



INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

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TO: All Design, Operations, and District Personnel, and Consultants

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SUBJECT: Overhead Box-Truss Sign Structures and Foundations

ADDS: *Indiana Design Manual* Section 75-6.01

EFFECTIVE: September 10, 2009, Letting

Overhead box-truss sign structures and their foundations have been redesigned, including fatigue considerations, based on the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 4th Edition*, including 2006 Interims. New and redesigned box-truss structures have been developed for use with certain combinations of sign areas and spans lengths.

I. STANDARDIZED STRUCTURES

Standard details have been developed for the following:

1. Span lengths of 100 ft (30 m) and 130 ft (40 m)
2. Total areas of signs of 500 ft² (47 m²), 700 ft² (65 m²), and 900 ft² (84 m²)
3. Mounting height of 28'-6" ft (8.7 m)

The standard types are designated as A through E, and are more fully described in Figure 09-__A. They are built up from exterior and interior sections. The number of interior sections depends on the required span length. A minimum number of interior sections should be used for each truss to keep the maximum section length at 35'-6" (10.8 m). A single interior section should have an even number of panels to maintain the pattern of vertical diagonals. The standard box-truss width is 6'-6" (2 m). All truss panels should be the same length. The minimum panel length is 5'-0" (1.5 m). The maximum panel length is 6'-6" (2 m).

A. Standardized Foundations

1. **Spread Footings.** Standard spread-footing foundation details are provided for concrete barriers of 33-in. (840-mm) common and 45-in. (1145-mm) truck heights. They are also provided for median or shoulder barrier of 36-in. (910-mm) height. A standard foundation can be specified if the allowable gross soil-bearing capacity is at least 1500 lb/ft² (72 kPa). If the bearing capacity is lower than this for a given site, its foundations must be designed, and its details must be shown on the plans.

The lateral placement of the foundations will determine the required box-truss length. If practical, an outside-shoulder-side foundation should be placed outside the clear zone. The front face of the exposed foundation portion should be at least 5 ft (1.5 m) from the edge of the paved shoulder. If the foundation cannot be placed outside the clear zone, it should be shielded with an impact attenuator as described in *Indiana Design Manual* Section 49-8.04(02), unless guardrail is present or warranted for another purpose. For a median side with a concrete barrier shape F, the foundation should be incorporated into the barrier. If the median barrier is steel, the foundation should be placed such that the barrier can be attached to it. For a median with no barrier, the foundation should be placed and shielded as for an outside shoulder.

The details are shown on new INDOT *Standard Drawings* 802-SBTS-01 through -04. These supersede existing *Standard Drawings* 802-SNBF-01 through -07.

The foundation location and type should be shown on the plans.

2. **Drilled Shafts.** Standard details for foundations on drilled shafts will be developed in the future.

B. Standard Overhead-Sign Box-Truss Structure Types

The standard types which can be specified are shown in Figure 09-13A.

Type	Maximum Total Area of Signs	Maximum Span Length
A	500 ft ² (47 m ²)	130 ft (40 m)
B	700 ft ² (65 m ²)	100 ft (30 m)
C	700 ft ² (65 m ²)	130 ft (40 m)
D	900 ft ² (84 m ²)	100 ft (30 m)
E	900 ft ² (84 m ²)	130 ft (40 m)

STANDARD BOX-TRUSS TYPES

Figure 09-13A

The details are shown on new INDOT *Standard Drawings* 802-SBTS-05 through -19. These supersede existing INDOT *Standard Drawings* 802-SNOH-01 through -16.

The overhead-sign structure location, type, and length should be shown on the plans.

C. Pay Items and Contract Information

The new pay items are as follows:

802-09709	Box Truss Sign Structure Foundation, 33-in. Height Box Truss Sign Structure Foundation, 840-mm Height
802-09710	Box Truss Sign Structure Foundation, 36-in. Height Box Truss Sign Structure Foundation, 910-mm Height
802-09711	Box Truss Sign Structure Foundation, 45-in. Height Box Truss Sign Structure Foundation, 1145-mm Height
802-09712	Overhead Sign Structure, A
802-09713	Overhead Sign Structure, B
802-09714	Overhead Sign Structure, C
802-09715	Overhead Sign Structure, D
802-09716	Overhead Sign Structure, E

The pay unit for both foundations and structures is each.

English-units INDOT *Standard Drawings* appear on the Department's website at

<http://www.in.gov/dot/div/contracts/standards/drawings/sep09/e/sep700.htm>.

Metric-units versions are in development.

II. NONSTANDARDIZED STRUCTURE

A. Design Parameters

If a standard truss type and foundations cannot be used, an overhead sign-truss structure and its supports should be designed and analyzed in accordance with the AASHTO *Standard Specifications for Highway Signs, Luminaires, and Traffic Signals*. The design parameters are as follows:

1. Dead Loads.

- a. The density of aluminum should be taken as 169 lb/ft^3 (2707 kg/m^3).
- b. The density of steel should be taken as 490 lb/ft^3 (7850 kg/m^3).
- c. The density of message-sign aluminum 12-in. (300 mm) extruded panels should be taken as 2.48 lb/ft (3.69 kg/m).

2. Wind Loads.

- a. The wind importance factor, I_r , should be taken as 1.
- b. The gust effect factor, G , should be taken as 1.14.
- c. The height coefficient varies depending on the structure height. If it appears between two heights, use the average value for the two heights.
- d. Wind pressure applied to the sign face considered to be exposed to the wind should be taken as 100%. Wind pressure applied to the sign face considered to be shielded from the wind should be taken as 65%.
- e. The sign height should be taken as 20 ft (6.1 m), but the length varies based on the sign area under consideration.
- f. Signs should be placed such that their horizontal centerline is the same as that of the box truss.

3. Ice Loads. Ice loading should be taken as 3 lb/ft^2 (14.7 kg/m^2). Ice is assumed to form only on one side of the sign.

4. Fatigue Loads.

- a. Fatigue category, I , should be considered for truck and natural-wind-gust loads only.
- b. The fatigue importance factor, I_f , should be taken as 1.

B. Design Considerations

A box truss should be designed as an aluminum structure. An end-support column should be designed as a steel structure.

End-support members are tubes spaced at 9'-0" (2.7 m). The required sections for steel tubes are tabulated and depend on the maximum sign area and truss span length. The maximum mounting height assumed for calculation is 28'-6" (8.7 m).

Gusset plates have been used at the horizontal and horizontal diagonal member connections to the chords where the calculations indicate the critical fatigue stress range for the member sizes used.

The interior-walkway maximum load should be taken as 2.7 lb/ft² (13.2 kg/m²).

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