

## **ITEM 11557.42 M - PRECAST EXODERMIC BRIDGE DECK PANELS**

### **DESCRIPTION:**

This work shall consist of fabricating, delivering to the job site and installing Exodermic Bridge Deck panels consisting of galvanized steel grid frames, metal forms, epoxy coated reinforcing steel, and precast concrete as shown in the contract plans and in accordance with this specification.

### **MATERIAL REQUIREMENTS:**

Obtain the steel grid panels for the patented Exodermic Bridge Deck from:

L. B. Foster Company	or	American Bridge Manufacturing
1016 Greentree Road		2000 American Bridge Way
Pittsburgh, PA 15220		Coraopolis, PA 15108
TEL: (412) 928-3548		TEL: (412) 631-3040
FAX: (412) 928-3514		FAX: (412) 631-4001

or other licensed Exodermic Bridge Deck steel grid panel manufacturers. Licensing status and other information can be obtained from:

Exodermic Bridge Deck, Inc.  
60 Long Pond Road  
Lakeville, CT 06039  
TEL: 860-435-0300 or toll free: 888-EXODERM (396-3376)  
FAX: 860-435-4868  
E-MAIL: info@exodermic.com

The Contractor shall notify the Engineer of the name, address, telephone number, and contact person of the steel grid panel manufacturer within seven days of contract award.

### **Exodermic Panels:**

Structural Steel - (ASTM A36M with a minimum 0.20% copper content, unless the plans show otherwise)	§715-01
Stud Shear Connectors	§709-05
Galvanized Coatings and Repair Methods	§719-01 (as modified)
Leveling Bolts	ASTM F568M, Class 4.6
Nuts	ASTM A563M
Bar Reinforcement (Epoxy Coated)	§709-04
Concrete Repair Material	§701-04
Mechanical Connectors for Reinforcing Bar Splices	§709-10
Membrane Curing Compound	§711-05
Water	§712-01
Fine Aggregate	§703-01
Course Aggregate	§703-02

Use 20 gauge (minimum) galvanized steel, sheet metal conforming to ASTM A653M for the forms. Use ASTM A366M for sheet metal that is installed prior to galvanizing the panels.

Fasteners shall conform to §715-14 and shall be galvanized as per §719-01.

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### **FABRICATION DETAILS:**

#### **Grid Manufacturing Details:**

Prior to steel grid panel manufacture, the Contractor must check the proposed panel layout and verify all shop drawing dimensions and cross-slopes to satisfy actual jobsite conditions.

The steel members and steel grating shall be fabricated to the dimensions and properties as shown on the contract plans and approved shop drawings and in accordance with Section 564 as well as the requirements of the New York State Steel Construction Manual except as modified by this specification. It shall be the Contractor's responsibility to field verify all dimensions in order to make necessary changes prior to fabrication. Due consideration shall be given to the placement of reinforcement and leveling devices to provide adequate clearance for their field adjustment from above using a socket wrench. The panel layout shown in the Contract Plans is suggested. The fabricator shall develop the layout and detail it on the shop drawings. After the attachment of all edge bars, leveling devices, horizontal shear studs and other components, the steel and grating shall be galvanized according to §719-01 Type 1. Show lift arrangement for lowering the panels into the galvanizing tank. Steel members and grating shall be fabricated to proper roadway cross slopes prior to galvanizing. The minimum size of a fillet weld shall be 5mm and the minimum length of fillet weld shall be 20mm.

After the steel members and grating have been galvanized, they shall be inspected for defects in the galvanized coating. Any defects shall be repaired as specified in §719-01 as well as the requirements of the New York State Steel Construction Manual, except that repairs by spray coating will not be permitted and repairs with material containing aluminum will not be permitted to areas that will be in contact with concrete.

Gas Metal Arc Welding (MIG) may be used for steel grid panel manufacture. Prior to welding, an approved Procedure Qualification Record (PQR) and Welding Procedure Specification (WPS) are required in accordance with the AASHTO Bridge Welding Code except that the New York State Steel Construction Manual three year window on PQR's shall be required. Identify each steel grid panel for correct placement on the structure. Attach vertical (bulkhead) forms to the grids by means other than welding (once galvanizing is complete). Support the steel grid panels with wood or similar blocks and position binders to avoid distortion or other damage during transportation and storage.

Grid tolerances: Use the Bridge Grid Flooring Manufacturers Association current standards for dimension tolerances for the steel grids after galvanizing. Additionally the webs of main bars and the distribution bars shall be perpendicular to the plane of the grid within 3.5 degrees. See Concrete Placement section for tolerances on finished panels.

#### **Concrete Placement:**

Concrete mix design, fabrication, handling and installation of Exodermic Bridge Deck panels shall meet the requirements in the NYSDOT Prestressed Concrete Construction Manual (PCCM) - September, 2000 edition and the following:

- The submitted shop drawings shall include a set of drawings with details of handling of the panels in the production facility, their storage, their transportation and their handling at the construction site. The proposed handling method shall be such that the actual tension in any part of the concrete will not exceed a tension  $0.5 (f'c)^{1/2}$ . A set of calculations showing actual concrete stresses based on the proposed support locations and expected dynamic loading of the panels during handling, storage and transportation of the panels prepared by a NYS licensed Professional

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Engineer shall be submitted along with the shop drawings. These drawings and the calculations shall be stamped and signed by the Professional Engineer.

- Precast Concrete Tolerances (Section 7.7 of the PCCM for Precast Concrete Structural Units is not applicable for Exodermic Bridge Deck panels). Only the following tolerances shall apply to this product (this replaces 7.7 for this product):

Overall panel thickness  $+4/-3$  mm prior to surface texturing  
Concrete thickness  $+4/-3$  mm prior to surface texturing  
Overall Panel length  $\pm 6$  mm  
Overall Panel width  $\pm 6$  mm  
Overall Panel Squareness diagonal measurement  
 $\pm 13$  mm of opposite diagonal  
Longitudinal Camber  $\pm 6$  mm maximum  
Transverse Camber  $0.005 \times$  width of panel, maximum of  $\pm 6$  mm  
Sweep (panel length divided by 5)  $\times 3$  mm, maximum of  $\pm 6$  mm  
Center (midspan) of an Exodermic Bridge Deck panel (in relation to the ends) - i.e. deviation from a straight line (in storage or on a truck for shipping):  $+0, -12$  mm (Sag), provided that the 12 mm sag is consistent with the permitted calculated stress levels as required in the shop drawings for handling, storage and transportation.  
Forms must be sufficiently tight such that seepage of concrete paste is minimal.

(Note: It will be necessary for the precaster to make some adjustments in the exterior dimensions of the forms and to provide the casting beds with a means to align and hold the steel grid deck panels flat and square.)

- Corrosion inhibitor requirement under Section 4.1, Materials for Concrete, in the PCCM shall not apply.
- Coating of units under Section 6.2.3 of the PCCM shall not apply.
- The required minimum concrete strength shall be 35 MPa at 28 days.
- Accelerated curing will not be allowed.

### **INSTALLATION REQUIREMENTS:**

The following shall apply (in addition to the provisions in the PCCM):

1. When rehabilitating a structure, and prior to steel grid panel installation, blast clean the top surface of beam flanges, and the surfaces of concrete or reinforcing that will be in contact with new concrete, according to §584-3.04A. and B.
2. Form haunches, if required, with closure angles or install adhesive backed foam on the supporting steel beams as indicated on the plans, position steel grid panels on the steel beams and align with adjacent panels. Measure from fixed points to avoid cumulative error. Adjust elevations with the attached leveling devices and square-up as necessary.

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3. After sheet metal form and miscellaneous form installation, attach the stud shear connectors through openings in the steel grid panels as per §556-3.03. With precise layout and the Engineer's permission, stud shear connectors may be welded in place prior to placing the steel grid panels.
4. Break the ceramic ferrules around the welded studs and remove all debris.
5. Place Cast In-Place Concrete (Field Placed) where shown on the Contract Plans and conforming to the following requirements:
  - a) Concrete shall be batched in a mobile mixer meeting 501-2.04C. No hand mixing will be allowed.
  - b) Place concrete only within an ambient temperature range of 10°C to 25°C. If temperatures are expected to fall below 10°C, cold weather concreting procedures, in accordance to §555-3.06 Provisions for Concreting in Cold Weather, must be followed. If temperatures are expected to go above 25°C, contact the Material's Bureau for appropriate placement procedures. Do not expose fresh concrete to direct rainfall.
  - c) Blast clean all surfaces to be in contact with fresh concrete prior to installation. Remove grease, dirt and all other contaminants. Protect the galvanized grid and epoxy rebar from damage due to the blastcleaning operation.
  - d) Prior to the placement of fresh concrete, thoroughly wet all surfaces to be in contact with fresh concrete for as long as possible. Remove all standing water with oil-free compressed air, and protect the existing concrete from drying, so it remains in a saturated-surface-dry condition.
  - e) A representative of the cement producer shall be on site to verify field conditions and placement procedures for at least the initial placement.
  - f) Firmly work fresh concrete into place and consolidate with pencil vibrators to minimize voids. Vibrators should be hand held pencil vibrators having a maximum diameter of 25 mm and capable of operating through a frequency range of 6000 - 9000 vibrations per minute..
  - g) Hand screed fresh concrete to the level of the surrounding concrete, but do not over work or apply additional water to the surface.
  - h) Cure the concrete with wet burlap, placed immediately, for as long as possible. Do not allow the burlap to dry. Prior to opening to traffic, apply a membrane curing compound.
  - i) Do not open to traffic until the concrete has achieved a minimum compressive strength of 18 MPa. The time required to reach this strength should be determined through the trial batches.

### **FIELD PLACED CONCRETE:**

This material will be used to fill in shear-keys and to secure panels in the field. The maximum allowable total chloride content in the concrete shall not exceed 0.10 percent by weight of cement.

Develop a mix design using an Accelerated Cement, with an approved fine aggregate (§703-01) and coarse aggregate (§703-02). The mix shall meet the specified properties of Table 1. The proposed mix design must be submitted to the Director Materials Bureau for review. All materials used are subject to the approval of the Director Materials Bureau. Final approval will be based on the results of the trial batch.

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A mix design must be finalized at least 30 days prior to the beginning of the work.

<b>TABLE 1 - Mix Design Requirements</b>	
6 Hour Strength	18 MPa
28 Day Strength	42 MPa
Minimum Set Time	15 min.
Maximum Coarse Aggregate Size	10 mm
Shrinkage	0.05 % max.
Capable of being retarded when necessary.	
Provide a working time which allows for placement in a continuous operation without cold joints.	
Be flowable such that the mix pours into and completely fills the shear-keys.	
Match the color and texture of the surrounding concrete.	
Provide a durable, crack free final product.	

### **Trial Batch:**

Prepare a trial batch using the same (1) materials and (2) mixing, transporting, and discharging methods as those to be used on the project. Demonstrate the mix's ability to achieve the specified properties to the Regional Materials Engineer. Determine the required time to achieve the specified strengths.

Changes other than minor fluctuations in admixture dosage rates will require a new mix design and trial batch as determined by the Regional Materials Engineer. The Engineer may halt material placement and order new trial batches whenever the specified properties are not achieved.

Using material from the trial batch, construct a 280 mm wide by 102 mm thick by 2 m long (min.) test panel in order to determine the mix's crack susceptibility. Also test the mix's pourability by placing the concrete in a simulated shear-key, 300 mm (min.) in length, which matches the dimensions of the shear-key shown on the project plans.

### **METHOD OF MEASUREMENT:**

The work will be measured as the number of square meters of pre-fabricated Exodermic Bridge Deck panels. Measurement will be taken as the total area of deck surface covered with exodermic deck panels including joints between panels. Measurement will be taken from outside edge to outside edge of the top surface. No deduction will be made for joint or chamfers.

### **BASIS OF PAYMENT:**

The square meter bid price shall include the cost of all labor, materials and equipment necessary to complete the work of furnishing and installation of all Exodermic Bridge Deck panels (including the cost of the transporting, storing and protecting the deck panels from damage), the furnishing and installation of closures, forms, backer rods, stud shear connectors, additional epoxy coated reinforcement, and field placed concrete.