## **Specification Guide**

*Ref.: National Master Specification (NMS), approved April 25, 2017*

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|  | Glued-laminated and cross-  laminated Construction | Section 06 18 00 |

*SPEC NOTE: This Section specifies the laminating stock, adhesive, fasteners, etc., for glued-laminated or cross-laminated structural units, including fabrication and erection.*

*SPEC NOTE: This Section includes general requirements and procedures for compliance with the Canada Green Building Council’s (CaGBC) LEEDv4 prerequisites or credits required for LEED Project certification. Coordinate with Section 01 35 21 – LEED Requirements.*

1. **General**
   1. **RELATED REQUIREMENTS**

*SPEC NOTE: Edit the following paragraphs to list documents or Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. Do not include Division 00 or Division 01 Sections in this listing.*

1. [\_\_\_].
   1. **REFERENCE STANDARDS**

*SPEC NOTE: Edit the following paragraphs for this specific project.*

* + 1. American National Standards Institute (ANSI)
       1. ANSI/APA PRG 320-2017: Standard for Performance-Rated Cross-Laminated Timber.
    2. American Society of Mechanical Engineers (ASME)
       1. ASME B18.2.1-[2012] Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws.
    3. American Society for Testing and Materials International (ASTM)
       1. ASTM A36/A36M-[14], Standard Specification for Carbon Structural Steel.
       2. ASTM A47/A47M-[99 (2014)], Standard Specification for Ferritic Malleable Iron Castings.
       3. ASTM A123/A123M-[15], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
       4. ASTM A307-[14], Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
       5. ASTM A653/A653M-[15e1], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
    4. Canada Green Building Council (CaGBC)
       1. LEEDv4 Canada-BD+C [2013] (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package New Construction and Major Renovation.
    5. Canadian Standards Association (CSA) Group
       1. CSA B111-[1974 (R2003)], Wire Nails, Spikes and Staples.
       2. CSA G40.20-[13]/G40.21-[13], General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
       3. CSA O86 Consolidation-[14], Engineering Design in Wood.
       4. CSA O112.9-[10 (R2014)], Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
       5. CSA O112.10-[08 (R2013)], Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
       6. CAN/CSA-O122-[16], Structural Glued-Laminated Timber.
       7. CSA O177-[06 (R2015)], Qualification Code for Manufacturer’s of Structural Glued-Laminated Timber.
       8. CSA S16-[14], Design of Steel Structures.
       9. CSA W47.1-[09 (R2014)], Certification of Companies for Fusion Welding of Steel Structures
    6. Forest Stewardship Council (FSC)
       1. FSC-STD-01-001-V52-2-[2015], FSC Principles and Criteria for Forest Stewardship.
    7. Green Seal Environmental Standards (GS)
       1. GS-11-[11], Paints and Coatings.
    8. Society of Automotive Engineers International (SAE)
       1. SAE Handbook [2009].
    9. South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
       1. SCAQMD Rule 1113-[A2016], Architectural Coatings.
       2. SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.
    10. The Master Painters Institute (MPI)
        1. Architectural Painting Specification Manual – [current edition].

* 1. **ADMINISTRATIVE REQUIREMENTS**
     1. Pre-Installation Meetings:
        1. Convene pre-installation meeting [1] week prior to beginning [work of this Section] [on-site installation], with [Consultant] [DCC Representative] [Contractor's Representative] [Departmental Representative] in accordance with Section [01 31 19 - Project Meetings] to:
           1. Verify project requirements.
           2. Review installation and substrate conditions.
           3. Co-ordination with other building subtrades.
           4. Review [manufacturer's] written installation instructions and warranty requirements.
     2. Hold project meetings every [week] [month].
     3. Ensure [site supervisor] [key personnel] [project manager] [subcontractor representatives] attend.
     4. [Consultant] [Departmental Representative] [DCC Representative] will provide [verbal] [written] notification of change to meeting schedule established upon contract award [24] hours prior to scheduled meeting.

*SPEC NOTE: Use the following paragraph when manufacturer's services are specified during construction operations to verify the installation and application, and co-ordinate with PART 3 - FIELD QUALITY CONTROL as specified below or co-ordinate with appropriate NMS Section used in project. If no field inspections are required, delete the following paragraph.*

* + 1. Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work.
  1. **ACTION AND INFORMATION SUBMITTALS**
     1. Submit in accordance with Section [01 33 00 – Submittal Procedures].

*SPEC NOTE: Include requests for relevant data to be furnished by the Contractor, before, during or after construction.*

* + 1. Product Data:
       1. Submit manufacturer’s instructions, printed product literature and data sheets for [glued-laminated construction] [and] [cross-laminated construction] and include product characteristics, performance criteria, physical size, finish and limitations.
       2. Submit WHMIS SDS in accordance with Section [01 35 43 – Environmental Procedures] [01 35 29.06 – Health and Safety Requirements].
       3. Shop Drawings:
          1. Submit drawings stamped and signed by professional engineer registered or licensed in [Province] [Territory], Canada.
          2. Submit erection drawings in accordance with [CSA O86] [CSA S16].
          3. Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
       4. Samples:
          1. Submit for review and acceptance of each [finish].
          2. Samples returned for inclusion into work.
          3. Submit [2] samples of connector plates.
       5. Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
          1. Submit the product report published by a certification agency accredited by the Standards Council of Canada at completion of fabrication.
       6. Test and Evaluation Reports: submit certified test reports for [\_\_\_] from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
       7. Manufacturer’s Instructions: submit manufacturer’s installation instructions and special handling criteria, installation sequence, cleaning procedures.
       8. Manufacturer’s Reports:
          1. Manufacturer’s Field Reports: submit manufacturer’s written reports within [3] days of review, verifying compliance of Work, as described in Part 3 – FIELD QUALITY CONTROL.

*SPEC NOTE: Coordinate the following paragraph with Section 01 35 21 – LEED Requirements.*

* + - 1. Sustainable Design Submittals:
         1. LEED Canada Submittals: in accordance with [Section 01 35 21 – LEED Requirements].

*SPEC NOTE: Coordinate the following paragraph with Section 01 35 21 – LEED Requirements.*

* + - * 1. Construction Waste Management:

Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.

Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating [50] [75] % of construction wastes recycled or salvaged.

* + - * 1. Recycled Content:

Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of [post-consumer] [post-industrial] content, and total cost of materials for project.

* + - * 1. Regional Materials: submit evidence project incorporates required percentage [10] [20] % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

*SPEC NOTE: Coordinate the following paragraph with Section 01 35 21 – LEED Requirements.*

* + - * 1. Wood Certification: submit [vendor’s] [manufacturer’s] Chain-of-Custody Certificate number for FSC certified wood.
        2. Low-Emitting Materials:

Submit listing of [paints and coatings] [adhesives and sealants] used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

Submit listing of [laminate adhesives used in building, stating they contain no urea-formaldehyde] [glued-laminated and/or cross-laminated products used in building, stating that they contain no added urea-formaldehyde resins]

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* 1. **QUALITY ASSURANCE**
     1. Qualifications :
        1. Manufacture structural [glued-laminated] [and] [cross-laminated] members in plant certified as meeting requirements by a certification agency accredited by the Standards Council of Canada.
     2. Submit the product report published by a certification agency accredited by the Standards Council of Canada at completion of fabrication.
     3. Fabricator for welded steel connections certified to CSA W47.1.
     4. Place on [glued-laminated] [and] [cross-laminated] members the product report number published by a certification agency accredited by the Standards Council of Canada, indicating manufactured in certified plant.
     5. Certification of material protective sealer.
  2. **DELIVERY, STORAGE AND HANDLING**

1. Deliver, store and handle materials in accordance with Section [01 61 00 – Common Product Requirements] and with manufacturer’s written instructions.
2. Delivery and Acceptance Requirements:
   1. Deliver materials to site in original factory packaging, labelled with manufacturer’s name and address.
   2. Apply protective sealer to [glued-laminated] [and] [cross-laminated] units before shipping unless specified otherwise.
   3. Wrap architectural classification grade members prior to leaving plant with a moisture resistant wrapping.
   4. Use padded, non-marring slings for handling [glued-laminated] [and] [cross-laminated] members.
   5. Protect corners with wood blocking.
   6. Make adequate provision for delivery and handling stresses.
3. Storage and Handling Requirements:
   1. Store materials [indoors] [off ground] [in dry location] and in accordance with manufacturer’s recommendations in clean, dry, well-ventilated area.
   2. Slit underside of membrane covering during storage at site without defacing member.
   3. Store [glued-laminated] [and] [cross-laminated] units and protect from weather, block off ground and separate with stripping, so air may circulate around faces of members.
   4. Cover [glued-laminated] [and] [cross-laminated] units with opaque moisture resistant membrane if stored outside.
   5. Store and protect [glued-laminated] [and] [cross-laminated] products from [nicks, scratches, and blemishes].
   6. Replace defective or damaged materials with new, unless written approval by the manufacturer.

*SPEC NOTE: Coordinate the following paragraph with Section 01 35 21 – LEED Requirements.*

1. Develop [Waste Reduction Workplan] [Construction Waste Management Plan] related to Work of this Section and in accordance with Section [01 35 21 – LEED Requirements].
2. Packaging Waste Management: remove for reuse [and return] [by manufacturer] of [pallets,] [packaging materials] [padding,] [crates,] as specified in [Waste Reduction Workplan] [Construction Waste Management Plan] in accordance with Section [01 35 21 – LEED Requirements] [01 74 21 – Construction/Demolition Waste Management and Disposal].
   1. Ensure preservative treated wood disposed of by means other than for recycling or reuse.
   2. Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by [Consultant] [DCC Representative] [Department Representative].
   3. Dispose of unused wood preservative material at official hazardous material collections site approved by [Consultant] [DCC Representative] [Department Representative].
   4. Divert unused wood materials from landfill to [recycling] [composting] [reuse] facility approved by [Consultant] [DCC Representative] [Department Representative].
3. **Products**
   1. **MATERIALS**
      1. Laminating stock:
         1. Glued-laminated: Spruce-Pine-Fir, to the product report published by a certification agency accredited by the Standards Council of Canada.
         2. Cross-laminated: Spruce-Pine-Fir, to the product report published by a certification agency accredited by the Standards Council of Canada.
         3. Materials and Resources Credit 5 – Regional Materials: [20%; 30%] extracted, harvested, recovered and processed regionally.
         4. FSC certified.
      2. Laminating Adhesive:
         1. To [CSA O112.9] [CSA O112.10], to grade of service required in accordance with CAN/CSA-O122.
         2. Urea-formaldehyde free.
         3. VOC limit: [50] [150] g/L maximum [to SCAQMD Rule 1168].
      3. Sealer for [glued-laminated] [and] [cross-laminated] members: penetrating type, clear, non-yellowing liquid.
         1. VOC limit: [550] [275] g/L maximum [to SCAQMD Rule 1113].
      4. Fastenings:
         1. Split ring connectors: hot rolled carbon steel, SAE 1010, in accordance with SAE Handbook.
         2. Shear plate connectors:
            1. Pressed steel type: hot rolled carbon steel, SAE 1010, in accordance with SAE Handbook.
            2. Malleable iron type: to ASTM A47/A47M, grade [350].
         3. Lag screws: to ASME B18.2.1.
         4. Bolts: to ASTM A307.
         5. Side plates: to [ASTM A36] [CSA G40.20/G40.21].
         6. Drift pins: to ASTM A307.
         7. Glued-laminated timber rivets: [hot dipped galvanized,] to [ASTM A36] [CSA G40.20/G40.21].
         8. Nails and spikes: to CSA B111.
         9. Wood screws: to ASME B18.2.1.

*SPEC NOTE: Delete the following paragraph if galvanized finish is specified.*

* + 1. Shop coat primer for steel connections: to MPI #18.

*SPEC NOTE: Delete is shop coat primer is specified. For conditions of severe exposure, increase zinc coating thickness.*

* + 1. Galvanizing: to ASTM A123/A123M, hot dipped, minimum zinc coating of [610] g/m2.

*SPEC NOTE: Seldom needed. Use only if required for high humidity atmosphere or ground contact.*

* + 1. Preservative: [\_\_\_].
       1. VOC limit: [550] [275] g/L maximum [to SCAQMD Rule 1113].
    2. Fire retardant: [\_\_\_].
       1. VOC limit: [550] [275] g/L maximum [to SCAQMD Rule 1113].
  1. **FABRICATION**
     1. Fabricate members to following classifications:
        1. Stress grade:
           1. Glued-laminated timber: [bending, compression and/or tension members 24F-ES/NPG (beams, columns, and ties)] [and] [20F-ES/CPG (decking)], to the product report published by a certification agency accredited by the Standards Council of Canada.
           2. Cross-laminated timber: bending, compression and/or tension members E1 (slabs and panels), to the product report published by a certification agency accredited by the Standards Council of Canada.

*SPEC NOTE: For interior areas having humidity causing equilibrium moisture content to exceed 15%, specify exterior service grade.*

* + - 1. Service grade:
         1. Glued-laminated timber: [Interior] [Exterior]
         2. Cross-laminated timber: Interior
      2. Appearance grade:
         1. Glued-laminated timber: Architectural
         2. Cross-laminated timber: [Industrial] [Architectural]
    1. Mark [glued-laminated] [and] [cross-laminated] members for identification during erection. Marks not visible in final assembly.
    2. Design connections to CSA O86, and CSA S16 unless specifically detailed, to resist shears, moments and forces indicated.
       1. Fabricate in accordance with CSA S16.

*SPEC NOTE: Galvanize hardware in exterior locations, highly humid interiors and areas where corrosive chemicals are stored. Galvanizing may also be advisable to minimize staining of wood during prolonged erection periods.*

* + 1. [Prime] [Galvanize] Paint] connections after fabrication.

*SPEC NOTE: Coordinate the following paragraph with Section 01 35 21 – LEED Requirements.*

* + - 1. Anti-corrosive paint: VOC limit [250] g/L maximum to [SCAQMD Rule 1113] [GS-11].
  1. **FACTORY FINISHING**
     1. Applying sealer to areas to receive stained finish or preservative treatments is prohibited.
     2. Apply one coat of wax emulsion to end grain and one coat of sealer to remainder of members.
     3. Prepare steel connection surfaces to applicable requirements of Section 05 50 00.
     4. [Prime paint] [Galvanize] connection steel after fabrication.

1. **Execution** 
   1. **EXAMINATION**
      1. Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for [glued-laminated] [and] [cross-laminated material] installation in accordance with manufacturer’s written instructions.
         1. Visually inspect substrate in presence of [Consultant] [DCC Representative] [Department Representative].
         2. Inform [Department Representative] [Consultant] [DCC Representative] of unacceptable conditions immediately upon discovery.
         3. Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval from [Consultant] [DCC Representative] [Department Representative]].
   2. **PRESERVATIVE TREATMENT**
      1. [n/a].
   3. **ERECTION**
      1. Protect protective sealer from damage before erection.
         1. Touch up damaged areas on site with specified sealer.
      2. Erect [glued-laminated] [and] [cross-laminated] members [as indicated] [in accordance with [reviewed] [approved] erection drawings].
      3. Brace and anchor members until permanently secured by structure.
      4. Make adequate provisions for erection stresses.
      5. Splice and join only at locations as indicated on [reviewed] [approved] erection drawings.
      6. Field cutting or altering members without [Departmental Representative’s] [Consultant’s] [DCC Representative’s] approval is prohibited. If approved, preservative treat cut ends.
      7. Where applicable, erect glued-laminated decking in accordance with erection drawings issued for construction.
         1. Install glued-laminated decking in a single- or multiple-span continuous pattern as indicated on the drawings (no controlled random pattern).
         2. When possible, stagger end joints in adjacent elements over supports.
         3. Nail decking to supports and adjacent courses as shown on the drawings. When the underside of the decking is to have an architecture appearance, particular care must be taken when nailing the decking to supports or to adjacent elements, and when nailing other miscellaneous framing to the wood decking, that nails do not penetrate through the full thickness of the decking.
   4. **FIELD QUALITY CONTROL**
      1. Manufacturer's Field Services:
         1. Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of product..
         2. Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
         3. Ensure manufacturer's representative present before and during [critical periods of installation] [construction of field joints] [testing].
         4. Schedule site visits:
            1. After delivery and storage of products, and when preparatory Work, or other Work, on which Work of this Section depends, complete but before installation begins.
            2. [Twice] during progress of Work at [25%] and [60%] complete.
            3. Upon completion of Work, after cleaning carried out.
   5. **CLEANING**
      1. Progress Cleaning: clean in accordance with Section [01 74 11 – Cleaning].
         1. Leave Work area clean at end of each day.
      2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 – Cleaning].
      3. Waste Management: separate waste materials for [reuse] [and] [recycling] in accordance with Section [01 35 21 – LEED Requirements] [01 74 11 – Construction/Demolition Waste Management and Disposal].
         1. Remove recycling containers and bins from site and dispose of materials at appropriate facility.
   6. **PROTECTION**
      1. Protect installed products and components from damage during construction (by the general contractor).
      2. Repair damage to adjacent materials caused by [glued-laminated] [and] [cross-laminated] construction installation.

**END OF SECTION**