



Interactive Highway Safety Design Model (IHSDM)

Design Consistency Module (DCM) User's Manual

Developed for
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1. Introduction

The Design Consistency Module estimates the magnitude of potential speed inconsistencies to help identify and diagnose potential safety concerns at horizontal curves. These evaluations also provide quality-assurance checks of preliminary and final alignment designs.

The Design Consistency Module (PRM) User's Manual is a reference for the mechanics of using the DCM software graphical user interface.

2. Background

For background information on the Design Consistency Module, refer to the Design Consistency Module (DCM) Engineer's Manual .

3. Design Consistency Module Graphical User Interface

The Design Consistency Module may be accessed through the Master Control Module primary window's DCM tab. Details of the Master Control Module's graphical user interface are described in the IHSDM User's Manual. The Design Consistency Module may also be started independently of the Master Control Module. The DCM.EXE executable in the IHSDM system home directory may be invoked to directly start the Design Consistency Module dialog. There is also a command script named RUNDCM.BAT in the bat subdirectory of the IHSDM system home directory. Either of these commands may be started by double clicking them in Windows Explorer, by creating a Desktop shortcut, or by entering the full file name in the Windows run dialog on the Start Menu.

3.1 Design Consistency Module Dialog

This is the initial frame for the DCM when called directly from the command line (i.e., the stand-alone version). The **Design Consistency Module** frame includes the following menu items: File, Edit, View and Help. The **Design Consistency Module** frame includes the following toolbar buttons: Change Project, Change Analysis, Edit Highway Data, Edit User Properties, Edit User Defaults, View Current Analysis Report, View Analysis Report Index and Search Master Index. The **Design Consistency Module** frame includes the following tabs: Project/Analysis, Attributes and Evaluation. The **Design Consistency Module** frame includes the following statusbar fields: Progress Bar and Progress Bar Text.

3.1.1 Menu Items

The Design Consistency Module Frame includes the following menu items:

- **File** - This menu includes menu items to change the current project and/or analysis and to exit DCM. The **File** menu includes the following menu items: Change Current Project, Change Current Analysis, Import Highway Data and Exit.
 - **Change Current Project** - This menu item brings up a dialog to change the current project. From this dialog, you can edit project attributes. For additional information, see Project, Analysis and Master Highway Operations in the Running IHSDM Software Manual.
 - **Change Current Analysis** - This menu item brings up a dialog to change the current analysis. From this dialog, you can edit analysis attributes and change the master highway associated with the analysis. For additional information, see Project, Analysis and Master Highway Operations in the Running IHSDM Software Manual.
 - **Import Highway Data** - This menu item invokes the Data Import Utility to import a file such as a highway file. The **Import Highway Data** menu includes the

following menu items: IHSDM Highway Data and TWOPAS Input Data.

- **IHSDM Highway Data** - This menu item imports either IHSDM CSV or LandXML highway data files.
- **TWOPAS Input Data** - This menu item imports TWOPAS input data.
- **Exit** - This menu item closes and exits the DCM module.
- **Edit** - This menu includes menu items to edit highway datasets, edit user properties and to complete an IHSDM program report. The **Edit** menu includes the following menu items: Edit/View Highway Data, Edit Intersections, Manage Highway Datasets, Edit User Properties, Edit Defaults and Problem Report/Change Request.
 - **Edit/View Highway Data** - This menu includes menu items to edit either the current or selected highway dataset. For additional information, see Editing Highway Elements. The **Edit/View Highway Data** menu includes the following menu items: Select Master Highway, Select from Available Highways, Create Highway Data and Clone Highway Data.
 - **Select Master Highway** - This menu item brings up a new window to edit the master highway associated with the current analysis.
 - **Select from Available Highways** - This menu item brings up a dialog to select a highway dataset by name and then launches the edit/view highway data editor with the selected highway.
 - **Create Highway Data** - This menu item brings up a dialog to create a new highway dataset name and then launches the edit/view highway data editor.
 - **Clone Highway Data** - This menu item brings up a dialog to select a highway dataset by name and creates a new name for the cloned highway dataset.
 - **Edit Intersections** - This menu item invokes the intersection data editor dialog to allow intersection data associated with this highway dataset to be edited. For additional information, see IHSDM Intersection Model.
 - **Manage Highway Datasets** - This menu item launches the highway dataset list manager. The current analysis must be closed to perform this operation. Highway dataset list management operations include renaming and deleting highway datasets.
 - **Edit User Properties** - This menu item brings up a dialog to edit the IHSDM user properties. For additional information, see User Properties in the User Properties and Defaults Manual.
 - **Edit Defaults** - This menu item brings up a dialog to edit the default values to the IHSDM modules.
 - **Problem Report/Change Request** - This menu contains menu items to create a new PR/CR or edit an existing PR/CR. The **Problem Report/Change Request** menu includes the following menu items: Create New PR/CR, Edit Existing PR/CR and List Existing PR/CR .
 - **Create New PR/CR** - This menu item brings up a dialog to complete a new IHSDM problem report/change request. For additional information, see Creating an IHSDM Problem Report/Change Request.

- **Edit Existing PR/CR** - This menu item brings up a file chooser dialog to select a file. If selected, the file will be read as an IHSDM problem report/change request and displayed. For additional information, see Creating an IHSDM Problem Report/Change Request.
- **List Existing PR/CR** - This menu item brings up browser with a listing of the current PR/CR issues at the development website. For additional information, see Creating an IHSDM Problem Report/Change Request.
- **View** - This menu includes menu items to display and clear the analysis log and analysis report. The **View** menu includes the following menu items: View Analysis Log, Start a New Analysis Report, View Current Analysis Report, View Analysis Report Index, Clear Analysis Log, Clear Analysis Report and Open Saved Graph.
 - **View Analysis Log** - This menu item launches the user's specified text editor with the current analysis log.
 - **Start a New Analysis Report** - This menu item causes a new analysis report file to be started.
 - **View Current Analysis Report** - This menu item launches the user's specified analysis report display tool with the current analysis report.
 - **View Analysis Report Index** - This menu item launches the user's specified HTML browser to display an index of analysis reports available within the current analysis.
 - **Clear Analysis Log** - This menu item clears (erases) the current analysis log.
 - **Clear Analysis Report** - This menu item clears (erases) the current analysis report.
 - **Open Saved Graph** - This menu item invokes a dialog to open and display a previously saved graph. The graph file may be created from a DCM, CPM, DVM or TAM analysis.
- **Help** - This menu includes menu items to display various help documents and the module's 'about box'. The **Help** menu includes the following menu items: IHSDM User's Manual, DCM User's Manual, DCM Engineer's Manual, User Documentation Summary, Master Index, Search Master Index and About DCM.
 - **IHSDM User's Manual** - This menu item launches the HTML browser to display the IHSDM User's Manual.
 - **DCM User's Manual** - This menu item will display the DCM User's Manual in the HTML browser.
 - **DCM Engineer's Manual** - This menu item will display the DCM Engineer's Manual in the HTML browser.
 - **User Documentation Summary** - This menu item launches the HTML browser to display the **User Documentation Summary**. The summary contain links to all the user documentation.
 - **Master Index** - This menu item launches the HTML browser to display the **IHSDM Documentation Master Index**.
 - **Search Master Index** - This menu item launches a dialog to allow a keyword search of the **IHSDM Documentation Master Index**.

- **About DCM** - This menu item will display the DCM 'about box', which contains release information and development credits.

3.1.2 Toolbar

The Design Consistency Module Frame includes the toolbar buttons listed below.

Change Project - This button item brings up a dialog to change the current project. From this dialog, you can edit project attributes. For additional information, see Project, Analysis and Master Highway Operations in the Running IHSDM Software Manual.

Change Analysis - This button brings up a dialog to change the current analysis. From this dialog, you can edit analysis attributes and change the master highway associated with the analysis. For additional information, see Project, Analysis and Master Highway Operations in the Running IHSDM Software Manual.

Edit Highway Data - This toolbar button starts the Edit/View Highway Data editor for the master highway. For additional information, see Editing Highway Elements.

Edit User Properties - This toolbar button brings up a dialog to edit the IHSDM user properties. For additional information, see User Properties in the User Properties and Defaults Manual.

Edit User Defaults - This button brings up a dialog to edit the default values to the IHSDM modules.

View Current Analysis Report - This toolbar button item launches the user's specified analysis report display tool with the current analysis report.

View Analysis Report Index - This button launches the user's specified HTML browser to display an index of analysis reports available within the current analysis.

- This button will launch the user's HTML browser to display the DCM Engineer's Manual.
- This button will invoke the HTML browser to display the DCM User's Manual.

Search Master Index - This toolbar button launches a dialog that support searching the master documentation index.

- This button will save all DCM analysis data and exit the DCM program.

3.1.3 Tabs

The Design Consistency Module Frame includes the tabs described in the following sections.

3.1.3.1 Project/Analysis Tab

This tab contains the project/analysis identification, the current highway identification, and processing bounds.

Project/Analysis Information		Master Highway (Highway to be Analyzed)	
Project Name	Beta testing IHSDM	Highway Name	Example
Project Comment	Test project #1	Chain	none
Project Unit System	Metric	Comment	imported roadway
Analysis Name	Test 1	Edit/View Highway Data	
Analysis Comment	default analysis	Analysis Limits	
Analysis E Max (%)		Start Station	0.000
Default Normal Cross Slope (%)		End Station	3727.662
Analysis Year			

Figure 1 Project/Analysis Tab

The **Project/Analysis** tab includes the following widgets: Project Name, Project Comment, Project Unit System, Analysis Name, Analysis Comment, Analysis E Max, Default Normal Cross Slope, Analysis Year, Highway Name, Chain, Comment, Edit/View Highway Data, Start Station and End Station.

- **Project Name** - Widget type: text field (read-only). The value of this item is the name of the project.
- **Project Comment** - Widget type: text field (read-only). This is an optional comment about the project.
- **Project Unit System** - Widget type: combo box (read-only). This item specifies the unit system used for the entry and display of all values associated with the project. This unit system is used to control all outputs as well as the unit system assumed for imported datasets if no unit system is explicitly specified in the imported file. The enumeration values are:
 - **user default** (user default unit system),
 - **Metric** (Metric unit system) and
 - **English** (English (Imperial) unit system).
- **Analysis Name** - Widget type: text field (read-only). This is the name of the analysis. The name of the analysis is unique within a project. If the user does not specify a name, the system will create one.
- **Analysis Comment** - Widget type: text field (read-only). This is an optional comment about the analysis.
- **Analysis E Max** - Widget type: combo box (read-only). Unit of measure: percent. The value of this item is the maximum superelevation, as a percentage, for this analysis. The enumeration values are: **4, 6, 8, 10** and **12**. The unit of measure for this item is percent.
- **Default Normal Cross Slope** - Widget type: text field (read-only). Unit of measure: percent. The value of this item is the default normal cross slope, as a percentage, for this analysis. Once a highway dataset is imported, normal cross slope elements can be defined to vary the value along the alignment. The unit of measure for this item is percent.

- **Analysis Year** - Widget type: text field (read-only). Unit of measure: YEAR. The value of this item is the year of the analysis. It is used to compute the average daily traffic volume (ADT).
- **Highway Name** - Widget type: text field (read-only). The value of this item is the name of the master highway associated with the analysis.
- **Chain** - Widget type: text field (read-only). The value of this item is an optional chain name for the alignment associated with the highway dataset.
- **Comment** - Widget type: text field (read-only). The value of this item is an optional comment for the highway dataset.
- **Edit/View Highway Data** - Widget type: button. This button starts the edit/view highway data editor for the master highway. For additional information, see Editing Highway Elements.
- **Start Station** - Widget type: text field. Unit of measure: STATION. The value of this item is the effective starting station of this highway dataset for purposes of this analysis.
- **End Station** - Widget type: text field. Unit of measure: STATION. The value of this item is the effective end station of this highway dataset for purposes of this analysis.

3.1.3.2 Attributes Tab

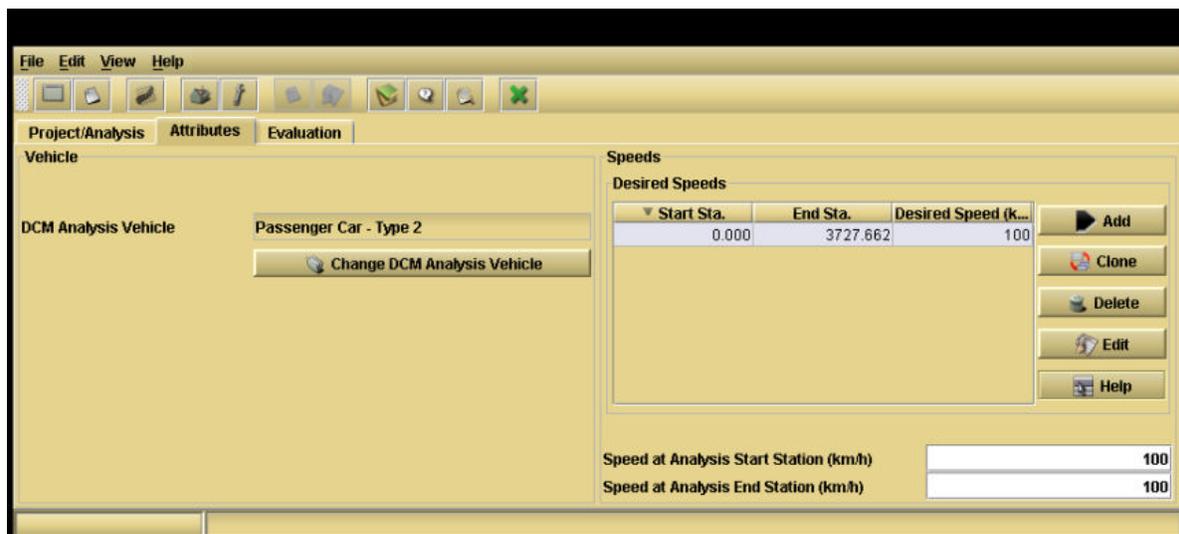


Figure 2 Attributes Tab

The **Attributes** tab includes the following widgets: DCM Analysis Vehicle, Change DCM Analysis Vehicle, Speed at Analysis Start Station, Speed at Analysis End Station and Desired Speed Elements.

- **DCM Analysis Vehicle** - Widget type: text field (read-only). This item is the vehicle type associated with the analysis. The type selected can affect the estimated speed for each element of the alignment.
- **Change DCM Analysis Vehicle** - Widget type: button. This button sets the vehicle type for the active analysis.
- **Speed at Analysis Start Station** - Widget type: text field. Unit of measure: kilometers/hour (miles/hour). This item is the speed used at the start of the analysis. The

unit of measure for this item is kilometers/hour (miles/hour).

- **Speed at Analysis End Station** - Widget type: text field. Unit of measure: kilometers/hour (miles/hour). This item is the speed used at the end of the analysis. The unit of measure for this item is kilometers/hour (miles/hour).
- **Desired Speed Elements** List Box - Widget type: list box. Unit of measure: kilometers/hour (miles/hour). This item is the desired speed that drivers select when not constrained by the vertical or horizontal alignment for the span. The **Desired Speed Elements** list box includes the following items: Start Sta., End Sta. and Desired Speed.
 - **Start Sta.** Item - Unit of measure: STATION. The value of this item is the starting station for this highway or design element. This item defaults to the minimum station for the highway.
 - **End Sta.** Item - Unit of measure: STATION. The value of this item is the ending station for this highway or design element. This item defaults to the maximum station for the highway.
 - **Desired Speed** Item - Unit of measure: kilometers/hour (miles/hour). This item is the desired speed that drivers select when not constrained by the vertical or horizontal alignment for the segment. The unit of measure for this item is kilometers/hour (miles/hour).

3.1.3.3 Evaluation Tab

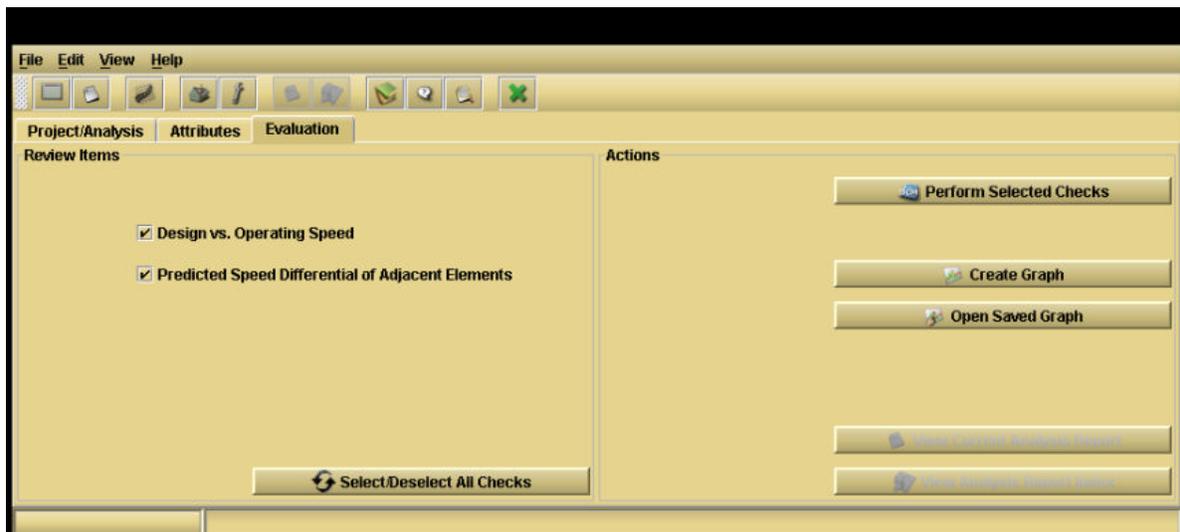


Figure 3 Evaluation Tab

The **Evaluation** tab includes the following widgets: Design vs. Operating Speed, Predicted Speed Differential of Adjacent Elements, Select/Deselect All Checks, Perform Selected Checks, Create Graph, Open Saved Graph, View Current Analysis Report and View Analysis Report Index.

- **Design vs. Operating Speed** - Widget type: check box. This check box selects/deselects the design speed verses operating speed check.
- **Predicted Speed Differential of Adjacent Elements** - Widget type: check box. This check box selects/deselects the speed differential of adjacent elements check.

- **Select/Deselect All Checks** - Widget type: button. This button will select or deselect all DCM design consistency evaluation items.
- **Perform Selected Checks** - Widget type: button. This button processes the highway element data and generates the results of the design consistency model.
- **Create Graph** - Widget type: button. This button starts the graph dialog that configures the graphical display of the analysis results.
- **Open Saved Graph** - Widget type: button. This button invokes a dialog to open and display a previously saved graph.
- **View Current Analysis Report** - Widget type: button. This button launches the user's preferred report viewer to display the current analysis report.
- **View Analysis Report Index** - Widget type: button. This button item launches the user's specified HTML browser to display an index of analysis reports available for the current analysis.

3.1.4 Status Bar

The Design Consistency Module Frame includes the statusbar fields listed below.

Progress Bar - This progress bar displays the progress of the current processing.

Progress Bar Text - This text field bar displays the current processing status message.

3.2 DCM Graph Wizard Dialog

This dialog determines the elements displayed on the output graph. The **Create DCM Graphic Output** dialog includes the following menu items: File and Help. The **Create DCM Graphic Output** dialog includes the following tabs: View, Titles and Lines. The **Create DCM Graphic Output** dialog includes the following widgets: Show Graph and Cancel.

3.2.1 Menu Items

The Create DCM Graphic Output Dialog includes the following menu items:

- **File** - The **File** menu includes the following menu items: Exit.
 - **Exit** - This menu item saves all data and closes the dialog.
- **Help** - The **Help** menu includes the following menu items: IHSDM User's Manual and Graph Dialog Help.
 - **IHSDM User's Manual** - This menu item displays the IHSDM User's Manual in a browser.
 - **Graph Dialog Help** - This menu item displays the DCM graph dialog help in a browser.

3.2.2 Tabs

The Create DCM Graphic Output Dialog includes the tabs described in the following sections.

3.2.2.1 View Tab

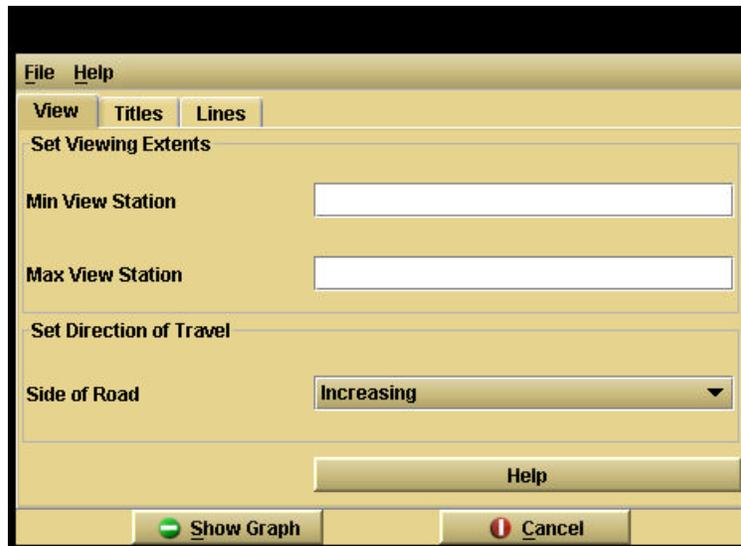


Figure 4 View Tab

The **View** tab includes the following widgets: Min View Station, Max View Station, Side of Road and Help.

- **Min View Station** - Widget type: text field. Unit of measure: STATION. This item is the minimum station initially viewed on the x-axis.
- **Max View Station** - Widget type: text field. Unit of measure: STATION. This item is the maximum station initially viewed on the x-axis.
- **Side of Road** - Widget type: combo box. This item selects the side of the road to be displayed. The selected item from the combo box determines the side of road to be displayed. The enumeration values are: **Increasing** and **Decreasing**.
- **Help** - Widget type: button. This button will display help about DCM Graph Tool.

3.2.2.2 Titles Tab

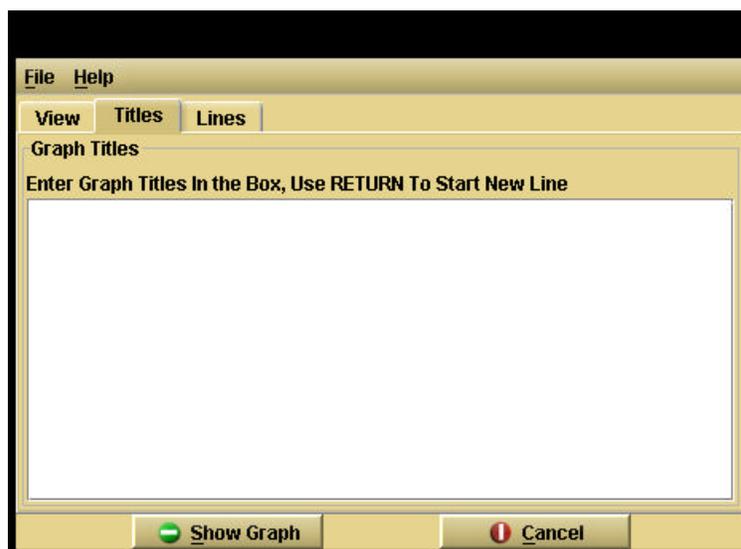


Figure 5 Titles Tab

The **Titles** tab includes the following widgets: Enter Graph Titles In the Box, Use RETURN To Start New Line.

- **Enter Graph Titles In the Box, Use RETURN To Start New Line** - Widget type: text area. The selected items are the descriptive titles listed at the top of the graph.

3.2.2.3 Lines Tab

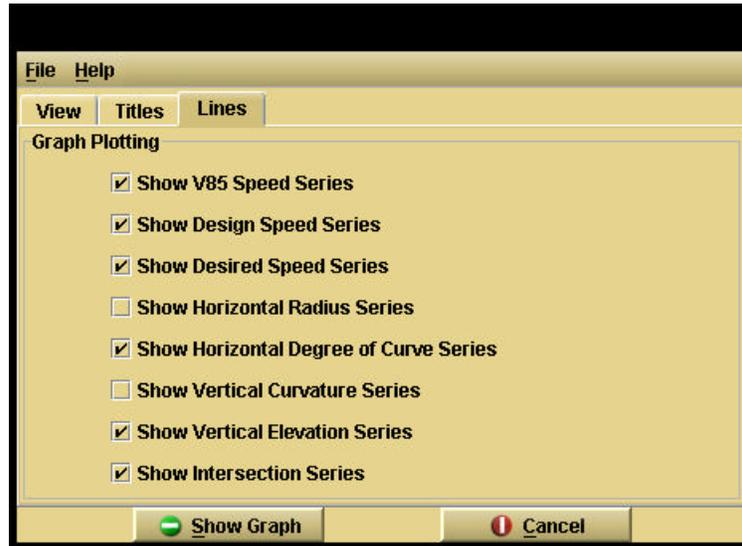


Figure 6 Lines Tab

The **Lines** tab includes the following widgets: Show V85 Speed Series, Show Design Speed Series, Show Desired Speed Series, Show Horizontal Radius Series, Show Horizontal Degree of Curve Series, Show Vertical Curvature Series, Show Vertical Elevation Series and Show Intersection Series.

- **Show V85 Speed Series** - Widget type: check box. This check box determines if the V85 speed series on the graph is visible (checked) or not visible (not checked).
- **Show Design Speed Series** - Widget type: check box. This check box determines if the design speed series on the graph is visible (checked) or not visible (not checked).
- **Show Desired Speed Series** - Widget type: check box. This check box determines if the desired speed series on the graph is visible (checked) or not visible (not checked).
- **Show Horizontal Radius Series** - Widget type: check box. The value of this item enables or disable the display of the horizontal radius series on the graph.
- **Show Horizontal Degree of Curve Series** - Widget type: check box. The value of this item enables or disable the display of the horizontal degree of curve series on the graph.
- **Show Vertical Curvature Series** - Widget type: check box. The value of this item enables or disable the display of the vertical curvature (K-value) series on the graph.
- **Show Vertical Elevation Series** - Widget type: check box. The value of this item enables or disable the display of the vertical elevation series on the graph.
- **Show Intersection Series** - Widget type: check box. The value of this item enables or disable the display of the intersection series on the graph.

3.2.3 Widgets

- **Show Graph** - This button proceeds with the generation and display of the specified graphic output.
- **Cancel** - This button cancels the generation and display of graphic output and closes the dialog.

4. Other Topics

4.1 IHSDM User Properties

IHSDM properties are used to control the runtime behavior of the system. For detailed information on IHSDM User Properties refer to User Properties in the User Properties and Defaults Manual and User Default Values in the User Properties and Defaults Manual.

4.2 Projects, Analyses and Master Highways

For detailed information on projects, analyses and highways, see Running IHSDM Software Manual.

4.3 IHSDM Documentation

IHSDM documentation is organized in a series of manuals oriented to specific user types and information needs. User types include first-time users, regular users, and system administrators. Information needs include: installing and configuring IHSDM, the mechanics of using the various features of the software, engineering insights to ensure appropriate use of the software and interpretation of outputs, and administering and maintaining the software installation.

The structure of the series of manuals is illustrated in the User Documentation Map. The manuals are listed and described below by the users and information needs they support:

- **Manuals for First-Time Users:** These manuals are oriented to assist new users in installing and configuring IHSDM and running it for the first time. Manuals include:
 - **Getting Started Guide** - An overview of the installation and use of IHSDM. This Guide should be sufficient for stand-alone installations. For client-server installations, the more detailed IHSDM Installation Manual will be needed.
 - **Installation Manual** - A detailed reference to the installation and configuration of IHSDM.
 - **Running IHSDM Software Manual** - An overview of the basic operations in running the IHSDM software. The intent is to provide new users the information they need to run IHSDM for the first time.
- **User's Manuals:** These Manuals are intended as references that regular users can consult when issues arise about the mechanics of using the IHSDM graphical user interface. Manuals include:
 - **IHSDM User's Manual** - A reference for using the primary IHSDM graphical user interface. Other User's Manuals provide additional details on specific components of the IHSDM graphical user interface:
 - **Policy Review Module (PRM) User's Manual** - A reference for using the (stand-alone) Policy Review Module software graphical user interface.
 - **Crash Prediction Module (CPM) User's Manual** - A reference for using the (stand-alone) Crash Prediction Module software graphical user interface.

- Design Consistency Module (DCM) User's Manual - A reference for using the (stand-alone) Design Consistency Module software graphical user interface.
- Intersection Review Module (IRM) User's Manual - A reference for using the (stand-alone) Intersection Review Module software graphical user interface.
- Traffic Analysis Module (TAM) User's Manual - A reference for using the (stand-alone) Traffic Analysis Module software graphical user interface.
- Using the IHSDM Graphical User Interface - A reference for the operation of the individual components of the graphical user interface.
- User Properties and Defaults Manual - A reference for editing IHSDM system properties, user properties, and user default values.
- Frequently Asked Questions - A list of frequently asked questions related to the IHSDM software.
- IHSDM Troubleshooting Guide - A reference for troubleshooting IHSDM software problems.
- Documentation of IHSDM Data: These documents provide detailed descriptions of all IHSDM data elements and references for importing and editing data.
 - IHSDM Highway Model - A reference for the IHSDM highway model, including descriptions of the data elements comprising the model.
 - LandXML Support - A reference for IHSDM support for the LandXML data standard.
 - Editing Highway Elements - A reference for using the Edit/View Highway Elements graphical user interface.
 - GEOPAK-TO-IHSDM Application Programmer's Interface (API) User's Manual - A reference for using the Application Program Interface (API) to export data from GEOPAK into a format that IHSDM can import.
- Engineer's Manual: The intent of these Manuals is to provide the engineering information necessary to make appropriate use of IHSDM evaluation capabilities and interpretation of results. Manuals include:
 - Policy Review Module (PRM) Engineer's Manual - A reference for the engineering issues of using the Policy Review Module.
 - Crash Prediction Module (CPM) Engineer's Manual - A reference for the engineering issues of using the Crash Prediction Module.
 - Design Consistency Module (DCM) Engineer's Manual - A reference for the engineering issues of using the Design Consistency Module.
 - Intersection Review Module (IRM) Engineer's Manual - A reference for the engineering issues of using the Intersection Review Module.
 - **Intersection Policy Review Sub-Manual** - Describes the procedures for checking an intersection design element against relevant policy, including references to the section of the AASHTO policy that contains the information used to develop the module and check the design. **(The Intersection Policy Review Sub-Manual is not available in the current release of IHSDM.)**
 - Intersection Diagnostic Review Engineer's Sub-manual - Describes in detail the concerns that the diagnostic review component considers and the models used to

evaluate those concerns.

- Traffic Analysis Module (TAM) Engineer's Manual - A reference for the engineering issues of using the Traffic Analysis Module.
- Manuals for System Administrators: These Manuals provide system administrators the information they need to maintain IHSDM installations.
 - System Administrator's Manual - A reference for using the IHSDM Administration Tool software graphical user interface. This manual also discusses customizing variable components of IHSDM, including analysis report templates, data dictionaries, and policy files.
 - PRM/IRM Policy Table Maintenance - A reference for editing design policy tables used in the Policy Review Module and Intersection Review Module.

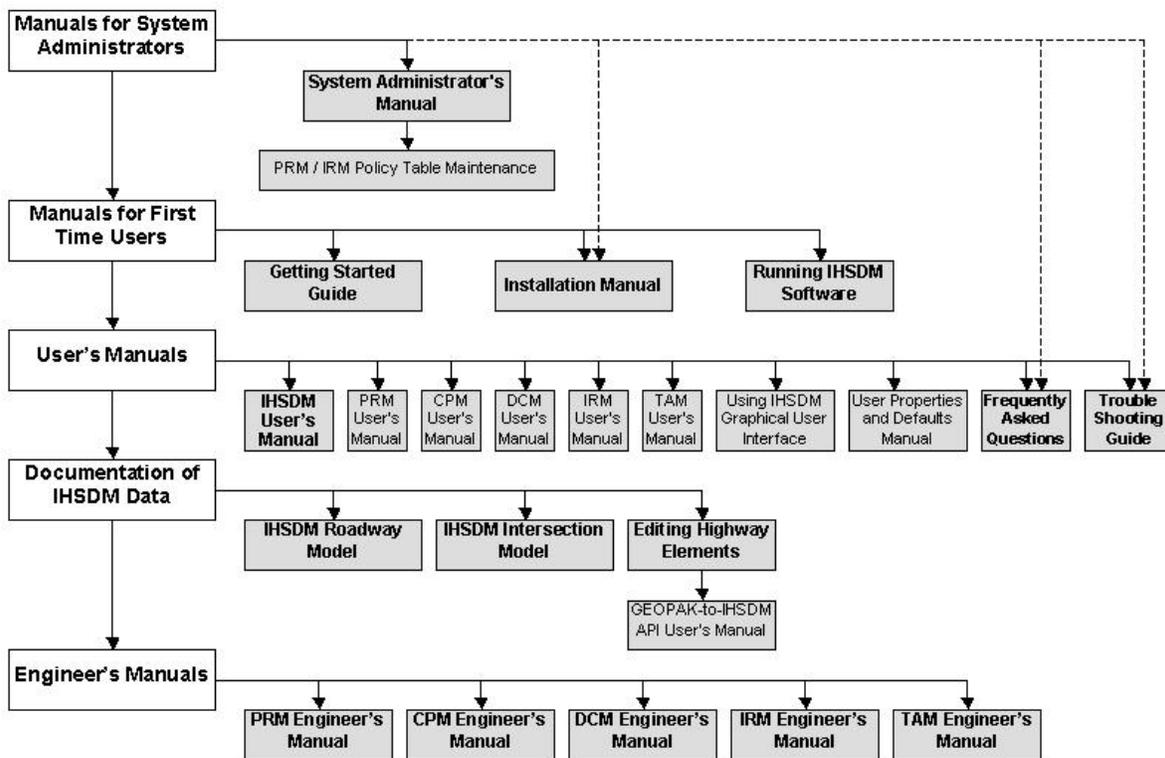


Figure 7 User Documentation Map

4.4 Troubleshooting

For updated information on troubleshooting problems in the IHSDM, refer to the IHSDM Troubleshooting guide.

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