ENGINEERING AND CONSTRUCTION BULLETIN

US Army Corps of Engineers®

No. 2019-5	**Issuing Office:** CECW-EC	**Issued:** 26 Mar 19	**Expires:** 26 Mar 21
		19 May 21, Rev 1	19 May 23

SUBJECT: Glass in Handrails and Guards.

CATEGORY: Guidance.

1. **References**:

    a.   Unified Facilities Criteria (UFC) 1-200-01, DoD Building Code (General Building Requirements) Change 2, 01 November 2018
https://wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-1-200-01

    b.   International Building Code (IBC) 2015

2. **Background.** A change went into effect for the 2015 International Building Code (IBC) (Ref. b) directing that monolithic non-laminated tempered glass can no longer be used in a handrail, guardrail, in-fill panel or a guard section. The 2015 IBC section 2407, in part, requires use of laminated glass which is fully tempered or heat-strengthened. There are exceptions, but they are limited to areas where there is no walking area below the glass railing. This code change was in response to several instances across North America of monolithic non-laminated glass spontaneously breaking. Monolithic non-laminated tempered glass is also subject to breakage by impact on its edges. In November 2018 an incident of spontaneously breaking glass of an infill panel for a handrail occurred at Fort Hood Replacement Hospital. The design and construction of the hospital were prior to the code change. The primary causes of breakage have been determined to be nickel-sulfide (NiS) inclusions, or unprotected edges. Nickel-sulfide inclusions are imperfections in flat glass that have the potential to expand and cause the glass to break, often spontaneously. These NiS inclusions are not detectable by non-destructive methods. Currently, there are no known repair methods, so replacement or full encasement are the current known resolutions. Potential for spontaneous breakage due to NiS inclusions are rare. There are various industry studies on the topic. For an indication of the order of magnitude of probability, one industry study of destructive heat soak tests of samples of glass from 25,000 tons of glass shows the potential for spontaneous breakage is one break caused by a NiS inclusion per 8.7 tons of glass.

3. **Applicability and Guidance.** This guidance is applicable to all new and proposed USACE facilities as follows.

    a.   All projects currently in pre-planning, planning or design will be in compliance with current codes including UFC 1-200-01C1 and associated codes, with regard to glass in handrails and guards.

    b.   All contracts currently under construction will consider a modification for the change to the UFC 1-200-01C1 code, to reduce the risk to as low as reasonably practicable. Corrective

action may be authorized as a mandatory change at the discretion of the resident engineer and the contracting officer and does not require approval by the end user.

4. **Field Inspection and Mitigation.** For facilities that have been transferred via DD1354 (either interim or final) and are in the active inventory:

a. Departments of Public Works (DPWs), Base Civil Engineer (BCEs) or Inter-service/Inter-agency Stakeholders (IIS) may consult their DD1354 as-built documentation to determine if UFC 1-200-01C1 or IBC 2015 was followed.

b. For on-site inspection, laminated glass can be easily identified by inspecting the edge. Laminated glass will have an interlayer separating the inner and outer lites of the glass pane. Monolithic glass will not have that interlayer. Tempered glass will also have a code-required etched marking or "bug" on one of the corners of the pane. See the images below:
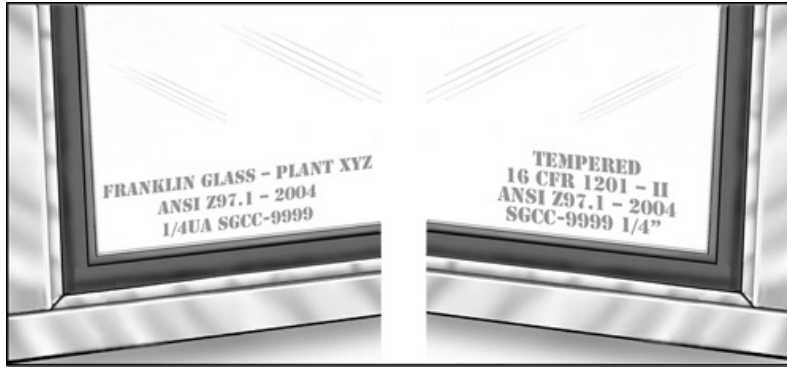

Interlayer
Glass Panels
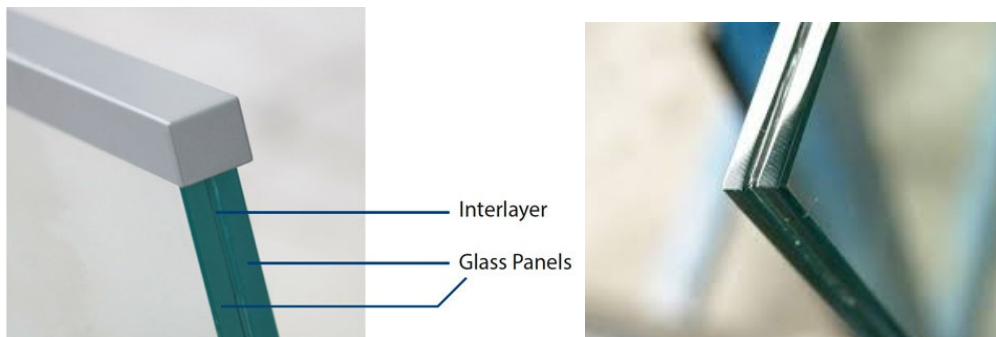
Laminated Glass

Monolithic (Non-laminated) Glass

Tempered Glass Marking

c. For mitigation, arrange with your local DPW/BCE or USACE project manager on a reimbursable basis.

5. **Point of Contact.** The point of contact for this ECB is Mr. Billy Tindell, CECW-EC, Billy.S.Tindell@usace.army.mil.

//S//
LARRY D. McCALLISTER, PhD, P.E., PMP, SES
Chief, Engineering and Construction
U.S. Army Corps of Engineers