

GRIDFORM – Prefabricated FRP panel for rapid bridge deck construction

What is the innovation?

GRIDFORM is a prefabricated Glass Fiber Reinforced Polymer (GFRP) integrated stay-in-place (SIP) and bidirectional, double layer rebar panel for the rapid construction of corrosion-free concrete bridge decks. The lightweight GRIDFORM panel, which weighs only 4.7 psf, is prefabricated in very large units that are limited only by shipping constraints to approximately 50 ft by 8 ft. When the GRIDFORM panel arrives on site it is easily lifted with a single pick of a crane and placed directly on the bridge girders. The GRIDFORM panel is pre-engineered and detailed to enable rapid attachment to the bridge girders and subsequent concrete placement and finishing. The panel is made of off-the-shelf glass/vinylester FRP components that are produced commercially by many US pultrusion companies and the current prototype sells for \$26 ft². The anticipated lifespan of a GRIDFORM bridge deck is 75 to 100 years.

Why is it innovative?

GRIDFORM is innovative because it enables truly accelerated construction of lower-cost bridge decks that have a longer lifespan than traditional decks reinforced using tied-in-place steel rebars built on temporary plywood formwork. The faster construction is due to the prefabricated and pre-engineered geometry of the GRIDFORM panels - inconceivable with conventional materials due to their weight - that typically allow for an entire regular (45 ft wide by 200 ft long) bridge deck formwork and reinforcing system to be placed in a single working day leading to significant labor cost savings. The cast-in-place concrete can then be poured and finished the following day. Since a bottom concrete cover is not required for the FRP bars, the depth of the concrete slab can be reduced by 1 to 2 inches compared with traditional steel reinforced concrete decks, which leads to material cost savings. The GRIDFORM panels produce a completely steel free reinforced concrete bridge deck that is additionally protected on the underside by the FRP SIP panel, which leads to maintenance cost savings.

What has the innovation changed or replaced?

The GRIDFORM panel has changed the way in which concrete bridge decks are constructed. The pre-engineered GRIDFORM panel fundamentally changes the way in which concrete bridge deck construction is viewed. The GRIDFORM panel takes the labor-intensive activities of formwork construction and rebar placement and tying out of the field and into the factory, where precise placement, quality control and labor productivity is enhanced and material waste is less. However, as is necessary for an economical, better-finished, homogenous and contiguous concrete material system it keeps the concrete placement activity in the field.

Where and when did the innovation originate, has it been used, and where is it expected to be used in the future?

The GRIDFORM system is a result of 13 years of research at universities funded primarily by the FHWA. Two bridges have been constructed in Wisconsin on the busy Highway 151 corridor between Madison and Fond-du-Lac using first-generation versions of GRIDFORM. The current third-generation GRIDFORM system was used in November 2005 for the construction of the deck of bridge no. 14802301 in Greene County, Missouri. The old superstructure was replaced due to extensive corrosion-induced degradation of the steel reinforced concrete deck and of the steel girders. The new 144 ft long four-span slab-on-girder bridge, consists of four W24x84 girders spaced at 6 ft and acting non-compositely with a 7 in thick GRIDFORM deck. GRIDFORM can be used for bridge deck construction in any structural system configuration – steel girders, precast concrete girders, composite or non-composite action decks, and for both new deck and bridge deck replacement construction. It is anticipated that the price of the GRIDFORM system will decrease with increased applications.

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PREFAB GFRP CONCRETE BRIDGE DECK PANELS

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