

LTPPBind is a tool that helps highway agencies select the most suitable performance grade (PG) binder for a particular location based on the American Association of State Highway and Transportation Officials (AASHTO) M320-10 and M332-14 standards. (See references 1, 2, 3, and 4.) LTPPBind is currently available for public use online through LTPP InfoPave™ (LTPPBind Online) or by downloading a desktop version of the LTPPBind software.^(1,2) Since the development and release of the tool, LTPP users' questions and comments have resulted in multiple changes, updates, and improvements. This technical note aims to summarize the changes made to the LTPPBind desktop software, LTPPBind documentation, or the online tool available through LTPP InfoPave since 2016.^(1,2)

Summary of Changes

As described in the preceding paragraph, the LTPPBind Online, desktop software, and documentation have been updated multiple times since 2016.^(1,2) Table 1 provides an overview of each query and its resulting changes to the LTPPBind tool.⁽²⁾

Table 1. Overview of LTPPBind tool since 2016.

Query Source	Issue Description	Resulting Actions	Date of Resolution
Email—Don Bailey	Question on whether LTPPBind 3.1 was compatible with Windows® 10. ^(1,5)	No action taken. LTPPInfo informed user that the software had been replaced by LTPPBind Online. ⁽²⁾	03-13-2017
Phone Call—Sayed Tabib, Ministry of Transport, Ontario, Canada	Question on equation used in LTPPBind Online to convert air temperature to pavement temperature for the low-temperature calculation. ⁽²⁾ Question on size of MERRA-2 (Modern-Era Retrospective analysis for Research and Applications, version 2) grid cell. ⁽⁶⁾	Email response to questions is as follows: <ul style="list-style-type: none"> • Low PG temperature at 50 percent = $(-1.56 + (0.72 * \text{Lowest Yearly Air Temperature, } ^\circ\text{C}) - (0.004 * \text{Latitude in decimal degrees}^2) + (6.26 * (\log(0+25)))) - (0 * (4.4 + 0.52 * \text{Low Air Temperature Standard Deviation}^{1/2}))$. • Low PG temperature at 98 percent = $(-1.56 + (0.72 * \text{Lowest Yearly Air Temperature, } ^\circ\text{C}) - (0.004 * \text{Latitude in decimal degrees}^2) + (6.26 * (\log(0 + 25)))) - (\text{NORM.S.INV}(0.98) * (4.4 + 0.52 * \text{Low Air Temperature Standard Deviation}^2)^{1/2})$. • Size of MERRA-2 grid cell is 55.883 km by 55.615 km (in degrees of latitude and longitude).⁽⁷⁾ However, the cell size varies based on where the point of interest is located on the planet. 	07-27-2017
Email—Heather Bell	Drastic change in lowest yearly air temperature and other	The Highway Infrastructure Engineering and Research Data contract (HIERD) team suggested the	08-23-2017

Query Source	Issue Description	Resulting Actions	Date of Resolution
	MERRA-populated weather data for the same project.	customer could continue using the projects created but that the changes in MERRA data were related to the replacement of MERRA-1 data with MERRA-2 data. ⁽⁸⁾ MERRA-2 data have additional cells, and, therefore, the centroid of the project might have changed. Other differences were addressed in a Technical Support Service contract (TSSC) memorandum titled “Comparison of MERRA-1 and MERRA-2 Data.”	
Email—Hong Ye, Ministry of Transportation, Ontario, Canada	Question on where to find the active weather stations in LTPPBind Online. ⁽¹⁾	Customer support responded that there are no weather stations other than LTPP climate module virtual weather stations in the online tool. Instead, the climatic data rely on MERRA cells. ⁽⁹⁾	08-29-2017
Email—Multiple LTPP users, including Shane Underwood and Jim Weston	Updates to the LTPPBind climate data resulted in degree days over 10°C calculations that were inconsistent with manual computations using weather station data from InfoPave. ^(1,2) The tool was not computing high-temperature (HT) PG grades (PG _H) correctly. ⁽³⁾	The TSSC recommended the degree day over 10 °C computation be updated to use MERRA-2 data. ¹ The HIERD team removed the Z δ model term from LTPPBind Online in July 2018. ⁽¹⁾	08-10-2018 (A technical memorandum describing each of the issues was submitted to the Federal Highway Administration at that time) ⁽¹⁰⁾
Email—Lindsay Matthews, Canadian Centre for Climate Services	Some of the equations in the LTPPBind memorandum (dated August 2015) were incorrect. ⁽¹¹⁾ Specifically, the equation for the calculation of T10 and the computation of the yearly degree days over 10 °C for the example in the memorandum were incorrect.	The TSSC commented on areas in the technical memorandum that needed to be updated. ⁽¹²⁾ The TSSC developed a technical memorandum updating the equation in the previous technical memorandum.	09-06-2022 (per TSSC memorandum) ⁽¹²⁾
Email—Lindsay Matthews, Canadian Centre for Climate Services	The LTPPBind Online tool’s calculation for the lowest yearly temperature was incorrect. ^(1,2) The tool was assigning the lowest yearly temperature to the value that is the minimum of all the daily minimum temperatures throughout history (i.e., the minimum daily temperature of all days available for that location).	The HIERD team updated lowest yearly air temperature in the tool to the average of the coldest air temperature in a year (computed as the minimum of the daily minimum temperature for all days in a given year) for all years in which data are available. ⁽²⁾	03-02-2021

¹ WSP USA Environment & Infrastructure Inc. (WSP), formerly known as Wood Environment & Infrastructure Solutions, Inc. under FHWA ID/IQ Contract 693JJ320D000025 for “Long-Term Pavement Performance Program Technical Support Services Contract (TSSC),” November 2021.

Query Source	Issue Description	Resulting Actions	Date of Resolution
	<p>Confirmation was needed that the high pavement temperature in the online tool was correct.</p> <p>An issue exists with how degree days were being calculated in the LTPPBind Online tool.⁽¹⁾</p>	<p>Confirmed. No further action was needed.</p> <p>The HIERD team updated the LTPPBind Online tool so that degree days were calculated as the yearly cumulative difference between the maximum daily high air temperature and 10 °C when the high air temperature value exceeds 10 °C for any day between April and September of each year, averaged for all years of available data.⁽¹⁾</p>	
<p>Email—Rashid Bashir, York University</p>	<p>While determining the performance-graded asphalt cement (PGAC) binder for different sections using the National Aeronautics and Space Administration’s MERRA climatic data, the customer observed that when using the AASHTO M 332-14 standard, the tool sometimes suggests an HT PGAC after rounding it off to the nearest PGAC below the current PG temperature at 98-percent reliability, whenever a location with a latitude of 46 degrees is selected.^(3,4,6)</p>	<p>The issue was related to the calculated low-temperature PG grade (PG_L) at these locations.⁽³⁾ For each of the locations provided in the issue report, all of which are at a latitude of 46 degrees, the selected PG_L was less than or equal to -34. Per the “LTPPBind Task II PG Calculation-Technical Memorandum,” when the PG_L is less than -34, then the PG_H is assumed to be 46. No further action was needed.⁽¹⁾</p>	<p>06-16-2021</p>
<p>Email—Mansour Solaimanian, Pennsylvania State University</p>	<p>The top box under the PG results of the LTPPBind Online tool read AASHTO M 323-13 Performance-Graded Asphalt Binder instead of AASHTO M 320-10 Performance-Graded Asphalt Binder.^(2,3,13)</p>	<p>The HIERD team updated the heading in the online tool to AASHTO M320-10.⁽³⁾</p>	<p>03-18-2022</p>

References

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