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GFRC FACADE PANELS WITH STEEL STUD/FLEX ANCHOR CONNECTION

THE NEED

The ability of building cladding systems to perform successfully depends primarily on their proper design and construction. Current practices in the United States utilize GFRC (Glass Fiber Reinforced Concrete) panels. However, new problems are being detected with such systems. The facade and its attachments (using GFRC) are not being adequately implemented to accommodate vertical and horizontal differential movement between the panels and concrete frame which is resulting in failure or cracking of the panels, and chipping off of the supporting concrete. This differential movement results primarily from extensive GFRC shrinkage and creep, and thermal expansion/contraction of the panels relative to the concrete frame. Thus, there is a need for a system that provides freedom of movement under changing environmental conditions and that establishes sufficient rigidity under gravity, wind, and seismic loads.

FIGURE 1 INSPECTION DISCLOSED A DELAMINATED SECTION OF FACING MIX ON A SPANDREL PANEL

THE TECHNOLOGY

With proper design and construction, steel stud-framed GFRC-skin cladding concept provides a versatile system for freedom of expression in the architectural profile of facades. The system consists of GFRC skin supported by light gage, cold formed, steel studs (Schultz et al. 1987). The flex-anchor design concept can be used to support dead loads of the facade itself. It also neutralizes wind loads, and seismic loads by resisting skin bending stresses. Most importantly, the connection is designed to accommodate thermal expansion such that no buckling, opening of sealed joints, excessive stresses in

panel components, or other detrimental effects occur. Also, this system offsets initial drying and shrinkage loads, and moisture movements due to change of ambient conditions.

FIGURE 2 THIS TYPE OF FLEX ANCHOR IS USED TO PROVIDE FREEDOM OF MOVEMENT FOR GFRP CLADDING UNDER CHANGING TEMPERATURE AND MOISTURE CONDITIONS.

THE BENEFITS

- Flexibility provision for allowance of volumetric changes in the vertical direction related to changes in moisture (shrinkage) and temperature.
- Sound structural response against dead, wind, and earthquake loads.

STATUS

The underlying technology is under wide implementation in the USA. However, this specific system has not been adequately applied - as presented here - in building construction to sufficiently produce the outlined benefits.

BARRIERS

There is still no information available on the overall implementation costs associated with such a system. Another important barrier lies in the need for tight quality control and testing for the manufacturing of sufficiently conforming stud/flex-anchor connections.

POINTS OF CONTACT

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REFERENCES

1. Schultz et al: 'Design Considerations for GFRC Facade Panels Incorporating the Steel Stud/Flex-Anchor Connection', Proceedings of the 6th Biennial Congress, October 20-23, 1987.
2. Wright, Gordon: 'Inappropriate Details Spawn Cladding Problems', Building Design and Construction, January, 1996.

REVIEWERS

Peer reviewed as an emerging construction technology

DISCLAIMER

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

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