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