

Geometric Design Laboratory

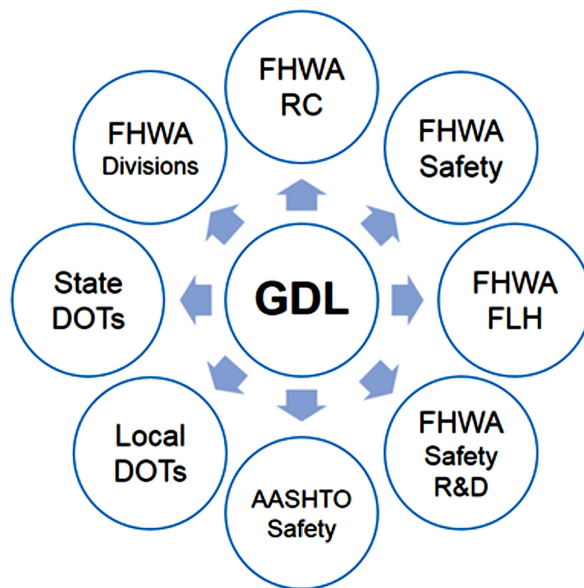
Bridging Safety, Design, and Innovation for Safer Roads

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The Federal Highway Administration (FHWA) Geometric Design Laboratory (GDL) is dedicated to supporting transportation safety, design, and innovation through advanced tools, technical reviews, and collaboration with research and implementation teams.

GDL's main mission is the *advancement of the safety practice*. Such advancement can be in the forms of identification of issues and needs, conducting of research that leads to usable information and tools, and technical support of researchers and practitioners to assist them in their efforts to develop and apply safety analysis methods and tools. Many GDL activities fit under the broad category of data driven safety analysis (DDSA) and support the general areas of performance-based analysis and design, performance effects of geometric design, and safety performance and analysis.

GDL serves to *bridge the gap between research and practice*—for example, by assisting agencies in developing and carrying out plans for conducting DDSA at both the project and program levels. Supporting DDSA and *Highway Safety Manual* (HSM) implementation is a high priority, highlighting GDL's coordinating role in connecting a range of FHWA offices and external partners (e.g., State agencies).⁽¹⁾



AASHTO = American Association of State Highway and Transportation Officials;
DOTs = departments of transportation; FLH = Federal Lands Highway;
R&D = research and development; RC = Resource Center.



For More Information Visit

<https://highways.dot.gov/research/laboratories/geometric-design-laboratory/geometric-design-laboratory-overview>



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GDL Core Activities

Support of DDSA and HSM-Related and Interactive Highway Safety Design Model (IHSDM)–Related Technical Activities^(1,2)

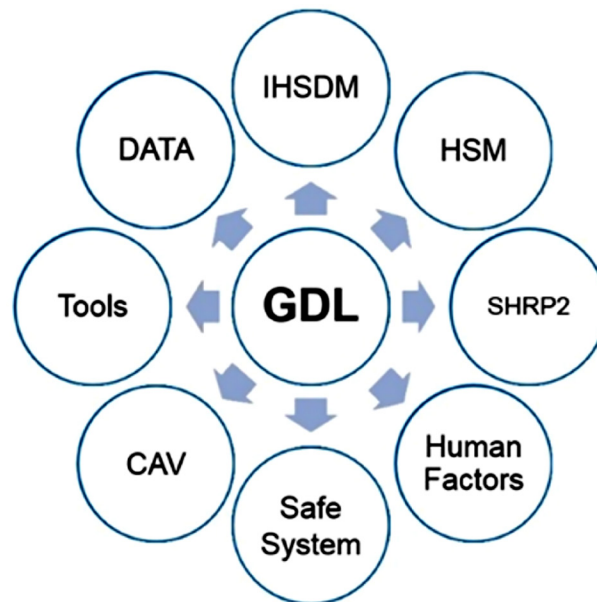
GDL supports DDSA technical activities, including technical support for HSM and IHSDM.^(1,2) These critical transportation safety analysis tools provide crash prediction and safety evaluations of roadway designs.

- Technical support for HSM and IHSDM users: GDL offers guidance on applying HSM and IHSDM for highway safety analysis, addressing user inquiries, and helping implement HSM methodologies.^(1,2)
- Second Edition HSM (HSM2) and DDSA research support: GDL supports the implementation of HSM2 crash prediction models (e.g., via IHSDM) and assists FHWA in advancing DDSA to close gaps in safety evaluation methods and improve predictive capabilities.^(2,3)
- HSM Implementation Pooled Fund (IPF): GDL participates in and supports HSM IPF activities.⁽¹⁾

In-House Research Initiatives

The GDL's role within technical and research areas showcases the Lab's broad scope in highway safety analysis and innovation. GDL in-house safety R&D activities focus on the following:

- Performance-based design and practical application of HSM.⁽¹⁾
- Safe system approach.
- Strategic Highway Research Program 2 (SHRP2) safety data–related research.
- Support of initiatives for Evaluation of Low-Cost Safety Improvements—Pooled Fund Study.
- Impacts of connected and automated vehicle (CAV) and advanced driver assistance system (ADAS) technologies on highway design and highway safety.



As part of a long-term research strategy, GDL focuses on high-impact research areas that will serve to close current gaps in highway safety analysis such as:

- **Intersection-control-type research (stop controlled versus signalized):** GDL is comparing the safety impacts of different intersection control types via crash prediction model results.⁽⁴⁾
- **ADAS features safety analysis:** Research on ADAS is ongoing, with a focus on evaluating how ADAS affect overall crash involvement.
- **Pedestrian and bicycle safety:** GDL is leveraging new Roadway Assessment Program (RAP)-based pedestrian and bicycle crash prediction models within the HSM2 framework to enhance safety assessments for vulnerable road users.⁽³⁾

Support for FHWA Project Management

While GDL does not directly conduct the analysis for certain FHWA projects, GDL plays a key supporting role in helping FHWA by providing initial research and insights, which can lead to larger FHWA-funded efforts. GDL's expertise contributes to FHWA-funded research, including the following recent projects:

- **Safety Effects of Freeway Rumble Strips on Crash Severity:** GDL's initial analysis helped define the scope of an FHWA-sponsored project.

- **State of the Practice Assessment and Gap Analysis of Safety-Focused Simulation and Performance Measures:** GDL supports FHWA by offering guidance and reviews for predictive modeling and safety simulations, thereby helping improve safety-focused performance measures.
- **Complete Streets - Safety Analysis:** GDL supports FHWA's Complete Streets initiatives by reviewing documents and providing feedback, ensuring that multimodal safety evaluations align with national safety standards and prioritize the safety of all road users.

Technical Reviews

GDL reviews key technical manuals and documents—such as the following—to make sure the materials reflect the latest safety knowledge and practice:

- **HSM:** GDL supports ongoing revisions to the HSM by offering expertise in crash prediction models and calibration practices for future updates.⁽¹⁾
- **AASHTO Green Book:** GDL provides feedback on performance-based design approaches to be included in the Green Book's upcoming 8th Edition.⁽⁵⁾



References

1. AASHTO. 2010. *Highway Safety Manual, 1st Edition*. Washington, DC: American Association of State Highway and Transportation Officials.
2. FHWA. 2024. “Interactive Highway Safety Design Model (IHSDM): Overview” (web page). Washington, DC: Federal Highway Administration. <https://highways.dot.gov/research/safety/interactive-highway-safety-design-model/interactive-highway-safety-design-model-ihsdm-overview>, last accessed October 1, 2024.
3. TRB. 2024. “NCHRP 17-71A - Proposed AASHTO Highway Safety Manual, Second Edition” (web page). Washington, DC: Transportation Research Board. <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5043>, last accessed October 1, 2024.
4. S. Dadvar, M. Dimaiuta and I.-K. Lim. 2024. “Comparative Sensitivity Analysis on Intersection Crash Prediction Models by Control Type: Highway Safety Manual Approach.” *Transportation Research Record (TRR): Journal of the Transportation Research Board (TRB)*, pp. 1-17. <https://doi.org/10.1177/03611981241252155>.
5. National Academy of Sciences. 2024. “NCHRP 07-29: Development of the 8th Edition of AASHTO’s A Policy on the Geometric Design of Highways and Streets (Green Book)” (web page). <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4944>, last accessed October 1, 2024.

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