## GENERAL INFORMATION

# BANG-IT™/~~WOOD-KNOCKER~~™

*Concrete Inserts*

### PRODUCT DESCRIPTION

Bang-It and Wood-Knocker concrete inserts are specifically designed to provide hangar attachments for mechanical, electrical, plumbing (MEP) and fire protection.

**Bang-It** concrete inserts are designed for installation in and through composite steel deck (i.e. "pan-deck") used to support newly poured concrete floors or roof slabs.

After installation, the protective sleeve of the insert protrudes below the surface of the deck. The sleeves are color coded by size and allow overhead attachment of steel threaded rod in sizes ranging from 1/4" to 3/4" in diameter. The sleeve prevents sprayed fireproofing material and acoustical dampening products from clogging the internal threads of the insert. It also prevents burying, masking or losing the insert location. A hex impact plate offers resistance to rotation within the concrete as a steel threaded rod is being installed.

**~~Wood-Knocker~~** concrete inserts are installed onto wooden forms used to support newly poured concrete ~~floor slabs, roof slabs or walls.~~

When the forms are stripped, the color-coded flange is visibly embedded in the concrete surface. The inserts allow the attachment of steel threaded rod or ~~threaded bolts~~ in sizes ranging from 1/4" to 3/4" in diameter. The hex impact plate offers resistance to rotation ~~within the concrete~~ as a steel threaded rod or threaded bolt is being installed.

### GENERAL APPLICATIONS AND USES

- Hanging Pipe and Sprinkler Systems
- HVAC Ductwork and Stud Channels
- Suspending Trapeze and Cable Trays
- Mechanical Unit Overhead Utilities
- Conduit and Lighting System
- Seismic Loading and Cracked Concrete

### FEATURES AND BENEFITS

+ Fast and simple to install, low installed cost
+ Color coded by size for simple identification
+ Bang-It can be installed in lower flute of steel deck as little as 1.5" topping thickness (see details)
+ Wood-Knocker can be installed in wood form pours only 3.5" thick
+ Hex head does not rotate when set
+ Insert design allows for full thread engagement
+ All sizes suitable for tension and shear loading

### APPROVALS AND LISTINGS

- International Code Council, Evaluation Service (ICC-ES), ESR-3657 for concrete. Approved for seismic and wind loading (all diameters)
- Code compliant with the 2012 IBC, 2012 IRC, 2009 IBC, 2009 IRC, 2006 IBC and 2006 IRC
- Tested in accordance with ASTM E 488 and ICC-ES AC446 for use in concrete under the design provisions of ACI 318 (Strength Design method)
- Evaluated and qualified by an accredited independent testing laboratory for recognition in cracked and uncracked concrete
- Underwriters Laboratories (UL Listed) - File No. EX1289, see listing for sizes. Also UL listed and recognized for use in air handling spaces.
- FM Approvals (Factory Mutual) – File No. J.I. 3015153

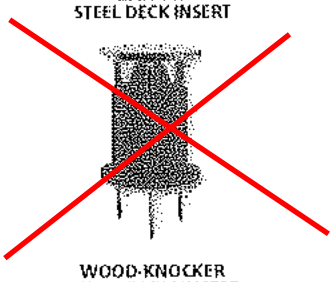
### GUIDE SPECIFICATIONS

CSi Divisions: 03 15 19 - Cast-In Concrete Anchors and 03 16 00 - Concrete Anchors. Concrete inserts shall be Bang-It and/or Wood-Knocker as supplied by Powers Fasteners, Inc., Brewster, NY.

### SECTION CONTENTS



BANG-IT
STEEL DECK INSERT



WOOD-KNOCKER
WOOD FORM INSERT

### ANCHOR MATERIALS

- Carbon Steel and Engineered Plastic

### ROD/ANCHOR SIZE RANGE (TYP.)

- 1/4" to 3/4" threaded rod for Bang-It Concrete Inserts
- 1/4" to 3/4" threaded rod for Wood-Knocker Concrete Inserts

### SUITABLE BASE MATERIALS

- Normal-Weight Concrete
- Lightweight Concrete

CODE LISTED
ICC-ES ESR-3657
CONCRETE

This Product Available in

PDA

Powers Design Assist®
Real-Time Anchor Design Software
www.powersdesignassist.com

MECHANICAL ANCHORS
BANG-IT™/WOOD-KNOCKER™
Concrete Inserts

# MATERIAL SPECIFICATIONS

## Bang-It

| Anchor Component | Component Material |
|---|---|
| Insert Body | AISI 1008 Carbon Steel or equivalent |
| Flange | AISI 1008 Carbon Steel or equivalent |
| Spring | Steel Music Wire |
| Protective Sleeve | Engineered Plastic |
| Zinc Plating | ASTM B 633 (Fe/Zn 5)<br>Min. Plating requirements for Mild Service Condition |

## Wood-Knocker

| Anchor Component | Component Material |
|---|---|
| Insert Body | AISI 1008 Carbon Steel or equivalent |
| Flange | Engineered Plastic |
| Zinc Plating | ASTM B 633 (Fe/Zn 5)<br>Min. plating requirements for mild service condition |

## Material Properties for Threaded Rod

| Steel Description | Steel Specification (ASTM) | Rod Diameter (inch) | Minimum Yield Strength, $f_y$ (ksi) | Minimum Ultimate Strength, $f_u$ (ksi) |
|---|---|---|---|---|
| Standard carbon rod | A 36 or A 307, Grade C | 1/4 to 3/4 | 36.0 | 58.0 |
| High strength carbon rod | A 193, Grade B7 | 1/4 to 3/4 | 105.0 | 125.0 |

## Allowable Steel Strength for Threaded Rod

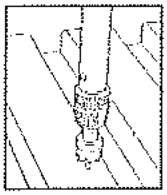
| Anchor Diameter d in. (mm) | Nominal Area of Rod in.² (mm²) | Allowable Tension | | | Allowable Shear | | |
|---|---|---|---|---|---|---|---|
| | | ASTM A36 lbs. (kN) | ASTM A307 Grade C lbs. (kN) | ASTM A193 Grade B7 lbs. (kN) | ASTM A36 lbs. (kN) | ASTM A307 Grade C lbs. (kN) | ASTM A193 Grade B7 lbs. (kN) |
| 1/4 (6.4) | 0.0491 (1.2) | 910 (4.2) | 940 (4.2) | 2,160 (9.7) | 485 (2.2) | 485 (2.2) | 1,030 (4.6) |
| 3/8 (9.5) | 0.1104 (2.8) | 2,115 (9.5) | 2,115 (9.5) | 4,375 (19.7) | 1,090 (4.9) | 1,090 (4.9) | 2,255 (10.1) |
| 1/2 (12.7) | 0.1963 (5.0) | 3,755 (16.9) | 3,755 (16.9) | 7,775 (35.0) | 1,940 (8.7) | 1,940 (8.7) | 4,055 (18.2) |
| 5/8 (15.9) | 0.3068 (7.8) | 5,870 (26.4) | 5,870 (26.4) | 12,150 (54.7) | 3,025 (13.6) | 3,025 (13.6) | 6,260 (28.2) |
| 3/4 (19.1) | 0.4418 (11.2) | 8,455 (38.0) | 8,455 (38.0) | 17,495 (78.7) | 4,355 (19.6) | 4,355 (19.6) | 9,010 (40.5) |

Allowable tension = $f_u$ $(A_{nom})$ (0.33); Allowable shear = $f_u$ $(A_{nom})$ (0.17)

# INSTALLATION INSTRUCTIONS

## Installation Instructions for Bang-It

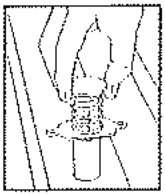
### Create Hole



**Step 1**

*Cut (e.g. drill/punch) a hole in the steel deck to the hole size required by the insert.*

### Position



**Step 2**

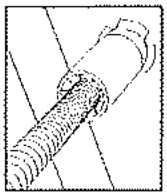
*Place the plastic sleeve of the insert through hole in steel deck.*

### Prepare

**Step 3**

*Step on or impact the insert head to engage. Optionally, base plate of insert can also be screwed to steel deck.*

### Attach

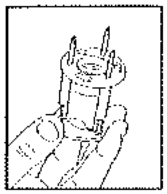


**Step 4**

*After concrete has reached design strength, install threaded steel element (rod/bolt) into the insert. Trim away for shear load application and attach fixture as applicable (e.g. seismic brace).*

## Installation Instructions for Wood-Knocker

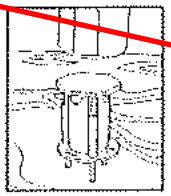
### Position



**Step 1**

*Position insert on formwork nails down.*

### Drive



**Step 2**

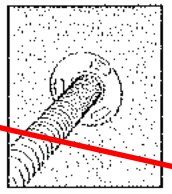
*Drive insert down until flush with the form.*

### Prepare

**Step 3**

*After formwork removal, remove nails as necessary (e.g. flush mounted fixtures).*

### Attach

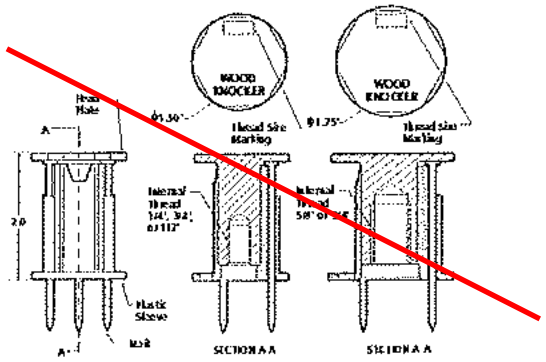


**Step 4**

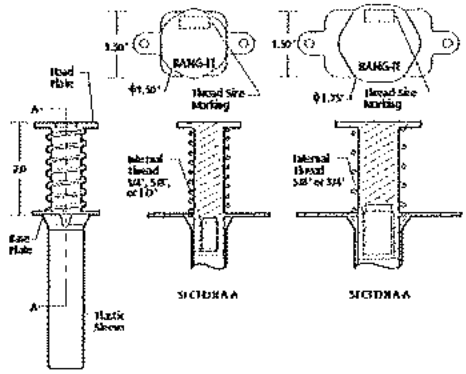
*After concrete has reached design strength, install threaded steel element (rod/bolt) into the insert or attach fixture as applicable (e.g. seismic brace).*

# INSTALLATION SPECIFICATIONS

## Wood-Knocker Cast-In-Place Inserts for Form Pour Concrete

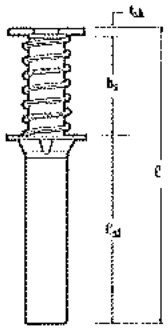



## Bang-It Cast-In-Place Inserts for Concrete Filled Steel Deck Floor and Roof Assemblies



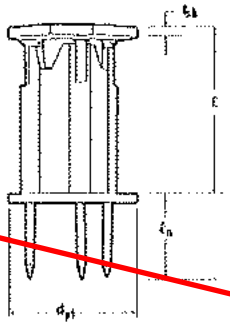

### Bang-It

| Dimension | Notation | Nominal Rod/Anchor Size | | | | |
|---|---|---|---|---|---|---|
| | | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" |
| Metal Hole Saw Diameter (in.) | $d_{bit}$ | 13/16 or 7/8 | | | 1-3/16 or 1-1/4 | |
| Metal Hole Saw Drilling Speed (rpm) | - | 700-900 | 700-900 | 700-900 | 500-700 | 500-700 |
| Height of Spring (in.) | $h_s$ | 1-7/8 | 1-7/8 | 1-7/8 | 1-7/8 | 1-7/8 |
| Insert Thread Length (in.) | - | 3/8 | 5/8 | 11/16 | 15/16 | 1-1/8 |
| Length of Sleeve (in.) | $\ell_{sl}$ | 3-3/8 | 3-3/8 | 3-3/8 | 3-3/8 | 3-3/8 |
| Thread Size, UNC | - | 1/4-20 | 3/8-16 | 1/2-13 | 5/8-11 | 3/4-10 |
| Overall Length (in.) | $\ell$ | 5-7/16 | 5-7/16 | 5-7/16 | 5-7/16 | 5-7/16 |
| Steel Flange Thickness (in.) | $t_{sh}$ | 1/8 | 1/8 | 1/8 | 1/8 | 1/8 |




### Wood-Knocker

| Dimension | Notation | Nominal Rod/Anchor Size | | | | |
|---|---|---|---|---|---|---|
| | | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" |
| Insert Thread Length (in.) | - | 3/8 | 5/8 | 11/16 | 15/16 | 1-1/8 |
| Plastic Flange Dia. (in.) | $d_{pf}$ | 1-3/8 | 1-3/8 | 1-3/8 | 1-5/8 | 1-5/8 |
| Plastic Flange Thickness (in.) | - | 7/64 | 7/64 | 7/64 | 7/64 | 7/64 |
| Thread Size, UNC | - | 1/4-20 | 3/8-16 | 1/2-13 | 5/8-11 | 3/4-10 |
| Overall Length (in.) | $\ell$ | 2 | 2 | 2 | 2 | 2 |
| Break-Off Nail Length (in.) | $\ell_n$ | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Steel Flange Thickness (in.) | $t_{sh}$ | 1/8 | 1/8 | 1/8 | 1/8 | 1/8 |



# STRENGTH DESIGN (SD)

## Wood-Knocker Insert Design Information[1,2,3,4,5,6,7]

| Design Information | Symbol | Units | 1/4-inch | 3/8-inch | 1/2-inch | 5/8-inch | 3/4-inch |
|---|---|---|---|---|---|---|---|
| Insert O.D. | $d_o$ ($d_h$) | in. (mm) | 0.7 (18) | 0.7 (18) | 0.7 (18) | 1.0 (25) | 1.0 (25) |
| Insert head net bearing area | $A_{brg}$ | in² (mm²) | 1.20 (762) | 1.20 (762) | 1.20 (762) | 1.30 (839) | 1.30 (839) |
| Effective embedment depth | $h_{ef}$ | in. (mm) | 1.75 (45) | 1.75 (45) | 1.75 (45) | 1.75 (45) | 1.75 (45) |
| Minimum member thickness | $h_{min}$ | - | 3.5 (89) | 3.5 (89) | 3.5 (89) | 3.5 (89) | 3.5 (89) |
| Effectiveness factor for cracked concrete | $k_c$ | - (SI) | 24 (10) | 24 (10) | 24 (10) | 24 (10) | 24 (10) |
| Modification factor for tension strength in uncracked concrete | $\Psi_{c,N}$ | - | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Nominal tension strength of single insert in tension as governed by steel strength | $N_{sa,static}$ | lb (kN) | 10,270 (45.7) | 10,270 (45.7) | 9,005 (40.1) | 12,685 (56.4) | 13,370 (59.5) |
| Nominal seismic tension strength of single insert in tension as governed by steel strength | $N_{sa,seismic}$ | lb (kN) | 10,270 (45.7) | 10,270 (45.7) | 9,005 (40.1) | 12,685 (56.4) | 13,370 (59.5) |
| Nominal steel shear strength of single insert | $V_{sa,static}$ | lb (kN) | 10,550 (47.0) | 10,550 (47.0) | 10,550 (47.0) | 9,075 (40.4) | 9,075 (40.4) |
| Nominal steel shear strength of single insert for seismic loading | $V_{sa,seismic}$ | lb (kN) | 10,550 (47.0) | 10,550 (47.0) | 10,550 (47.0) | 9,075 (40.4) | 9,075 (40.4) |

For SI: 1 inch = 25.4 mm, 1 inch² = 635 mm², 1 pound = 0.00445 kN, 1 psi = 0.006895 MPa. For pound-inch unit: 1 mm = 0.03937 inches.

1. Concrete must have a compressive strength f'c of 2,500 psi minimum.
2. Design of headed cast-in specialty inserts shall be in accordance with the provisions of ACI 318 Appendix D for cast-in headed anchors.
3. Strength reduction factors for the inserts shall be taken from ACI 318-11 D.4.3 for cast-in headed anchors. Strength reduction factors for load combinations in accordance with ACI 318 Section 9.2 governed by steel strength of the insert shall be taken as 0.65 for tension and 0.60 for shear; values correspond to brittle steel elements. The value of $\phi$ applies when the load combinations of Section 1605.2 of the IBC or ACI 318 Section 9.2 are used in accordance with ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the appropriate value of $\phi$ must be determined in accordance with ACI 318 D.4.4.
4. The concrete tension strength of headed cast-in specialty inserts shall be calculated in accordance with ACI 318 Appendix D.
5. Insert O.D. is the outside diameter of the headed insert body.
6. Minimum spacing distance between anchors and minimum edge distance for cast-in Wood-Knocker anchors shall be in accordance with ACI 318 D.8.
7. The strengths shown in the table are for inserts only. Design professional is responsible for checking threaded rod or bolt strength in tension, shear, and combined tension and shear, as applicable. See Steel Design Information table for common threaded rod elements.

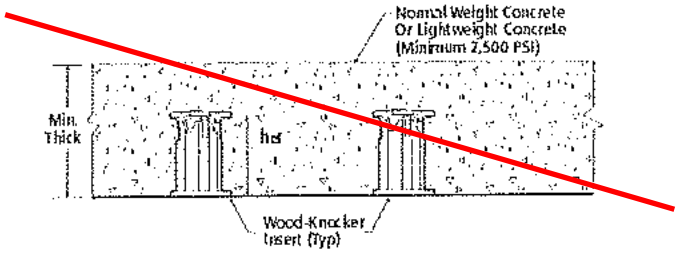
## Bang-It Insert Design Information[1,2,3,4,5,6,7,8]

| Design Information | | Symbol | Units | 1/4-inch | 3/8-inch | 1/2-inch | 5/8-inch | 3/4-inch |
|---|---|---|---|---|---|---|---|---|
| Insert O.D. | | $d_o$ ($d_h$) | in. (mm) | 0.7 (18) | 0.7 (18) | 0.7 (18) | 1.0 (25) | 1.0 (25) |
| Insert head net bearing area | | $A_{brg}$ | in² (mm²) | 1.20 (762) | 1.20 (762) | 1.20 (762) | 1.30 (839) | 1.30 (839) |
| Effective embedment depth | | $h_{ef}$ | in. (mm) | 1.75 (45) | 1.75 (45) | 1.75 (45) | 1.75 (45) | 1.75 (45) |
| Minimum member thickness | | $h_{min}$ | - | See Deck Figures as applicable | | | | |
| Minimum spacing and edge distances | Upper flute | $S_{min}$, $C_{min}$ | - | See ACI 318 Section D.8.1 and D.8.2 | | | | |
| | Lower flute | $S_{min}$, $C_{min}$ | - | See Deck Figures as applicable | | | | |
| Effectiveness factor for cracked concrete | | $k_c$ | - (SI) | 24 (10) | 24 (10) | 24 (10) | 24 (10) | 24 (10) |
| Modification factor for tension strength in uncracked concrete | | $\Psi_{c,N}$ | - | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Nominal tension strength of single insert in tension as governed by steel strength (4-1/2" W-Deck, B-Deck, 3-7/8" W-Deck) | | $N_{sa,deck}$ | lb (kN) | 10,440 (46.4) | 10,440 (46.4) | 8,240 (36.7) | 13,415 (59.7) | 11,985 (53.3) |
| Nominal seismic tension strength of single insert in tension as governed by steel strength (4-1/2" W-Deck, B-Deck, 3-7/8" W-Deck) | | $N_{sa,deck,eq}$ | lb (kN) | 10,440 (46.4) | 10,440 (46.4) | 8,240 (36.7) | 13,415 (59.7) | 11,985 (53.3) |
| Nominal steel shear strength of single insert in the soffit of concrete on steel deck, (4-1/2" W-Deck) | | $V_{sa,deck,slab}$ | lb (kN) | 2,280 (10.2) | 2,280 (10.2) | 2,280 (10.2) | 3,075 (13.7) | 3,075 (13.7) |
| Nominal steel shear strength of single insert in the soffit of concrete on steel deck, for seismic loading, (4-1/2" W-Deck) | | $V_{sa,deck,slab,eq}$ | lb (kN) | 2,280 (10.2) | 2,280 (10.2) | 2,280 (10.2) | 2,695 (12.0) | 2,695 (12.0) |
| Nominal steel shear strength of single insert in the soffit of concrete on steel deck, (B-Deck, 3-7/8" W-Deck) | | $V_{sa,deck,slab}$ | lb (kN) | 2,080 (10.2) | 2,080 (10.2) | 2,080 (10.2) | 2,975 (13.2) | 2,975 (13.2) |
| Nominal steel shear strength of single insert in the soffit of concrete on steel deck, for seismic loading, (B-Deck, 3-7/8" W-Deck) | | $V_{sa,deck,slab,eq}$ | lb (kN) | 2,080 (10.2) | 2,080 (10.2) | 2,080 (10.2) | 2,695 (12.0) | 2,695 (12.0) |

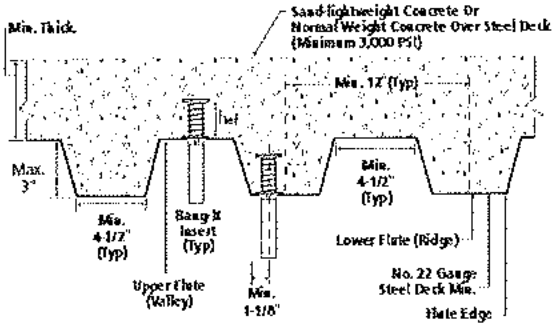
For SI: 1 inch = 25.4 mm, 1 inch² = 635 mm², 1 pound = 4.45 N, 1 psi = 0.006895 MPa. For pound-inch unit: 1 mm = 0.03937 inches.

1. Concrete must have a compressive strength f'c of 2,500 psi minimum.
2. Design of headed cast-in specialty inserts shall be in accordance with the provisions of ACI 318 Appendix D for cast-in headed anchors.
3. Strength reduction factors for the inserts shall be taken from ACI 318-11 D.4.3 for cast-in headed anchors. Strength reduction factors for load combinations in accordance with ACI 318 Section 9.2 governed by steel strength of the insert shall be taken as 0.65 for tension and 0.60 for shear; values correspond to brittle steel elements. The value of $\phi$ applies when the load combinations of Section 1605.2 of the IBC or ACI 318 Section 9.2 are used in accordance with ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the appropriate value of $\phi$ must be determined in accordance with ACI 318 D.4.4.
4. The concrete tension strength of headed cast-in specialty inserts in concrete filled steel deck assemblies shall be calculated in accordance with ACI 318 Appendix D and Deck Figures.
5. Insert O.D. is the outside diameter of the headed insert body.
6. Minimum spacing distance between anchors and minimum edge distances for cast-in Bang-It anchors shall be in accordance with Deck Figures, as applicable, and noted provisions.
7. The strengths shown in the table are for inserts only. Design professional is responsible for checking threaded rod strength in tension, shear, and combined tension and shear, as applicable. See Steel Design Information table for common threaded rod elements.
8. The tabulated insert strength values are applicable to installations in the lower flute or upper flute of the steel deck profiles; see Deck Figures.

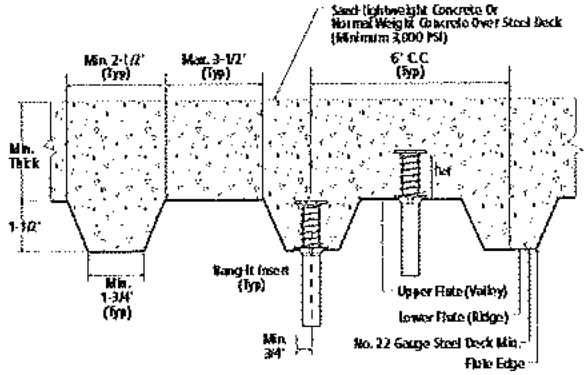
## Wood-Knocker Insert Installed in Soffit of Form Pour Concrete Floor and Roof Assemblies



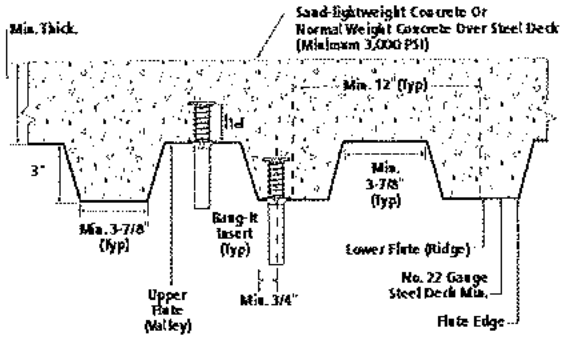

## Bang-It Inserts Installed in Soffit of Concrete Filled Steel Deck Floor and Roof Assemblies, 4-1/2 -inch W-Deck[1,2,3,4]




## Bang-It Inserts Installed in Soffit of Concrete Filled Steel Deck Floor and Roof Assemblies, B-Deck[1,2,3,4,5,6,7]




## Bang-It Inserts Installed in Soffit of Concrete Filled Steel Deck Floor and Roof Assemblies, 3-7/8 -inch W-Deck[1,2,3,8]




1. Inserts may be placed in the upper flute or lower flute of the steel deck assembly. Inserts in the lower flute require a minimum 1.5" of concrete topping thickness (min. thick) from the top of the deck at the location of the installation. Upper flute installations require a minimum 3" topping thickness concrete (min. thick) from the top of the deck at the location of the installation.
2. Axial spacing for Bang-It inserts along the flute length shall be minimum 3hef.
3. Upper flute Bang-It inserts are not subject to steel deck dimension limitations, or the minimum steel deck gauge limitations.
4. Inserts in the lower flute of 4-1/2-inch W-Deck may be installed with a maximum 1-1/8 -inch offset in either direction from the center of the flute. The offset distance may be increased for flute widths greater than those shown provided the minimum lower flute edge distance of 1-1/8 -inch is also satisfied.
5. Inserts in the lower flute of B-Deck may be installed with a maximum 1/8 -inch offset in either direction from the center of the flute. The offset distance may be increased for flute widths greater than those shown provided the minimum lower flute edge distance of 3/4 -inch is also satisfied.
6. Lower flute installations of B-Deck with flutes widths greater than 1-3/4 -inch are permitted.
7. Lower flute installations of B-Deck in flute depths greater than 1-1/2 -inch are permitted provided the minimum edge distance of 3/4 -inch is met and the minimum lower flute width is increased proportionally (e.g. applicable to a lower flute depth of 2-inch with a minimum lower flute width of 2-1/4 -inch).
8. Inserts in the lower flute of 3-7/8-inch W-Deck may be installed with a maximum 1-3/16 -inch offset in either direction from the center of the flute.

## Specifications And Physical Properties Of Common Carbon Steel Threaded Rod Elements[1]

| Threaded Rod Specification | | Units | Min. Specified Ultimate Strength, $F_{ua}$ | Min. Specified Yield Strength 0.2 Percent Offset, $F_{ya}$ | $F_{ua}$ / $F_{ya}$ | Elongation Minimum Percent[5] | Reduction Of Area Min. Percent | Related Nut Specification[6] |
|---|---|---|---|---|---|---|---|---|
| Carbon Steel | ASTM A36/A36M[2] and F1554[3] Grade 36 | psi (MPa) | 58,000 (400) | 36,000 (248) | 1.61 | 23 | 40 (50 for A36) | ASTM A194 / A563 Grade A |
| | ASTM F1554[3] Grade 105 | psi (MPa) | 125,000 (862) | 105,000 (724) | 1.19 | 15 | 45 | ASTM A194 / A563 Grade DH |
| | ASTM A193/A193M[4] Grade B7 | psi (MPa) | 125,000 (860) | 105,000 (720) | 1.19 | 16 | 50 | |

For SI: 1 inch = 25.4 mm, 1 psi = 0.006897 MPa. For pound-inch units: 1 mm = 0.03937 inch, 1 MPa = 145.0 psi.

1. Inserts may be used in conjunction with all grades of continuously threaded carbon steels (all-thread) that comply with code reference standards and that have thread characteristics comparable with ANSI B1.1 UNC Coarse Thread Series.
2. Standard Specification for Carbon Structural Steel.
3. Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
4. Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
5. Based on 2-inch (50 mm) gauge length except ASTM A193, which are based on a gauge length of 4d ($d_{nut}$).
6. Where nuts are applicable, nuts of other grades and style having specified proof load stress greater than the specified grade and style are also suitable.

## Steel Design Information For Common Threaded Rod Elements Used With Concrete Inserts[1,2,3,4]

| Design Information | Symbol | Units | 1/4-inch | 3/8-inch | 1/2-inch | 5/8-inch | 3/4-inch |
|---|---|---|---|---|---|---|---|
| Threaded rod nominal outside diameter | $d_{nom}$ | in. (mm) | 0.250 (6.4) | 0.375 (9.5) | 0.500 (12.7) | 0.625 (15.9) | 0.750 (19.1) |
| Threaded rod effective cross-sectional area | $A_{se}$ | in² (mm²) | 0.032 (21) | 0.078 (50) | 0.142 (92) | 0.226 (146) | 0.335 (216) |
| Nominal tension strength of ASTM A36 threaded rod in tension as governed by steel strength | $N_{sa,rod,A36}$ | lb (kN) | 1,855 (8.2) | 4,525 (20.0) | 8,235 (36.6) | 13,110 (58.3) | 19,130 (86.3) |
| Nominal seismic tension strength of ASTM A36 threaded rod tension as governed by steel strength | $N_{sa,rod,A36,eq}$ | lb (kN) | 1,855 (8.2) | 4,525 (20.0) | 8,235 (36.6) | 13,110 (58.3) | 19,430 (86.4) |
| Nominal tension strength of ASTM A193, Gr. B7 threaded rod in tension as governed by steel strength | $N_{sa,rod,B7}$ | lb (kN) | 4,000 (17.7) | 9,750 (43.1) | 17,750 (78.9) | 28,250 (125.7) | 41,875 (186.0) |
| Nominal seismic tension strength of ASTM A193, Gr. B7 threaded rod tension as governed by steel strength | $N_{sa,rod,B7,eq}$ | lb (kN) | 4,000 (17.7) | 9,750 (43.1) | 17,750 (78.9) | 28,250 (125.7) | 41,875 (186.0) |
| Nominal shear strength of ASTM A36 threaded rod in shear as governed by steel strength | $V_{sa,rod,A36}$ | lb (kN) | 1,115 (4.9) | 2,715 (12.1) | 4,940 (22.0) | 7,865 (35.0) | 11,660 (51.9) |
| Nominal seismic shear strength of ASTM A36 threaded rod in shear as governed by steel strength | $V_{sa,rod,A36,eq}$ | lb (kN) | 780 (3.5) | 1,900 (8.4) | 3,460 (15.4) | 5,505 (24.5) | 8,160 (36.3) |
| Nominal shear strength of ASTM A193, Gr. B7 threaded rod in shear as governed by steel strength | $V_{sa,rod,B7}$ | lb (kN) | 2,385 (10.6) | 5,815 (25.9) | 10,640 (7.3) | 16,950 (75.4) | 25,085 (111.6) |
| Nominal seismic shear strength of ASTM A193, Gr. B7 threaded rod in shear as governed by steel strength | $V_{sa,rod,B7,eq}$ | lb (kN) | 1,680 (7.5) | 4,095 (18.2) | 7,455 (34.2) | 11,865 (52.8) | 17,590 (78.2) |

For SI: 1 inch = 25.4 mm, 1 pound = 0.00445 kN, 1 in² = 645.2 mm². For pound-inch unit: 1 mm = 0.03937 inches.

1. Values provided for steel element material types based on minimum specified strengths and calculated in accordance with ACI 318-11 Eq. (D-2) and Eq. (D-29).
2. $\phi N_{sa}$ shall be the lower of the $\phi N_{sa,rod}$ or $\phi N_{sa,insert}$ for static steel strength in tension; for seismic loading $\phi N_{sa,eq}$ shall be the lower of the $\phi N_{sa,rod,eq}$ or $\phi N_{sa,insert,eq}$.
3. $\phi V_{sa}$ shall be the lower of the $\phi V_{sa,rod}$ or $\phi V_{sa,insert}$ for static steel strength in tension; for seismic loading $\phi V_{sa,eq}$ shall be the lower of the $\phi V_{sa,rod,eq}$ or $\phi V_{sa,insert,eq}$.
4. Strength reduction factors shall be taken from ACI 318-11 D.4.3 for steel elements. Strength reduction factors for load combinations in accordance with ACI 318 Section 9.2 governed by steel strength shall be taken as 0.75 for tension and 0.70 for shear for ductile steel elements; values correspond to ductile steel elements. The value of $\phi$ applies when the load combinations of Section 1605.2 of the IBC or ACI 318 Section 9.2 are used in accordance with ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the appropriate value of $\phi$ must be determined in accordance with ACI 318 D.4.4.

## Tension and Shear Design Strengths for Bang-It Inserts Installed in the Soffit of Uncracked Concrete Filled Steel Deck Floor and Roof Assemblies[1,2,3,4,5,6]

| Nominal Anchor Diameter | Embed. Depth $h_{ef}$ (in.) | Minimum Concrete Compressive Strength f'c = 3,000 psi | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4-1/2" W-Deck | | | | B-Deck | | | | 3-7/8" W-Deck | | | |
| | | Upper Flute | | Lower Flute | | Upper Flute | | Lower Flute | | Upper Flute | | Lower Flute | |
| | | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) |
| 1/4 | 1-3/4 | 2,665 | 1,370 | 1,340 | 1,370 | 2,265 | 1,250 | 595 | 1,250 | 2,265 | 1,250 | 1,145 | 1,250 |
| 3/8 | 1-3/4 | 2,665 | 1,370 | 1,340 | 1,370 | 2,265 | 1,250 | 595 | 1,250 | 2,265 | 1,250 | 1,145 | 1,250 |
| 1/2 | 1-3/4 | 2,665 | 1,370 | 1,340 | 1,370 | 2,265 | 1,250 | 595 | 1,250 | 2,265 | 1,250 | 1,145 | 1,250 |
| 5/8 | 1-3/4 | 2,665 | 1,845 | 1,340 | 1,845 | 2,265 | 1,785 | 595 | 1,785 | 2,265 | 1,785 | 1,145 | 1,785 |
| 3/4 | 1-3/4 | 2,665 | 1,845 | 1,340 | 1,845 | 2,265 | 1,785 | 595 | 1,785 | 2,265 | 1,785 | 1,145 | 1,785 |

□ - Anchor Pullout/Pryout Strength Controls ▯ - Concrete Breakout Strength Controls ■ - Steel Strength Controls

## Tension and Shear Design Strengths for Bang-It Inserts Installed in the Soffit of Cracked Concrete Filled Steel Deck Floor and Roof Assemblies[1,2,3,4,5,6]

| Nominal Anchor Diameter | Embed. Depth $h_{ef}$ (in.) | Minimum Concrete Compressive Strength f'c = 3,000 psi | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4-1/2" W-Deck | | | | B-Deck | | | | 3-7/8" W-Deck | | | |
| | | Upper Flute | | Lower Flute | | Upper Flute | | Lower Flute | | Upper Flute | | Lower Flute | |
| | | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) | $\phi N_n$ Tension (lbs.) | $\phi V_n$ Shear (lbs.) |
| 1/4 | 1-3/4 | 1,810 | 1,370 | 1,070 | 1,370 | 1,810 | 1,250 | 475 | 1,250 | 1,810 | 1,250 | 915 | 1,250 |
| 3/8 | 1-3/4 | 1,810 | 1,370 | 1,070 | 1,370 | 1,810 | 1,250 | 475 | 1,250 | 1,810 | 1,250 | 915 | 1,250 |
| 1/2 | 1-3/4 | 1,810 | 1,370 | 1,070 | 1,370 | 1,810 | 1,250 | 475 | 1,250 | 1,810 | 1,250 | 915 | 1,250 |
| 5/8 | 1-3/4 | 1,810 | 1,845 | 1,070 | 1,845 | 1,810 | 1,785 | 475 | 1,785 | 1,810 | 1,785 | 915 | 1,785 |
| 3/4 | 1-3/4 | 1,810 | 1,845 | 1,070 | 1,845 | 1,810 | 1,785 | 475 | 1,785 | 1,810 | 1,785 | 915 | 1,785 |

□ - Anchor Pullout/Pryout Strength Controls ▯ - Concrete Breakout Strength Controls ■ - Steel Strength Controls

1- Tabular values are provided for illustration and are applicable for single anchors installed in sand-lightweight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
- $c_{a1}$ is greater than or equal to the critical edge distance, $c_{ac}$.
- $c_{a2}$ is greater than or equal to 1.5 times $c_{a1}$.

2- Calculations were performed following methodology in ACI 318-11 Appendix D. The load level corresponding to the failure mode listed (steel strength of insert ($N_{sa,insert}$, $V_{sa,insert}$), concrete breakout strength, or pryout strength) must be checked against the tabulated steel strength of the corresponding threaded rod type, ($N_{sa,rod}$, $V_{sa,rod}$), the lowest load level controls.

3- Strength reduction factors ($\phi$) for the inserts are based on ACI 318-11 D.4.3 for cast-in headed anchors. Condition B is assumed. Strength reduction factors for load combinations in accordance with ACI 318 Section 9.2 governed by steel strength of the insert are taken as 0.65 for tension and 0.60 for shear; values correspond to brittle steel elements.

4- Tabular values are permitted for short-term static loads only, seismic loading is not considered with these tables.

5- For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-11 Appendix D.

6- Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths please see ACI 318-11 Appendix D and information contained in this product supplement. For other design conditions including seismic considerations please see ACI 318-11 Appendix D.

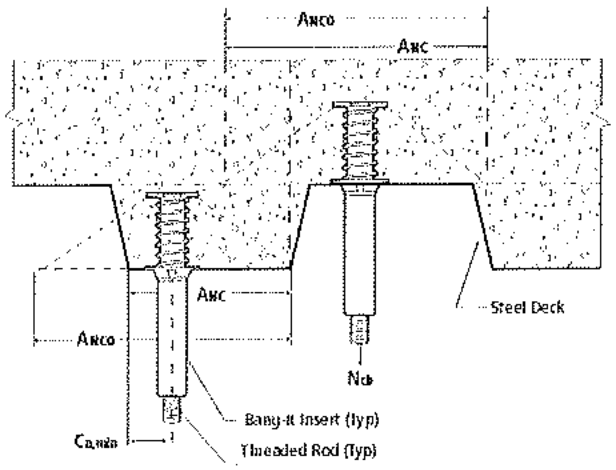
## Tension and Shear Design Strength of Steel Elements (Steel Strength)[1,2,3,4]

| Nominal Rod Diameter (in.) | Steel Elements - Threaded Rod | | | |
|---|---|---|---|---|
| | ASTM A36 and ASTM F1554 Grade 36 | | ASTM A193 Grade B7 and ASTM F1554 Grade 105 | |
| | $\phi N_{sa,rod}$ Tension (lbs.) | $\phi V_{sa,rod}$ Shear (lbs.) | $\phi N_{sa,rod}$ Tension (lbs.) | $\phi V_{sa,rod}$ Shear (lbs.) |
| 1/4 | 1,390 | 720 | 3,000 | 1,550 |
| 3/8 | 3,395 | 1,750 | 7,315 | 3,780 |
| 1/2 | 6,175 | 3,210 | 13,315 | 6,915 |
| 5/8 | 9,835 | 5,115 | 21,190 | 11,020 |
| 3/4 | 14,550 | 7,565 | 31,405 | 16,305 |

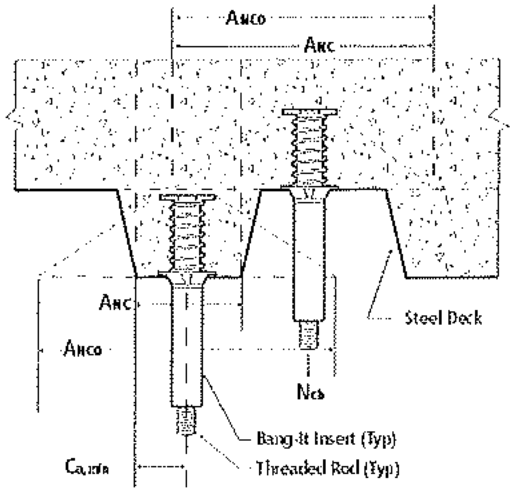
■ - Steel Strength Controls

1. Steel tensile design strength according to ACI 318 Appendix D, $\phi N_{sa} = \phi \bullet A_{se,N} \bullet f_{uta}$
2. The tabulated steel design strength in tension for the threaded rod must be checked against the design strength of the steel insert, concrete breakout and pullout design strength to determine the controlling failure mode, the lowest load level controls.
3. Steel shear design strength according to ACI 318 Appendix D, $\phi N_{sa} = \phi \bullet 0.60 \bullet A_{se,N} \bullet f_{uta}$
4. The tabulated steel design strength in shear for the threaded rod must be checked against the design strength of the steel insert, concrete breakout and pryout design strength to determine the controlling failure mode, the lowest load level controls.

## Idealization of Concrete Filled Steel Decks for Determination of Concrete Breakout Strength in Accordance with ACI 318




Idealization of Standard Steel Deck Profiles

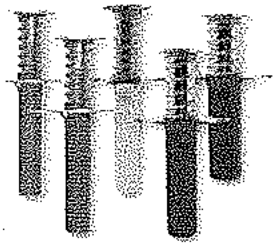



Idealization of B-Deck Steel Deck Profiles

## ORDERING INFORMATION

### Bang-It Deck Insert (UNC)

| Cat.No. | Description | Color Code | Pre-Drilled Hole | Std. Box | Std. Pallet |
|---|---|---|---|---|---|
| 7540 | 1/4" Bang-It | Brown | 13/16" or 7/8" | 100 | 4,000 |
| 7542 | 3/8" Bang-It | Green | 13/16" or 7/8" | 100 | 4,000 |
| 7544 | 1/2" Bang-It | Yellow | 13/16" or 7/8" | 100 | 4,000 |
| 7546 | 5/8" Bang-It | Red | 1-3/16" or 1-1/4" | 50 | 2,400 |
| 7548 | 3/4" Bang-It | Purple | 1-3/16" or 1-1/4" | 50 | 2,400 |

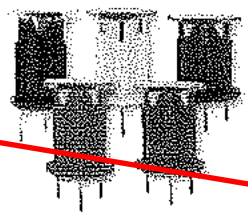


### Bang-It Installation Accessories

| Cat.No. | Description | Std. Box |
|---|---|---|
| 7560 | Bang-It Stand Up Pole Tool | 1 |
| 7562 | 13/16" Carbide Hole Saw for 1/4", 3/8" and 1/2" sizes | 1 |
| 7564 | 1-3/16" Carbide Hole Saw for 5/8", 3/4" and 7/8" sizes | 1 |
| 7566 | Extra Carbide Hole Saw Center Bit | 1 |

### Wood-Knocker Form Insert (UNC)

| Cat No. | Description | Color Code | Std. Box | Std. Pallet |
|---|---|---|---|---|
| 7550 | 1/4" Wood-Knocker | Brown | 200 | 9,600 |
| 7552 | 3/8" Wood-Knocker | Green | 200 | 9,600 |
| 7554 | 1/2" Wood-Knocker | Yellow | 200 | 9,600 |
| 7556 | 5/8" Wood-Knocker | Red | 150 | 6,000 |
| 7558 | 3/4" Wood-Knocker | Purple | 150 | 6,000 |



Threaded inserts are color coded to easily identify location and diameter of the internally threaded coupling, allowing multiple trades on the same job to suspend their systems with various size steel threaded rods.

WM TAO & ASSOCIATES
CONSULTING ENGINEERS

# Shop Drawing Submittal Review

Transmitted To: Cannon Design

Date: August 26, 2016

Attention: **stl-cac@cannondesign.com**

Contact Person / WTA Field Inspector: Patrick Garner

Project Name: Webster University-**ISB**

Reviewed by: Mark Schaefer

Project No. WT 14127.01

☐ UPS ☐ Courier ☒ **Email**

| Copies | No. | Description |
|---|---|---|
| 1 PDF | 238800M03 | (Submittal No.'s) ~~(R&B CxSRC )~~ |
| | | (Cannon #238800-006) - (Paric #15051-0194) – ~~(WES #607)~~ |
| | | • **Ductwork Hangers and Supports** |
| | | |
| | | |
| | | |
| | | |

Remarks:

c: **Kelvin Patel**
**Kpatel@cannondesign.com**

☒ **Furnish as Submitted** ☐ Furnish as Noted

☐ Rejected ☐ Revise & Resubmit

☐ Reviewed ☐

Corrections or comments made on shop drawings during this review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with the design concept of project and general compliance with information given in contract documents. Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

7955 Manchester Road, Suite 125 • St. Louis, Missouri 63143-2711 • Phone: 314-884-7600 • Fax: 314-884-7601

**If enclosures are not as noted, please notify us at once.**

**Sara Trout (314) 884-7645**

**WTASHOP - Webster ISB - 23 8800-006**

---

**From:** STL-CAC <STL-CAC@CANNONDESIGN.COM>
**To:** 'Patrick Garner' <pgarner@wmtao.com>, WTASHOP <wtashop@wmtao.com>
**Date:** 8/19/2016 1:06 PM
**Subject:** Webster ISB - 23 8800-006
**Cc:** "Patel, Kelvin" <kpatel@CANNONDESIGN.COM>
**Attachments:** 238800-006 Ductwork Hangers and Supports.pdf

---

Attached for review.

**Melissa Pirtle**
Construction Admin
CANNONDESIGN
1100 Clark Ave
St. Louis, Missouri 63102
T 314.425.8797 • M
cannondesign.com

CANNONDESIGN

# SUBMITTAL IDENTIFICATION SHEET

**To be completed by Contractor/CM**

WEBSTER UNIVERSITY ISB
PROJECT NAME

8274 BIG BEND BLVD
ADDRESS

NUMBER

WEBSTER UNIVERSITY
OWNER

CANNON DESIGN
ARCHITECT / ENGINEER

Joe Voypick
SUBMITTED BY

238800-006
CONTRACTOR / CM SUBMITTAL NO.

CANNON DESIGN SUBMITTAL NO.

DRAWING / DETAIL REFERENCE

238800
SPECIFICATION SECTION / PARAGRAPH

Icon Mechanical
MANUFACTURER / SUPPLIER

ITEM / PRODUCT ID

REQUIRED DATE

PRIORITY

☐ CRITICAL

ITEM BEING SUBMITTED (check only one)

- ○ Shop Drawings
- ○ Samples ( _____ copies)
- ○ LEED Submittal
- ○ Certification / Qualifications
- ○ Record Documents
- ○ Product Data
- ○ Coordination Drawing
- ○ Calculations
- ○ Schedules
- ○ O&M Manuals
- ○ Other _____

ITEM BEING SUBMITTED FOR (check only one)

○ Action ○ Information Only ○ Record

REMARKS OR DEVIATIONS

CONTRACTOR / CM CERTIFICATION
(SUBMITTALS NOT CERTIFIED WILL BE RETURNED WITHOUT REVIEW)

PARIC

PARIC CORPORATION
SUBMITTAL STAMP

THIS SHOP DRAWING HAS BEEN REVIEWED BY PARIC CORPORATION

Subcontractor remains responsible for dimensions, quantities, coordination with other trades and compliance with contract documents.

By:
Devin D. Gates

Joe Voypick
REVIEWED BY

8/19/16
DATE

**To be completed by Reviewer**

23 8800-006
CANNON DESIGN SUBMITTAL NUMBER

8/19/16
RECEIVED DATE

- ○ A. No Exceptions Taken
  No further review of submittal is required.
- ○ B. Make Corrections Noted
  Incorporate corrections in work; resubmission is not required.
- ○ C. Revise and Resubmit
  Revise as noted, and resubmit for review.
- ○ D. Rejected
  Submittal is not in compliance with Contract Documents; provide new submittal.
- ○ E. For Record / Information Only
  Submittal was reviewed for Record / Information purposes only.
- ○ F. Not Required for Review
  Submittal is not required by Contract Documents and has not been reviewed.

Review is for conformance with the design concept of this project and for general compliance with contract documents. Contractor is responsible for quantities, dimensions and compliance with contract documents and for information that pertains to fabrication processes, construction techniques and coordination of this work with all trades which will be affected thereby. This review is null and void if submittal deviates from contract documents and does not indicate or note deviations.

A/E COMMENTS ○ See attached sheet(s) for additional comments

REVIEWED BY

DATE

77 Westport Plaza
Suite 250
St. Louis, MO 63146

# TRANSMITTAL

**No. 15051-0194**

*Paric Corporation*

**PROJECT:** 15051-Webster University Interdisciplinary Science Building

**DATE:** 08/18/2016

**TO:** Cannon Design
1100 Clark Ave
St Louis MO 63102

**RE:** Ductwork Hangers and Supports

**ATTN:** Kelvin Patel

**JOB: 15051**

| WE ARE SENDING: | SUBMITTED FOR: | ACTION TAKEN: |
|---|---|---|
| ☐ Shop Drawings | ☑ Approval | ☐ Approved as Submitted |
| ☐ Letter | ☐ Your Use | ☐ Approved as Noted |
| ☐ Prints | ☐ As Requested | ☐ Returned After Loan |
| ☐ Change Order | ☐ Review and Comment | ☐ Resubmit |
| ☐ Plans | | ☐ Submit |
| ☐ Samples | **SENT VIA:** | ☐ Returned |
| ☐ Specifications | ☐ Attached | ☐ Returned for Corrections |
| ☑ Other: Product Data | ☐ Separate Cover Via: | ☐ Due Date: |

| *Item* | *Package* | *Code* | *Rev.* | *Copies* | *Date* | *Description* | *Status* |
|---|---|---|---|---|---|---|---|
| Submittal | | 238800-006 | 1 | | 08/18/2016 | Ductwork Hangers and Supports | Submitted |

**NOTES:**

**CC:**

**Signed:** _____

Devin Gates

# LETTER OF TRANSMITTAL

TO: Paric Corporation
77 West Port Plaza #250
St. Louis, MO 63146

ATTN: Jason Szachnieski, Devin Gates

DATE: 8/17/16
JOB # : 5768
RE: Webster ISB

We are sending you
( ) Attached ( ) Under separate cover
(X) Shop drawings ( ) Prints ( ) Plans ( ) Samples ( ) Specifications
( ) Copy of letter ( ) Change order ( ) Other

| COPIES | DATE | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | 8/17/16 | 238800-2.5 | Ductwork Hangers and Supports |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

These are transmitted as checked below:

( ) For signature ( ) Approved as submitted ( ) Resubmit ( ) copies for approval
( ) For your use ( ) Approved as noted (X) Submit ( ) copies for distribution
( ) As requested ( ) Returned for corrections ( ) Return ( ) corrected prints
( ) For bids due ( ) Prints returned after loan to us
(X) For review and comment ( ) Other

Remarks: Please return by 8/24/16
Gripple Pending AHJ Approval. Verbal Approval given. Waiting on Formal Approval Document. Will Forward to Design Team Once in Hand.

COPY TO: file

SIGNED: Alex Chambers

icon Mechanical

# Webster University ISB
# Webster Groves, MO

| | |
|---|---|
| Submittal #: | 238800-2.5 |
| Submittal Description: | Ductwork Hangers and Supports |
| Return By: | 8/24/16 |

Please Note: To avoid scheduling delays and equipment release delays, please submit by the "Return By" date.

CHECKED BY:

DESIGNER: ENGINEER:

| | | | |
|---|---|---|---|
| X | NO EXCEPTION TAKEN | | MAKE CORRECTIONS NOTED |
| | SUBMIT SPECIFIED ITEM | | REVISE AND RESUBMIT |
| | REJECTED | | |

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Equipment supplier is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and satisfactory performance of his work.

icon Mechanical

| | |
|---|---|
| Job #: | 5768 |
| Date: | 8/17/16 |
| By: | ARC |