

Selection of raw material for a demanding wooden façade and the quality control of timber from harvesting to construction site

Introduction

- How wood material properties develop in respect to growth site specific variables?
- What are the possibilities of optimizing raw material selection for timber façades?
- How is the high quality retained throughout the production process – from production to installation?

Background of study

- Largest timber cladding project in Finland: Central Library of Helsinki
 - Problem: Straining factors in claddings are well studied; timber selection and properties against strains not precisely known
 - Development for quality control process for high quality timber claddings was required

Raw material selection

- Timing the felling season provides only limited benefit
- Optimal growing rate multivariable problem:
 - Too narrow year growths causes high cracking tendency
 - Too wide year growths indicate more knots and grain direction distortions
 - Semi-wide year growths decrease cracking tendency: suggestion 1,5 – 5mm

Timber production

- Drying procedure is crucial for quality formation
- Radial sawing is an effective method to promote the quality of cladding timber (see Figure 1)

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Quality control

- Quality control process was developed (Figure 2 and Table 1)
- Moisture management in the supply chain is crucial, especially in on-site operations

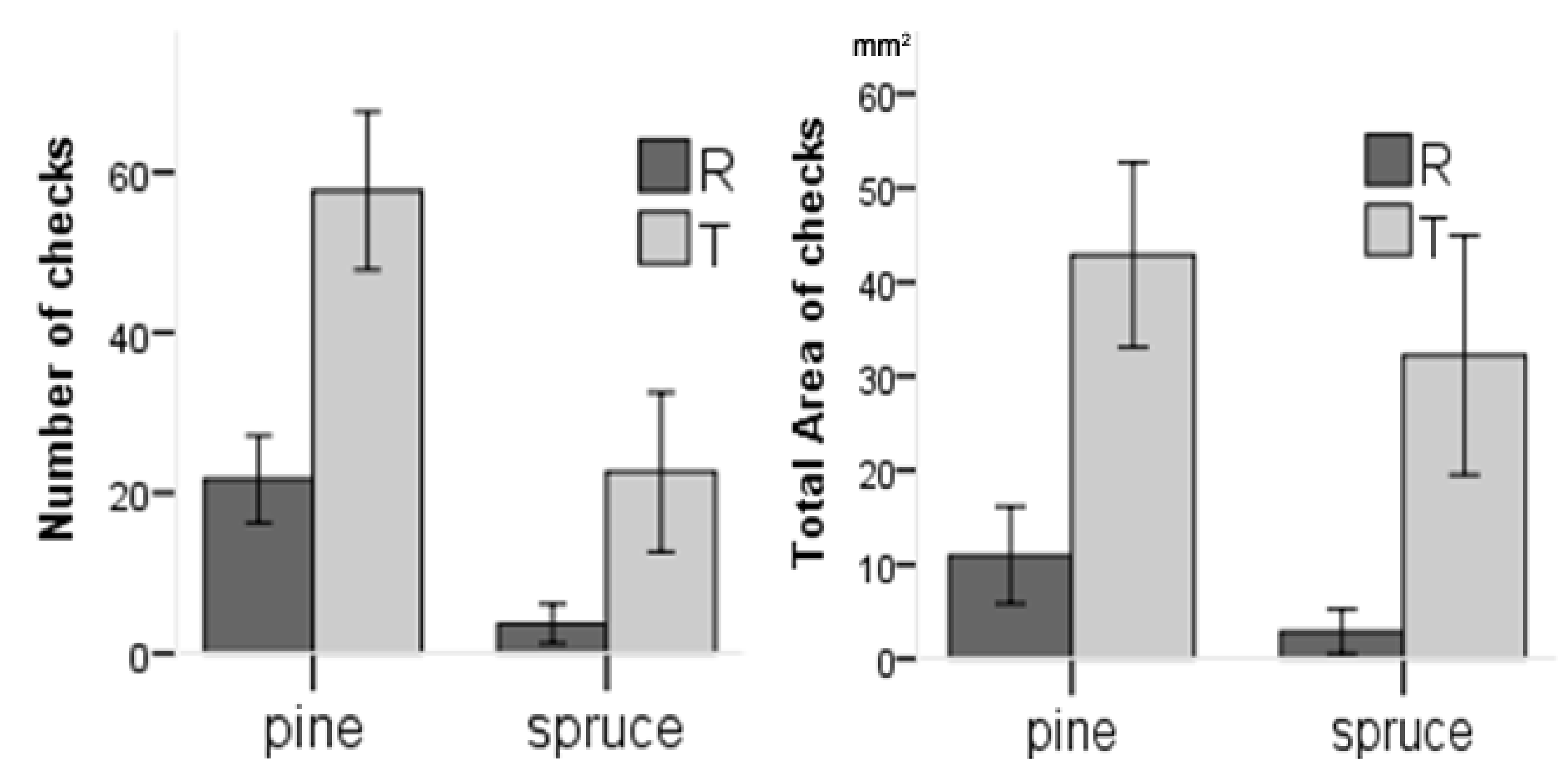


Figure 1. Checking performance of radially (R) and tangentially (T) sawn Scots pine and Norway spruce wood. (Venäläinen et al. 2016)

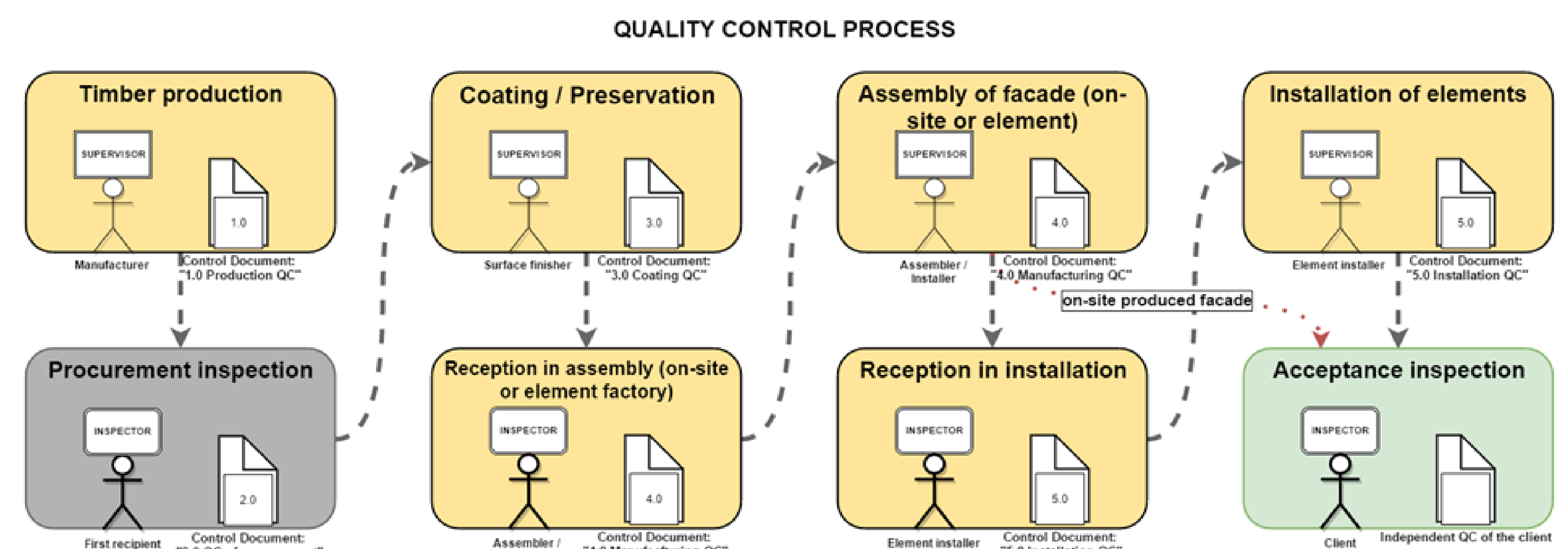


Figure 2. A schematic overview of the quality control process for manufacturing a timber façade.

Table 1. An example of quality controlled parameters in façade manufacturing process.

Phase	Control document	Inspector	Supervisor	Control parameters
Timber production	1.0 "Production quality control (QC)"		Manufacturer	Drying, sorting, moisture control, packing and storing
Timber procurement	2.0 "QC of procurement"	Recipient		Packaging and storing, handling defects, timber species, quality class, drying result, moisture control, gluing, annual ring width and angle, profile, finger joints, dimensions, knots, cracks and checks, deformations
Coating / preservation	3.0 "Coating QC"		Surface finisher	Coating/preservation procedure, color and tone, fire retardant application, thickness and penetration of coating, chemical compatibility, coating of cut surfaces, stabilization, moisture control, packing and storing
Assembly of façade (on-site or element)	4.0 "Manufacturing QC"	Assembler / Installer		Packaging and storing, handling defects, moisture control, coating/preservation, color and tone, fire retardant, chemical compatibility, stabilization
			Assembler / Installer	Type of connectors, fastening, edge and fastener distances, fastener induced cracks, fastener groups and rows, mounting, board extensions, accessories, tolerances, lifting hooks and spots, moisture control, packing and storing
Installation of element	5.0 "Installation QC"	Element installer		Packaging and storing, handling defects, moisture control, correspondence to design documents
			Element installer	Type of connectors, fastening, edge and fastener distances, fastener groups and rows, mounting, seams, footing height, accessories, tolerances, color and tone, installation defects
Acceptance inspection	Independent QC of the client	Client		Installation, coating, defects