REQUEST FOR INFORMATION #0000468162
Engineered Composite Crossties
Reply Date: July 18, 2024

New York City Transit (NYCT) is seeking expressions of interest in order to identify and obtain information from firms experienced in manufacturing engineered composite crossties. Engineered composite crossties must meet or exceed NYCT Specification Section 81, dated 4/17/2019 and Section 1, dated 7/5/18.

NYCT is currently utilizing the following engineered composite crossties:

- Fiber-reinforced Foamed Urethane (FFU)
- Sicut Composite Ties

This Request for Information (RFI) is not a solicitation of actual bids. However, it may be solicited by means of an Invitation For Bid (IFB) at a later date. This RFI has two purposes:

1) To identify proven manufacturers of engineered composite crossties that may have been successfully utilized in subway transit systems or freight railroad systems worldwide.

2) To elicit information from manufacturers on what engineered composite crossties are currently commercially available.

Project Background and Overview

NYCT has a need to identify suppliers that can supply engineered composite crossties that meet or exceed NYCT Specification Section 81, dated 4/17/2019 and Section 1 dated 7/5/18. Prospective suppliers must submit certified and notarized test reports showing that their engineered composite crossties meet or exceed NYCT Specification Section 81, dated 4/17/2019 and Section 1, dated 7/5/18.

Questions/Requirements

- What is your experience in manufacturing engineered composite crossties (crossties)?
- How many years of experience does your company have in manufacturing crossties?
- Provide a list of transit agencies or freight railroads to which you have successfully supplied your crossties. The number of units provided per contract, where the units are being used and a contact for each contract.
- Have the crossties been used in elevated structures? If yes, provide the location(s) and reference(s).
- Have the crossties been used in special work portions (switch areas)? If yes, provide the location(s) and reference(s).
- Provide the exact method of manufacturing the crosstie in detail.
- Provide a list of materials used in manufacturing the crosstie.
- What quality control is in place for raw materials, manufacturing, test reports, finished product, and product handling? Include a copy of the manufacturer's Quality Assurance and

Quality Control Program and quality assurance/control manuals.

- Can the crosstie be modified in the field without losing its properties?
- Are test reports issued by the manufacturer's in-house lab or an independent laboratory?
- Can the supplier provide notarized certifications and test data from the original raw material manufacturer?
- What is your experience in providing technical documentation (i.e., drawings, specifications, and procedures)?
- How long have your engineered composite crossties been in use?
- How many years are your engineered composite crossties expected to last?

If you are a distributor, reseller, or manufacturer of engineered composite crosstie, please provide responses to the above questions.

Please review the above requirements and submit your reply which should include responses to the questions/requirements posed above and any other information you deem relevant. Replies must be submitted no later than July 18, 2024, to Salvatore.Cordaro@nyct.com.

1 - MTA - NEW YORK CITY TRANSIT
SPECIFICATION FOR GENERAL CLAUSES

1.1 General

1.1.1 Scope

This specification covers general clauses for MTA - NYCT Standard Specifications for Track, Infrastructure and Power Distribution Materials, and is a requirement of every Section of these Specifications.

1.2 Technical Requirements

1.2.1 Material

A. Track, Infrastructure and Power Distribution Materials shall conform to the Drawings, the Bid Documents, and as specified herein.

B. Anything indicated on the Drawings and not mentioned in the Specifications or anything mentioned in the Specifications and not indicated on the Drawings shall be considered of having the same effect as if indicated or mentioned in both the Drawings and Specifications. In the event of conflict between the Drawings and Specifications, the Drawings shall govern.

C. All issue or revision dates of the Drawings and or Specifications shall be construed as that date issued or revised. Where no issue or revision date exists, the date of Bid shall be used.

D. All issue or revision dates of nationally recognized associations shall be construed as that date issued or revised. Where no issue or revision date exists, the date of Bid shall be used.

E. Where no specific requirements are given for materials, the same shall conform with the latest applicable standards of nationally recognized associations, subject to prior MTA – NYCT's approval.

F. Examples of nationally recognized associations shall include, but not be limited to, the following:

AALA	American Association for Laboratory Accreditation
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACGIH	American Conference of Governmental Industrial Hygienists

ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories, Inc.
AIHA	American Industrial Hygiene Association
AIIM	Association for Information and Image Management
AISI	American Iron and Steel Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ARA	American Railway Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing, Inc.
ASQC	American Society for Quality Control
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
CFR	Code of Federal Register
EPA	Environmental Protection Agency
IACS	International Annealed Copper Standard
FIPS	Federal Information Processing Standards
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
IFI	Industrial Fastener Institute
ISO	International Organization for Standardization
MIL	Military Standard Specification
MHA	Material Handling Association
NACE	National Association of Corrosion Engineers
NALSB	North American Lumber Standards Bureau
NCSA	National Crushed Stone Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NIST	National Institute for Standards and Technology
NLGI	National Lubricating Grease Institute
NMA	National Micrographics Association
NPCA	National Paint and Coatings Association
NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SPIB	Southern Pine Lumber Inspection Bureau
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.

G. Physical properties of materials shall be suitable for their intended end use.

H. Chemical composition of materials may include, in addition to that or of those specified, other elements or compounds necessary to achieve the particular performance requirements, except that the composition shall not contain known or suspected human or animal carcinogens, mutagens or reproductive toxins. Prior written MTA – NYCT's approval will be mandatory for any material, element or compound classified as a toxic and/or hazardous substance listed in the NIOSH Registry of Toxic Chemicals and which may cause injury or illness during or as a direct result of any customary or foreseeable handling and use.

I. Flammable materials, or materials that emit toxic or corrosive gases when burned, shall not be permitted without prior written approval of MTA - NYCT.

J. Materials that contain asbestos, lead, polyvinyl chloride (PVC) and polychlorinated biphenyl (PCB) shall not be used without prior written approval of MTA - NYCT.

1.2.2 Specifications

All requirements appearing in the Specifications shall be considered as part of the Specifications.

1.2.3 Definitions

The following words and expressions shall, except where by the context it is clear that another meaning is intended, be construed to mean:

1. "Submittal": is any written document furnished by the manufacturer sent to and subject for MTA – NYCT's approval, such as, but not limited to, shop drawings, record drawings, recorded magnetic tapes, microfilm, maintenance manuals and replacement parts lists, chemical analysis reports, material certification sheets and safety documentation. The quantity of submittals required shall be as indicated in the Bid Documents.

2. "Shop drawings": are collectively all working diagrams, plans and graphic representations documented by the manufacturer for fabrication and assembly.

3. "Record drawings": are original MTA – NYCT's approved shop drawings documenting in full all aspects of the shop drawings, including the layout of any existing work adjacent to or incorporated therein to the extent indicated on the Drawings.

4. "Standard nomenclature": are all symbols, conventions and designation means indicated on the Drawings and the current AREMA Portfolio of Trackwork Plans when indicated by MTA - NYCT.

5. "Critical dimensions": are all dimensions required for proper geometry, fit and performance to the satisfaction of MTA - NYCT.

6. "General plan": is the shop drawing of a particular special trackwork layout and/or arrangement indicating rail lengths, gauge, flangeway, tie dimensions, tie spacing, rail fastener plate or tie plate locations, critical dimensions, joint locations and switch machine locations, together with all other tabulated data and cross references required by MTA - NYCT.

1.2.4 Drawings

A. All symbols and other representations appearing on the Drawings shall be considered as part of the Drawings.

B. In the event of a discrepancy between scaled dimensions on any Drawing and the figures written thereon, the figures shall govern over the scale dimensions.

C. In case of differences between small and large-scale Drawings, the large-scale Drawings shall govern.

D. In the event of any ambiguity between the Drawings and the Specifications, the vendor shall notify MTA - NYCT in writing and request the Engineer's determination before manufacturing any materials.

1.2.5 Shop Drawings

A. Shop drawings shall be scale or full-size drawings made to the third angle projection system and shall indicate in detail all dimensions, descriptions and quantities of materials, specifications and notes with such information as is usual and customary for fabrication and manufacture.

B. All welds shall be detailed on the shop drawings.

C. Shop drawing dimensions shall include units of measure customary to the United States of America. All notes and legends on the drawings shall include the English language. All terminology and nomenclature shall be representative of Track, Infrastructure and Power Distribution Materials and conventional to current AREMA and ANSI standard practices.

D. The scale of shop drawings for Track, Infrastructure and Power Distribution Materials shall be sufficiently large such that the represented materials may be properly dimensioned to indicate all details prominently and to facilitate the incorporation of as much information as will reasonably fit thereon. The drawings shall be clear and legible throughout such that the resolution of the smallest detail may easily be read.

E. Except where otherwise indicated, the scale of shop drawings for trackwork shall be as follows:

1. A scale of 1/4 inch to 1 foot, or larger, for general plans of special work portions.

2. A scale of one inch to 1 foot, or larger, for special work portion parts such as switches.

3. A scale of 1 inch to 1 foot or 1 1/2 inches to 1 foot, or larger, for special work portion pieces such as frogs.

F. Shop drawing title block information shall include the following information:

1. The drawing title and complete description.
2. MTA – NYCT's route location (if any).
3. MTA – NYCT's route section and structure survey stationing locations (if any).
4. Drawing reference (if any).
5. Specification reference (if any).
6. The manufacturer's name.
7. The date of origination.
8. The rail section (if any).
9. The drawing scale (if none designate "not to scale").
10. The manufacturer's shop order number (if any).
11. The manufacturer's shop drawing number (if any).
12. The manufacturer's revision designation (if any).
13. The names of suppliers and other vendors (if any), where the main subject material(s) represented originate from a source other than the manufacturer's own production facilities. The names may be indicated adjacent to the title block or submitted separately at the option of the manufacturer.
14. Cross-references (if any).

G. Shop drawings shall be produced on computer aided design drafting (CADD) equipment.

H. White print reproductions of shop drawings shall be submitted to MTA - NYCT for approval. The drawings shall be examined, and, if necessary, may be returned to the manufacturer for correction. After the corrections have been made, the manufacturer shall promptly resubmit as many copies thereof as required for MTA – NYCT's approval.

I. If the shop drawings deviate from the Drawings or are intended to deviate from the Drawings, the manufacturer shall notify MTA - NYCT in writing, stating the difference between the Drawings and that denoted by the shop drawings.

J. The manufacturer shall not proceed with fabrication and or manufacture until approval of the shop drawings has been received. The manufacturer shall

notify MTA - NYCT of any apparent discrepancies on the approved shop drawings and shall obtain approval of any modifications or corrections required prior to fabrication and or manufacture.

K. The manufacturer shall be responsible to obtain proper fit and assembly of all work performed, supplied or otherwise furnished and shall make certain that proper fit is obtained with any existing work.

L. Shop drawings will not be required where no submittal requirements are indicated, however the manufacturer shall assume complete responsibility that the Drawings (if any) represent the full extent of detail necessary for fabrication and or manufacture.

1.2.6 Record Drawings

Record drawing submittals and PDF documents shall be provided on a thumb or flash drive, in Bentley Microstation V8 format. The folder containing the files shall be labeled with the purchase order number, stock number, special work portion number, Division and Line as applicable. An index with the Drawings and PDF documents contained in the folder shall be also submitted in Excel format.

1.2.7 Fabrication

A. Fabrication shall be performed in accordance with the best available technology and current manufacturing practices.

B. Welding workmanship, technique, qualification of welders, welding procedures and inspection of welds shall be in accordance with AREMA, AWS, AISC and ASME codes, specifications and requirements.

C. Mill or commercial tolerances shall apply to all raw or unfinished materials unless otherwise indicated.

D. If, during the course of fabrication any matter or detail requires explanation, or additional information as necessary for a clear understanding, or should any error become apparent, the manufacturer shall notify MTA - NYCT in writing and shall not proceed until instructed to do so.

1.2.8 Bid Documents

All requirements appearing in the Bid Documents shall be considered as part of the Bid Documents.

1.2.9 Media for Approved Shop Drawings

Final approved shop drawings shall be provided on a thumb or flash drive, in Bentley Microstation V8 format.

1.2.10 Maintenance Manuals and Replacement Parts Lists

A. Maintenance manual and replacement parts list submittals shall describe and list in sufficient detail the complete description, operation and maintenance instructions of the indicated track and/or structure material.

B. Replacement parts lists shall contain the complete breakdown of all parts and or components including the part or component description, the manufacturer's name and the manufacturer's part number.

C. Maintenance manuals and replacement parts lists shall be documented and shall be printed, bounded and identified in a suitable manner.

D. Sample maintenance manuals and replacement parts lists shall be submitted for MTA – NYCT's approval. The approved sample maintenance manual and replacement parts list submittal and the submitted maintenance manuals and replacement parts lists shall be identical.

1.2.11 Chemical Analysis Reports

A. Chemical analysis report submittals shall be notarized documents of the material chemical analysis or chemical test results.

B. Chemical analysis reports shall originate from the manufacturer's raw material source or mill supplier.

C. MTA - NYCT reserves the right to verify the chemical analysis report of any material.

1.2.12 Material Certification Sheets

A. Material certification sheet submittals shall be notarized documents of material origin, certified by the original manufacturer. Supplier names that are not customarily indicated on shop drawings (as specified in Article 1.2.5.F.13 of this Section) shall be submitted as part of the Material Certification Sheet requirements.

B. The format of material certification sheets shall be suitable to indicate all applicable information. The sheet format shall include blank spaces as required.

C. Material certification sheets shall be standard 8 $^{1}/_{2}$ inches by 11 inches white paper sheets and shall contain the following information:

1. The material description.
2. MTA – NYCT's Drawing reference (if any).

3. MTA – NYCT's Specification reference (if any).
4. MTA – NYCT's commodity number (if any).
5. MTA – NYCT's purchase order number (if any).
6. The material list or bill number (if any).
7. The material subassembly designation (if any).
8. The material identification marking (if any).
9. Cross reference designation (if any).
10. The name of the manufacturer.
11. The names of suppliers and other vendors (if any).
12. The manufacturer's part number(s) (if any).
13. Date of manufacture or fabrication.
14. Chemical analysis report designation (if any).
15. Quality plan designation (if any).

1.2.13 Safety Documentation

A. Material shall be subject to the approval of the MTA – NYCT's Office of System Safety.

B. Material safety data sheets shall document chemical, physical and safety characteristics of materials.

C. Material safety data sheets shall be provided in accordance with all relevant requirements of the current CFR title 29, Part 1910, Section 1200, Hazard Communication and the current Federal Standard FED-STD-313, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities.

D. Material safety data sheet forms shall be approved by the U.S. Department of Labor-OSHA and shall contain all relevant information for the material in accordance with all relevant requirements of the Public Employee Safety and Health Act and the New York State Toxic Substance Law.

E. Material safety data sheets shall provide the nominal chemical composition of the material listing the specific chemical components by their Chemical Abstract series (CAS) designations.

F. MTA - NYCT reserves the right to request Material Safety Data Sheets for any material at any time.

1.3 Quality Assurance

1.3.1 Quality Program

The manufacturer shall establish and maintain a Quality Assurance Program that meets or exceeds, but not limited by, the requirements of the International

Standards for Quality Management Systems (ISO 9000 Series), or the technical equivalent National ANSI/ASQC Q90 Series of Quality Standards.

1.3.2 Inspection

A. MTA - NYCT's inspector shall be admitted at any time summarily and without delay to any relevant part of the manufacturer's plant and shall be permitted to inspect materials at any place or stage of their manufacture, preparation, shipment or delivery when such activities are taking place.

B. MTA - NYCT's inspector shall be permitted to inspect the manufacturer's records and documents for any material. The manufacturer shall provide MTA - NYCT's inspector with material samples in sufficient quantities upon request.

C. The manufacturer shall supply all labor necessary for handling and rehandling of material to permit a proper inspection.

1.3.3 Testing

A. All tests necessary to demonstrate compliance of the material with these Specifications shall be performed by the manufacturer at its own expense, or, as required, by the recognized independent testing laboratory approved by MTA - NYCT. Testing shall include as applicable: verification of dimension, weight, density, specific gravity; physical properties such as tensile strength, elongation, hardness, abrasion resistance, dielectric strength, resistivity, flammability, toxicity and smoke density; radiographic testing; ultrasonic testing; dye penetration testing; and any other test necessary to demonstrate that the material supplied complies with these Specifications. MTA - NYCT reserves the right to witness all tests and to request additional testing as required.

B. All welding shall be subjected to nondestructive testing procedures in accordance with AREMA, AWS, ASNT, ASTM and ASME codes and specifications.

C. Test data shall be arranged in the order of the tests indicated, such that the data are capable of being correlated to the respective test requirements.

1.4 Shipment and Acceptance

1.4.1 Shipment

A. Materials shall be securely and properly packed for shipment, storage and stocking in non-returnable shipping containers and in accordance with the current ASTM Designation D3951, Standard Practice for Commercial Packaging. All packing shall be performed so as to prevent damage or loss.

B. Wood packaging materials, where feasible, shall be fire retardant lumber conforming to the current AWPA Standard C20, Structural Lumber-Fire-Retardant Treatment by Pressure Processes. Plastic packaging materials, where feasible, shall not contain chlorofluorocarbons or other substances harmful to the environment.

C. Material bills of lading shall be provided for each shipment and shall accompany shipments to their delivery destinations.

D. Material shipments shall be grouped in standard units of measure to facilitate efficient storage and convenience of handling at their delivery destinations.

E. Material shipments shall be identified with MTA – NYCT's commodity number, MTA – NYCT's purchase order number, MTA – NYCT's storeroom delivery destination, the material description, the quantity contained therein, the weight (gross weight, net weight and tare weight) and the name of the manufacturer. Shipments of chemical commodities shall be further identified in accordance with the current MTA – NYCT's labeling specification CCSS-001, Labeling Requirements for Chemical Commodities.

1.4.2 Acceptance

A. Final acceptance of all materials will be subject to verification of count and inspection after delivery at the locations indicated in the Bid Documents.

B. Not withstanding tests, inspection or acceptance at any previous time or location, materials that do not comply with MTA - NYCT's requirements and which are found to contain any defects, will be rejected. Material rejection, if any, shall require the removal, disposal and replacement of the rejected materials by the manufacturer.

C. The vendor (contractor) shall bear the cost of handling and transporting all rejected materials, regardless of when and where the rejection was made.

81 – MTA – NEW YORK CITY TRANSIT
SPECIFICATION FOR ENGINEERED COMPOSITE CROSSTIES

81.1 General

81.1.1 Scope

A. This specification covers MTA - NYCT's requirements for furnishing engineered composite crossties for use on rail transit track.

B. The general clauses of Section 1 of MTA - NYCT's Standard Specifications for Track and Structures Materials shall be integral with the provisions of this Section.

81.1.2 Types

A. Engineered composite crossties shall combine two or more materials (including selected reinforcing elements and fillers) in a matrix binder to obtain physical and mechanical properties that are superior to the individual components that constitute the crosstie. The general types of Engineered Composite crossties are:

1. Engineered Polymer Composite (EPC) crossties – a system that incorporates reinforcements such as glass fibers and other property modifiers embedded in a polymer matrix.

2. Fiber-reinforced Foamed Urethane (FFU) synthetic crossties – produced by molding continuous fiberglass filaments into a rigid thermosetting urethane foam resin.

3. Engineered Wood Product (EWP) crossties – consisting of selected wood laminates or strands bonded together with a structural adhesive (phenolic).

81.1.2 Material

A. Engineered Composite crossties shall be manufactured to conform to the Drawings, the Bid Documents, and as specified herein.

B. Engineered Polymer Composite (EPC) crossties shall be produced using a polymer matrix of recycled high-density polyethylene (HDPE), reinforced with materials such as fiberglass or polymeric fibers. No wood or rubber material in excess of 15 % is allowed.

C. Fiber-reinforced Foamed Urethane (FFU) synthetic crossties shall be produced by molding continuous fiberglass filaments into a rigid thermosetting urethane foam resin, so that the continuous fiberglass filaments are homogeneously dispersed into the thermosetting urethane foam, and the form maintains a completely closed cell structure.

D. Engineered Wood Product (EWP) crossties shall be structural composite lumber products manufactured using wood strands laminated together using structural exterior adhesives such as phenolics.

E. The materials used in the manufacturing of engineered composite ties shall not require the use of toxic preservatives or any other hazardous or leaching elements.

F. Engineered Composite ties shall be non-conductive electrically and shall resist decay and insect attack. Water absorption shall not cause loss of strength.

G. In addition, the requirements of the following paragraphs shall also apply.

81.2 Technical Requirements

81.2.1 Design

A. Engineered Composite crossties shall be designed to resist rail seat positive and negative bending moments as well as tie center positive and negative bending moments without failure. Refer to AREMA's Chapter 30, "Substitute Timber Ties" and "Concrete Ties", for design considerations.

B. Engineered Composite crosstie design shall be based on a maximum load of 50 kips per axle, with four axles per car, operating at speeds up to 50 mph. Typical crosstie spacing (center-to-center) ranges from 18 inches to 24 inches. The maximum annual traffic is 55 to 60 MGT.

C. Engineered Composite ties shall be suitable for installation on open-deck steel girder elevated structures, conventional ballasted track and concrete-embedded track. The expected service life of the Engineered Composite crosstie shall be 50 years. The Engineered Composite crosstie shall support the dynamic loads of the trains without failure.

81.2.2 Engineered Composite Crosstie Properties

A. Engineered Composite crossties shall be able to hold the gauge of the track on tangent and curved track with values equal or better than those of a southern yellow pine wood crosstie. The minimum acceptable screw pullout test load value shall be 2,500 lb.

B. Engineered Composite crossties shall permit the application of standard rail, tie plate and hold-down fasteners such as screw spikes, bridge anchor clips, etc. without requiring special procedures for the installation of such devices, except for ordinary pre-drilling of the crosstie.

C. Engineered Composite crossties shall provide a minimum resistance of 1,000 psi to the rail seat compression test without failure.

D. All Engineered Composite crosstie top surfaces shall be non-skid and have a minimum dry coefficient of friction of 0.50 between the shoe sole and the top of the crosstie. The top surface of the crosstie where rail fasteners will be placed on must be flat. The side faces of the crosstie shall have dimples, textures or other indentations approved by MTA-NYCT's Track Engineering in order to "lock in" the ballast or concrete that the crosstie will be embedded into. The indentations shall cover at least 65 % of the face, and have, on the average, a depth of no less than $^{1}/_{8}$ inch. Indentations are not required for crossties to be used in the construction of open-deck elevated tracks. Dimples, textures or other indentations are <u>not</u> required for Fiber-reinforced Foamed Urethane (FFU) synthetic crossties, except that short tie blocks to be embedded in concrete (Type II/IIM track) shall have a groove on the side faces of the tie block, conforming to the Standard Track Drawings.

E. Engineered Composite crossties shall not exhibit degradation of mechanical properties when exposed to very cold (-10^{o} F) or very hot (120^{o} F) temperatures. In addition, the surface degradation of the engineered composite crosstie when exposed to UV radiation shall not exceed 0.003 inches per year.

F. Engineered Composite crossties shall not exhibit splits or cracks in excess of the following values:

1. Any separation of the material, on any face, greater than 18 inches in length (regardless of depth) shall be cause for rejection.

2. Separation of the material over 1 ½ inches deep or ½ inch wide, on any face, and longer in aggregate than one-third of the length of the engineered composite crosstie, shall be cause for rejection.

3. Splits (defined as a separation of the material extending from one surface through the piece to an opposite or adjacent surface) shall be cause for rejection.

81.2.3 Dimensions

A. Engineered Composite crosstie dimensions shall be as indicated on the Drawings and in the Bid Documents.

B. Unless otherwise indicated on the Drawings or in the Bid Documents, Engineered Composite crosstie dimensions shall be subject to the following (note: any manufacturing "protrusions" shall not be considered – the length and width of the crosstie shall be checked along its top face):

1. A tolerance of plus ¼ inch and minus $^{1}/_{16}$ inch in width.

2. A tolerance of plus $^{1}/_{8}$ inch and minus $^{1}/_{16}$ inch in thickness.

3. A tolerance of plus 1 inch and minus $^{1}/_{8}$ inch in length.

C. The top surface flatness in the rail bearing areas shall be within $\pm$ $^{1}/_{16}$ inch. Rail bearing area for crossties up to and including ten (10) feet in length shall be defined as the sections between 12 inches and 48 inches from the centerline of the tie, except that for tie blocks the rail bearing area shall be defined as the section between 1 inch from each end of the tie block. Rail bearing area for crossties longer than 10 feet shall be as defined in Chapter 30, Section 2.1.3.1a, of the AREMA Manual for Railway Engineering.

81.2.4 Physical Properties

A. Engineered Composite crossties shall exhibit the following properties when tested, for qualification purposes, as per the listed standards and specifications below:

Mechanical Properties	Test Method (*)	Typical Value (*)
Density	ASTM D6111-97	50.0 pcf Min.
Compressive Strength (Compression parallel to grain)	ASTM D6108-97	3,000 psi Min.
Rail Seat Compression (Compression perpendicular to grain)	ASTM D6108-97	1,000 psi Min.
Permanent Deformation Under Load (Compression perpendicular to grain)	ASTM D6108-97	0.015 inch Max.
Flexural Strength	ASTM D6109-97	2,500 psi Min.
Modulus of Elasticity (flexure)	ASTM D6109-97	170,000 psi Min.
Shear Strength (calculated)	ASTM D6109-97	1,000 psi Min.
Screw Spike Pullout test	ASTM D6117-97	2,500 lbs. Min.
Perpendicular Dielectric (0.25 in), VPM	ASTM D-149	170 Min.
Arc Resistance, sec.	ASTM D-495	120 Min.
Water Absorption, %	ASTM D-570	0.2 Max.
Flame Spread (average value)	ASTM E-162	185 Max.
Flame Resistance	UL 94	HB (Pass)
Tracking Resistance at 2,500V	ASTM D-2303	30 minutes Min.
Specific Optical Smoke Density (within 4 min. after start of test)	ASTM E-662	200 Max.
Coefficient of Thermal Expansion	ASTM D696-91	0.00005 in/in/°F Max.

(*) For FFU crossties, test methods and maximum/minimum values shall conform to the requirements of Japanese Industrial Standard **JIS E 1203** for Synthetic Sleepers

B. Smoke Toxicity - Gases emitted/ produced shall not exceed the following values when tested in accordance with Boeing Specification Support Standard BSS-7239, "Test Method for Toxic Gas Generation by Materials on Combustion":

Gases	Average Values (Max. PPM)
Hydrogen Chloride	10
Hydrogen Bromide	10
Hydrogen Cyanide	10
Hydrogen Sulfide	10
Vinyl Chloride	10
Ammonia	500
Aldehydes	45
Oxides of Nitrogen	100
Carbon Dioxide	30,000
Carbon Monoxide	1,000

C. The Rail Seat Compression Test shall be performed as follows:

1. A test specimen(s) shall be cut from a manufactured Engineered Composite crosstie with a cross-section of 6"x 8" (or 7" x 9" as an alternate) and a length of 36". The crosstie shall rest on a flat surface.
2. A one-foot section of 115#RE rail shall be secured to the top of the 36" crosstie by means of a rolled steel Pandrol plate, centered on the crosstie, fastened to the tie by means of two standard screw spikes. The rail section shall be attached to the plate by means of two Pandrol "e" clips.
3. A vertical load shall be applied centered on the top of the rail head, along its vertical axis, in increments of 10,000 lbs., until crosstie failure or a maximum vertical deformation of 0.125 inches. The load at failure shall be recorded and the compressive (bearing) stress under the tie plate shall be calculated using the tie plate's dimensions. Deformation of the engineered composite crosstie shall be measured and recorded, and shall not exceed $^1/_8$ inch.

D. The Permanent Deformation Under Load Test shall be performed as follows:

1. A test specimen(s) shall be cut from a manufactured Engineered Composite crosstie with a cross-section of 6"x 8" (or 7" x 9" as an alternate) and a length of 36". The crosstie shall rest on a flat surface.
2. A one-foot section of 115#RE rail shall be secured to the top of the 36" crosstie by means of a rolled steel Pandrol plate, centered on the crosstie, fastened to the tie by means of two standard screw spikes. The rail section shall be attached to the plate by means of two Pandrol "e" clips.
3. A vertical load shall be applied centered on the top of the rail head, along its vertical axis, in increments of 5,000 lbs., starting at 10,000 lbs. and ending at 30,000 lbs. Each 5,000-lb. increment must be applied for one hour to the head of the rail; after one hour has transpired, the load shall be

removed and the permanent deformation measured. The permanent deformation after the load is removed shall not exceed 0.015 inches.

E. The Screw Spike Pullout Test shall be performed with a standard 1" diameter screw spike (as shown in Standard Track Drawing T-2011) of 5 ½ inches length. Pre-drilling of the Engineered Composite crosstie shall be allowed, except that the pilot hole diameter shall not exceed $^{11}/_{16}$ inch.

F. Tests of flame spread index shall be performed according to the requirements of the current ASTM Standard Test Method E 162, Surface Flammability of Materials Using a Radiant Heat Energy Source.

G. Tests of flame resistance of Engineered Composite crossties shall be performed according to the requirements of the current ANSI/UL94, Standard for Tests for Flammability of Engineered Composite Materials for Parts in Devices and Appliances.

H. Tests of specific optical smoke density of Engineered Composite crossties shall be performed according to the requirements of the current ASTM Standard Test Method E662, Specific Optical Density of Smoke Generated by Solid Materials.

81.2.5 Marking

A. Engineered Composite crossties shall be marked as specified below:

1. Marking shall indicate the manufacturer's name or trademark, the month and year of production and the manufacturer's plant identification in figures at least ½ inch high. If dating nails are used, only the last two digits of the year of manufacture shall be shown.

2. Marking shall be by either dating nails, hot-iron branding or tagging on the middle of the tie and/or timber top surface. When anti-splitting devices are applied, brands or tags shall appear in the middle of the top surface of the tie or timber. Tags, if used, shall be of stainless steel conforming to ASTM Designation A176. Dating nails shall conform to the requirements of the AREA Manual for Railway Engineering chapter 3 Ties and Wood Preservation, section 1.8, Specifications for Dating Nails, dated 1975 or later.

B. Each bundle of Engineered Composite crossties accepted by MTA - NYCT's inspector shall be branded by NYCT's inspector by hammering a distinctive mark approved by MTA - NYCT for this purpose. The exposed face of each tie in each bundle and the end of each tie in the bundle shall be clearly marked.

C. All required marks and brands shall appear in the middle of the top surface of the crosstie.

81.3 Quality Assurance

81.3.1 Inspection

A. Engineered Composite crossties and all materials and processes will be subject to inspection. The vendor (contractor) shall afford MTA - NYCT's inspector, at no additional cost to MTA - NYCT, all necessary facilities, equipment and labor at the manufacturer's plant to enable MTA - NYCT's inspector to perform proper inspections, as deemed necessary by MTA - NYCT, during normal working hours.

B. MTA - NYCT's inspector will make reasonably close inspection of the top, bottom, sides and ends of each Engineered Composite crosstie. Each crosstie shall be judged independently without regard for decisions on other crossties in the same lot.

C. MTA - NYCT reserves the right to make any additional inspections of the Engineered Composite crossties during fabrication and after delivery to determine conformity to the specifications.

81.3.2 Testing

For qualification purposes, the vendor (contractor) shall, at no additional cost to MTA - NYCT, have performed all tests necessary to assure that all Engineered Composite crossties are in accordance with these specifications. Tests performed by independent qualified technical laboratories acceptable to MTA-NYCT's MOW Track Engineering may be substituted in lieu of performing all tests specified in section 81.2.4 of these specifications, provided that those tests are found to be equivalent in nature as the ones specified herein.

81.4 Shipment and Acceptance

81.4.1 Shipment

A. All Engineered Composite crossties shall be shipped to the locations indicated in the Bid Documents.

B. Engineered Composite crossties shall be banded in bundles of the same size and type. Unless otherwise indicated, each bundle shall contain 36 crossties or less. The banded bundles shall be further banded together in units weighing less than 6,000 pounds each.

C. Engineered Composite crosstie bundles shall be identified with MTA – NYCT's purchase order number, MTA – NYCT's commodity number, the name of the manufacturer, the description and the quantity contained therein.

D. Bundles of Engineered Composite crossties shall be stacked and secured in an open bed trailer truck, suitable for removal with overhead cranes or high lifts.

81.4.2 Acceptance

A. Any Engineered Composite crosstie which does not comply with MTA - NYCT's requirements or which, not withstanding tests, inspection or acceptance at any previous time or location, is found to contain deficiencies, will be rejected.

B. Final acceptance of Engineered Composite crossties will be subject to verification of count, and inspection after delivery to the locations indicated in the Bid Documents, and receipt of required shipping documents and inspection reports.

C. The vendor (contractor) shall bear the cost of handling and transporting rejected material, regardless of when or where the rejection was made.