

Vehicle Response Components in SAP2000

See the *CSI Analysis Reference Manual*, Chapter "Bridge Analysis", Topic "Vehicle Response Components" for a discussion of this topic. A summary is included here.

In order to satisfy certain requirements of the AASHTO H, HS and HL design vehicular live load, all the available response quantities (frame forces, joint reactions, shell stresses, etc.) are divided into the following categories:

(1) Superstructure span moments. For AASHTO H and HS lane loading, span moments use an 18 kip concentrated load rather than the 26 kip load used by other response quantities.

(2) Negative superstructure span moments over the supports (bents). For AASHTO H and HS lane loading, negative span moments may use two 18 kip concentrated loads, one in each of two different spans, if that condition is more severe than a single 18 kip load. For AASHTO HL loading, negative span moments over interior supports (bents) consider two truck loads at 90% magnitude, separated by a variable distance of not less than 50 feet, in addition to the other HL vehicles.

(3) Reactions at interior supports (bents). For AASHTO HL loading, reactions at interior supports consider two truck loads at 90% magnitude, separated by a variable distance of not less than 50 feet, in addition to the other HL vehicles.

(4) All other responses.

In order for these effects to be considered properly, it is necessary to identify how the vehicles are used for these different types of response quantities, and also to identify which element response components (e.g., axial force, moment M3, joint force F3, etc.) define a span moment or a support reaction.

The build-in standard vehicles are already properly defined. You can also make similar specifications for your own custom vehicles.

However, you must explicitly specify what response in the elements corresponds to superstructure moment and substructure interior support using Vehicle Response Components as follows:

Select the object(s) to be assigned the vehicle response overwrite(s)

Click the Assign menu > Frame/Cable/Tendon Loads > Vehicle Response Components command to display the Assign Vehicle Response Component Overwrites to Lines form

Assign Vehicle Response Component Overwrites to Lines

Select Overwrite Type to Assign

- AASHTO H, HS and HL - Superstructure Negative Moment Over Supports
- AASHTO HL - Reactions at Interior Supports
- AASHTO H & HS Lane Loads - Superstructure Moment

Assign Selected Overwrite Type...

OK Cancel

Select the vehicle and response type to be overwritten (*AASHTO H, HS and HL Superstructure Negative Moment Over Structure, AASHTO-HL Reaction of Interior Supports or AASHTO H & HS Lane Loads - Superstructure Moment*)

Click the Assign Selected Overwrite Type button to display the Vehicle Response Component Overwrites for Lines form. Use that form to specify which component is to be overwritten and the values to be used

Vehicle Response Component Overwrites for Lines

Component	Status
F1	Do Not Use
V2	Do Not Use
V3	Do Not Use
T	Do Not Use
M2	Do Not Use
M3	Do Not Use

Component Overwrites

Overwrite Type
AASHTO H, HS and HL - Superstructure Negative Moment Over Supports

Set All to Do Not Use

OK
Cancel

Click the cell in the *Status* column associated with the component

Select the appropriate options from the drop-down list: Do Not Use, Use Positive Values, Use Negative Values, or Use All Values

The following are the recommended Vehicle Response Components in SAP2000 V9:

(1) Select the frame elements, then Assign > Frame Loads > Vehicle Response Components, choose "AASHTO H, HS and HL - Superstructure Negative Moments Over Supports," then Assign for M3 "Use Negative Values".

(2a) Select the two interior joints (or all joints), Assign > Joint Loads > Vehicle Response Components, choose "AASHTO HL - Reactions at Interior Supports," then Assign for F3 "Use Positive Values".

If there are columns, then:

(2b) Select the column elements, then Assign > Frame Loads > Vehicle Response Components, choose "AASHTO HL - Reactions at Interior Supports," then Assign for P "Use Negative Values".

(3) Select the frame elements, then Assign > Frame Loads > Vehicle Response Components, choose "AASHTO H & HS Lane Loads – Superstructure Moment," then Assign for M3 "Use All Values."