

## An ACI and TMS Standard

# Thermal Bridge Mitigation for Buildings Having Concrete and Masonry Walls and Masonry Veneer – Code Requirements and Commentary

Reported by Joint ACI-TMS Committee 122



American Concrete Institute  
*Always advancing*



ACI-TMS CODE-122.1-21

Currently in preview, click buy full version



*This document is the intellectual property of ACI and the cosponsor, and both have copyright. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without written consent. ACI is the lead sponsor of this joint committee and its operating procedures were followed. ACI's information is below; the cosponsor's information is on the inside back cover of this document.*

## **Thermal Bridge Mitigation for Buildings Having Concrete and Masonry Walls and Masonry Veneer—Code Requirements and Commentary**

Copyright by the American Concrete Institute, Farmington Hills, MI. All rights reserved. This material may not be reproduced or copied, in whole or part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of ACI.

The technical committees responsible for ACI committee reports and standards strive to avoid ambiguities, omissions, and errors in these documents. In spite of these efforts, the users of ACI documents occasionally find information or requirements that may be subject to more than one interpretation or may be incomplete or incorrect. Users who have suggestions for the improvement of ACI documents are requested to contact ACI via the errata website at <http://concrete.org/Publications/DocumentErrata.aspx>. Proper use of this document includes periodically checking the errata for the most up-to-date revisions.

ACI committee documents are intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the material it contains. Individuals who use this publication in any way assume all risk and accept total responsibility for the application and use of this information.

All information in this publication is provided “as is” without warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose or non-infringement.

ACI and its members disclaim liability for damages of any kind, including any special, indirect, incidental, or consequential damages, including without limitation, lost revenues or lost profits, which may result from the use of this publication.

It is the responsibility of the user of this document to establish health and safety practices appropriate to the specific circumstances involved with its use. ACI does not make any representations with regard to health and safety issues and the use of this document. The user must determine the applicability of all regulatory limitations before applying the document and must comply with all applicable laws and regulations, including but not limited to, United States Occupational Safety and Health Administration (OSHA) health and safety standards.

Participation by governmental representatives in the work of the American Concrete Institute and in the development of Institute standards does not constitute governmental endorsement of ACI or the standards that it develops.

Order information: ACI documents are available in print, by download, through electronic subscription, or reprint and may be obtained by contacting ACI.

Most ACI standards and committee reports are gathered together in the annually revised the ACI Collection of Concrete Codes, Specifications, and Practices.

**American Concrete Institute**  
**38800 Country Club Drive**  
**Farmington Hills, MI 48331**  
**Phone: +1.248.848.3700**  
**Fax: +1.248.848.3701**

# Thermal Bridge Mitigation for Buildings Having Concrete and Masonry Walls and Masonry Veneer—Code Requirements and Commentary

An ACI Standard

Reported by Joint ACI-TMS Committee 122

Kevin Cavanaugh, Chair

Rajiv Pathak, Secretary

Charles B. Clark Jr.  
Darryl E. Dixon  
Emily B. Lorenz  
Hongyan Ma

William Mark McGinley  
M. Isha G. VanGeem  
Hongyu Zhou

## Consulting Member

Maribeth S. Bradfield  
John P. Ries

Phillip J. Samblanet  
Christine A. Subasic

*This code prescribes minimum design and construction requirements for mitigating thermal bridges in the building envelopes of new buildings and additions to existing buildings. It applies to buildings having concrete or masonry walls; masonry veneer, including veneer attached to frame walls; and balconies or components that extend through the building envelope. It also has criteria for metal thermal bridges in these buildings.*

*This code is applicable to commercial and mid- to high-rise residential buildings that use either electric or fossil fuel (regardless of the generation source). It can be used with applicable energy codes and standards.*

**Keyword:** thermal bridge.

## PREFACE

This code provides requirements for mitigation of thermal bridges for use with energy efficiency codes and standards that have been adopted by a jurisdiction, such as **ASHRAE/IES 90.1**, the IECC, or a state energy code. This code was developed by an ANSI-approved consensus process. The code has three alternative paths: a prescriptive path, a building envelope trade-off methodology, and a whole building energy simulation trade-off methodology.

The Commentary is intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations, and who will accept responsibility for the application of the information it contains. ACI disclaims any and all responsibility for the stated principles. The Institute shall not be liable for any loss or damage arising therefrom.

Reference to the Commentary shall not be made in construction documents. If items found in the Commentary are desired by the licensed design professional to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the licensed design professional.

ACI-TMS CODE-122.1-21 became effective October 22, 2021, and was published November 2021.

Adopted as a standard of the American Concrete Institute (November 10, 2021) and The Masonry Society (November 19, 2021) in accordance with each organization's standardization procedures.

All rights reserved including rights of reproduction and use in any form or by any means, including the making of copies by any photo process, or by electronic or mechanical device, printed, written, or oral, or recording for sound or visual reproduction or for use in any knowledge or retrieval system or device, unless permission in writing is obtained from the copyright proprietors.

**CONTENTS**

**PREFACE, p. 1**

**CHAPTER 1—GENERAL, p. 3**

- 1.1—Scope, p. 3
- 1.2—General, p. 3
- 1.3—Purpose, p. 4

**CHAPTER 2—DEFINITIONS, p. 5**

- 2.1—, p. 5

**CHAPTER 3—REFERENCED STANDARDS, p. 6**

**CHAPTER 4—GENERAL REQUIREMENTS, p. 7**

- 4.1—Climate zones, p. 7
- 4.2—Mitigation of thermal bridges, p. 7
- 4.3—U-factors for assemblies containing thermal bridges,  
p. 8

**CHAPTER 5—PRESCRIPTIVE METHOD, p. 9**

- 5.1—Building envelope walls extending above the roof  
insulation, p. 9
- 5.2—Balconies and projections, p. 10
- 5.3—Shelf angles supporting masonry veneer, p. 11
- 5.4—Other thermal bridges, p. 11

**CHAPTER 6—BUILDING ENVELOPE TRADE-OFF  
METHOD, p. 13**

- 6.1—Building envelope trade-off method, p. 13

**CHAPTER 7—WHOLE BUILDING SIMULATION  
METHOD, p. 14**

- 7.1—Whole building simulation method, p. 14

**REFERENCES, p. 15**

- Authored documents, p. 15

**APPENDIX—CLIMATE ZONE MAPS FOR USE  
WITH THE IECC AND ASHRAE 90.1, p. 16**

## CODE

## CHAPTER 1—GENERAL

## 1.1—Scope

**1.1.1** This code provides minimum design and construction requirements for mitigating thermal bridges in the building envelopes of new buildings and additions to existing buildings consisting of concrete or masonry construction. This code shall be permitted to be used with applicable energy efficiency codes and standards adopted by the jurisdiction.

## 1.2—General

**1.2.1** The provisions of the code apply to:

- a) Portions of buildings having concrete or masonry walls that are part of the building envelope
- b) Portions of buildings having a masonry veneer, including veneer attached to frame walls that are part of the building envelope
- c) Portions of buildings having concrete balconies or concrete projections that penetrate through the building thermal envelope

**1.2.2** The provisions of this code do not apply to:

- a) Single-family houses and residential structures with three stories or fewer above grade
- b) Buildings that do not use either electricity or fossil fuel.

**1.2.3** The official version of this code is the English language version using inch-pound units published by the American Concrete Institute.

## COMMENTARY

## CHAPTER R1—GENERAL

## R1.1—Scope

**R1.1.1** This code applies to buildings having concrete or masonry walls that are part of the building envelope, masonry veneer including veneer attached to frame walls that are part of the building envelope, and balconies or components that extend through the building envelopes. It also has criteria for metal thermal bridges in these buildings.

This code applies minimum requirements for mitigating thermal bridges in concrete and masonry construction in buildings.

This code applies to commercial and mid- to high-rise residential buildings. It can be used with applicable energy codes and standards such as **ASHRAE 90.1** or the IECC.

The provisions of this code are not intended to place any limits on the amount of concrete or steel that can be used for structural connections.

For some buildings, such as those in Climate Zones 0 through 4, the code indicates no mitigation is required. For buildings in Climate Zone 5, limited mitigation requirements apply. The minimum provisions provided by this code are not intended to prevent designers from applying more stringent thermal bridge mitigation strategies if desired. The provisions include the following components:

- a) Thermal bridges at the intersection of parapets and roof insulation (Climate Zones 6 through 8)
- b) Concrete balconies and projections (Climate Zones 5 through 8)
- c) Shelf angles that support masonry or masonry veneer (Climate Zones 6 through 8)
- d) Concrete, masonry, or metal components that penetrate completely through insulation in the building envelope excluding beams or columns that are part of the building envelope (Climate Zones 5 through 8)