ICRI'S NEW GUIDELINE FOR EVALUATION OF MASONRY FAÇADE STRUCTURES

BY MICHAEL TABASSI

Are you experiencing moisture infiltration, cracking, settlement, deflection, bulging, efflorescence, organic growth, or corrosion of a masonry façade structure? Do you need a step-by-step guide to get you through a façade investigation? ICRI has what you are looking for—its new Technical Guideline No. 410.1-2008, "Guide for the Evaluation of Masonry Façade Structures."

Masonry technology has evolved slowly over the centuries from simple solid load-bearing walls to curtain wall structures with a drainable system. Over time, materials such as finely cut stone, fired clay brick, structural clay tile, concrete masonry units, glazed terra-cotta, cast stone, precast concrete, glazed concrete block, and brick have been introduced to make masonry more versatile and allow more elaborate and intricate designs.

Masonry structures are susceptible to moisture and movement. Masonry assemblies are generally not waterproof. The masonry units themselves, the

Volume change in masonry has caused cracking at the corner

Efflorescence on face of masonry pier

Expansion of brick façade and shrinkage of concrete frame has caused the concrete slab edge to shear off at a shelf angle embed

Brick faces are spalling off due to moisture infiltration and freezing-and-thawing damage

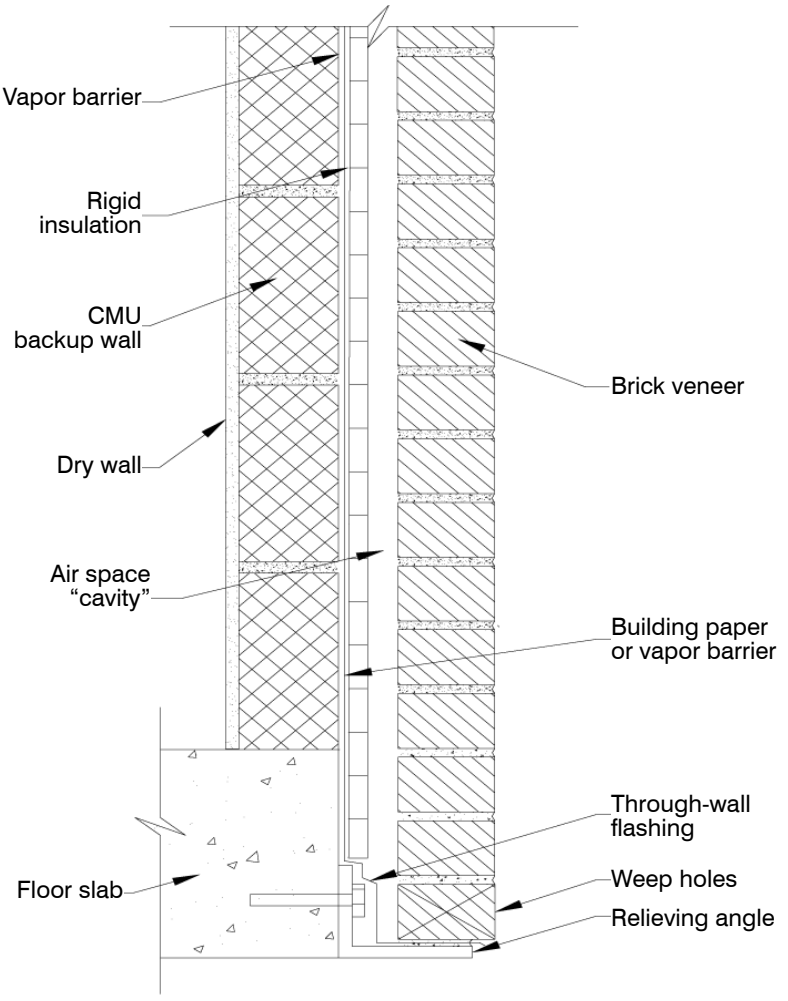
mortar, and the bond lines may allow water penetration. A solid masonry construction, in most cases, controls the moisture through sheer mass that distributes the moisture and allows dissipation before it can enter the building. A curtain wall system controls moisture with flashing, vapor barrier, and weep holes.

Movement in masonry can be caused by a myriad of factors: building frame shortening under service load due to creep and shrinkage; settlement; lateral loading; thermal movement; expansion due to moisture absorption; and corrosion of embedded anchors, angles, or structural members. Failure mechanisms can impact types and styles of masonry construction differently. A thorough evaluation, including a comprehensive knowledge of timelines, characteristics of building materials, and structures, is required to interpret the response of masonry systems to these failure mechanisms.

The new Guideline describes the tools, techniques, and processes that are used in the evaluation of masonry façade structures. It offers background into the history and evolution of masonry structure design and construction and is presented as a flow process beginning with an investigation of the history of the structure, including review of documents and interviews of building maintenance management. The environmental service conditions are reviewed to determine the climatic variables that contribute to the current state of the building masonry components. Techniques and procedures for nondestructive evaluation are described, including a detailed description of visual observations of the structure, followed by a variety of nondestructive instrument testing procedures and tools that are available to the investigator. The evaluation process includes exploratory investigation to determine the actual in-place condition of the components of the masonry façade. The Guideline describes the physical inspection process and provides a detailed description of the façade elements to be evaluated. Summarizing the evaluation and report format are discussed and suggestions for frequency of testing and the scope are provided at the conclusion of the guidelines.

The new "Guide for the Evaluation of Masonry Façade Structures" contains information on the evaluation of the entire masonry façade structure which includes:

- Introduction
- Definitions and Notation
- Safety Consideration
- Evaluation Process
- History and Background Information
  - Environment Condition
    - Exterior Climate
    - Interior Climate
    - Industrial Environments
    - Coastal Environments



Drainage (cavity) wall system with CMU backup wall

Structural steel column corrosion

- Field Investigation (Nondestructive Evaluation)
  - Visual Examination
    - Moisture Infiltration
    - Cracking
    - Spalling
    - Settlement
    - Deflection
    - Creep/Bulging/Compression/Shrinkage
    - Volume

        - Freezing-and-Thawing Cycle
        - Efflorescence
        - Pollution/Atmospheric Staining
        - Organic and Inorganic Staining
        - Graffiti and Paint
        - Corrosion
    - Instrument Testing
        - Thermal Imaging (Infrared Thermography)
        - Moisture Meter
        - Vertical Tube
        - Pressurized Water Nozzle
        - Spray Rack Tests
        - Chamber Water Penetration Tests
        - Covermeter
        - Crack Monitor/Strain Gauge
        - Borescope
        - Half-Cell Assessment
        - Flat Jack Testing
        - Magnetic Mass Probes
        - Ground-Penetrating Radar
        - Plumb Bob Measurement
        - Laser Measurement
    - Field Investigation (Exploratory Evaluation)
        - Connectors
        - Cavity (Air Space) Condition
        - Movement and Deflection
        - Backup System Condition
        - Supporting System Condition
        - Flashing Detail and Condition
        - Air Barrier, Vapor Retarder, and Insulation
    - Laboratory Testing
        - Petrographic Examination
        - Chemical Analysis
        - Prism Strength Analysis
        - Moisture Absorption Test
        - Compressive Strength Test
        - Metallurgical Test
        - Weldability Test
        - Shear and Tensile Strength (Anchorages)
        - Hazardous Materials Testing
    - Structural Analysis
- Summary
    - Scope of Investigation and Frequency of Testing
    - Final Report

This Guideline will provide necessary tools and knowledge to assess the condition of a masonry façade structure and the causes of its failures. In addition, the Guideline will provide an interpretation of the clues and patterns found during the investigation. It contains the experience and knowledge of more than 25 engineers, architects, material suppliers, and contractors experienced in the field of masonry structures. Having a personal copy of this Guideline will be a great addition to everyone's reference library.

ICRI's Masonry Committee is working on another Technical Guideline, "Guide for the Repair of Masonry Façade Structures," which is scheduled for publication in 2010. This Guideline will help the reader repair the damage found during the evaluation process.

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