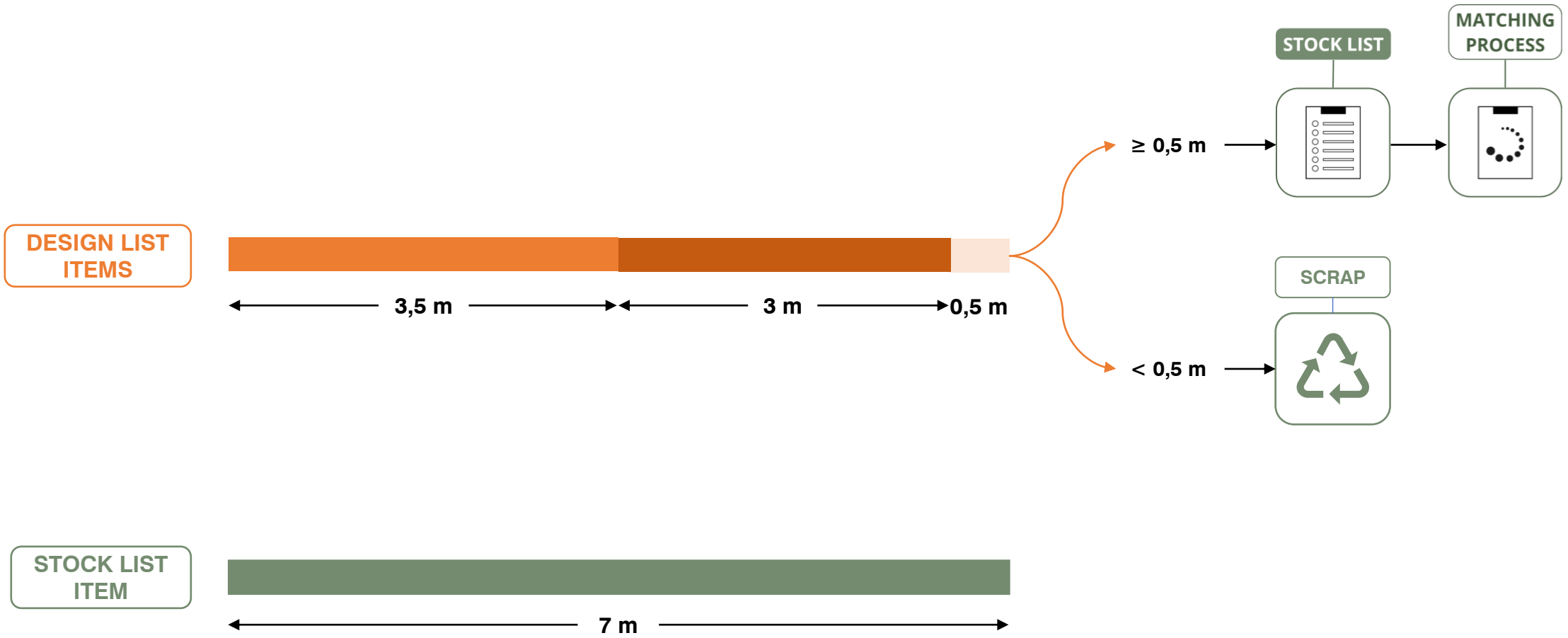


Matching Algorithm: Part 3



CUT-OFF WASTE

Cut-off Waste



Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

CSM 01	S235	HEA 140	18	530	13.1
CSM 02	S235	HEA 180	2	1869	66.3
CSM 03	S235	HEA 180	1	3000	106.5
CSM 04	S235	HEA 180	12	3012	106.9
CSM 05	S235	HEA 180	2	3050	108.3
CSM 06	S235	HEA 180	2	3070	109
CSM 07	S235	HEA 180	6	3077	109.2
CSM 08	S235	HEA 180	6	3077	109.2
CSM 09	S235	HEA 180	1	3177	112.7
CSM 10	S235	HEA 180	2	3182	112.9
CSM 11	S235	HEA 180	1	3247	115.2
CSM 12	S235	HEA 180	1	3247	115.2
CSM 13	S235	HEA 180	12	3280	116.4
CSM 14	S235	HEA 180	3	3285	116.6
CSM 15	S235	HEA 180	12	3300	117.2
CSM 16	S235	HEA 180	2	3325	118
CSM 17	S235	HEA 180	1	3377	119.8
CSM 18	S235	HEA 180	2	3382	120
CSM 19	S235	HEA 180	1	3447	122.3
CSM 20	S235	HEA 180	1	3447	122.3
CSM 21	S235	HEA 180	1	5868	208.3
CSM 22	S235	HEA 200	1	6700	283.3
CSM 23	S235	HEA 200	1	6700	283.3
CSM 24	S235	HEA 200	1	7006	296.3
CSM 25	S235	HEA 200	1	7006	296.3
CSM 26	S235	HEA 200	2	7006	296.3
CSM 27	S235	HEA 240	1	1199	72.3
CSM 28	S235	HEA 240	1	1212	73.1
CSM 29	S235	HEA 240	1	1460	88
CSM 30	S235	HEA 240	1	3788	228.4
CSM 31	S235	HEA 240	1	5221	314.8
CSM 32	S235	HEA 240	2	5512	332.4
CSM 33	S235	HEA 240	2	5623	339.1
CSM 34	S235	HEA 260	1	18000	1227.6
CSM 35	S235	HEB 180	2	2658	136.1
CSM 36	S235	HEB 180	1	3408	174.5
CSM 37	S235	HEB 180	2	6760	346.1

82% MATCHED

Stock Yard 1: 42 matched elements

Stock Yard 2: 36 matched elements

Stock Yard 4: 29 matched elements

Stock Yard 5: 18 matched elements

Stock Yard 6: 15 matched elements

Stock Yard 8: 7 matched elements

NEXT >

Stock Yard 1

☐	SIG 12	HEA 120	5	4150	20.3	84.245	677	2809.55	1, 2
☐	SIG 13	HEA 120	6	12000	20.3	243.6	677	8124	1, 2
☐	SIG 14	HEA 120	1	12000	20.3	243.6	677	8124	1, 2
☐	SIG 15	HEA 120	9	12150	20.3	246.645	677	8225.55	1, 2
☐	SIG 16	HEA 140	2	2100	25.2	52.92	794	1667.4	1, 2
☐	SIG 17	HEA 140	1	2490	25.2	62.748	794	1977.06	1, 2
☐	SIG 18	HEA 140	2	2500	25.2	63	794	1985	1, 2
☐	SIG 19	HEA 140	1	2500	25.2	63	794	1985	1, 2

Stock Yard 2

☐	SIG 101	HEA 180	1	2880	36.2	104.256	1024	2949.12	1, 2
☐	SIG 102	HEA 180	5	2890	36.2	104.618	1024	2959.36	1, 2
☐	SIG 103	HEA 180	1	2910	36.2	105.342	1024	2979.84	1, 2
☐	SIG 104	HEA 180	2	3020	36.2	109.324	1024	3092.48	1, 2
☐	SIG 105	HEA 180	1	3020	36.2	109.324	1024	3092.48	1, 2
☐	SIG 106	HEA 180	5	3030	36.2	109.686	1024	3102.72	1, 2
☐	SIG 107	HEA 180	11	3040	36.2	110.048	1024	3112.96	1, 2
☐	SIG 108	HEA 180	2	3040	36.2	110.048	1024	3112.96	1. 2

Stock Yard 3

☐	SIG 191	HEA 220	1	6100	51.5	314.15	1255	7655.5	1, 2
☐	SIG 192	HEA 220	2	6410	51.5	330.115	1255	8044.55	1, 2
☐	SIG 193	HEA 220	1	6440	51.5	331.66	1255	8082.2	1, 2
☐	SIG 194	HEA 220	1	6500	51.5	334.75	1255	8157.5	1, 2
☐	SIG 195	HEA 220	1	6810	51.5	350.715	1255	8546.55	1, 2
☐	SIG 196	HEA 220	1	6820	51.5	351.23	1255	8559.1	1, 2
☐	SIG 197	HEA 220	1	6820	51.5	351.23	1255	8559.1	1, 2
☐	SIG 198	HEA 220	1	6830	51.5	351.745	1255	8571.65	1, 2

Stock Yard 4

☐	SIG 283	HEA 260	1	4550	69.5	316.225	1484	6752.2	1, 2
☐	SIG 284	HEA 260	1	4620	69.5	321.09	1484	6856.08	1, 2
☐	SIG 285	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
☐	SIG 286	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
☐	SIG 287	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
☐	SIG 288	HEA 260	2	4700	69.5	326.65	1484	6974.8	1, 2
☐	SIG 289	HEA 260	1	4750	69.5	330.125	1484	7049	1, 2
☐	SIG 290	HEA 260	1	4900	69.5	340.55	1484	7271.6	1, 2

Stock Yard 5

☐	SIG 431	HEA 260	1	12950	69.5	900.025	1484	19217.8	1, 2
☐	SIG 432	HEA 260	1	13000	69.5	903.5	1484	19292	1, 2
☐	SIG 433	HEA 260	1	13100	69.5	910.45	1484	19440.4	1, 2
☐	SIG 434	HEA 260	1	14900	69.5	1035.55	1484	22111.6	1, 2
☐	SIG 435	HEA 260	4	14900	69.5	1035.55	1484	22111.6	1, 2
☐	SIG 436	HEA 260	1	14950	69.5	1039.025	1484	22185.8	1, 2

NEXT >

MATCHED RESULTS

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

Stock Yard 1

SIG 12	HEA 120	5	4150	20.3	84.245	677	2809.55	1, 2
SIG 13	HEA 120	6	12000	20.3	243.6	677	8124	1, 2
SIG 14	HEA 120	1	12000	20.3	243.6	677	8124	1, 2
SIG 15	HEA 120	9	12150	20.3	246.645	677	8225.55	1, 2
SIG 16	HEA 140	2	2100	25.2	52.92	794	1667.4	1, 2
SIG 17	HEA 140	1	2490	25.2	62.748	794	1977.06	1, 2
SIG 18	HEA 140	2	2500	25.2	63	794	1985	1, 2
SIG 19	HEA 140	1	2500	25.2	63	794	1985	1, 2

Stock Yard 2

SIG 101	HEA 180	1	2880	36.2	104.256	1024	2949.12	1, 2
SIG 102	HEA 180	5	2890	36.2	104.618	1024	2959.36	1, 2
SIG 103	HEA 180	1	2910	36.2	105.342	1024	2979.84	1, 2
SIG 104	HEA 180	2	3020	36.2	109.324	1024	3092.48	1, 2
SIG 105	HEA 180	1	3020	36.2	109.324	1024	3092.48	1, 2
SIG 106	HEA 180	5	3030	36.2	109.686	1024	3102.72	1, 2
SIG 107	HEA 180	11	3040	36.2	110.048	1024	3112.96	1, 2
SIG 108	HEA 180	2	3040	36.2	110.048	1024	3112.96	1. 2

Stock Yard 3

SIG 191	HEA 220	1	6100	51.5	314.15	1255	7655.5	1, 2
SIG 192	HEA 220	2	6410	51.5	330.115	1255	8044.55	1, 2
SIG 193	HEA 220	1	6440	51.5	331.66	1255	8082.2	1, 2
SIG 194	HEA 220	1	6500	51.5	334.75	1255	8157.5	1, 2
SIG 195	HEA 220	1	6810	51.5	350.715	1255	8546.55	1, 2
SIG 196	HEA 220	1	6820	51.5	351.23	1255	8559.1	1, 2
SIG 197	HEA 220	1	6820	51.5	351.23	1255	8559.1	1, 2
SIG 198	HEA 220	1	6830	51.5	351.745	1255	8571.65	1, 2

Stock Yard 4

SIG 283	HEA 260	1	4550	69.5	316.225	1484	6752.2	1, 2
SIG 284	HEA 260	1	4620	69.5	321.09	1484	6856.08	1, 2
SIG 285	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
SIG 286	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
SIG 287	HEA 260	1	4650	69.5	323.175	1484	6900.6	1, 2
SIG 288	HEA 260	2	4700	69.5	326.65	1484	6974.8	1, 2
SIG 289	HEA 260	1	4750	69.5	330.125	1484	7049	1, 2
SIG 290	HEA 260	1	4900	69.5	340.55	1484	7271.6	1, 2

Stock Yard 5

SIG 431	HEA 260	1	12950	69.5	900.025	1484	19217.8	1, 2
SIG 432	HEA 260	1	13000	69.5	903.5	1484	19292	1, 2
SIG 433	HEA 260	1	13100	69.5	910.45	1484	19440.4	1, 2
SIG 434	HEA 260	1	14900	69.5	1035.55	1484	22111.6	1, 2
SIG 435	HEA 260	4	14900	69.5	1035.55	1484	22111.6	1, 2
SIG 436	HEA 260	1	14950	69.5	1039.025	1484	22185.8	1, 2

RESERVE

PURCHASE

RESERVE MATCHED ITEMS

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

Stock Yard 1
Items
42
Reservation Period
7.5 months

Stock Yard 2
Items
36
Reservation Period
7.5 months

Stock Yard 3
Items
29
Reservation Period
7.5 months

Stock Yard 4
Items
18
Reservation Period
7.5 months

Stock Yard 5
Items
15
Reservation Period

RESERVATION FEES

Stock Yard 1 € XX.XX / month	€ XX.XX
Stock Yard 2 € XX.XX / month	€ XX.XX
Stock Yard 3 € XX.XX / month	€ XX.XX
Stock Yard 4 € XX.XX / month	€ XX.XX
Stock Yard 5 € XX.XX / month	€ XX.XX
Stock Yard 6 € XX.XX / month	€ XX.XX
TOTAL	€ XX.XX

CONFIRM RESERVATION

UNMATCHED RESULTS

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

CSM 15	S235	HEA 180	12	3300	117.2
CSM 16	S235	HEA 180	2	3325	118
CSM 17	S235	HEA 180	1	3377	119.8
CSM 18	S235	HEA 180	2	3382	120
CSM 19	S235	HEA 180	1	3447	122.3
CSM 20	S235	HEA 180	1	3447	122.3
CSM 21	S235	HEA 180	1	5868	208.3
CSM 22	S235	HEA 200	1	6700	283.3
CSM 23	S235	HEA 200	1	6700	283.3
CSM 24	S235	HEA 200	1	7006	296.3
CSM 25	S235	HEA 200	1	7006	296.3
CSM 26	S235	HEA 200	2	7006	296.3
CSM 27	S235	HEA 240	1	1199	72.3
CSM 28	S235	HEA 240	1	1212	73.1
CSM 29	S235	HEA 240	1	1460	88
CSM 30	S235	HEA 240	1	3788	228.4
CSM 31	S235	HEA 240	1	5221	314.8
CSM 32	S235	HEA 240	2	5512	332.4
CSM 33	S235	HEA 240	2	5623	339.1
CSM 34	S235	HEA 260	1	18000	1227.6
CSM 35	S235	HEB 180	2	2658	136.1
CSM 36	S235	HEB 180	1	3408	174.5
CSM 37	S235	HEB 180	2	6760	346.1
CSM 38	S235	HEB 180	2	6860	351.2
CSM 39	S235	HEB 200	1	5800	355.5
CSM 40	S235	HEB 200	1	6060	371.5
CSM 41	S235	HEB 240	1	6785	564.5
CSM 42	S235	HEB 240	1	6830	568.3
CSM 43	S235	HEB 240	1	7030	584.9
CSM 44	S235	HEB 240	1	7070	588.2
CSM 45	S235	HEB 300	1	6799	795.5
CSM 46	S235	HEB 320	2	7120	904.2
CSM 47	S235	HEB 360	2	7120	1011
CSM 48	S235	IPE 300	4	5863	247.4
CSM 49	S235	IPE 300	4	5863	247.4
CSM 50	S235	IPE 300	20	6988	294.9
CSM 51	S235	IPE 300	1	7138	301.2
CSM 52	S235	IPE 360	1	7093	405
CSM 53	S235	IPE 360	1	7093	405

18% UNMATCHED

RE-RUN MATCH TOOL FOR BEAM SPLICES

UPDATE DISTANCE RADIUS

UPLOAD TO REQUEST FORUM

DOWNLOAD ORDER LIST

REQUEST ITEMS:

EDIT UPLOAD

CSM 15	S235	HEA 180	12	3300	117.2		
CSM 16	S235	HEA 180	2	3325	118		
CSM 17	S235	HEA 180	1	3377	119.8		
CSM 18	S235	HEA 180	2	3382	120		
CSM 19	S235	HEA 180	1	3447	122.3		
CSM 20	S235	HEA 180	1	3447	122.3		
CSM 21	S235	HEA 180	1	5868	208.3		
CSM 22	S235	HEA 200	1	6700	283.3		
CSM 23	S235	HEA 200	1	6700	283.3		
CSM 24	S235	HEA 200	1	7006	296.3		
CSM 25	S235	HEA 200	1	7006	296.3		
CSM 26	S235	HEA 200	2	7006	296.3		
CSM 27	S235	HEA 240	1	1199	72.3		
CSM 28	S235	HEA 240	1	1212	73.1		
CSM 29	S235	HEA 240	1	1460	88		
CSM 30	S235	HEA 240	1	3788	228.4		
CSM 31	S235	HEA 240	1	5221	314.8		
CSM 32	S235	HEA 240	2	5512	332.4		
CSM 33	S235	HEA 240	2	5623	339.1		
CSM 34	S235	HEA 260	1	18000	1227.6		

3 Comments

Swanenberg Ijzer Groep — 1 days ago

Thank you for submitting your item request. We have received your item request and will follow up as soon as we update our stock inventory. We will be receiving two truck loads by next week.

CSM — 2 days ago

Great to hear, thank you!

Swanenberg Ijzer Groep — 4 days ago

RELATED QUESTIONS

What is the estimated lead time for fulfilling an item request?

1 days ago

Are there any limitations or restrictions on the quantity or size of steel sections that can be requested?

3 days ago

How often are stock lists typically updated?

5 days ago

Is it possible to extend my reservation period?

1 week ago

Can I request an express order?

1 week ago

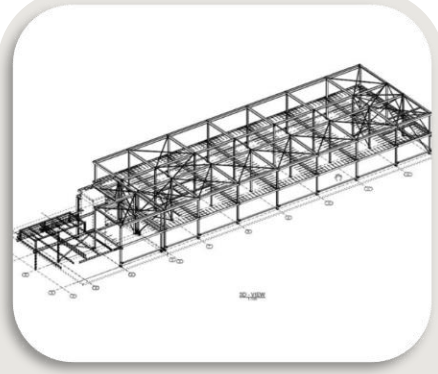
Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

CONCEPT DESIGN (17)

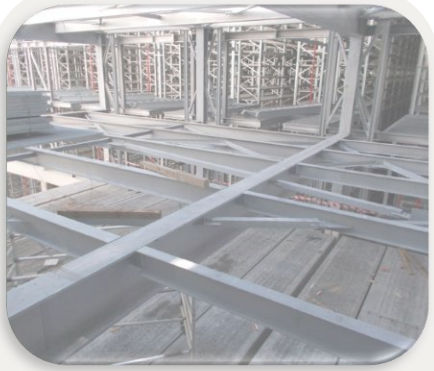
Royal Museum C.A., Brussels

Night, Amsterdam

FINAL DESIGN (08)



Fenengastraat, Amsterdam



Nike Ham, Ham

COMPLETED PROJECTS (23)

Fenix Shed, Rotterdam

Music Palace, Utrecht

The Timber House, Rotterdam

Theater Square, Antwerp

Project Overview

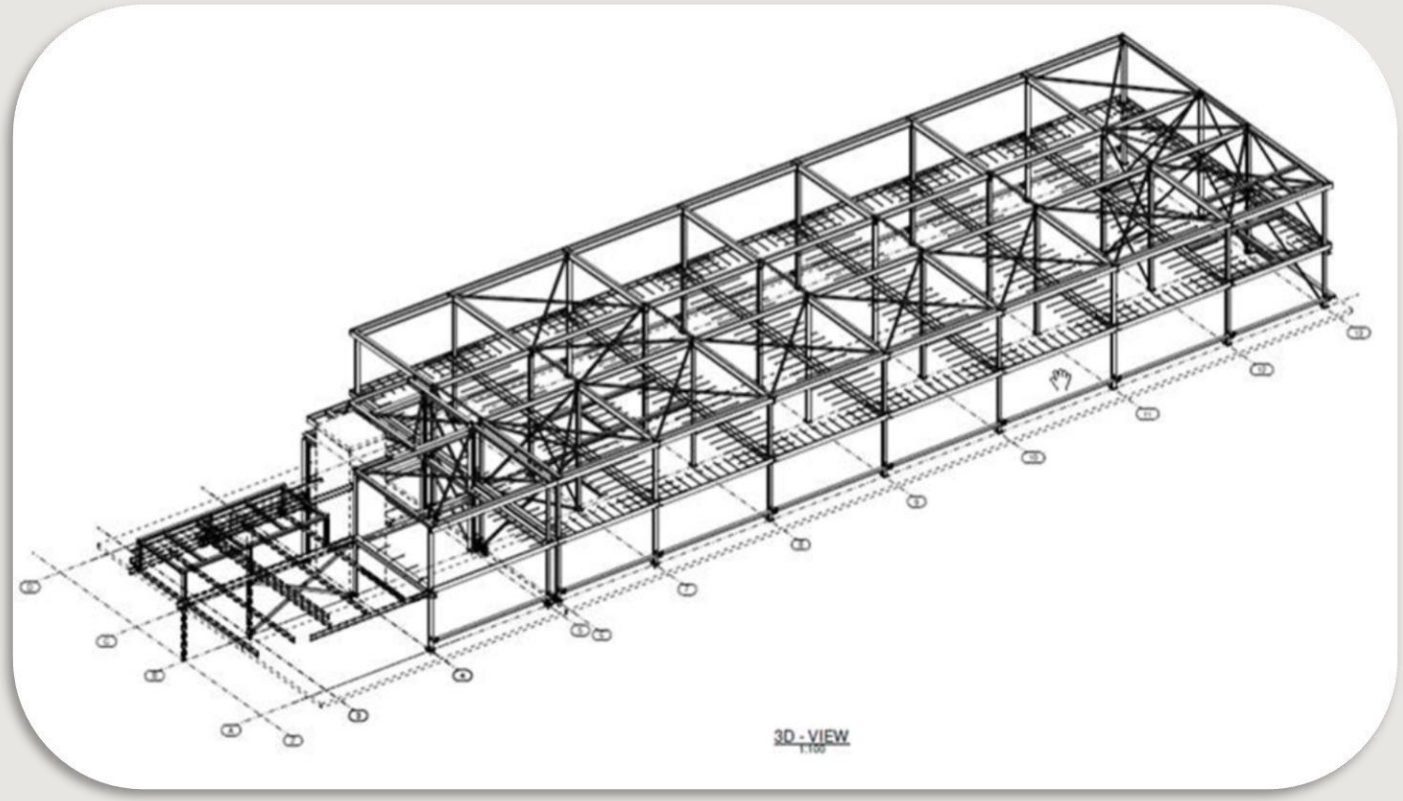
Orders

Map

Request Forum

Reclaimed Marketplace

Settings



TOTAL NEEDED ITEMS:

164 H & I sections

Design List Case Study:

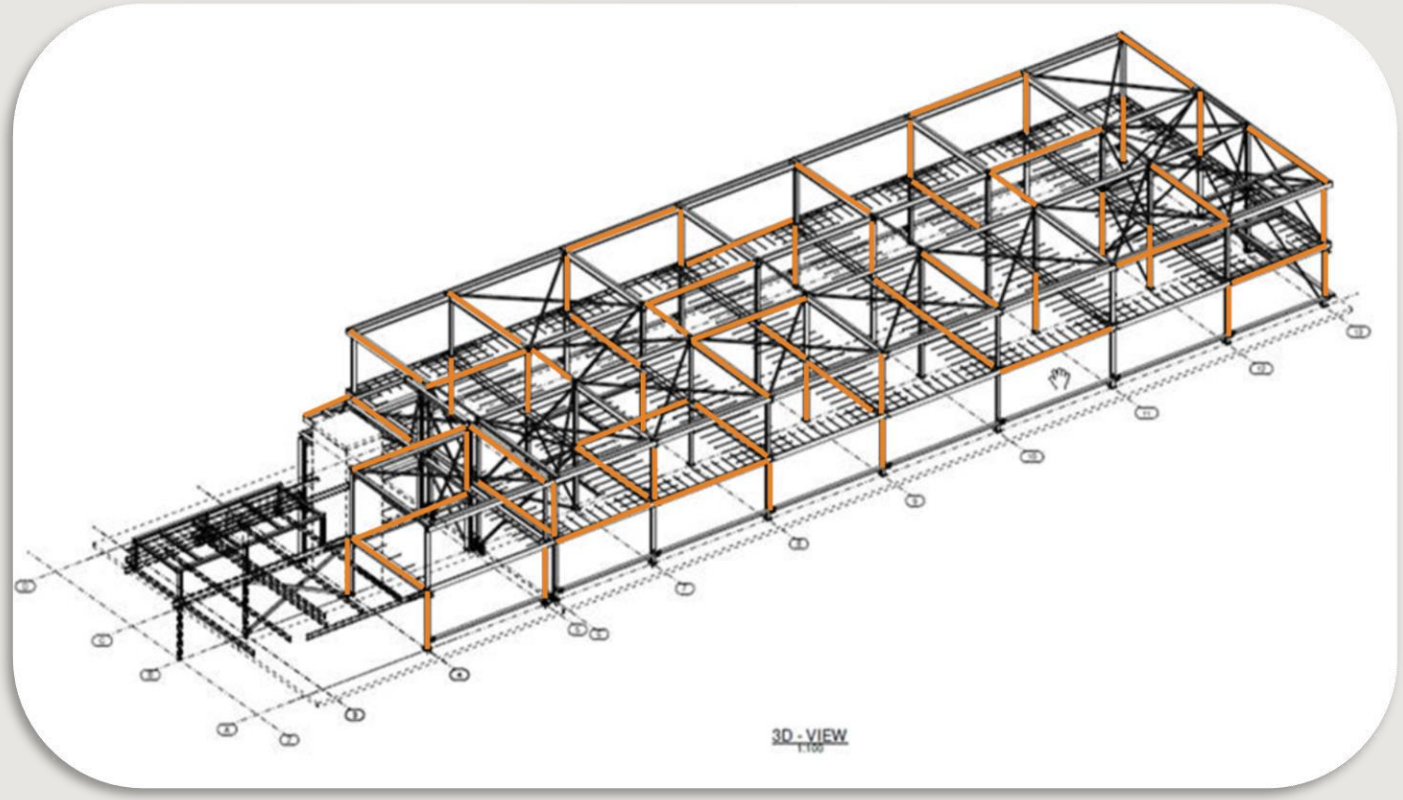
CSM STEELSTRUCTURES

Stock List Case Study:

SWANENBERG IJZER GROEP

VIEW MATCHED RESULTS

Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings



MATCHED ITEMS:

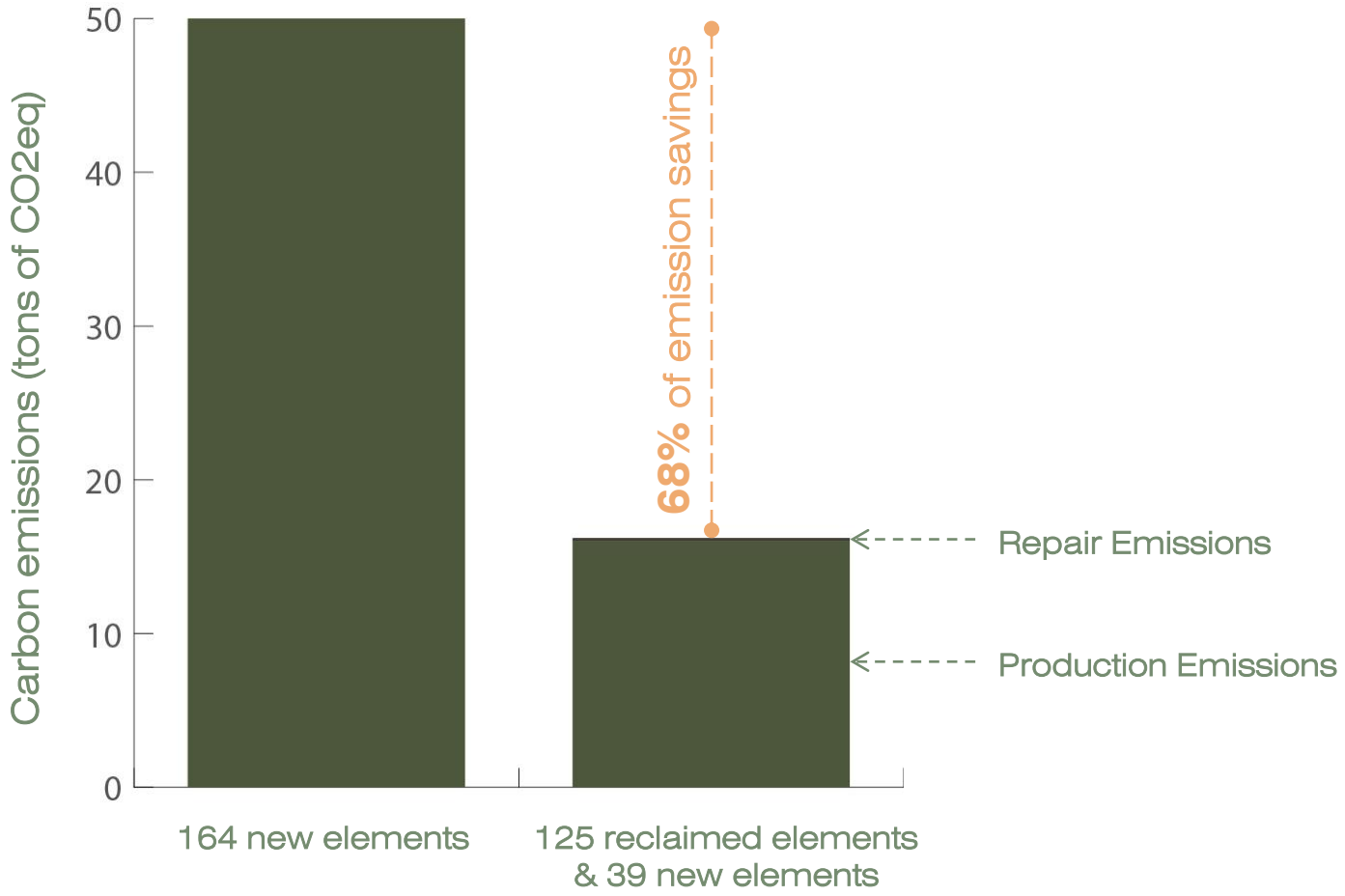
125 sections

(utilizing 89 reclaimed steel elements)

UNMATCHED ITEMS:

39 sections

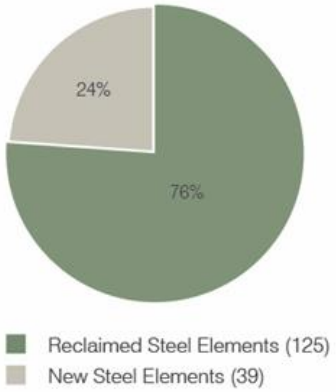
VIEW ENVIRONMENTAL RESULTS


Carbon emissions (tons of CO2eq)
50
40
30
20
10
0
68% of emission savings
Repair Emissions
Production Emissions
164 new elements
125 reclaimed elements & 39 new elements

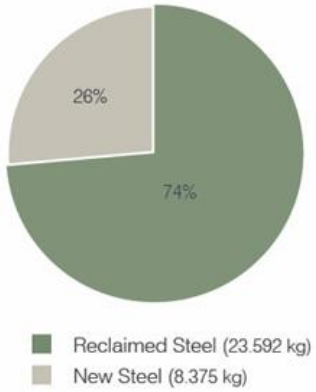
NEXT >

MATERIAL RESULTS

MATCH RESULTS

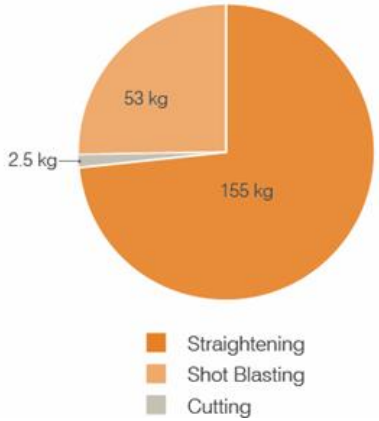


TOTAL AMOUNT MATERIAL

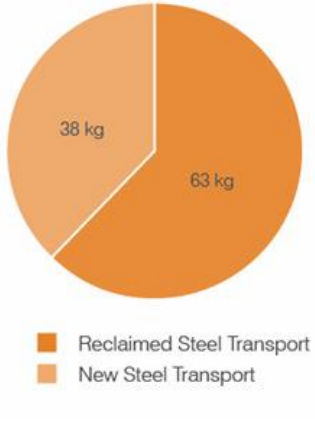


ENVIRONMENTAL EMISSIONS

REPAIRS EMISSIONS (kg of CO2eq)

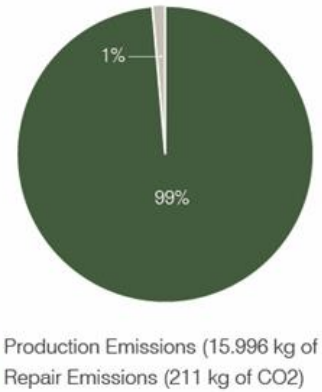


TRANSPORTATION EMISSIONS (kg of CO2eq)

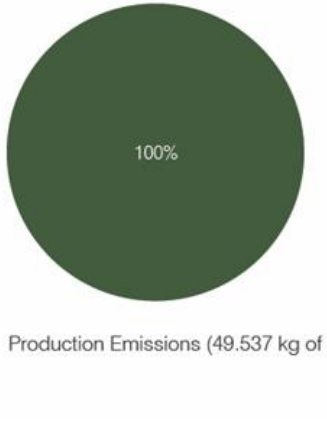


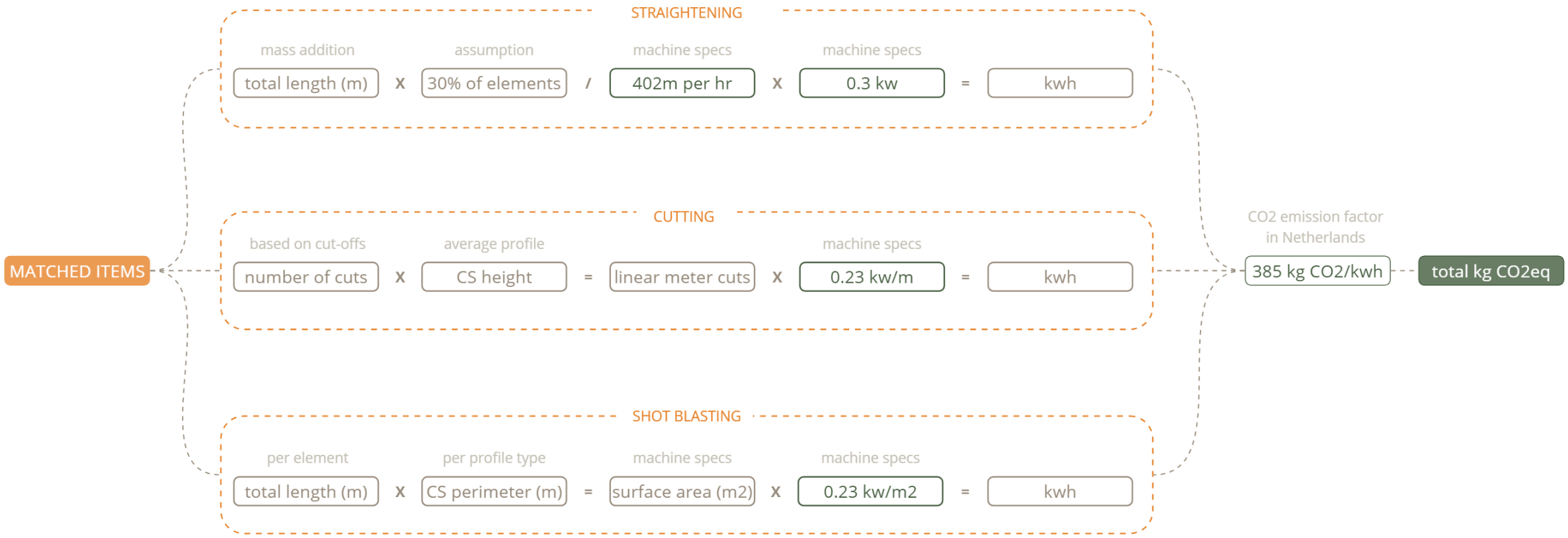
COMPARISON

NEW & RECLAIMED STEEL (kg of CO2)



ONLY NEW STEEL (kg of CO2)

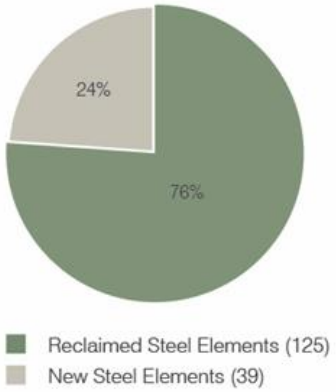




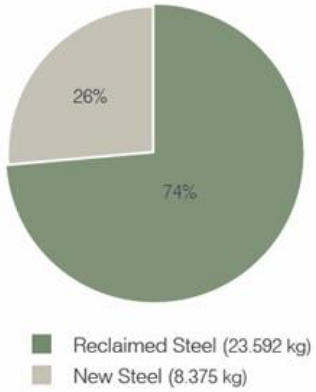
BACK TO RESULTS >

MATERIAL RESULTS

MATCH RESULTS

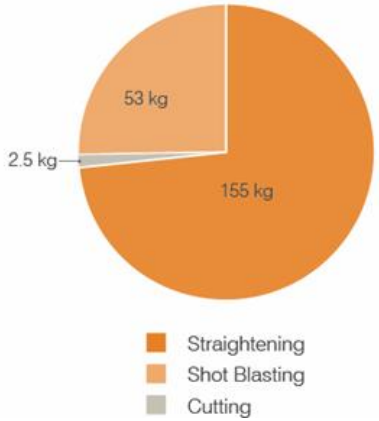


TOTAL AMOUNT MATERIAL

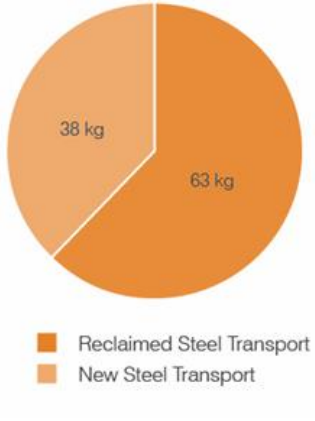


ENVIRONMENTAL EMISSIONS

REPAIRS EMISSIONS (kg of CO2eq)

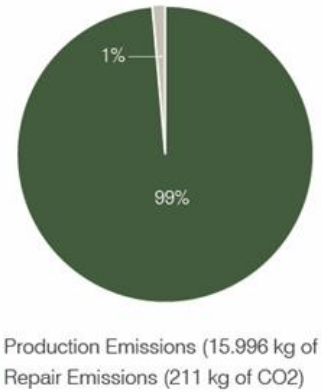


TRANSPORTATION EMISSIONS (kg of CO2eq)

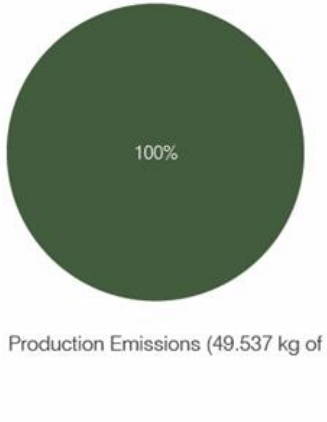


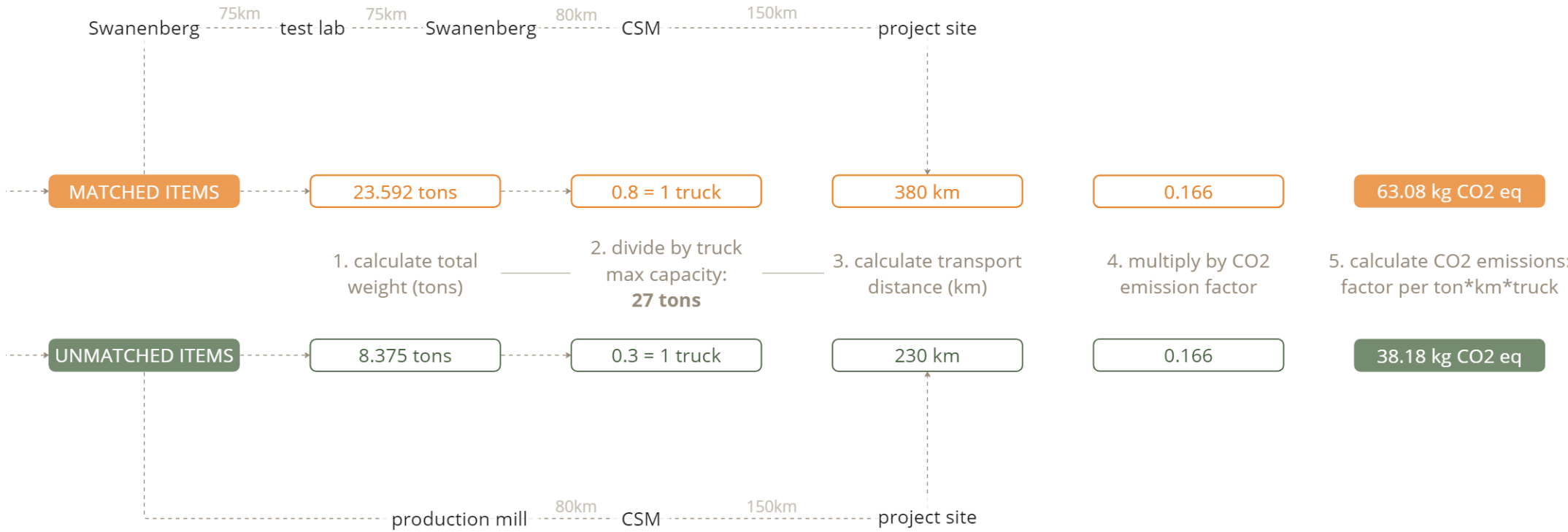
COMPARISON

NEW & RECLAIMED STEEL (kg of CO2)



ONLY NEW STEEL (kg of CO2)





CO2 Emission Factor (Nationale Milieu Database (NMD) & NL CO2 Emissiefactoren)

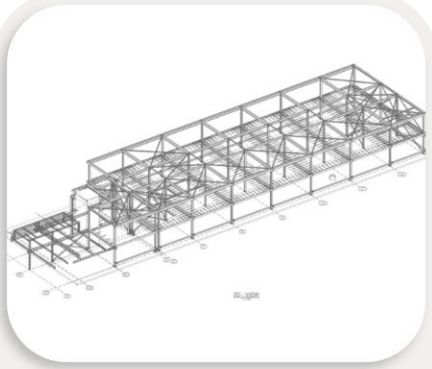
Project Overview
Orders
Map
Request Forum
Reclaimed Marketplace
Settings

CONCEPT DESIGN (17)

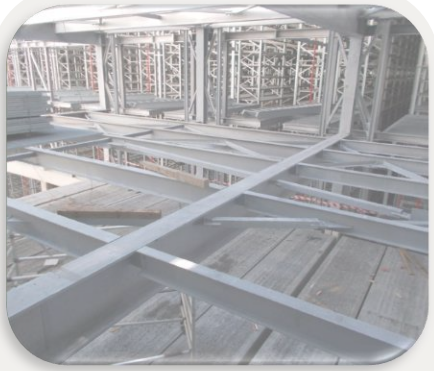
Royal Museum C.A., Brussels

Night, Amsterdam

FINAL DESIGN (08)



Fenengastraat, Amsterdam



Nike Ham, Ham

COMPLETED PROJECTS (23)

Fenix Shed, Rotterdam

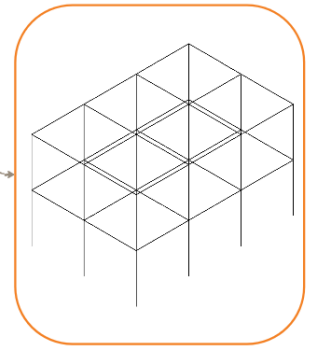
Music Palace, Utrecht

The Timber House, Rotterdam

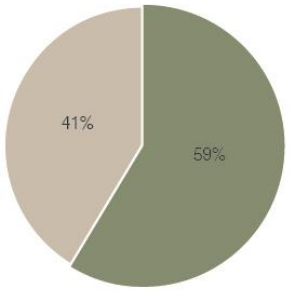
Theater Square, Antwerp

DESIGN OPTION 1

(x) direction	3.2m
(y) direction	2.6m
(z) direction	4.2m
grid in (x) direction	2
grid in (y) direction	3
grid in (z) direction	2

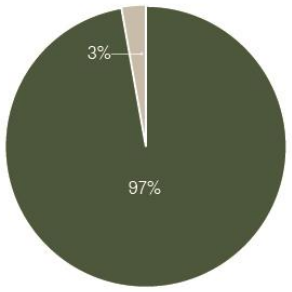


MATCH RESULTS



Reclaimed Steel Elements (34)
New Steel Elements (24)

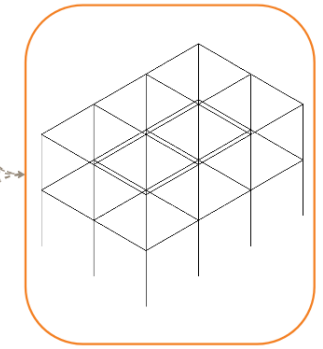
NEW & RECLAIMED STEEL (kg of CO2)



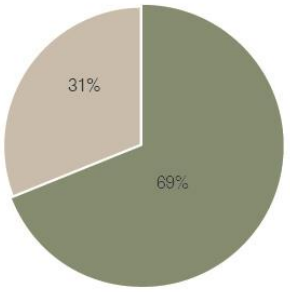
Production Emissions (6.964 kg of CO2)
Repair Emissions (196 kg of CO2)

DESIGN OPTION 2

(x) direction	3.2m
(y) direction	3.6m
(z) direction	3.2m
grid in (x) direction	2
grid in (y) direction	3
grid in (z) direction	2

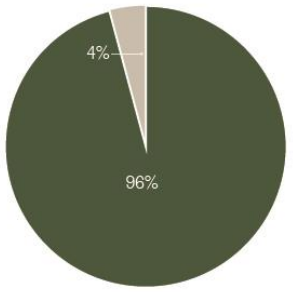


MATCH RESULTS

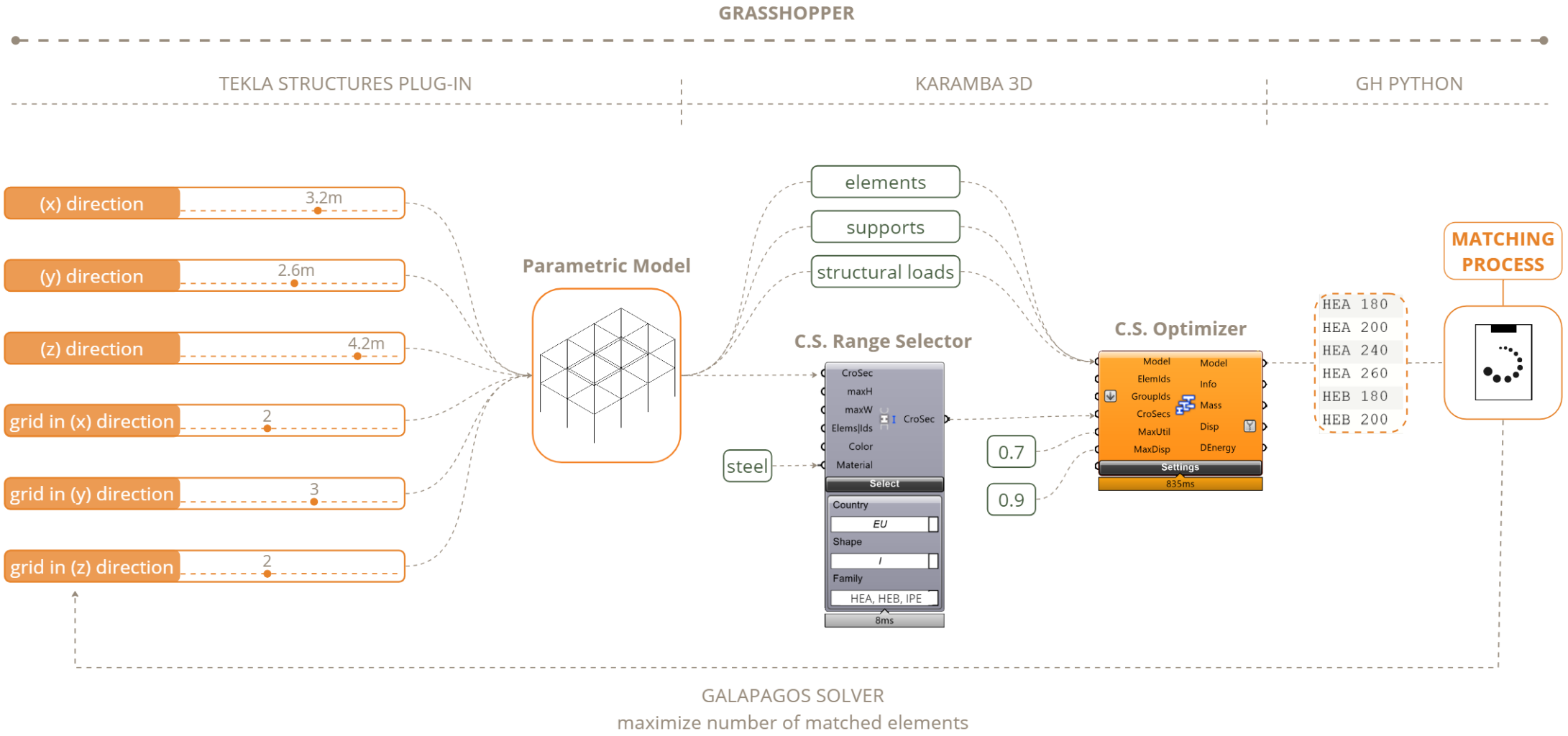


Reclaimed Steel Elements (40)
New Steel Elements (18)

NEW & RECLAIMED STEEL (kg of CO2)



Production Emissions (4.757 kg of CO2)
Repair Emissions (203 kg of CO2)


GRASSHOPPER
TEKLA STRUCTURES PLUG-IN
KARAMBA 3D
GH PYTHON
(x) direction
3.2m
(y) direction
2.6m
(z) direction
4.2m
grid in (x) direction
2
grid in (y) direction
3
grid in (z) direction
2
Parametric Model
elements
supports
structural loads
C.S. Range Selector
CroSec
maxH
maxW
Elems|Ids
Color
Material
steel
Select
Country
EU
Shape
I
Family
HEA, HEB, IPE
8ms
0.7
0.9
C.S. Optimizer
Model
ElemIds
GroupIds
CroSecs
MaxUtil
MaxDisp
Info
Mass
Disp
DEnergy
Settings
835ms
HEA 180
HEA 200
HEA 240
HEA 260
HEB 180
HEB 200
MATCHING PROCESS
GALAPAGOS SOLVER
maximize number of matched elements

CREATE NEW ACCOUNT

ENTER YOUR CREDENTIALS BELOW

NAME
Daniela Martinez

PROFESSION
Building Technologist

EMAIL ADDRESS
Daniela_martinez@example.com

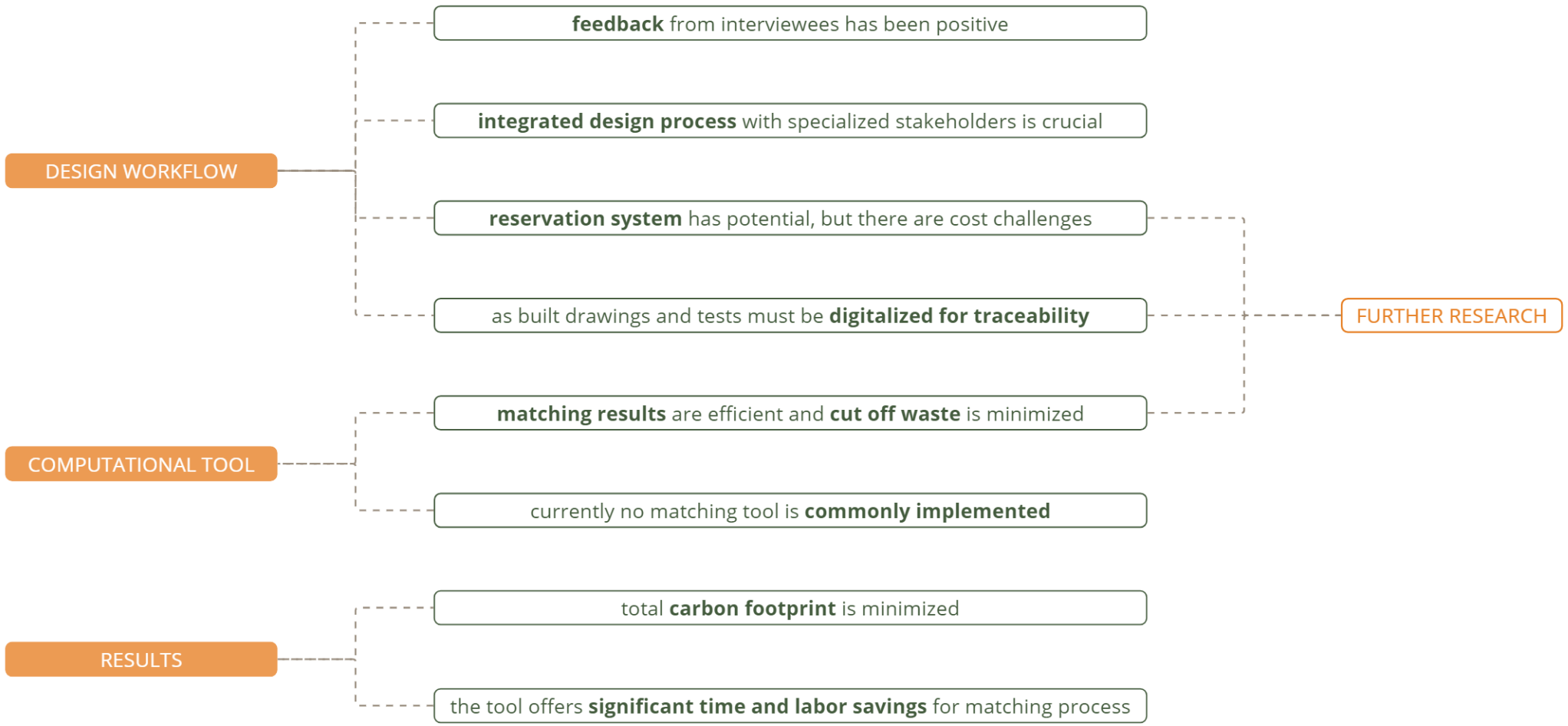
CREATE PASSWORD
****

CONFIRM PASSWORD
****

CREATE ACCOUNT

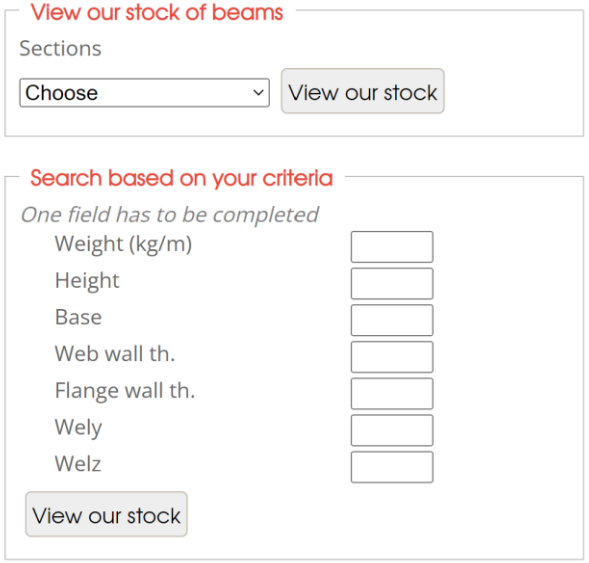
CONCLUSION

Conclusions

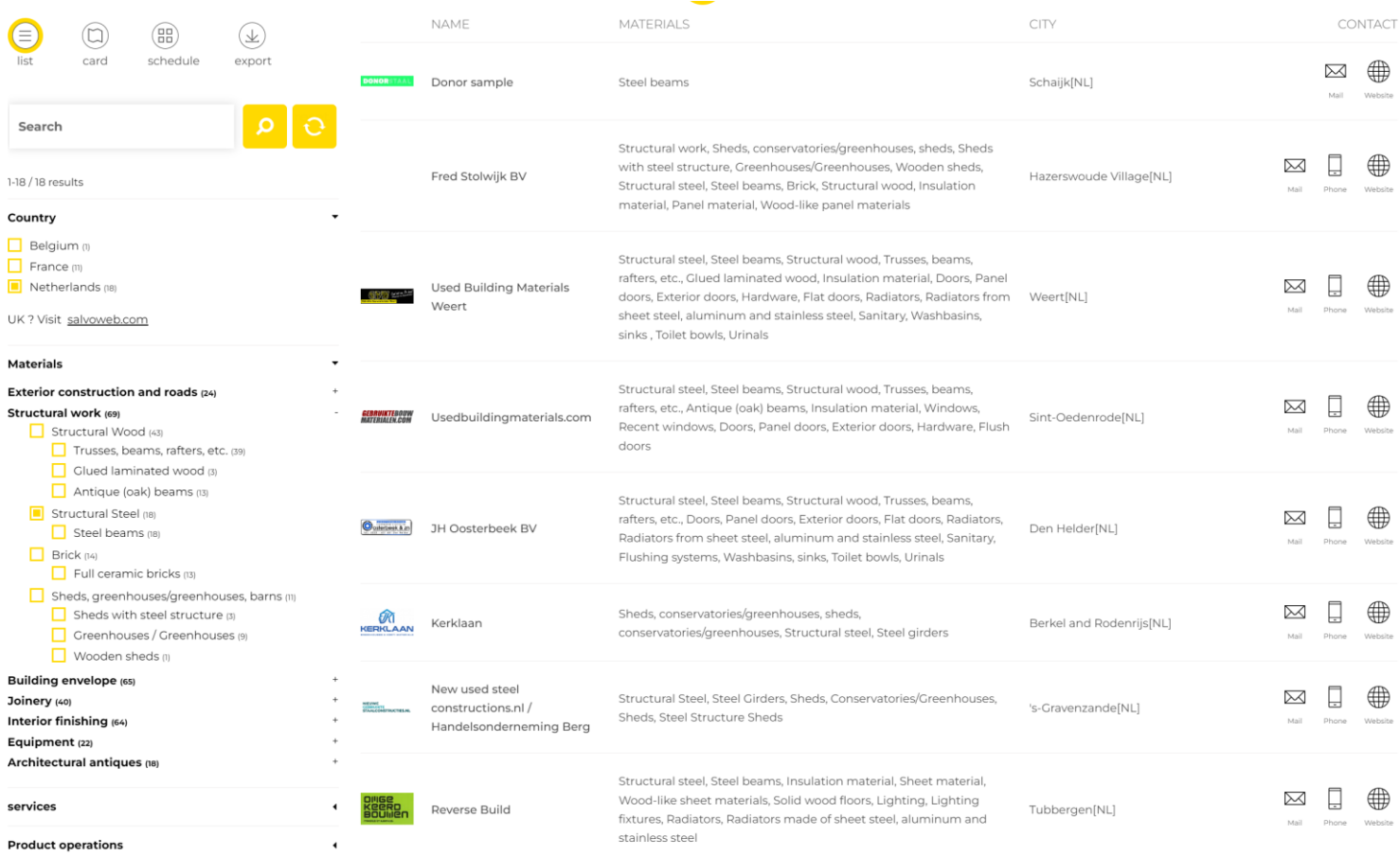


Current Search for Reclaimed Steel Elements

Stad (FR)



Opalis (NL)



Time and Labor Savings

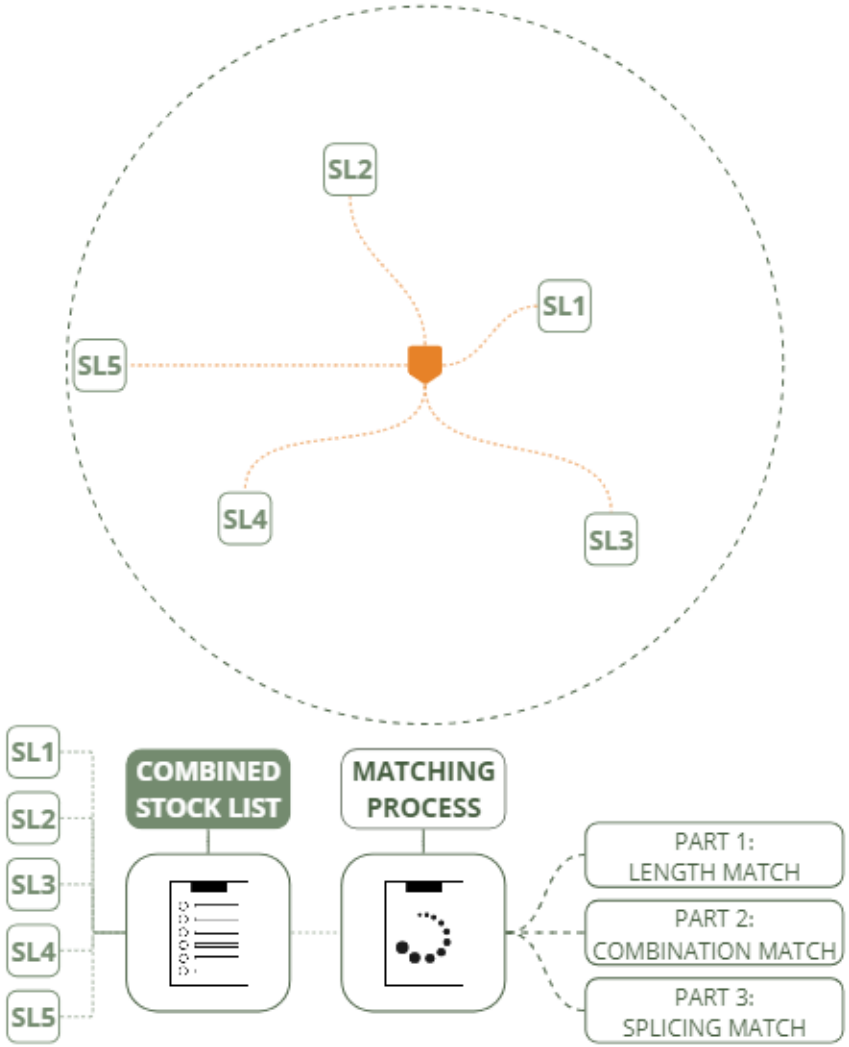
3 weeks

few hours

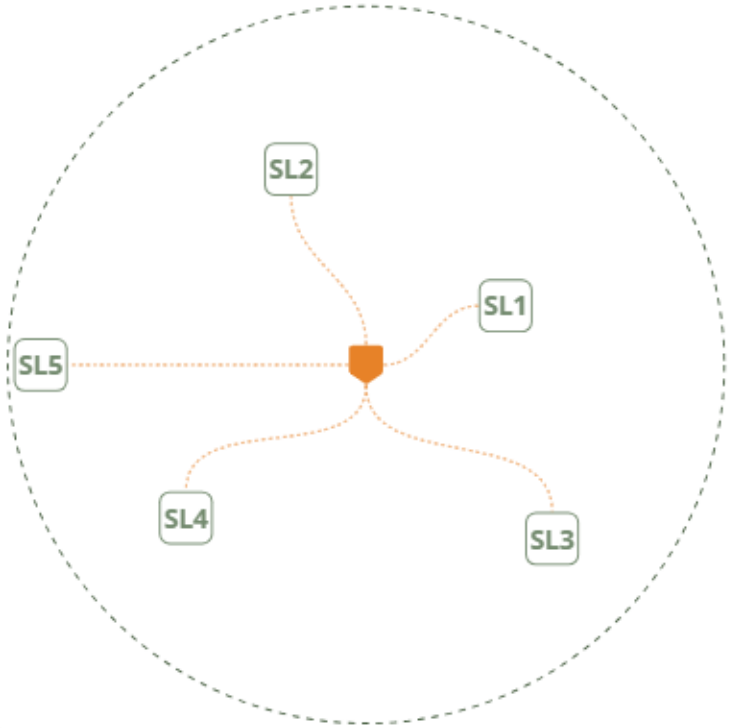
THANK YOU

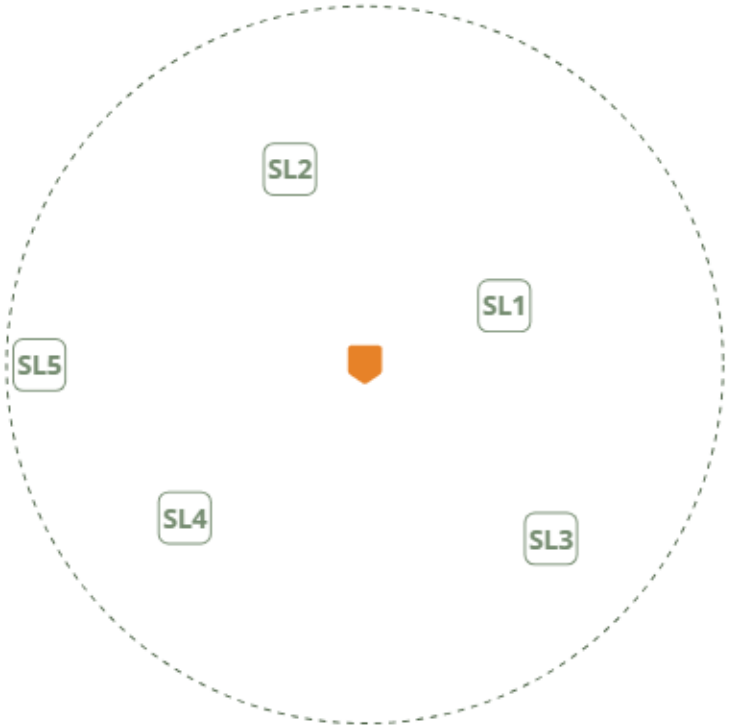
FURTHER DEVELOPMENTS

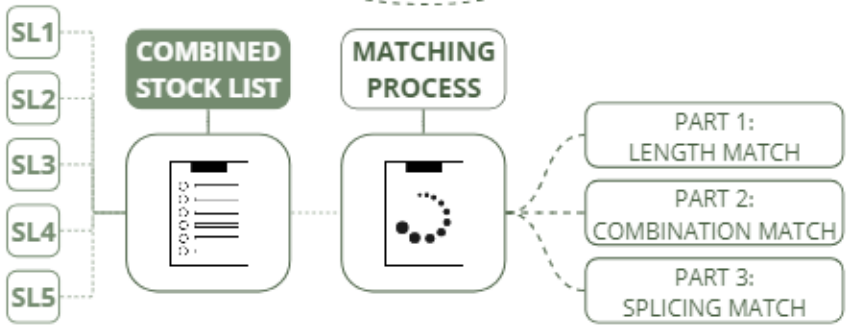
Further Development



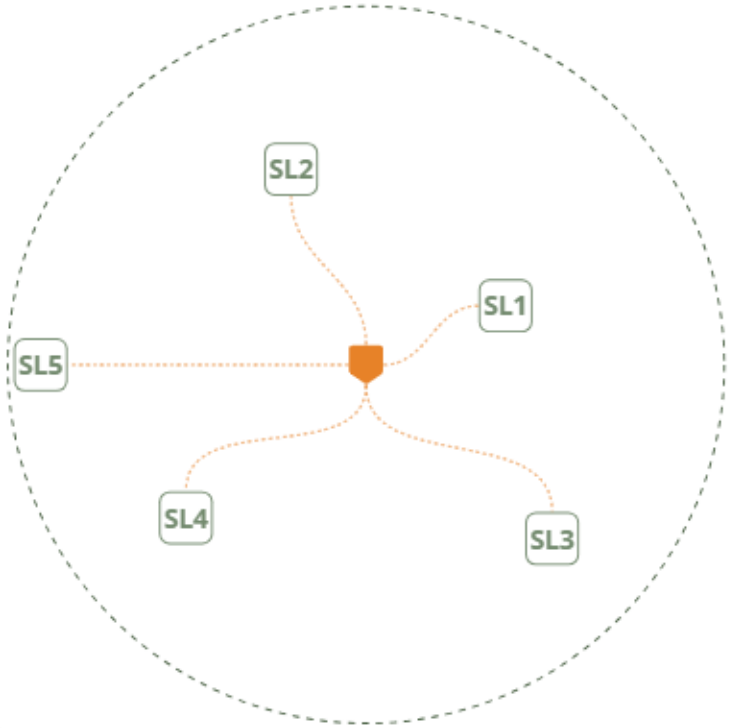
Further Development

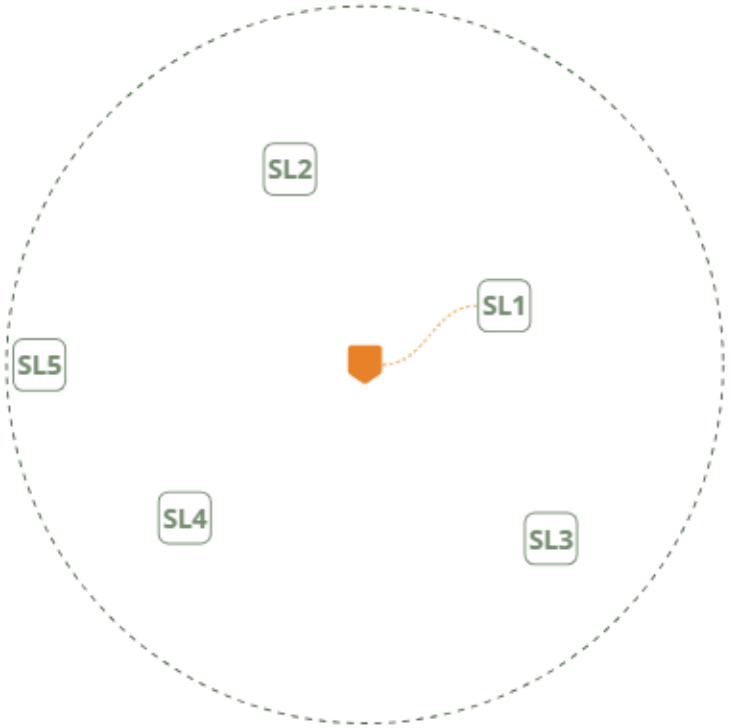


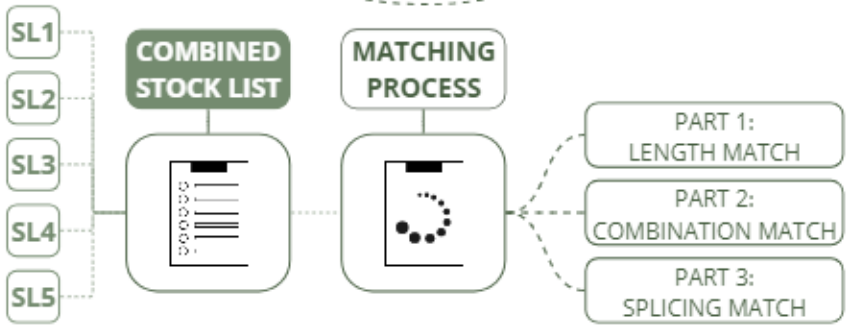




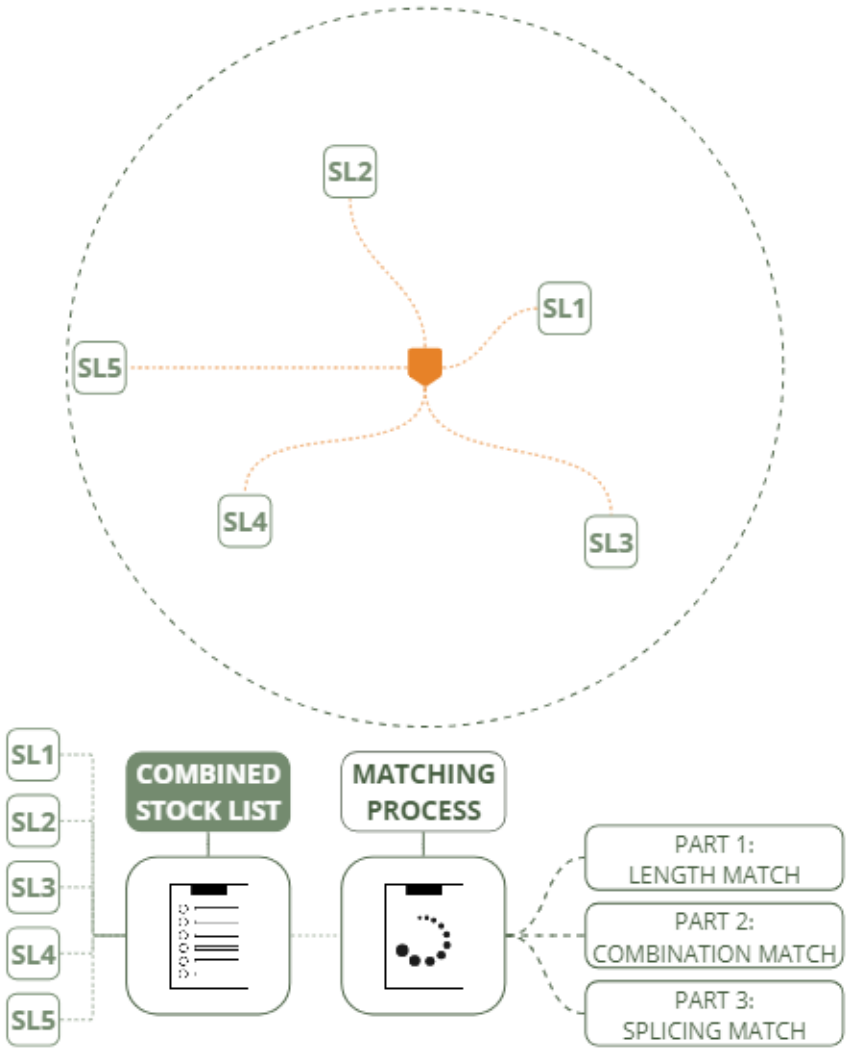
Further Development

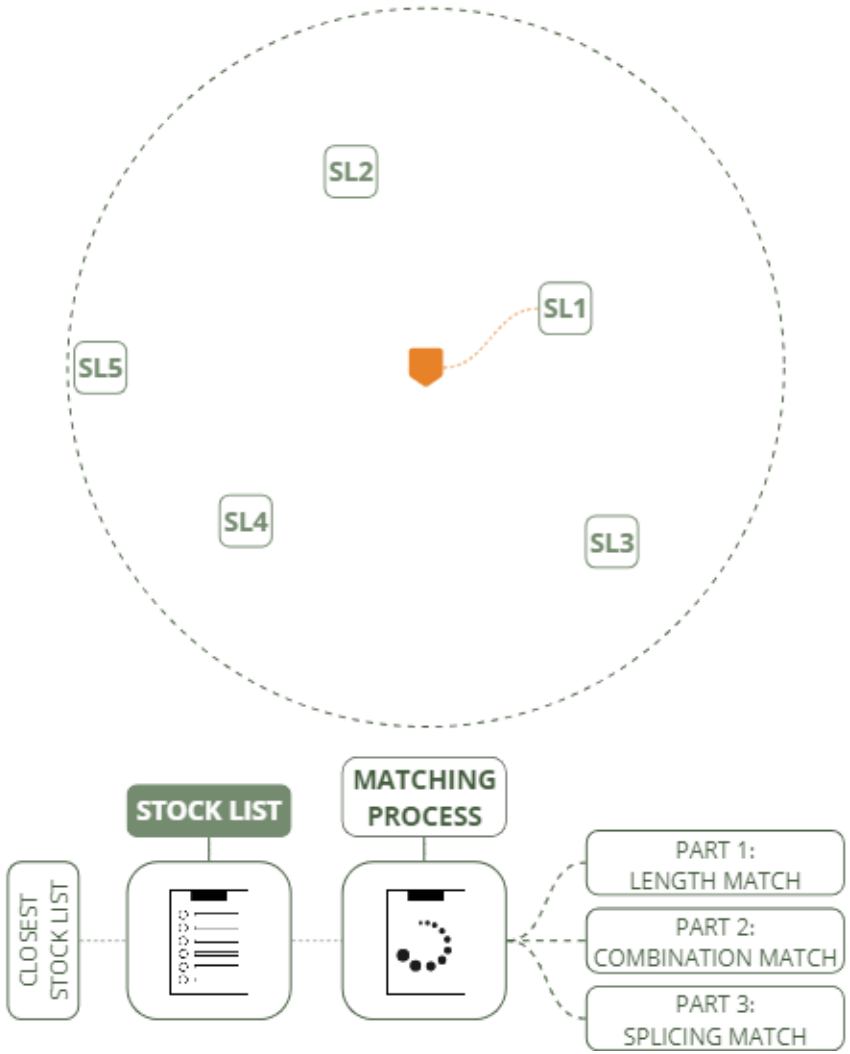




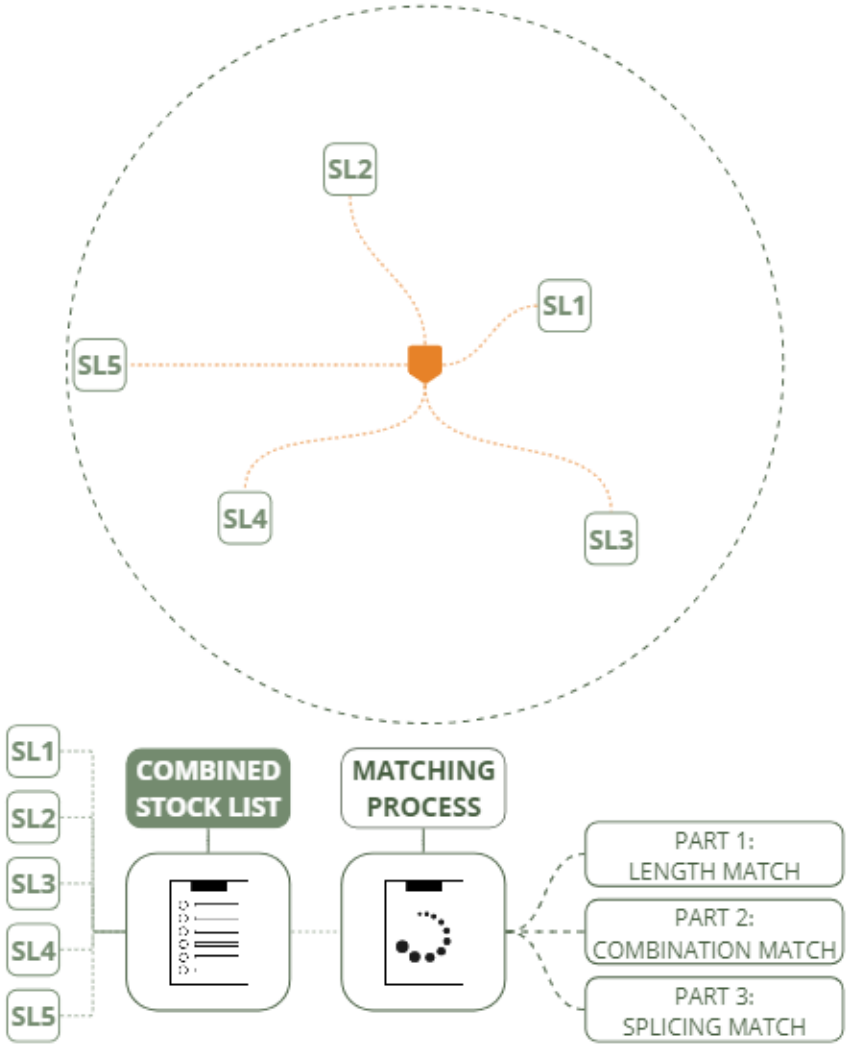


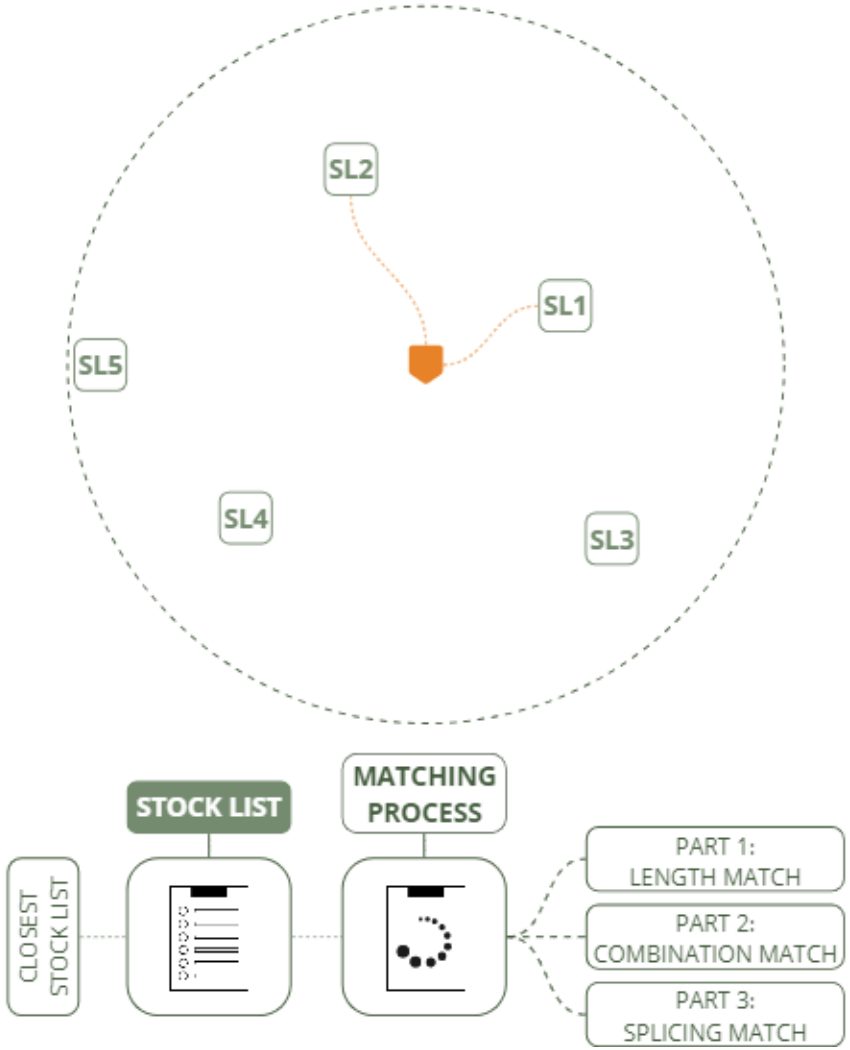
Further Development

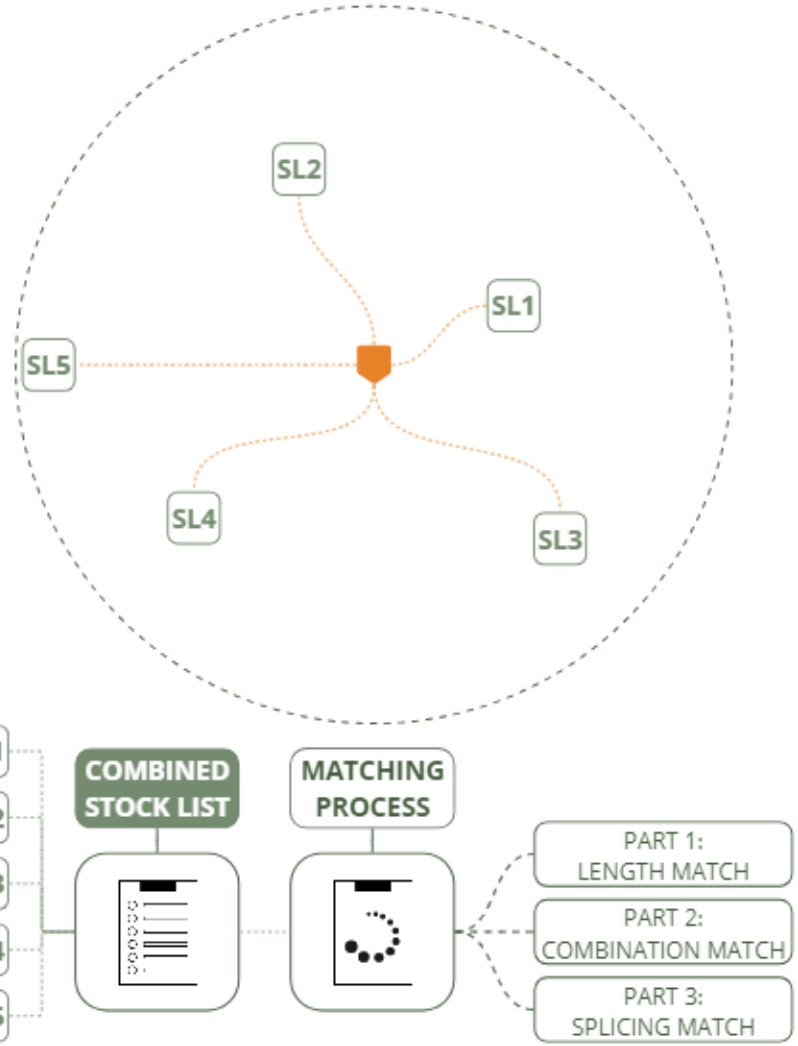


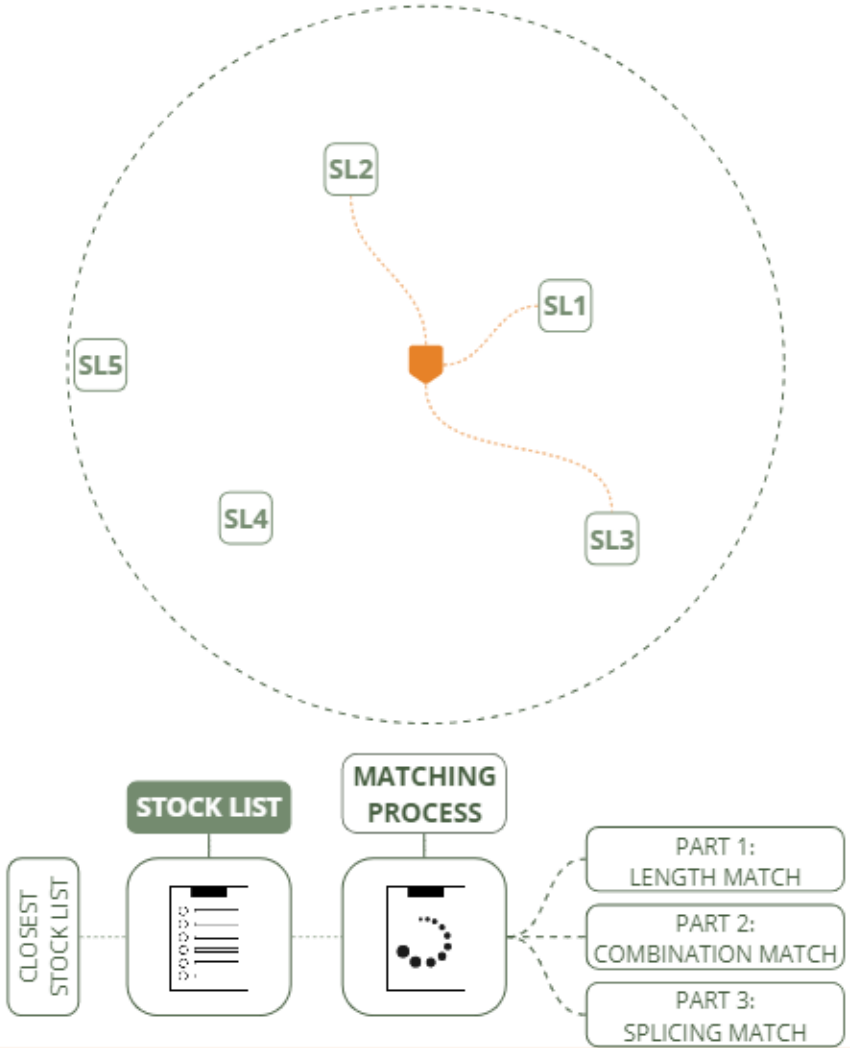


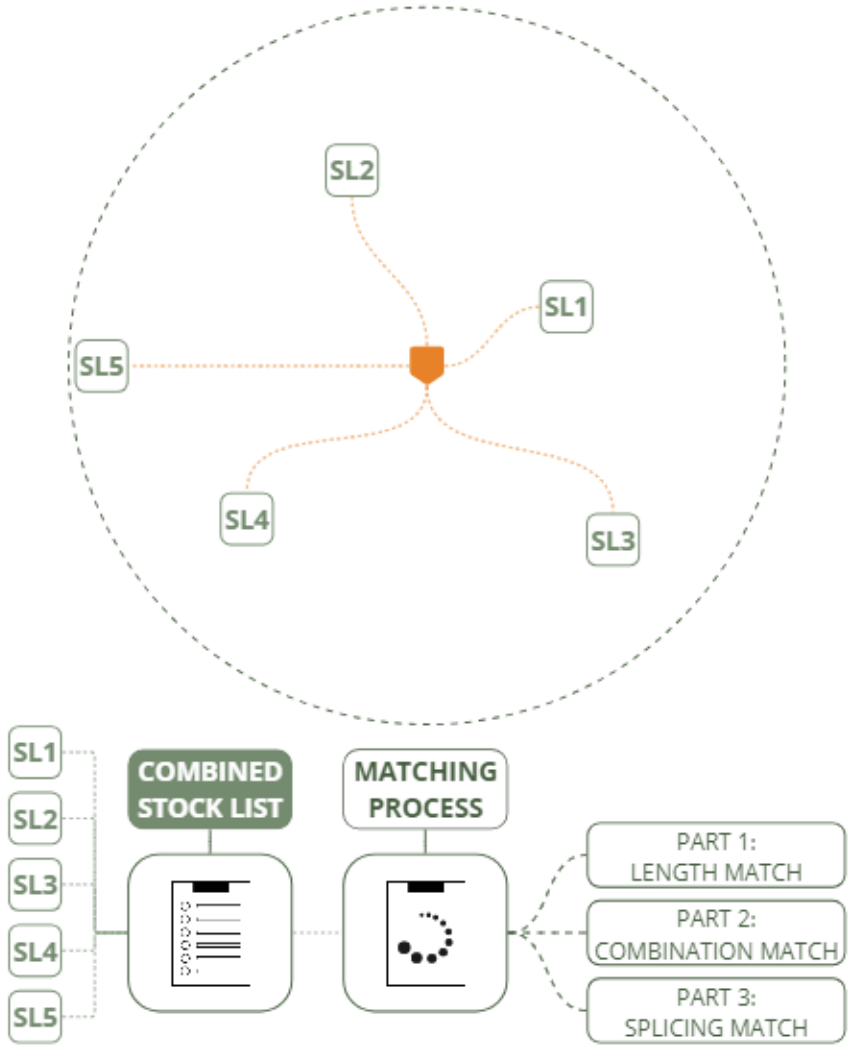
Further Development

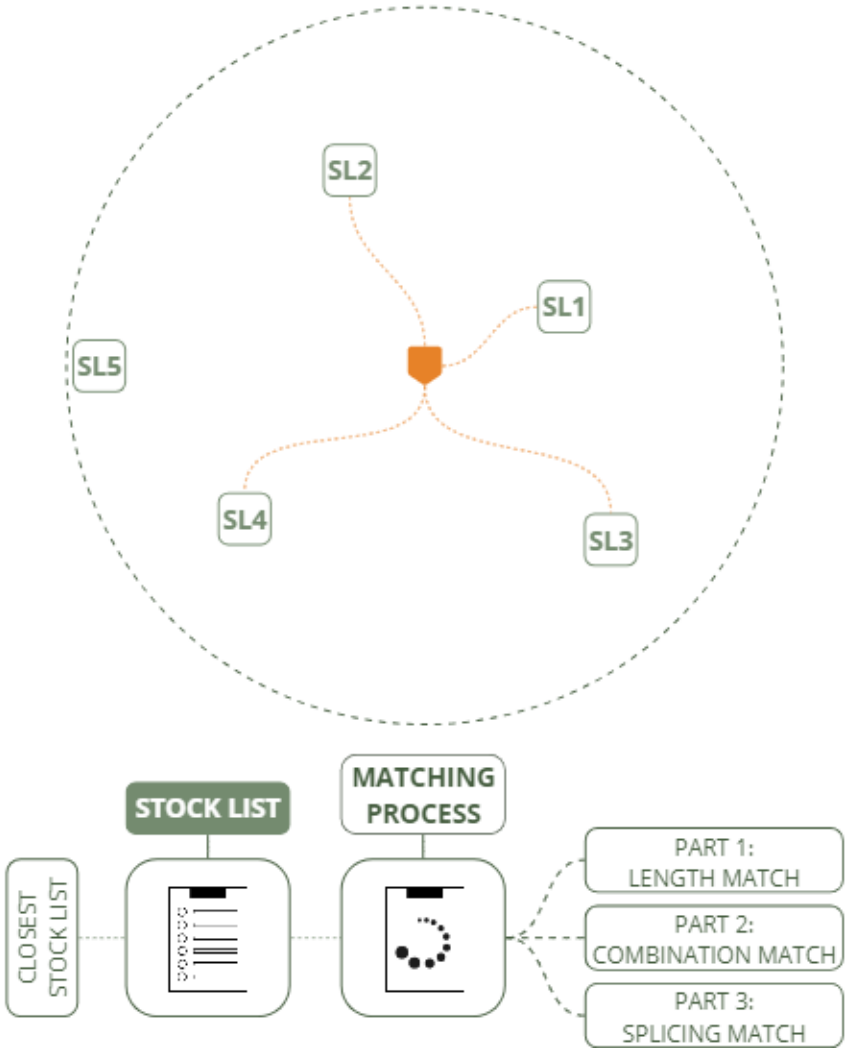




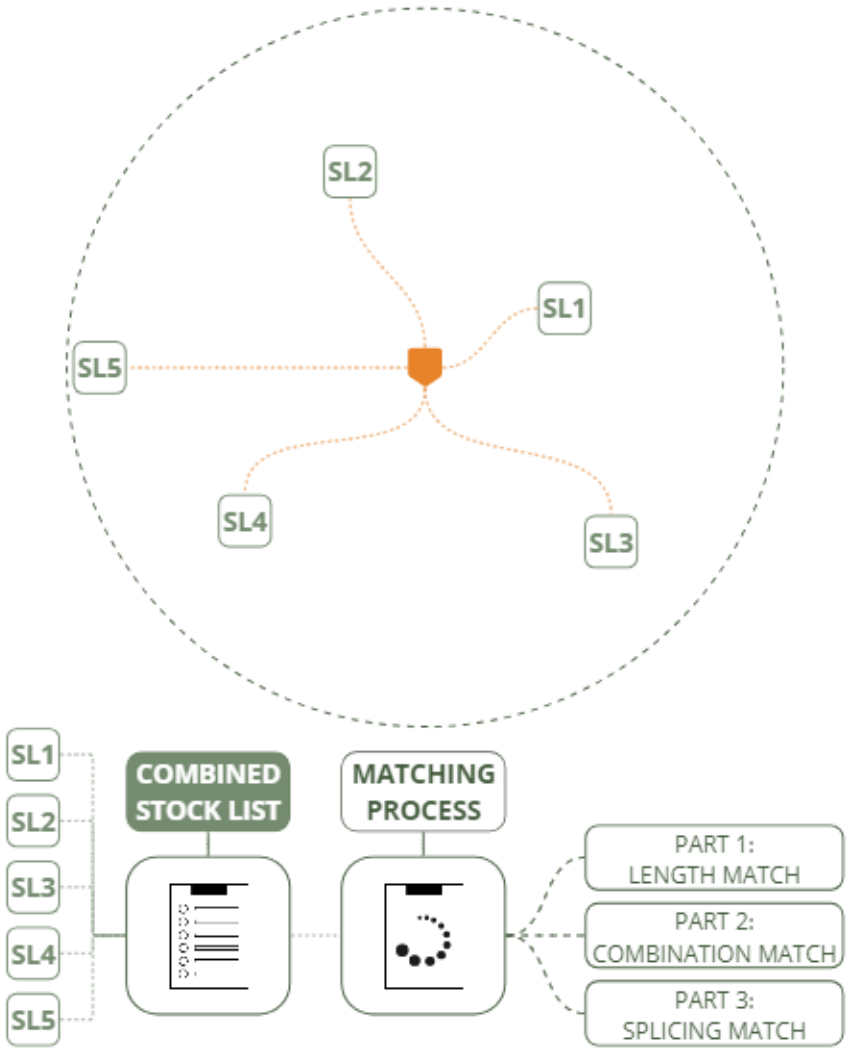

SL2
SL1
SL5
SL4
SL3
SL1
SL2
SL3
SL4
SL5
COMBINED STOCK LIST
MATCHING PROCESS
PART 1: LENGTH MATCH
PART 2: COMBINATION MATCH
PART 3: SPLICING MATCH

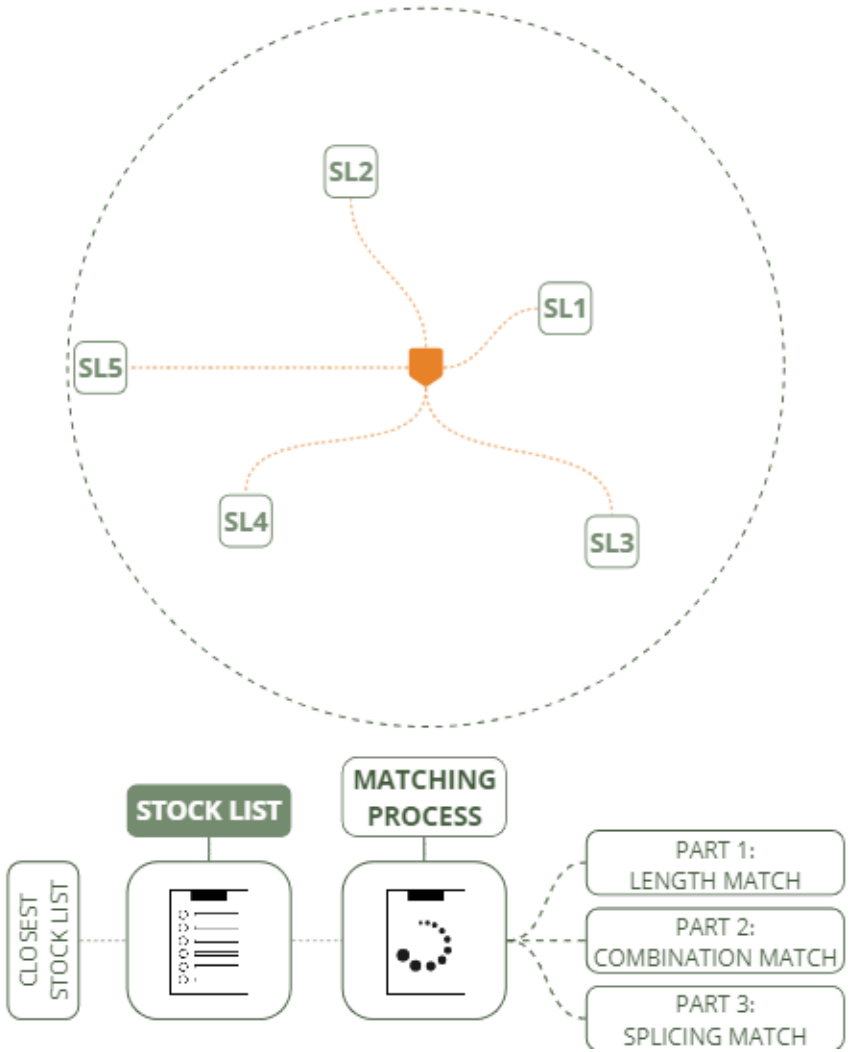

SL2
SL1
SL5
SL4
SL3
CLOSEST STOCK LIST
STOCK LIST
MATCHING PROCESS
PART 1: LENGTH MATCH
PART 2: COMBINATION MATCH
PART 3: SPLICING MATCH


SL2
SL1
SL5
SL4
SL3
SL1
SL2
SL3
SL4
SL5
COMBINED STOCK LIST
MATCHING PROCESS
PART 1: LENGTH MATCH
PART 2: COMBINATION MATCH
PART 3: SPLICING MATCH

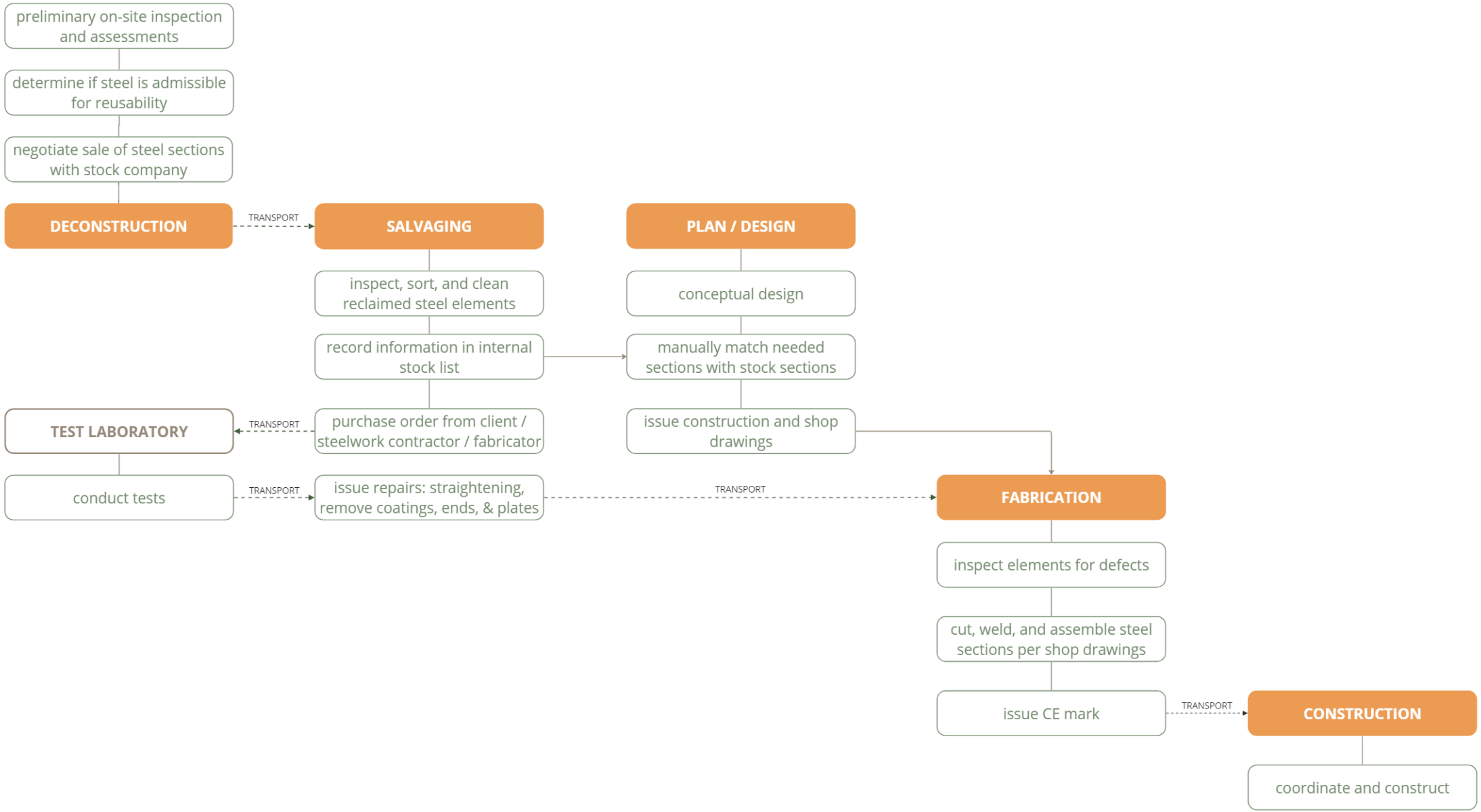

SL2
SL1
SL5
SL4
SL3
CLOSEST STOCK LIST
STOCK LIST
MATCHING PROCESS
PART 1: LENGTH MATCH
PART 2: COMBINATION MATCH
PART 3: SPLICING MATCH

Further Development

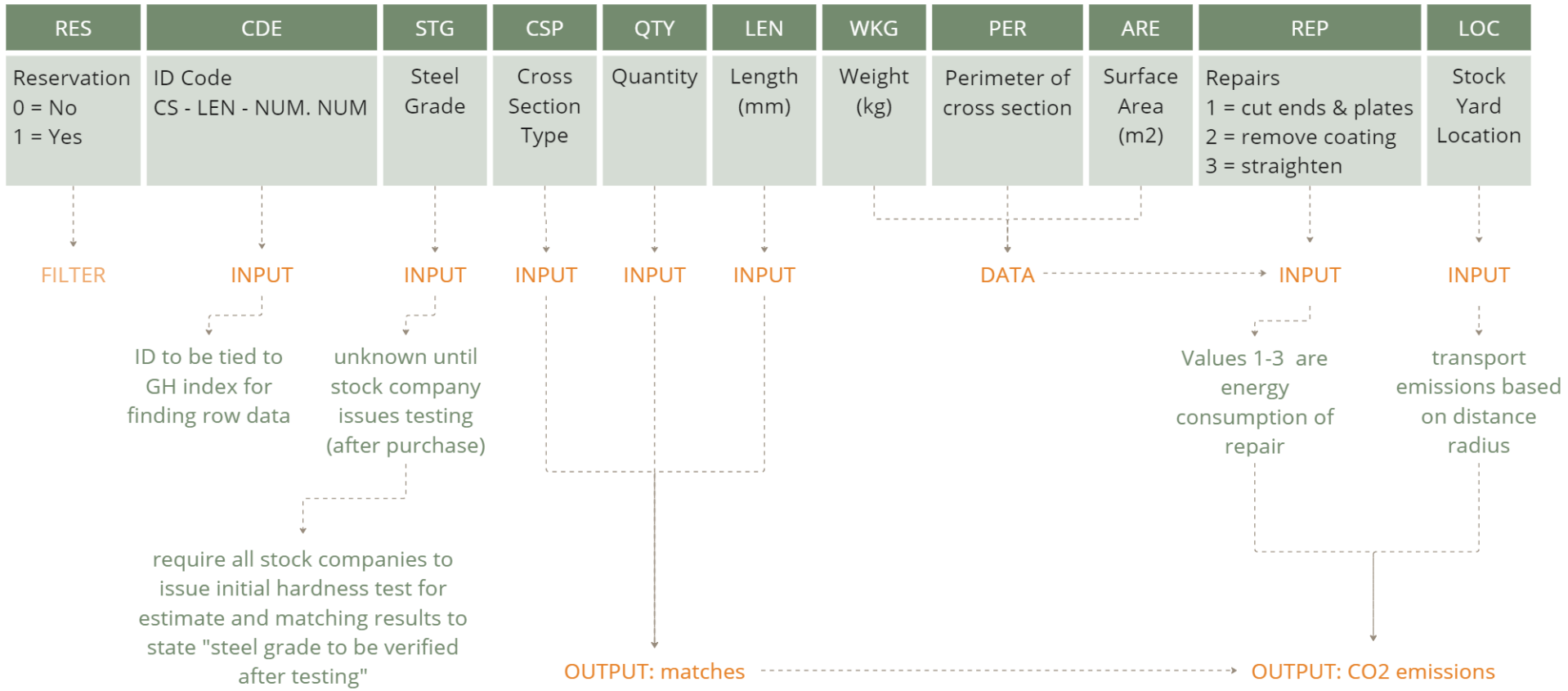




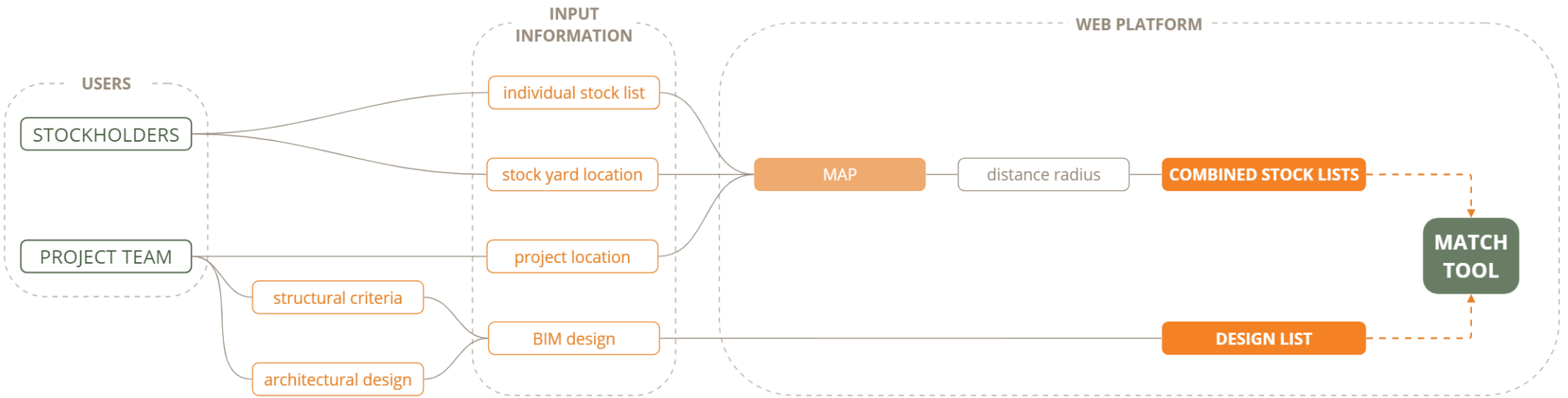
Annex: Current Workflow Process



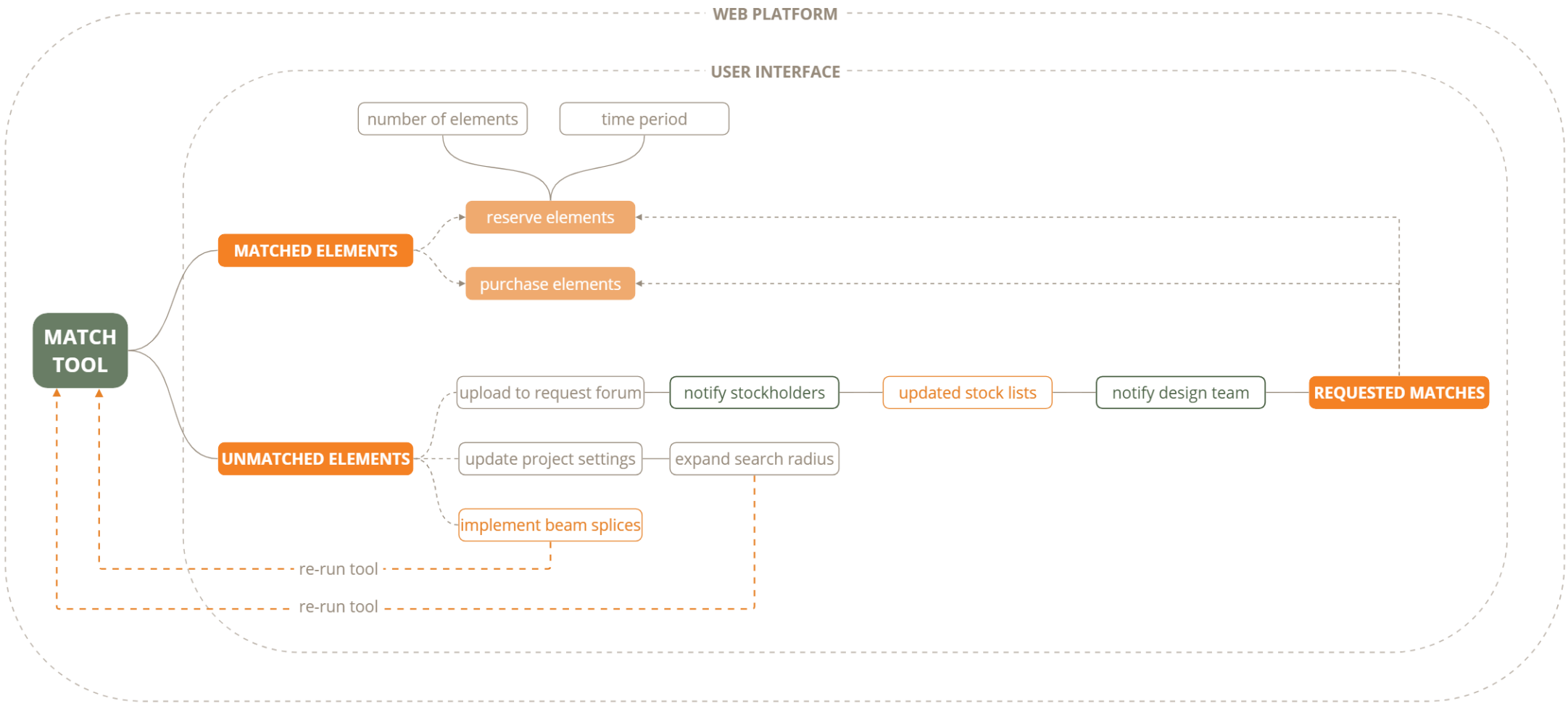
Annex: Stock List Template



Annex: User Interface Workflow – Pre Matching Tool



Annex: User Interface Workflow – Post Matching Tool



USER PROFILE - MATERIAL PROVIDERS

Project Team

- Contact information
- Website link

Stockholders

- Contact information
- Website link

Information

- Reuse Guidelines
- Regulations
- News

About

- About
- Contact
- FAQ

Stock Overview

- Stock list set up
- Uploads & updates

Orders

- Review reservations / purchases
- Track order progress

Map

- Project & Stock locations
- Search feature

Request Forum

- View request demands
- Question forum

Reclaimed Marketplace

- View available sales – for purchase or assist in coordination for deconstruction
- Steel market

Settings

- Account information
- Edit information

USER PROFILE - MATERIAL SEEKERS

Project Team

Stockholders

Information

About

Project Overview

- Project set up
- Project dashboard

- Contact information
- Website link

- Contact information
- Website link

- Reuse Guidelines
- Regulations
- News

- About
- Contact
- FAQ

Orders

- Review reservations / purchases
- Track order progress

Map

- Project & Stock locations
- Search feature

Request Forum

- Request product
- Question forum

Reclaimed Marketplace

- Post sales
- Steel market

Settings

- Account information
- Edit information

Matching Tool Workflow