ISO 22156:2021 (E)

Bamboo structures — Bamboo culms — Structural design

Contents

Foreword

Introduction

- 1 Scope
- 2 Normative references
- 3 Terms and definitions
- 4 Symbols and abbreviated terms
- 5 Basic requirements of design
 - 5.1 General
 - 5.2 Design methodology
 - 5.3 Susceptibility to splitting
 - 5.4 Redundancy
 - 5.4.1 Non-redundant structural members
 - 5.4.2 Redundant structural members
 - 5.5 Serviceability considerations
 - 5.6 Service classes
 - 5.6.1 Service class 1
 - 5.6.2 Service class 2
 - 5.6.3 Service class 3
 - 5.7 Durability
 - 5.7.1 Use classes
 - 5.7.2 Resistance to corrosion of metallic elements
 - 5.8 Effects of elevated temperature
 - 5.9 Maintenance, inspectability and replacement considerations
 - 5.10 Seismic force reduction factor for bamboo structures
 - 5.11 Alternate design methodologies
 - 5.11.1 Partial safety factor design (PSFD) or load and resistance factor design (LRFD) methodology
 - 5.11.2 Experience from Previous Generations
 - 5.11.3 Design by testing
- 6 Member component and material properties
 - 6.1 General
 - 6.2 Characteristic material and component properties
 - 6.3 Allowable member design capacity
 - 6.4 Allowable design strength
 - 6.4.1 Culm geometry for use with allowable design strength
 - 6.5 Component flexural stiffness
 - 6.6 Modulus of elasticity
- 7 Structural modelling bamboo structures
- 8 Flexural members (beams)
 - 8.1 General
 - 8.2 Multiple culm flexural members
 - 8.2.1 Bracing requirements for multiple culm flexural members
 - 8.3 Flexural member capacity
 - 8.3.1 Flexural capacity determined from component capacity
 - 8.3.1.1 Shear capacity of flexural members determined from single culm component capacity

- 8.3.2 Flexural capacity determined from bending strength
- 8.3.2.1 Shear capacity in multiple culm flexural members determined from shear strength
- 8.4 Calculation of deflection
- 8.4.1 Flexural stiffness determined from component properties
- 8.4.2 Flexural stiffness determined from material and geometric properties
- 8.4.3 Long term deflections
- 9 Axial load carrying members
 - 9.1 General
 - 9.2 Compression member effective length
 - 9.2.1 Lateral restraint of compression members
 - 9.3 Compression capacity
 - 9.3.1 Compression capacity from geometric and material properties
 - 9.3.2 Crushing capacity
 - 9.3.3 Buckling capacity
 - 9.4 Tension capacity
 - 9.4.1 Tension capacity from component capacity
 - 9.4.2 Tension capacity from geometric and material properties
 - 9.5 Combined axial and flexural loads

10 Joints and splices

- 10.1 General
- 10.2 Design properties by complete joint testing
- 10.3 Design properties by component capacities
- 10.4 Allowable joint design capacity
- 10.5 Joint stiffness
- 10.6 Ductility of joints
- 10.7 Robustness against culm splitting
- 10.7.1 Radial clamping to resist splitting
- 10.8 Splices joints
- 10.9 Requirements for non-bamboo components of joints
- 10.9.1 Metallic components of joints
- 10.9.2 Joints utilising flowable infill material (grouted joints)
- 10.9.3 Lashing
- 10.9.4 Mechanical and proprietary joint systems
- 10.10 End bearing capacity of bamboo culms
- 10.11 Circumferential bearing capacity of bamboo culms
- 10.12 Joints having through culm wall dowels
- 10.12.1 Capacity of single dowel
- 10.12.2 Requirements for dowels
- 10.12.3 Tension forces on dowel joints
- 11 Trusses
- 12 Shear panels (walls)
 - 12.1 General
 - 12.1.1 Openings in panels
 - 12.2 Loads
 - 12.2.1 Out-of-plane loads
 - 12.2.2 In-plane loads
 - 12.2.3 Gravity loads
 - 12.3 Determination of design strengths
- 13 Fire resistance
- 14 Structural grading
- 15 Quality assessment and control
- Annex A (informative) Bases of provisions in this document
 - A.1 General
 - A.2 Bamboo species
 - A.3 Culm dimensions

Annex B (informative) Durability and preservation recommendations

- B.1 General
- B.2 Recommendations for designing durable bamboo structures
- B.3 Bamboo preservatives

Annex C (informative) Examples of seismic and alternative design factors

- C.1 General
- C.2 Seismic force reduction factors for bamboo structures
- C.3 Partial safety factor design (PSFD) or load and resistance factor design (LRFD)
- Annex D (informative) Examples and classification of bamboo connections and joints

Annex E (informative) Design of LCBF components to satisfy requirements of 12

- E.1 General
- E.2 Requirements of LCBF components
- E.2.1 Wall matrix
- E.2.2 Render
- E.2.3 Render reinforcement
- E.2.4 Vertical members (studs)
- E.2.5 Bracing
- E.2.6 Head and sole plates

Page count: 48