

2009 ROADS AND BRIDGES CONFERENCE



Resurfacing and Overlay Made Easy with New Overlay Tools in Roadway Designer

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Why Overlay?



Why Overlay?

- Accommodate wedging / leveling
- Milling
- Widening
- Crown correction
- Longitudinal smoothing
- Superelevation correction
- Cost minimization

What To Expect...

- Optimized vertical alignment without the “washboard effect”.
- Leveling / stripping components
- Corrected superelevation
- Distinct volumes to minimize construction cost
- Several tolerance settings for overlay design

Why New Tools?

- A majority of all roadway construction projects today require overlay and or widening (rehabilitation) versus new construction.
- Machine control construction becoming the “norm” even with rehabilitation projects.
- Need new tools in Roadway Designer to better optimize quantities and follow specific standards like minimum overlay thickness or max. overlay depths.
- Need ability to optimize proposed profiles to lessen the “washboard effect”.
- Need ability to “*match what’s out there*” to minimize cost.

What Abilities Will These Tools Provide?

- Existing cross slope optimization with slope and elevation tolerances
- Minimum overlay thickness / maximum milling (scarification) depth analysis examining template points and optionally all ground points
- “Smooth” the vertical profile.
- Apply the adjusted profile.
- Crown correction / match existing milling
- Bituminous and Milling estimate of cost based on unit rates.

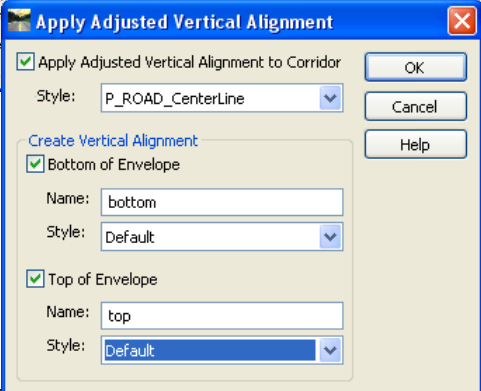
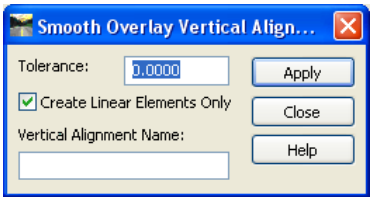
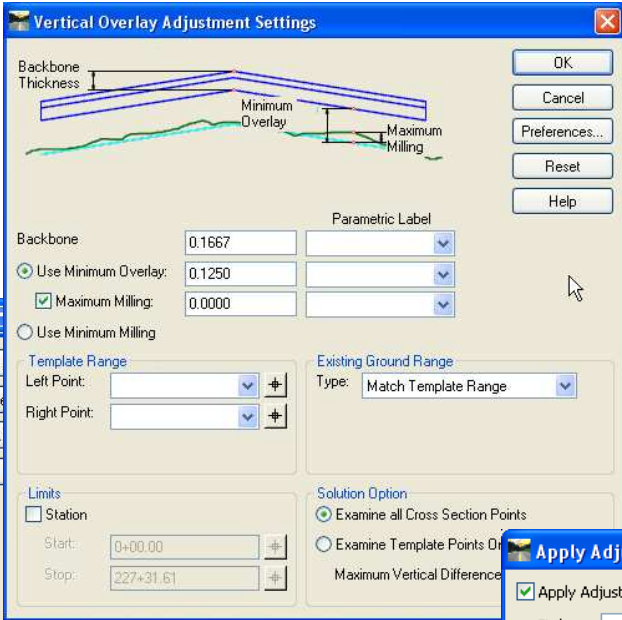
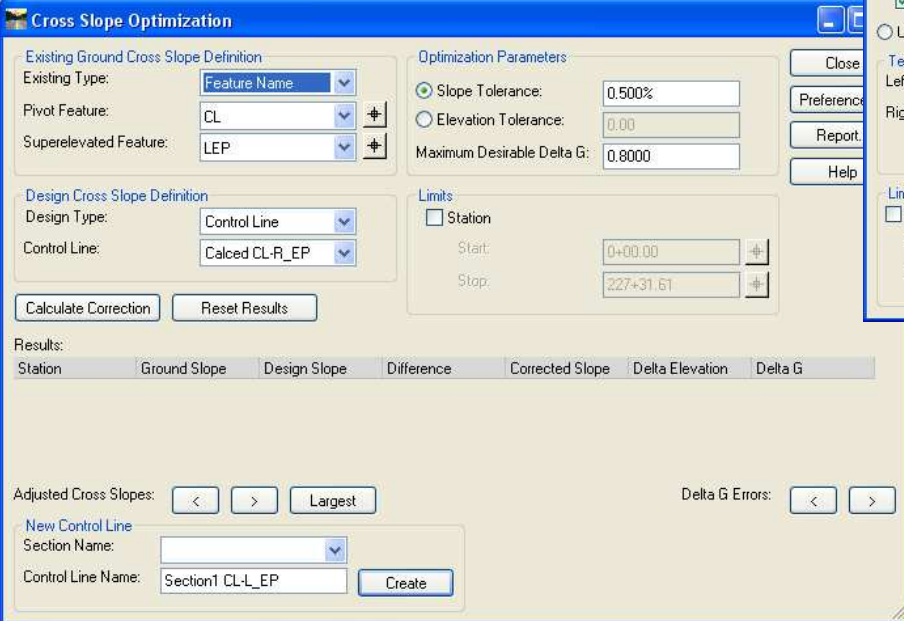
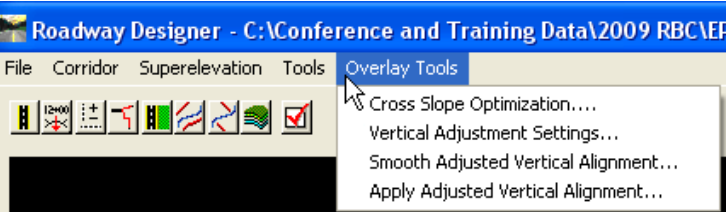
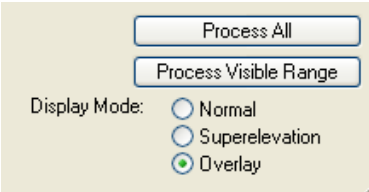
Introducing Roadway Designer's Overlay Toolset

The screenshot displays the 'Roadway Designer' software interface with the 'Overlay Tools' window open. The window title is 'Roadway Designer - C:\Conference and Training Data\2009 RBC\EP-9 RD - Resurfacing and Overlay made Easy\Data\overlay.ird'. The 'Overlay Tools' window contains a menu with options: 'Cross Slope Optimization...', 'Vertical Adjustment Settings...', 'Smooth Adjusted Vertical Alignment...', and 'Apply Adjusted Vertical Alignment...'. Below the menu is a 3D perspective view of a road cross-section. To the right is a 2D profile view showing a white curve representing the road's vertical alignment over a stationing range from 5+00 to 45+00. Below the profile view is a cross-section graph showing 'Overlay Adjustment = 0.2238' with a grey shaded area representing the overlay. At the bottom right is a 'PQB' (Profile Quality Block) graph showing various curves and points labeled 'BC' and 'EC'. The bottom of the window features a control panel with 'Corridor' set to 'Overlay & Level & Grind & Wide', 'Active Surface' set to 'OG', 'Station' set to '10+30.00', 'Interval' set to '10.0000', and 'Template' set to 'Overlay & Grind & Level'. There are also buttons for 'Process All', 'Process Visible Range', and 'Display Mode' options: 'Normal', 'Superelevation', and 'Overlay' (which is selected). A callout box labeled 'Overlay Mode' points to the 'Overlay' radio button.

Overlay Display Mode

A new Display Mode has been added to Roadway Designer

In the "Overlay" Display Mode, the "Overlay Tools" drop down menu entry becomes active



New Component Type

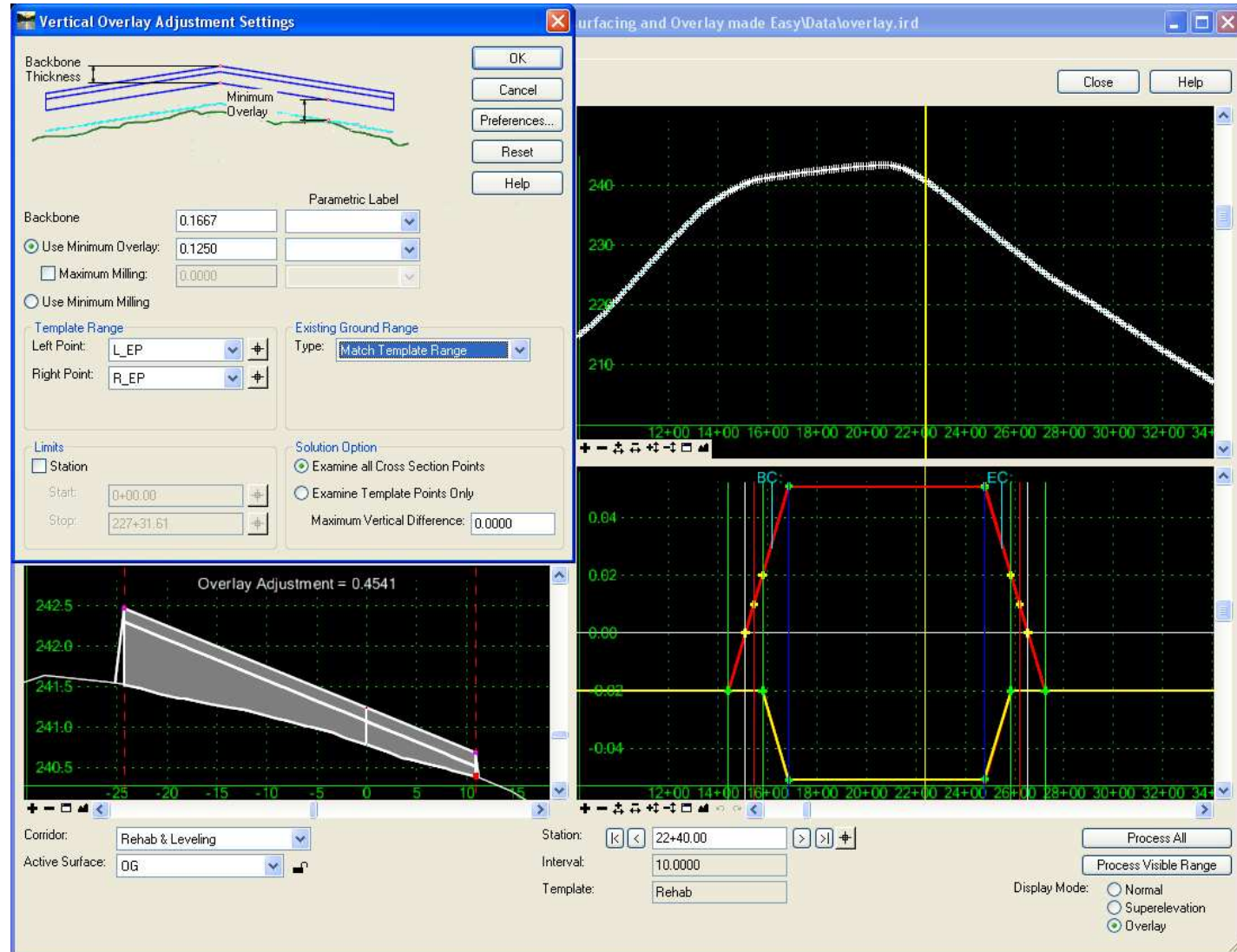
A new component type → Overlay / Stripping

The image shows two overlapping windows. On the left is the 'Current Component' dialog box with the following fields: Name: Milling, Style: Milling, Top option: Follow Component, Bottom option: Follow Component, Component Depth: 3', Surface: <Active>, Surface Depth: 0.0000. On the right is the 'Add New Component' menu with options: Simple, Constrained, Unconstrained, Null Point, End Condition, Overlay/Stripping (highlighted), and Set Dynamic Origin (Ctrl-D).

The image shows the 'Component Properties' dialog box with the following fields: Name: L_Leveling, Use Name Override: L_Leveling, Description: (empty), Style: P_ROAD_BinderCo, Parent Component: (empty), Display Rules: (empty), Exclude From Triangulation: (unchecked), and Overlay/Stripping Properties: Top option: Follow Component, Bottom option: Follow Surface, Component Depth: 0.0000, Surface: <Active>, Surface Depth: 0.0000.

Vertical Optimization with Superelevation correction

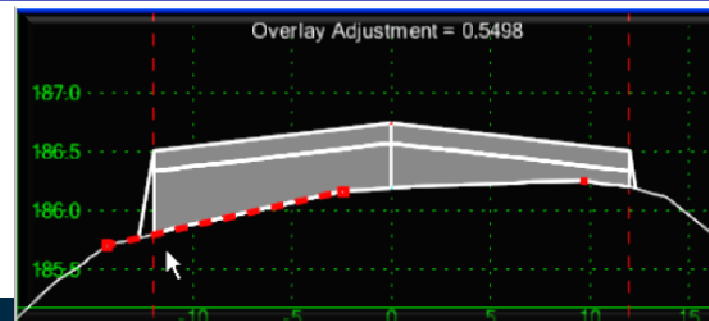
- Designer first applies the required superelevation based on project standards.
- Optimize the vertical profile utilizing the design superelevation



Cross Slope Optimization

- Analyzes the existing cross slope and Delta G between sections.
- Takes into account theoretical design standard superelevation.
- Adjust the proposed cross slope based on user defined tolerances.
- Creates new point control lines.
- Allows for user interaction to manually adjust computed slopes.

Station	Ground Slope	Design Slope	Difference	Corrected Slope	Delta Elevation	Delta G
74+80.00	-3.456%	-2.000%	1.456%	-2.956%	0.0599	0.2755
74+90.00	-3.570%	-2.000%	1.570%	-3.070%	0.0598	0.2765
75+00.00	-3.685%	-2.000%	1.685%	-3.185%	0.0597	0.2776
75+10.00	-3.741%	-2.000%	1.741%	-3.241%	0.0596	0.1375
75+20.00	-3.795%	-2.000%	1.795%	-3.295%	0.0596	0.1306
75+30.00	-3.849%	-2.000%	1.849%	-3.349%	0.0595	0.1308
75+40.00	-3.903%	-2.000%	1.903%	-3.403%	0.0595	0.1310
75+50.00	-3.957%	-2.000%	1.957%	-3.457%	0.0594	0.1312
75+60.00	-4.012%	-2.000%	2.012%	-3.512%	0.0594	0.1314
75+70.00	-4.066%	-2.000%	2.066%	-3.566%	0.0593	0.1316



Cross Slope Optimization Report

Cross Slope Optimization Station Report

Report Created: 4/29/2009
Time: 9:46am

Corridor: Overlay Sample

File Name: C:\NCDOT Overlay\Overlay Sample.ird

Input Grid Factor: 1.000000

Note: All units in this report are in feet unless specified otherwise.

Existing Ground Data: Type: Alignment

Pivot: L

Superelevated: It_ex_eop

Design Data: Type: Control Line

Control Line: Section1 CL-EEOP_L

Optimization Parameters: Tolerance Type: Slope


Slope Tolerance: 2.00%

Station	Existing Slope/Elevation	Design Slope/Elevation	Difference Slope/Elevation	Corrected Slope/Elevation	Delta G
20+20.00	0.18% 0.02	-1.95% -0.21	-2.13% -0.23	-1.82% -0.20	0.00
20+30.00	-1.76% -0.19	-1.14% -0.13	0.62% 0.07	-1.14% -0.13	0.71

Vertical Overlay Adjustment

- Design via minimum overlay and optional maximum milling.
- Design via minimum milling
- Utilize Parametric Constraint labels to vary depths throughout a project
- Examine template points only or all points including existing ground
- Multiple choices when setting offset limits for analysis

Vertical Overlay Adjustment Settings



OK
Cancel
Preferences...
Reset
Help

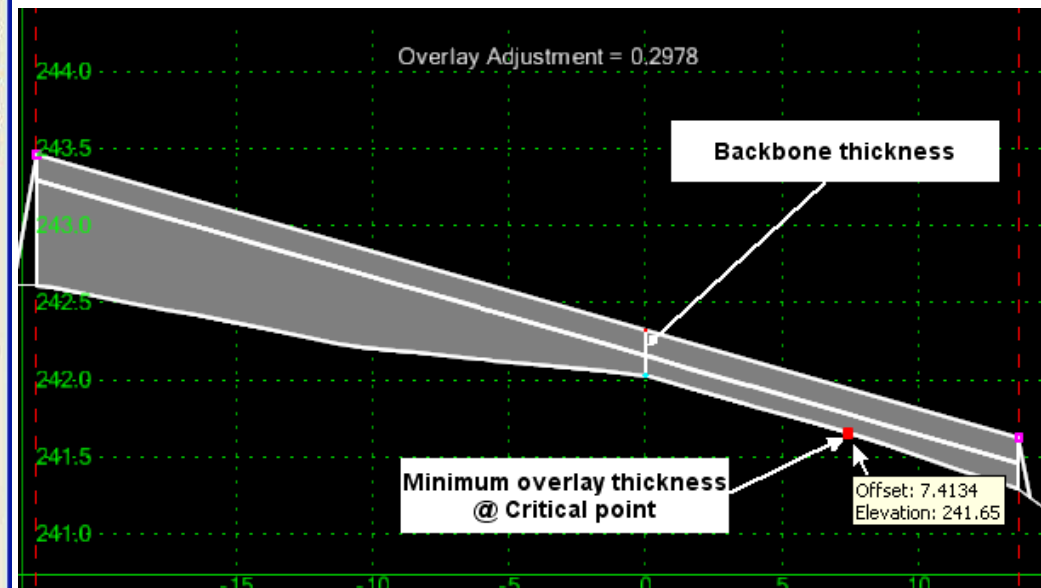
Backbone: 0.1667
 Use Minimum Overlay: 0.1250
 Maximum Milling: 0.0000
 Use Minimum Milling

Template Range:
 Left Point: L_EP
 Right Point: R_EP

Existing Ground Range:
 Type: Match Template Range
 Match Template Range
 Match Existing Ground Features
 Match Existing Alignments
 Match Existing Styles
 Fixed Offsets

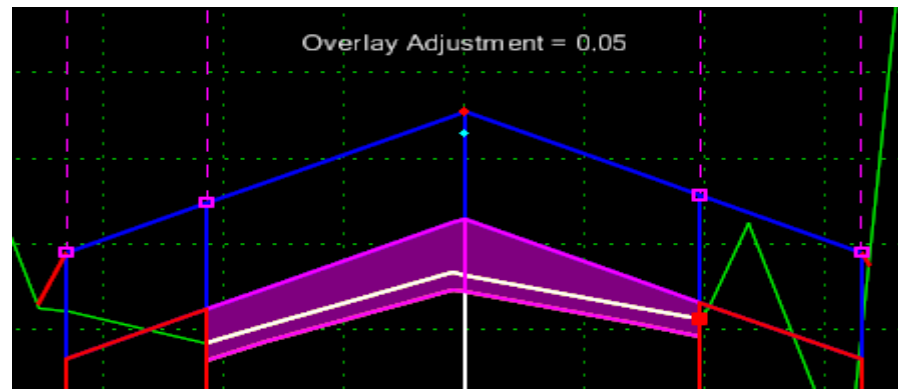
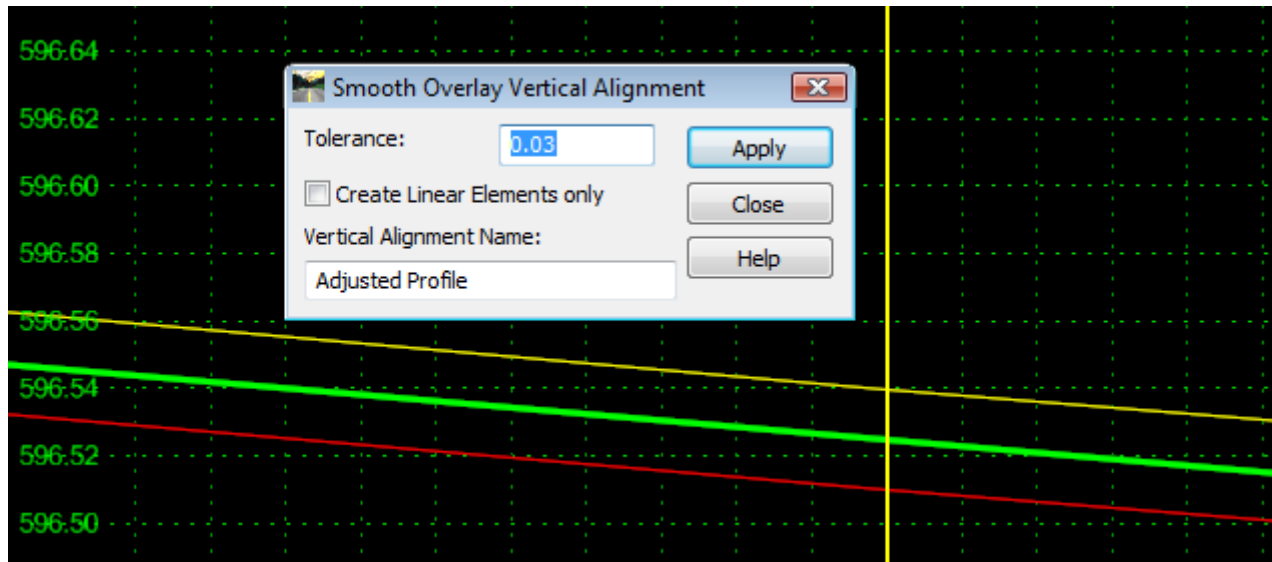
Limits:
 Station
 Start: 0+00.00
 Stop: 227+31.61

Solution Option:
 Examine all Cross Section Points
 Examine Template Points Only
 Maximum Vertical Difference: 0.0000



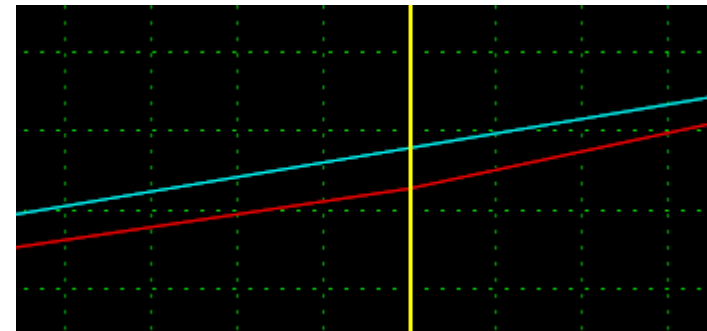
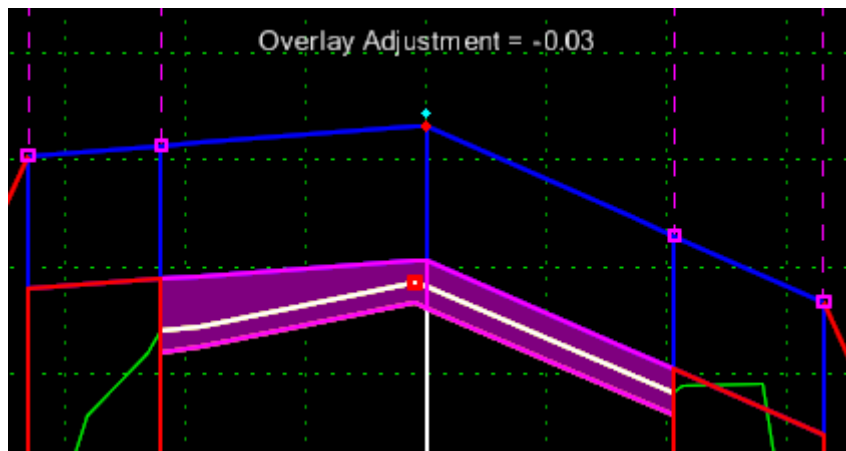
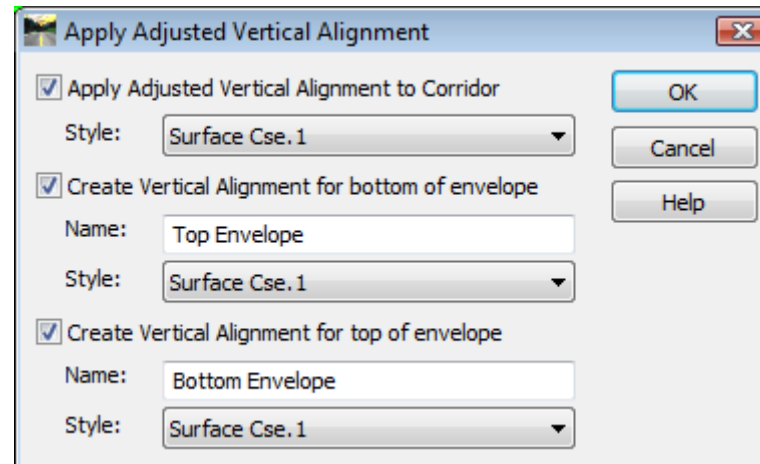
Vertical Overlay Adjustment

- Creates a vertical profile design window.
- Linear Regression is utilized to “best fit” the design profile.



Vertical Overlay Adjustment

- Applies adjusted profile automatically.
- Allows designer to store top and bottom envelope profile for manual tweaking.



Corrected Superelevation

- Combine Optimized Vertical with Theoretical Superelevation

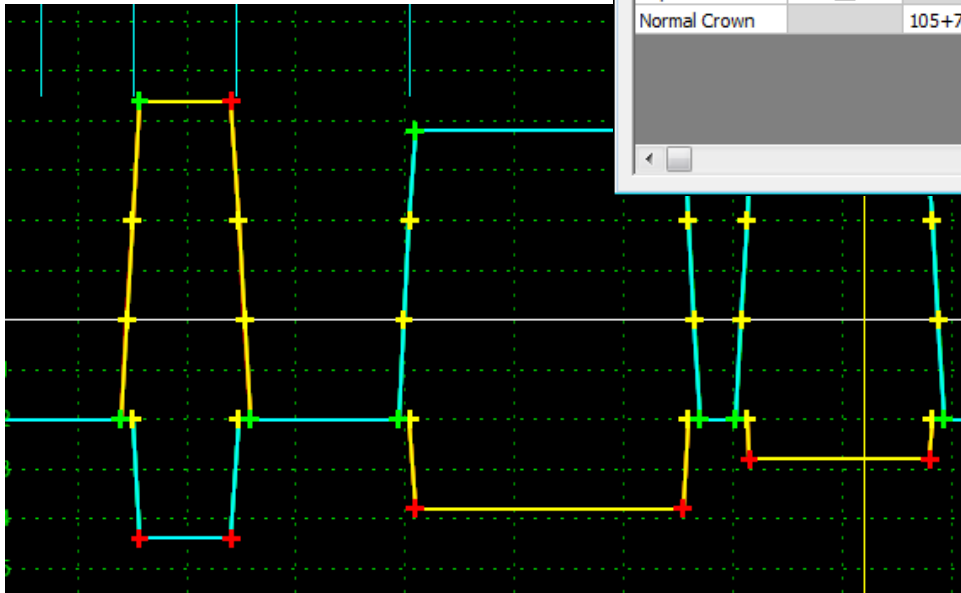
Superelevation Control Curve Set Station Edit

Section Name: Section1

Curve Set: 2

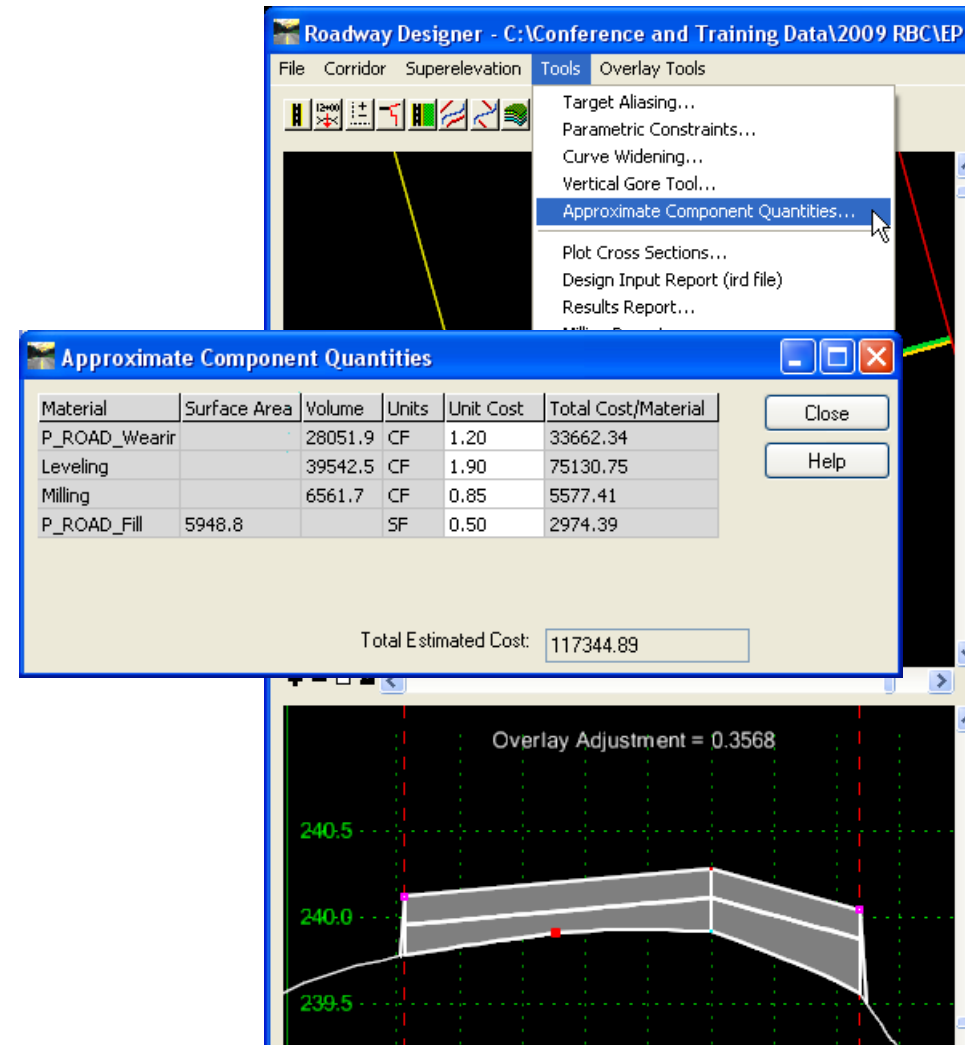
Show Curve Set Information

Type	Constrained	Station	Cross Slope	Length	Grade
Normal Crown		93+96.96	-2.000%		2.385%
Super Runoff	<input checked="" type="checkbox"/>	94+50.14	-0.000%	53.18	1.308%
Reverse Crown	<input checked="" type="checkbox"/>	95+03.32	2.000%	53.18	0.666%
Full Super		95+67.14	4.400%	63.82	0.666%
Full Super	<input checked="" type="checkbox"/>	104+06.81	4.400%	839.67	-3.374%
Reverse Crown	<input checked="" type="checkbox"/>	104+70.63	2.000%	63.82	-3.374%
Super Runoff	<input checked="" type="checkbox"/>	105+23.81	-0.000%	53.18	-3.007%
Normal Crown		105+76.99	-2.000%	53.18	-3.007%

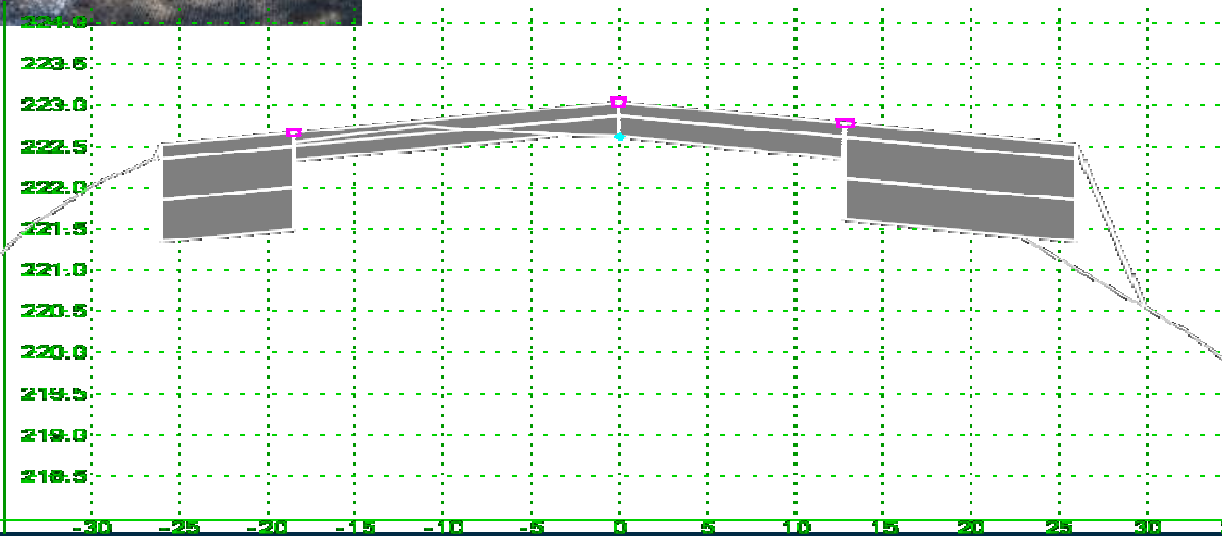


End Area Quantities / Material Cost

- User definable Unit Cost
- Computes end areas and volumes of each component
- Streamlines the design / cost analysis



Live Demonstration



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Questions?