Geometric Design Laboratory
## Bridging Safety, Design, and Innovation for Safer Roads

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 AASHTO's *Highway Safety Manual* (HSM) implementation is a high priority for GDL, highlighting GDL's coordinating role in connecting a range of FHWA offices and external stakeholders (e.g., State agencies).[1]
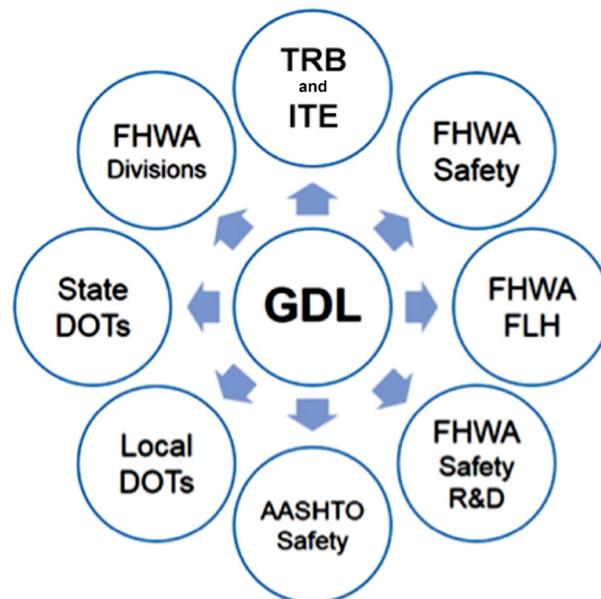
AASHTO = American Association of State Highway and Transportation Officials; DOTs = departments of transportation; FLH = Federal Lands Highway; ITE = Institute of Transportation Engineers; R&D = research and development; TRB = Transportation Research Board.

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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 assistance in 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.

- Second Strategic Highway Research Program 2 (SHRP2) safety data-related research.[4]

- Support of initiatives for Evaluation of Low-Cost Safety Improvements—Pooled Fund Study.[5]

- Impacts of connected and automated vehicle (CAV) and advanced driver assistance system (ADAS) technologies on highway design and highway safety.
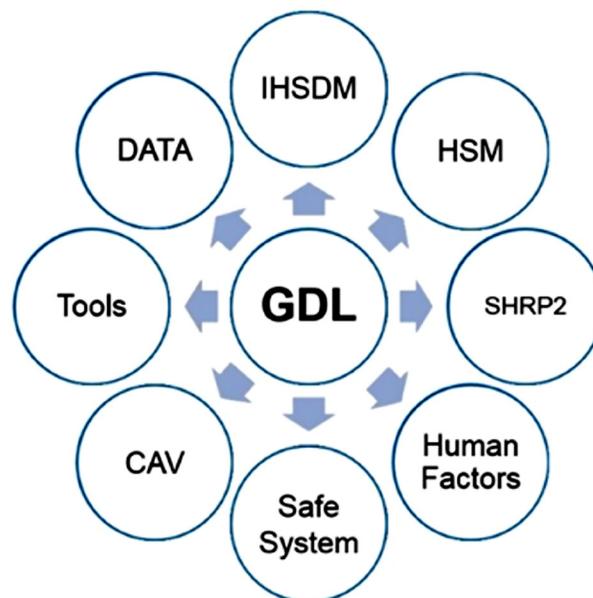
As part of a long-term research strategy, GDL focuses on high-impact research areas that will serve to close current gaps in highway safety analysis such as:

- *Intersection-Control-Type Research (Stop Controlled Versus Signalized):* GDL is comparing the safety impacts of different intersection control types via crash prediction model results.[6]

- *ADAS Features Safety Analysis:* Research on ADAS is ongoing, with a focus on evaluating how ADAS affect overall crash involvement.

- *National Intersection Database:* GDL is developing a comprehensive database of intersections in the United States, to be used for a wide range of safety analyses.

- *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]

- *Nationwide Horizontal Curve Identification and Analysis:* GDL is developing a comprehensive database containing detailed geometric parameters for all horizontal curves within the U.S. highway system, beginning with Interstate highways, then U.S. and State routes, and finally local roads. Planned integration of the curve database with crash databases will support curve-related safety analyses.

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.

- *Point-to-Point Speed Safety Cameras (P2P–SSC):* The project supports FHWA's speed management initiatives by gathering information about P2P–SSC systems to inform future deployments in the United States, including potential pilot deployments.

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 eighth edition.[7]

For More Information Visit
https://highways.dot.gov/turner-fairbank-highway-research-center/labs/geometric.[8]

References

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