

## QC/QA for Mass Timber Construction

This technical note for Quality Control and Quality Assurance for mass timber construction provides the minimum requirements for quality control and quality assurance for design and engineering, material manufacturing, and installation of mass timber in buildings and other structures.

### Design and Engineering

Nordic Structures aims to apply best practices in quality control and assurance in design. Internal practices include, but are not limited to:

- Training and well-developed communication channels
- Documentation of quality processes and procedures (« internal standard »)
- Use of checklists, varying according to the type of project / contract
- Systematic internal peer review, and conceptual-design review as required
- Internal technical committees (design and engineering)

### Nordic Lam+ Manufacturing

The principal responsibilities for assuring conformance to CSA O177, Qualification Code for Manufacturers of Structural Glued-Laminated Timber, are placed on the manufacturer's continuing quality control of the production operations and periodic audit thereof by an accredited inspection agency, APA.

At a minimum, the quality control system includes:

- Plant and process qualification
- Adhesive lot testing
- Daily quality control, consisting of:
  - o A continuous detailed check of each step of the process at production checkpoints including in-line tests
  - o Physical tests of representative samples
  - o Visual inspection of finished production
- Regular audits by an accredited inspection agency
- Plant manuals
- Quality control records

Each new lot of adhesive previously qualified is tested for strength, wood failure, and durability prior to shipment of the members manufactured with this lot.

For visual characteristics of the product, refer to the technical guide (<https://www.nordic.ca/en/documentation/technical-documents/ns-gt5-ca>).

Daily testing requirements apply to each work shift or portion thereof. Daily quality control includes in-line assessments (such as evaluation of surfacing quality and tests of adhesive mix ratios), off-line tests of representative specimens (strength and durability of face joints, edge joints and end joints), and inspection of finished production.

### Nordic X-Lam Manufacturing

The purpose of quality assurance is to assure product quality by detecting changes in properties that may adversely affect the cross-laminated timber (CLT) performance. In all cases, the criteria to which the Nordic X-Lam products are tested are provided in the mill specification or equivalent document (however confidential).

The quality control requirements are listed in the ANSI/APA PRG 320 Standard (<https://www.apawood.org/ansi-apa-prg-320>), as summarized below:

- Plant and process qualification
- Adhesive lot testing
- Daily quality control, consisting of:
  - o Process Control
  - o End, Face, and Edge Joints in Laminations
  - o Finished Production Inspection
- Regular audits by an accredited inspection agency
- Plant manuals
- Quality control records

Each new lot of adhesive previously qualified is tested for strength, wood failure, and durability prior to shipment of the members manufactured with this lot.

For visual characteristics of the product, refer to the technical guide (<https://www.nordic.ca/en/documentation/technical-documents/ns-gt6-ca>).

Daily testing requirements apply to each work shift or portion thereof. Daily quality control includes in-line assessments (such as evaluation of surfacing quality and tests of adhesive mix ratios), off-line tests of representative specimens (strength and durability of face joints, and end joints), and inspection of finished production.

## **Steel Parts Manufacturing**

The quality control system includes, but is not limited to:

- Material
  - o Mill test certificate (MTC) records
- Machining
  - o Use of automated tools for preparation of cuts
  - o Identification of pieces (engraved)
- Welding
  - o Fabricator for welded steel connections certified to CSA W47.1, Division 2
  - o Welded connections conforming to specification CSA W59 (Note 1)
- Painting
  - o Prime coated with paint to specification CISC/CPMA 2-75.
  - o Visual inspection

Note 1: The Canadian certification is equivalent and in some cases more stringent than the American certification (AWS D1.1).

## **Machining**

Nordic mass timber products are fabricated using advanced 3D modeling software. Data is transferred directly to our computer numerical control (CNC) machines, allowing precise fabrication processes. One-piece shop drawings are used periodically for quality assurance.

Achieving quality control in CNC manufacturing also includes among others ensuring that the equipment can accurately make the products, is regularly calibrated and follows the maintenance protocol, conduct inspections by the staff, and adequately train the operators.

## **Installation**

Installation drawings are submitted for approval prior to the installation of the wood structure. Also, the following documents, as applicable, are available for review prior to installation of the wood structure: manufacturer's installation instructions and product data sheets, catalogues, independent evaluation reports, and any other relevant documents.

Nonconforming material and workmanship are brought to the immediate attention of the project team and Nordic Structures. Nonconforming material or workmanship are brought into conformance, or made suitable for its intended purpose as determined by the designer.