

**ICC-ES Evaluation Report****ESR-2635**

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**DIVISION: 05 00 00—METALS**  
**Section: 05 31 00—Steel Decking****REPORT HOLDER:****CONSOLIDATED SYSTEMS, INC. (CSi®)**  
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[www.metaldek.com](http://www.metaldek.com)**EVALUATION SUBJECT:****CSi® COMPOSITE DECK PANELS: VERSA-DEK®  
COMPOSITE 3.5 LS DECK PANELS, AND VERSA-DEK®  
COMPOSITE 3.5 LS ACOUSTICAL DECK PANELS****1.0 EVALUATION SCOPE****Compliance with the following code:**2006 *International Building Code*® (IBC)**Property evaluated:**

Structural

**2.0 USES**

The CSi® Versa-Dek Composite 3.5 LS deck panels are used in conjunction with a concrete topping to support the code-required loads.

**3.0 DESCRIPTION****3.1 General**

The composite deck panels are cold-formed from ASTM A 653 SS Grade 40 steel sheets into panels with fluted sections having a minimum G40 galvanization coating (total, both surfaces). Galvanized/painted finished deck panels have a primed, painted bottom surface. Panel dimensions and profiles are as shown in the tables and figures of this report.

**3.2 Versa-Dek Composite 3.5 LS (VDC35LS) Panels:**

The Versa-Dek Composite 3.5 LS deck panels are cold-formed from steel sheets into panels with fluted sections having galvanized and/or galvanized/painted finishes. The deck panels are available in design thicknesses ranging from No. 16 gage [0.0598 inch (1.52 mm)] to No. 20 gage [0.0358 inch (0.909 mm)]. Deck panel profiles are as shown in the accompanying tables and figures of this report.

**3.3 Versa-Dek Composite 3.5 LS Acoustical (VDC35LSA) Panels:**

The Versa-Dek Composite 3.5 LS Acoustical deck panels are cold-formed from steel sheets into panels with fluted sections having galvanized and/or galvanized/painted finishes. The deck panels are available in design thicknesses ranging from No. 16 gage [0.0598 inch (1.52 mm)] to No. 20 gage [0.0358 inch (0.909 mm)]. VDC35LSA deck panel assemblies include factory-installed acoustical insulation and a nonstructural No. 20 gage [0.0358 inch (0.909 mm)] cap to protect the acoustical insulation during concrete placement. Deck panel profiles are as shown in the tables and figures of this report.

**3.4 Concrete Fill Requirements For Composite Deck Panels:**

The deck panels described in Sections 3.1 through 3.3 are designed to act compositely with normal-weight or structural lightweight concrete fill incorporating rock or expanded shale aggregates, having a minimum 28-day compressive strength of 3,000 psi (20.6 MPa). Normal-weight structural concrete [ $w = 145 \pm \text{pcf}$  (2323 kg/m<sup>3</sup>)] must be coarse aggregate conforming to ASTM C 33; structural sand-lightweight concrete fill [ $w = 110 \pm \text{pcf}$  (1762 kg/m<sup>3</sup>)] must be light coarse aggregate conforming to ASTM C 330. The concrete must extend a minimum of 2 inches (51 mm) above the top surface of the steel deck panel, and must be reinforced with minimum 6 x 6 W1.4 x W1.4 steel welded-wire reinforcement complying with ASTM A 185, placed at the approximate center of the concrete fill. If fill in excess of 3<sup>1</sup>/<sub>4</sub> inches (82 mm) is used, the concrete must be reinforced in each direction with steel of a cross-sectional area (in square inches per linear foot) equal to 0.01 times the depth of fill over the top of the deck panel.

**4.0 DESIGN AND INSTALLATION****4.1 Design:**

Allowable gravity loads must be based on section properties shown in Table 1. Allowable reaction based on web crippling must not exceed values in Table 2. See the Table of Contents, following the text of this report, for allowable superimposed vertical loads and diaphragm shear capacities for each deck panel.

The section properties and allowable superimposed load tables in this report are established using the design thicknesses of the deck panels noted in Table 1 of this report. Additional design criteria are set forth in the "Table Notes" preceding the figures and tables in this report.

The one-third stress increase permitted for Allowable Stress Design, for load combinations in IBC Section 1605.3.2 including wind or seismic forces, must not be used for shear values in the diaphragm tables.

The allowable tension (uplift) load for arc spot welds fastening steel sheets to supporting members must be calculated in accordance with Section E2.2.2 of AISI-NAS.

The diaphragm design must take into account the following considerations:

1. Diaphragm classification (flexible or rigid) must comply with IBC Section 1602; the diaphragm deflection ( $\Delta$ ) must be calculated using the equations noted in the Diaphragm Flexibility Limitations table (Table 3).
2. Diaphragm flexibility limitations must comply with Table 3.
3. Diaphragm deflection limits must comply with ASCE 7 Sections 12.10.1 and 12.12.2.
4. Horizontal shears must be distributed in accordance with ASCE 7 Sections 12.8.4 and 12.9.5.

#### 4.2 Vertical Composite Load:

The allowable superimposed load tables give one-, two- or three-span conditions for construction loading with maximum spans to be used without midspan shoring and the allowable superimposed loads based on a simple-span condition for composite behavior. The determination of shoring limits for the tables is based on the strength or deflection of the deck panel section using a construction uniform live load of 20 psf (957.6 Pa) or a concentrated construction live load of 150 lbf (667.5 N).

#### 4.3 Installation:

The deck panels must be installed in accordance with this report and CSI's recommended guidelines and installation instructions. If there is a conflict between CSI's recommended installation instructions and this report, this report governs.

Deck panels must be clean and free of foreign materials prior to placement of concrete. Deck panels must be installed with the galvanized deck panel face in contact with the concrete.

#### 4.4 Special Inspection:

**4.4.1 Concrete:** Continuous special inspection for concrete and concrete reinforcement must be in accordance with IBC Section 1704.4. The inspector's duties include sampling and testing, and verification of concrete mixes, reinforcement types and placement, and concrete placement.

**4.4.2 Jobsite Welding:** Continuous or periodic special inspection for welding must be in accordance with IBC Section 1704.3. Prior to proceeding, the welder must demonstrate his ability to produce the prescribed weld to the special inspector's satisfaction. The inspector's duties include verification of materials, weld preparation, welding procedures, and welding processes.

**4.4.3 Periodic Special Inspection:** Periodic special inspections in accordance with IBC Section 1707.4 are required where the steel deck systems are used as part of a seismic-force-resisting system in structures assigned to Seismic Design Category C, D, E or F. Periodic special inspections also apply where noted in IBC Tables 1704.3 and 1704.4.

**4.4.3.1 Continuous Special Inspection:** Continuous special inspections must be provided where noted in IBC Tables 1704.3 and 1704.4.

**4.4.3.2 Statement of Special Inspections:** A statement of special inspections must be prepared by the registered design professional in charge and submitted to the code official as set forth in IBC Section 1705. The statement must include the inspector's duties noted in this section (Section 4.4.3).

### 5.0 CONDITIONS OF USE

The Versa-Dek® Composite 3.5 LS and Versa-Dek® Composite 3.5 LS Acoustical deck panels described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** The deck panels are manufactured, identified and installed in accordance with this report and CSI's published installation guidelines and instructions. If there is a conflict between the manufacturer's published installation guidelines and instructions and this report, this report governs.

**5.2** Allowable superimposed load capacity of concrete-filled composite deck panels must be as set forth in Tables 6 through 9.

**5.3** Where use is as diaphragms:

**5.3.1** The one-third stress increase permitted for Allowable Stress Design, for load combinations in IBC Section 1605.3.2 including wind or seismic forces, must not be used for shear values in the diaphragm tables.

**5.3.2** Allowable diaphragm shear capacities are as set forth in the tables of this report for the type of deck panel involved.

**5.3.3** Diaphragm deflections must not exceed the permitted relative deflections of walls between the diaphragm level and the floor below. The flexibility limitations shown in Table 3 may be used as a guide in lieu of rational analysis of the anticipated deflections.

**5.3.4** Diaphragms may be zoned by varying deck gage and/or connections across a diaphragm to meet varying shear and flexibility demands.

**5.4** Special inspection for field-welding must be provided in accordance with Section 4.4.3.

**5.5** Calculations and details demonstrating that the loads applied to the decks comply with this report must be submitted to the code official for approval. Calculations and drawings must be prepared, signed, and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

### 6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43), dated February 2008 (editorially revised April 2008).

### 7.0 IDENTIFICATION

Each bundle of the CSI® Versa-Dek Composite 3.5 LS and/or Versa-Dek® Composite 3.5 LS Acoustical composite steel deck panels described in this report is identified by labeling bearing the manufacture's name (CSI®); the deck panel profile name; the design thickness; the minimum specified yield strength; the cover width of the panel; the manufacturing location (TD—Terrell, Texas; or PD—Phoenix, Arizona); and the evaluation report number (ICC-ES ESR-2635).

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**TABLE NOTES**

The notes below apply to all of the tables unless noted otherwise.

<sup>1</sup>The allowable diaphragm shears listed in Tables 4 and 5 are in pounds per linear foot.

<sup>2</sup>The design thicknesses and cross-sectional properties are indicated in Table 1. The design thickness is the uncoated base-metal thickness of the deck panel.

<sup>3</sup>Arc spot (puddle) welds must have an effective fusion area to supporting members at least equivalent to <sup>3</sup>/<sub>8</sub> inch by 1 inch long or <sup>1</sup>/<sub>2</sub> inch in diameter.

<sup>4</sup>Puddle-weld pattern is shown in Figure 1.

<sup>5</sup>The standing seam joint must be fastened at a maximum of 3 feet on center.

<sup>6</sup>Spacing of marginal welds to members parallel to flutes:

- (a) Arc spot (puddle) welds to members such as chords and to collector elements, such as struts or ties, must have a spacing in feet equal to  $32,000 (t) C/v$

where:

- $t$  = Uncoated base-metal thickness of fluted deck panel in inches.
- $C$  = 1.0 for galvanized deck panels and 0.65 for painted deck panels.
- $v$  = Actual diaphragm shear at marginal supports or actual shear transferred to collector (at struts or ties) in pounds per foot.

- (b) Fillet welds to members such as diaphragm chords must have spacing in feet equal to  $480 I_w/v$

where:

- $I_w$  = Length of weld in inches (not less than  $1\frac{1}{2}$  inches).
- $v$  = Actual diaphragm shear to be transferred to chords in pounds per foot.

- (c) Fillet welds attaching the diaphragm to strut, ties or other collector elements must have a spacing in feet equal to  $300 I_w/v$  where  $v$  is the actual shear to be transferred to the collector elements.

- (d) In no case may any weld spacing exceed 3 feet.

<sup>7</sup>Attachments at interior lines of shear transfer perpendicular to deck panel corrugation:

- (a) The shear transfer from a diaphragm to interior tie or strut lines perpendicular to deck panel corrugation must not exceed the shear values indicated in the tables. Two lines of puddle welds may be used to develop the actual shear transfer to these collector elements,
- (b) In no case may the spacing of welds exceed the deck panel span divided by 3.0.

<sup>8</sup>Where individual panels are cut, the partial panel must be fastened in a manner to fully transfer the shears at the point of the diaphragm to the adjacent full panels for the values specified in the tables.

<sup>9</sup>For **SI** dimensions: 1 inch = 25.4 mm; 1 plf = 14.6 N/m; 1 inch<sup>2</sup> = 645.16 mm<sup>2</sup>; 1 inch<sup>3</sup> = 16.4 × 10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 41.6 × 10<sup>4</sup> mm<sup>4</sup>; 1 psf = 4.88 kg/m<sup>2</sup>; 1 pcf = 16.018 kg/m<sup>3</sup>; 1 inch-kip = 0.113 kN-m; 1 kip = 4.448 kN; 1 ksi = 6.89 MPa; 1 foot = 304.8 mm

TABLE 1—SECTION PROPERTIES<sup>1, 2, 3</sup>

| DECK PANEL                            | GAGE | DESIGN THICKNESS (in) | FULL MOMENT OF INERTIA (in <sup>4</sup> / ft. width) | EFFECTIVE MOMENT OF INERTIA (in <sup>4</sup> / ft. width) |                           | EFFECTIVE SECTION MODULUS (in <sup>3</sup> / ft. width) |                           |
|---------------------------------------|------|-----------------------|------------------------------------------------------|-----------------------------------------------------------|---------------------------|---------------------------------------------------------|---------------------------|
|                                       |      | t                     | I <sub>x</sub>                                       | Normal, I <sub>on</sub>                                   | Inverted, I <sub>oi</sub> | Normal, S <sub>en</sub>                                 | Inverted, S <sub>ei</sub> |
| VersaDek® Composite 3.5 LS            | 20   | 0.0358                | 2.042                                                | 1.917                                                     | 1.858                     | 0.767                                                   | 0.820                     |
|                                       | 18   | 0.0474                | 2.697                                                | 2.648                                                     | 2.527                     | 1.109                                                   | 1.190                     |
|                                       | 16   | 0.0598                | 3.395                                                | 3.394                                                     | 3.248                     | 1.504                                                   | 1.540                     |
| VersaDek® Composite 3.5 LS Acoustical | 20   | 0.0358                | 1.877                                                | 1.766                                                     | 1.775                     | 0.747                                                   | 0.803                     |
|                                       | 18   | 0.0474                | 2.480                                                | 2.436                                                     | 2.363                     | 1.080                                                   | 1.181                     |
|                                       | 16   | 0.0598                | 3.122                                                | 3.121                                                     | 2.980                     | 1.466                                                   | 1.522                     |

For SI: 1 inch = 25.4 mm; 1 ksi = 6.89 MPa

<sup>1</sup>Properties are determined in accordance with AISI-NAS

<sup>2</sup>Properties are based on yield strength, F<sub>y</sub> = 40 ksi (tensile strength, F<sub>u</sub> = 55 ksi)

<sup>3</sup>Effective properties are net values

TABLE 2—ALLOWABLE CONCENTRATED LOADS AND REACTIONS BASED ON WEB CRIPPLING (ASD)<sup>1, 2</sup>

| DECK PANEL                            | GAGE | BASE METAL THICKNESS, t (in) | ALLOWABLE LOAD (PLF) REACTION LOCATION |      |          |      |          |      |          |      |          |      |
|---------------------------------------|------|------------------------------|----------------------------------------|------|----------|------|----------|------|----------|------|----------|------|
|                                       |      |                              | BEARING LENGTH (in)                    |      |          |      |          |      |          |      |          |      |
|                                       |      |                              | 2                                      |      | 3        |      | 4        |      | 5        |      | 6        |      |
|                                       |      |                              | Interior                               | End  | Interior | End  | Interior | End  | Interior | End  | Interior | End  |
| VersaDek® Composite 3.5 LS            | 20   | 0.0358                       | —                                      | 681  | —        | 781  | 1437     | 865  | 1546     | 939  | 1645     | 1006 |
|                                       | 18   | 0.0474                       | —                                      | 1151 | —        | 1311 | 2390     | 1446 | 2561     | 1565 | 2717     | 1672 |
| VersaDek® Composite 3.5 LS Acoustical | 16   | 0.0598                       | —                                      | 1771 | —        | 2007 | 3638     | 2205 | 3888     | 2380 | 4114     | 2538 |

<sup>1</sup>Properties are determined in accordance with Section C3.4 of AISI-NAS

<sup>2</sup>Properties are based on yield strength, F<sub>y</sub> = 40 ksi (tensile strength, F<sub>u</sub> = 55 ksi)

TABLE 3—DIAPHRAGM FLEXIBILITY LIMITATIONS TABLE<sup>1,2,3,4,5,6</sup>

| F             | MAXIMUM DIAPHRAGM SPAN FOR MASONRY OR CONCRETE WALLS (feet) | DIAPHRAGM SPAN-DEPTH LIMITATION                                |                |                                  |                                  |
|---------------|-------------------------------------------------------------|----------------------------------------------------------------|----------------|----------------------------------|----------------------------------|
|               |                                                             | Rotation Not Considered in Diaphragm                           |                | Rotation Considered in Diaphragm |                                  |
|               |                                                             | Masonry or Concrete Walls                                      | Flexible Walls | Masonry or Concrete Walls        | Flexible Walls                   |
| More than 150 | Not used                                                    | Not used                                                       | 2:1            | Not used                         | 1 <sup>1</sup> / <sub>2</sub> :1 |
| 70-150        | 200                                                         | 2:1 or as required for deflection                              | 3:1            | Not used                         | 2:1                              |
| 10-70         | 400                                                         | 2 <sup>1</sup> / <sub>2</sub> :1 or as required for deflection | 4:1            | As required for deflection       | 2 <sup>1</sup> / <sub>2</sub> :1 |
| 1-10          | No limitation                                               | 3:1 or as required for deflection                              | 5:1            | As required for deflection       | 3:1                              |
| Less than 1   | No limitation                                               | As required for deflection                                     | No limitation  | As required for deflection       | 3 <sup>1</sup> / <sub>2</sub> :1 |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 plf = 14.594 N/m, 1 psi = 6894 Pa.

<sup>1</sup>Diaphragms are to be investigated regarding their flexibility and recommended span-depth limitations.

<sup>2</sup>Diaphragms supporting masonry or concrete walls are to have their deflections limited to the following amount:

$$\Delta_{wall} = \frac{H^2 f_c}{0.01 Et}$$

where:

- H = Unsupported height of wall in feet.
- t = Thickness of wall in inches.
- E = Modulus of elasticity of wall material for deflection determination in pounds per square inch.
- f<sub>c</sub> = Allowable compression strength of wall material in flexure in pounds per square inch. For concrete, f<sub>c</sub> = 0.45 f'<sub>c</sub>. For masonry, f<sub>c</sub> = F<sub>b</sub> = 0.33 f'<sub>m</sub>.

<sup>3</sup>The total deflection Δ of the diaphragm may be computed from the equation: Δ = Δ<sub>f</sub> + Δ<sub>w</sub>

where:

- Δ<sub>f</sub> = Flexural deflection of the diaphragm determined in the same manner as the deflection of beams
- Δ<sub>w</sub> = The web deflection may be determined by the equation:

$$\Delta_w = \frac{q_{ave} L F}{10^6}$$

where:

- L = Distance in feet between vertical resisting element (such as shear wall) and the point to which the deflection is to be determined.
- q<sub>ave</sub> = Average shear in diaphragm in pounds per foot over length L.
- F = Flexibility factor: The average micro inches (μm) a diaphragm web will deflect in a span of 1 foot (m) under a shear of 1 pound per foot (N/m).

<sup>4</sup>When applying these limitations to cantilevered diaphragms, the allowable span-depth ratio will be half that shown.

<sup>5</sup>Diaphragm classification (flexible or rigid) and deflection limits must comply with the diaphragm design consideration in Section 4.1.

<sup>6</sup>If there is a conflict between this table and the code requirements the code requirements govern.

TABLE 4

Versa-Dek® Composite 3.5 LS & LS Acoustical



Allowable Diaphragm Shear

SUPPORT CONNECTION: 1/2" Effective Weld Diameter
SIDELAP CONNECTION: S/L Screws #10
ATTACHMENT PATTERN: 24 / 3
CONCRETE DENSITY: 110 pcf
S = Allowable Diaphragm Shear (lbs/foot)
G' = Stiffness Factor (kips/in.)

Table with columns: GAGE, CONC. COVER THICKNESS (in.), FACTOR, and DECK SPAN - C to C SUPPORT (10'-0" to 24'-0"). Rows are categorized by gage (20, 18, 16) and factor (0.0358, 0.0474, 0.0598).

NOTES: Data is prepared in accordance with SDI'S DIAPHRAGM DESIGN MANUAL, DDM03
S values have been divided by a Safety Factor of 3.25 to obtain (ASD) Diaphragm Shear values for seismic loading.
The following Safety Factors shown are from Table D5 of 2004 Supplement AISI Specifications.
Seismic: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Wind: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Other: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Calculations are based on a "SINGLE SPAN CONDITION".
Concrete properties: fc = 3000 psi, Density = 110 pcf
Concrete cover thickness is defined as the thickness above the top flange of deck.
Side-lap attachment spacing = 36" o.c.
Deck properties: Fy = 40 ksi, Fu = 55 ksi

TABLE 5



Versa-Dek® Composite 3.5 LS & LS Acoustical

Allowable Diaphragm Shear

SUPPORT CONNECTION: 1/2" Effective Weld Diameter
SIDELAP CONNECTION: S/L Screws #10
ATTACHMENT PATTERN: 24 / 3
CONCRETE DENSITY: 145 pcf
S = Allowable Diaphragm Shear (lbs/foot)
G' = Stiffness Factor (kips/in.)

Table with columns: GAGE, CONC. COVER THICKNESS (in.), FACTOR, and DECK SPAN - C to C SUPPORT (10'-0" to 24'-0"). Rows are categorized by gage (20, 18, 16) and concrete cover thickness (0.0358, 0.0474, 0.0598).

NOTES: Data is prepared in accordance with SDI'S DIAPHRAGM DESIGN MANUAL, DDM03
S values have been divided by a Safety Factor of 3.25 to obtain (ASD) Diaphragm Shear values for seismic loading.
The following Safety Factors shown are from Table D5 of 2004 Supplement AISI Specifications.
Seismic: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Wind: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Other: phi = .50 for LRFD and Omega = 3.25 for ASD for filled diaphragms.
Calculations are based on a "SINGLE SPAN CONDITION".
Concrete properties: fc = 3000 psi, Density = 145 pcf
Concrete cover thickness is defined as the thickness above the top flange of deck.
Side-lap attachment spacing = 36" o.c.
Deck properties: Fy = 40 ksi, Fu = 55 ksi



TABLE 7



VERSAs-DEK® COMPOSITE 3.5 LS (ASD)  
3-1/2" high x 8" pitch x 24" wide

145 PCF CONCRETE

Table with columns for span, load, and various load capacities (psf) for different span lengths (5'-0" to 23'-0"). Includes sub-sections for 'SINGLE SPAN SLAB DESIGN' and 'MAXIMUM UNSHORED CONSTRUCTION CLEAR SPANS'.

Max. superimposed ASD dead + live load (psf) (governed by strength limitation)  
Max. superimposed ASD dead + live load (psf) (governed by instantaneous deflection limitation of L/240)  
Max. superimposed ASD live load (psf) (governed by instantaneous deflection limitation of L/360)  
Vertical load span (center to center spacing)

h Total height of concrete slab, in  
wc Weight of concrete (neglecting deflection), psf  
D Uniform dead load, psf  
L Uniform live load, psf  
fc 3000 psi

- NOTES: 1.) Construction spans shown based on 2" exterior bearing and 4" interior bearing width. 2.) Welded wire fabric is required per ACI requirements (0.00075/As). 3.) The superimposed loads and unshored construction clear spans above are based on ANSII SDI C1.0-2006 Standard for Composite Steel Floor Deck and ASCE 3-91 Standard for the Structural Design of Composite Slabs. The published loads are based on a Single Span Slab Design. 4.) Additional reinforcement may be required for Long-Term Deflection design requirements. 5.) Contact the Metal Dek Group for design assistance and vibration analysis, 686-355-3746 or www.metadek.com

145 PCF CONCRETE

TABLE 8



VERSAs-DEK® COMPOSITE 3.5 LS ACOUSTICAL (ASD)  
3-1/2" high x 8" pitch x 2.4" wide

110 PCF CONCRETE

Table with columns for span, load, and various load capacities (e.g., 5.5", 5.75", 6", 6.25", 6.5", 6.75", 7", 7.25", 7.5", 7.75", 8", 8.25") for different beam configurations.

NOTES: 1) Construction spans shown based on 2" exterior bearing and 4" interior bearing width. 2) Wadded wire fabric is required per ACI requirements (0.00075 x Ac).

110 PCF CONCRETE

Table with columns for span, load, and various load capacities (e.g., 5.5", 5.75", 6", 6.25", 6.5", 6.75", 7", 7.25", 7.5", 7.75", 8", 8.25") for different beam configurations.

TABLE 9

**VERSAs-DEK® COMPOSITE 3.5 LS ACOUSTICAL (ASD)**  
3-1/2" high x 8" pitch x 2.4" wide



**145 PCF CONCRETE**

| Span     | h (Wc)       | SINGLE SPAN SLAB DESIGN - MAXIMUM SUPERIMPOSED LOADS, (psf), NO STUDS ON BEAMS |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |     |              |  |  |  |               |  |
|----------|--------------|--------------------------------------------------------------------------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|----------------|------------------|----------------|-----|--------------|--|--|--|---------------|--|
|          |              | 5.5' (44.66)                                                                   |                  |                |                | 5.75' (47.58)    |                |                |                  | 6.0' (50.6)    |                |                  |                | 6.25' (53.92)  |                  |                |                | 6.5' (56.64)     |                |                |                  | 6.75' (59.66)  |                |                  |                | 7.0' (62.68)   |                  |                |                | 7.25' (65.7)     |                |                |                  | 7.5' (68.72)   |                |                  |                | 7.75' (71.74)  |                  |                |     | 8.0' (74.77) |  |  |  | 8.25' (77.79) |  |
| Load     | Combinations | GAGE                                                                           |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |                |                  |                |     |              |  |  |  |               |  |
| 11' - 0" |              | D+L (Strength)                                                                 | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) | D+L (Strength) | D+L (Deflection) | L (Deflection) |     |              |  |  |  |               |  |
| 11' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 12' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 13' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 14' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 15' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 16' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 17' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 18' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 19' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 20' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 21' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 22' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |
| 23' - 0" | 157          | 257                                                                            | 347              | 235            | 266            | 372              | 268            | 274            | 388              | 233            | 252            | 400              | 258            | 288            | 400              | 313            | 294            | 400              | 328            | 299            | 400              | 342            | 303            | 400              | 357            | 306            | 400              | 372            | 308            | 400              | 387            | 308            | 400              | 387            | 308            | 400              | 391            | 362            | 327              | 400            | 365 | 400          |  |  |  |               |  |

| Span              | h (Wc)  | MAXIMUM UNSHORED CONSTRUCTION CLEAR SPANS |        |         |        |               |        |         |         |             |        |         |        |               |        |         |         |              |        |         |        |               |        |         |        |              |        |        |        |              |        |        |        |              |        |        |        |               |        |        |         |              |        |         |        |               |  |
|-------------------|---------|-------------------------------------------|--------|---------|--------|---------------|--------|---------|---------|-------------|--------|---------|--------|---------------|--------|---------|---------|--------------|--------|---------|--------|---------------|--------|---------|--------|--------------|--------|--------|--------|--------------|--------|--------|--------|--------------|--------|--------|--------|---------------|--------|--------|---------|--------------|--------|---------|--------|---------------|--|
|                   |         | 5.5' (44.66)                              |        |         |        | 5.75' (47.58) |        |         |         | 6.0' (50.6) |        |         |        | 6.25' (53.92) |        |         |         | 6.5' (56.64) |        |         |        | 6.75' (59.66) |        |         |        | 7.0' (62.68) |        |        |        | 7.25' (65.7) |        |        |        | 7.5' (68.72) |        |        |        | 7.75' (71.74) |        |        |         | 8.0' (74.77) |        |         |        | 8.25' (77.79) |  |
| Unshored          | 11'-1"  | 13'-8"                                    | 15'-3" | 10'-10" | 13'-3" | 15'-6"        | 10'-7" | 12'-11" | 15'-3"  | 10'-4"      | 12'-8" | 14'-11" | 10'-1" | 12'-4"        | 14'-7" | 9'-10"  | 12'-1"  | 14'-3"       | 9'-9"  | 11'-11" | 14'-0" | 9'-7"         | 11'-9" | 13'-10" | 9'-6"  | 11'-7"       | 13'-8" | 9'-4"  | 11'-5" | 13'-6"       | 11'-7" | 13'-8" | 9'-3"  | 11'-4"       | 13'-4" | 9'-1"  | 11'-2" | 13'-2"        | 8'-6"  | 10'-8" | 12'-11" | 8'-3"        | 10'-6" | 12'-10" |        |               |  |
| 1 Row of Shoring  | 12'-6"  | 18'-2"                                    | 18'-6" | 12'-1"  | 15'-9" | 18'-3"        | 11'-9" | 15'-4"  | 17'-10" | 11'-6"      | 15'-0" | 17'-6"  | 11'-3" | 14'-8"        | 17'-3" | 10'-11" | 14'-4"  | 16'-11"      | 10'-8" | 14'-0"  | 16'-7" | 10'-6"        | 13'-8" | 16'-4"  | 10'-3" | 13'-5"       | 16'-1" | 10'-0" | 13'-2" | 15'-9"       | 16'-1" | 10'-2" | 13'-4" | 16'-4"       | 10'-2" | 13'-4" | 16'-4" | 10'-2"        | 13'-4" | 16'-4" | 10'-2"  | 13'-4"       | 16'-4" | 10'-2"  | 13'-4" | 16'-4"        |  |
| 2 Rows of Shoring | 12'-11" | 18'-9"                                    | 18'-6" | 12'-7"  | 16'-3" | 18'-3"        | 12'-3" | 15'-10" | 18'-0"  | 11'-11"     | 15'-6" | 17'-9"  | 11'-7" | 15'-2"        | 17'-6" | 11'-4"  | 14'-10" | 17'-3"       | 11'-1" | 14'-8"  | 17'-1" | 10'-10"       | 14'-2" | 16'-11" | 10'-7" | 13'-11"      | 16'-7" | 10'-4" | 13'-8" | 16'-4"       | 10'-3" | 13'-5" | 16'-4" | 10'-2"       | 13'-4" | 16'-4" | 10'-2" | 13'-4"        | 16'-4" | 10'-2" | 13'-4"  | 16'-4"       | 10'-2" | 13'-4"  | 16'-4" |               |  |
| 1 Cantilever      | 5'-8"   | 7'-3"                                     | 8'-6"  | 5'-6"   | 7'-1"  | 8'-3"         | 5'-5"  | 6'-11"  | 8'-1"   | 5'-4"       | 6'-10" | 7'-11"  | 11'-8" | 15'-3"        | 17'-9" | 11'-5"  | 14'-11" | 17'-6"       | 5'-1"  | 6'-6"   | 7'-6"  | 5'-0"         | 6'-4"  | 7'-5"   | 4'-11" | 6'-3"        | 7'-3"  | 4'-10" | 6'-2"  | 7'-2"        | 10'-3" | 13'-5" | 16'-2" | 10'-3"       | 13'-5" | 16'-2" | 10'-3" | 13'-5"        | 16'-2" | 10'-3" | 13'-5"  | 16'-2"       | 10'-3" | 13'-5"  | 16'-2" |               |  |
| csj/10kSF         | 1.14    | 1.22                                      | 1.37   | 1.28    | 1.45   | 1.52          | 1.60   | 1.68    | 1.83    | 1.91        | 1.98   | 2.16    | 2.28   | 2.46          | 2.64   | 2.82    | 3.00    | 3.18         | 3.36   | 3.54    | 3.72   | 3.90          | 4.08   | 4.26    | 4.44   | 4.62         | 4.80   | 4.98   | 5.16   | 5.34         | 5.52   | 5.70   | 5.88   | 6.06         | 6.24   | 6.42   | 6.60   | 6.78          | 6.96   | 7.14   | 7.32    | 7.50         | 7.68   |         |        |               |  |

**145 PCF CONCRETE**

**NOTES:**  
 1) Construction spans shown based on: 2" exterior bearing and 4" interior bearing width.  
 2) Welded wire fabric is required per ACI requirements (0.00075<sup>ACI</sup>).  
 3) The superimposed loads and unshored construction clear spans above are based on ANSI/SDI C11-2006 Standard for Composite Steel Deck and ASCE 3-91 Standard for the Structural Design of Composite Slabs. The published loads are based on a Single Span Slab Design.  
 4) Additional reinforcement may be required for Long-Term Deflection design requirements.  
 5) Contact the Metal Dek Group for design assistance and vibration analysis. 888-335-3746 or www.metaldek.com

**h** Total height of concrete slab, in  
**Wc** Weight of concrete (neglecting deflection), psf  
**D** Uniform dead load, psf  
**L** Uniform live load, psf  
**r<sub>c</sub>** 3000 psi

**Vertical load span (center to center spacing)**

**Max. superimposed ASD dead + live load (psf) (governed by strength limitation)**  
**Max. superimposed ASD dead + live load (psf) (governed by instantaneous deflection limitation of L/240)**  
**Max. superimposed ASD live load (psf) (governed by instantaneous deflection limitation of L/360)**

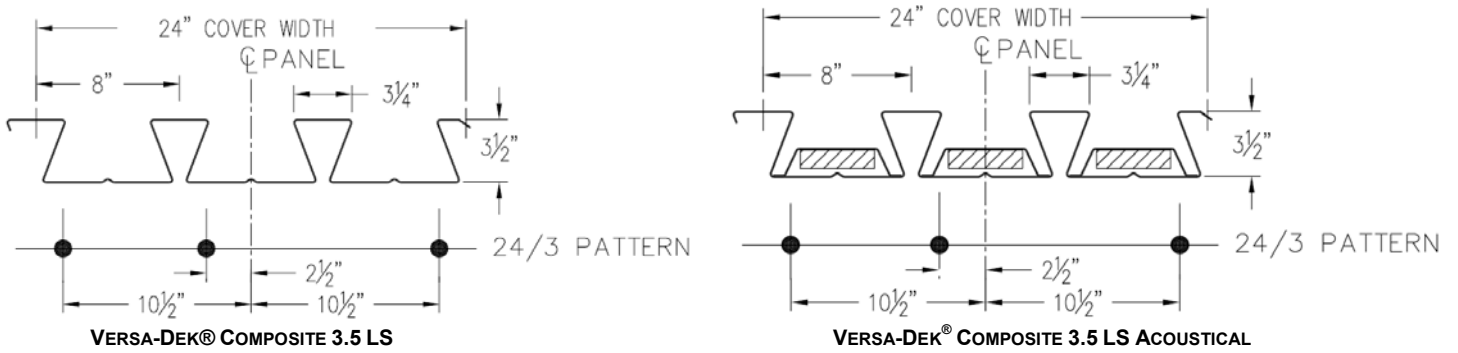


FIGURE 1—STEEL DECK PANEL PROFILES AND ATTACHMENT PATTERN AT SUPPORT

| DECK TYPE                             | DECK GAGE (in)             | PERFORATION DIAMETER (in) | PERFORATION SPACING, a (in)       |
|---------------------------------------|----------------------------|---------------------------|-----------------------------------|
| Versa-Dek Composite 3.5 LS Acoustical | 20 [0.0358]                | 0.156                     | 19 SPACES x 0.324 + 0.156 = 6.312 |
|                                       | 18 [0.0474]<br>16 [0.0598] |                           | 17 SPACES x 0.324 + 0.156 = 5.664 |

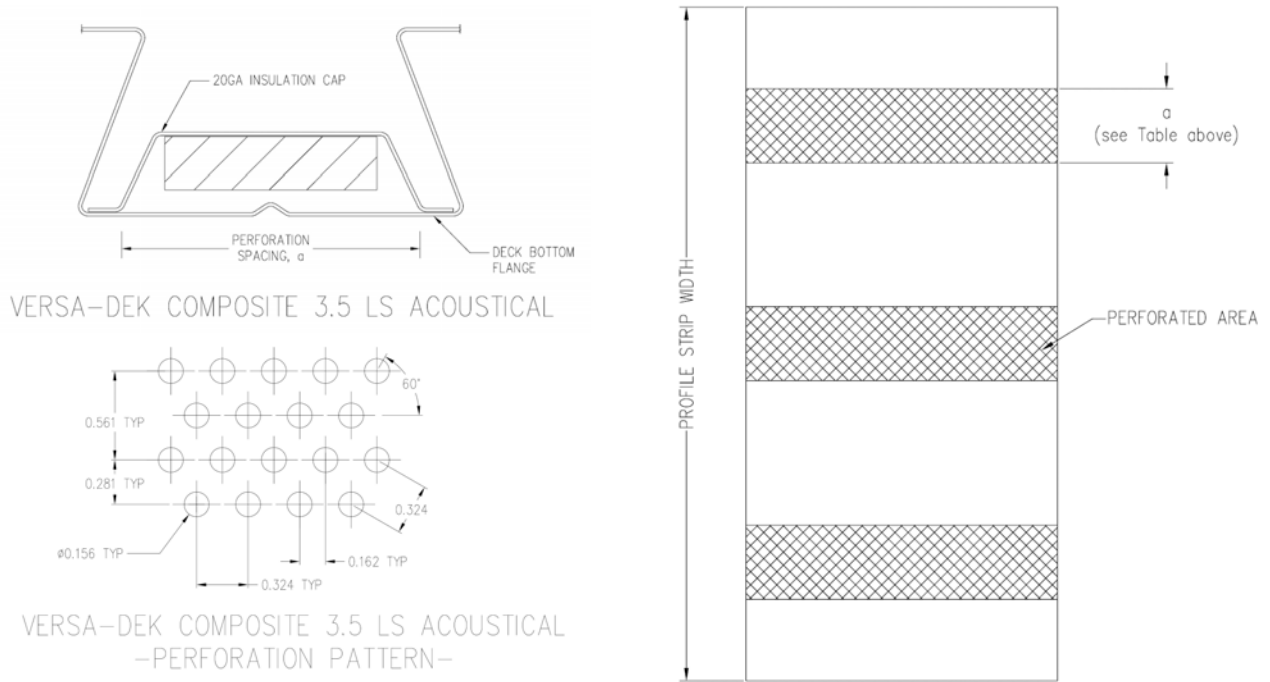
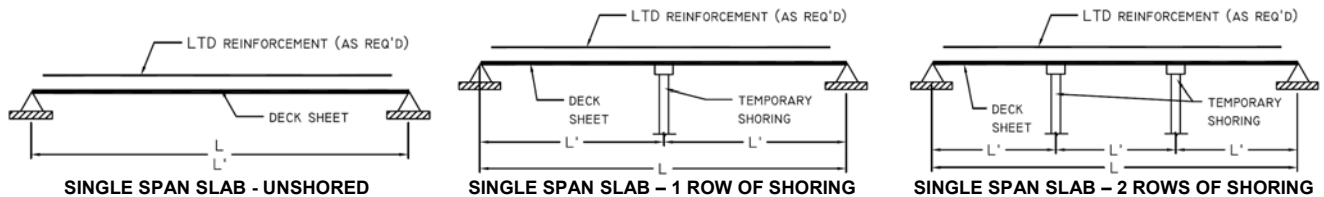


FIGURE 2—PERFORATION PATTERN OF ACOUSTICAL PROFILE



L = Center to center spacing of permanent supports  
 L' = Unshored construction clear span

**Notes:**

- 1) Reinforcement shown represents installation location relative to span length, not depth in slab. Rebar size, length and vertical location dependent on project requirements.
- 2) Reinforcement placement shall be in accordance with Chapter 19 of the IBC 2006.
- 3) Long-Term Deflection (LTD) reinforcement may be required based on design requirements.

FIGURE 3—SPAN CONDITIONS