

FIRST EDITION

Information Delivery Manual (IDM)

for the Design to Construction
Data Exchange for Highway Bridges

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AASHTO



American Association of State Highway and Transportation Officials

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TABLE OF CONTENTS

List of Acronyms	vii
Executive Summary	viii
Acknowledgements	ix
SECTION 1: INTRODUCTION	1-1
1.1—Purpose	1-1
1.2—Organization	1-1
1.3—Target Audience	1-1
1.4—Provenance.	1-2
1.5—How to use this Document	1-2
1.6—IDM Artifacts.	1-3
SECTION 2: BASIS FOR THE EXCHANGE	2-1
2.1—Business Use Case	2-1
2.1.1—Provide Design Information to Execute Construction	2-1
2.1.1.1—Prepare Bid Package	2-1
2.1.1.2—Provide Design Information to Initiate the Fabrication Phase	2-1
2.2—Processes	2-3
2.2.1—Processes Associated with the Construction Contract Model	2-3
2.3—Exchange.	2-4
2.3.1—Phases	2-5
2.3.2—Actors.	2-5
2.3.3—Activities	2-5
2.3.3.1—Owner	2-5
2.3.3.2—Contractor	2-6
2.3.3.3—Fabricator.	2-7
2.3.3.4—Detailer	2-7
SECTION 3: OVERVIEW OF THE EXCHANGE REQUIREMENT	3-1
3.1—Methodology.	3-1
3.1.1—Data Aggregation	3-1
3.1.2—Process Map Development	3-1
3.1.3—Exchange Model Requirement	3-1
3.2—Scope.	3-2
3.2.1—Procurement Methods	3-2
3.2.2—Construction Scope-of-Work	3-2
3.2.3—Structure Types.	3-2
3.2.4—Material Types	3-3
3.2.5—Appurtenance Elements.	3-3
3.3—Exclusions	3-3
SECTION 4: EXCHANGE REQUIREMENT	4-1
4.1—Exchange Requirement	4-1
4.1.1—Project Identification Information	4-1

4.1.2—Contract Information	4-3
4.1.3—Roadway Geometry	4-4
4.1.4—Bridge Layout	4-5
4.1.5—Approach Structure	4-6
4.1.6—Bridge Superstructure	4-7
4.1.7—Bridge Substructure	4-15
4.1.8—Element Details	4-21
4.1.9—Reinforcement	4-26
4.1.10—Coating	4-33
4.1.11—Construction Information	4-35
4.1.12—Common Buried Structures	4-35
4.1.13—Retaining Walls	4-35
SECTION 5: REFERENCES	5-1
APPENDIX A: DEFINITIONS	A-1
APPENDIX B: BRIDGE LIFECYCLE PROCESSES	B-1

LIST OF FIGURES

Figure 2.1.1-1: Bridge Construction Process Map	2-2
Figure 4.1-1: Structure of Exchange Requirement	4-1
Figure B-1: Bridge Lifecycle Management Overview Map	B-2

LIST OF TABLES

Table 2.3-1: Definition of Construction Contract Model	2-4
Table 2.3.3.1.-1: Definition of the “Prepare Contract Documents” Activity	2-6
Table 2.3.3.2-1: Definition of the “Prepare Bid” Activity	2-6
Table 2.3.3.3-1: Definition of the Fabricator’s “Review Contract Documents” Activity	2-7
Table 2.3.3.4-1: Definition of the Detailer’s “Finalize Contract Documents” Activity	2-8

LIST OF ACRONYMS

ACI—American Concrete Institute
AISC—American Institute of Steel Construction
BIM—Building Information Modeling
CBS—Committee on Bridges and Structures
CM/GC—Construction Manager/General Contractor
FEA—Finite Element Analysis
FHWA—Federal Highway Administration
GUID—Globally Unique Identifier
IDM—Information Delivery Manual
IFC—Industry Foundation Classes
MVD—Model View Definition
NSBA—National Steel Bridge Alliance
PCI—Precast/Prestressed Concrete Institute
RFI—Request for Information
TG—Task Group
TPF—Transportation Pooled Fund
U.S.—United States

EXECUTIVE SUMMARY

This Information Delivery Manual (IDM) provides a human-readable set of information requirements for the exchange of model-based information to execute the construction of highway bridges in the United States (U.S.). There are subtasks that are supported, including preparing a bid package and initiating the fabrication phase.

The exchange supported by this IDM is the Owner's provision of model-based information in the bidding and letting phase of a bridge project. The recipient of the construction contract model is the Contractor, who passes the information through to the Fabricator and Detailer. The scope of the exchange requirements includes "workhorse"-type bridges and other structures, such as slab bridges, girder bridges, common buried structures (i.e. box culverts, three-sided structures, arches), and retaining walls associated with or adjacent to a bridge. The exchange requirements were developed for design-bid-build delivery of full replacement and new build bridges and structures.

This IDM presents a human-readable list of U.S. bridge and structure entities, property sets, and properties, determined by U.S. bridge and structure domain experts. Entities are grouped into categories (e.g., project identification information) or systems (e.g., bridge superstructure). This IDM outlines the technical process and requires data to be exchanged between the Owner and bridge construction Contractor in the U.S. The intent is that this model data be passed through to the Fabricator and Detailer to be used in their processes.

It should be noted that a "model-based exchange" is not limited to graphical entities explicitly modeled in three dimensions, but should be construed as a data set including graphical entities along with information attached to the modeled entities. For example, notes and tabular information required for construction and fabrication are anticipated to be included in a model-based exchange. Nevertheless, some contractual documents in the bidding and letting phase are anticipated to be provided to the Contractor outside of the model-based exchange, which is designated as the "non-model-based exchange." Non-model-based exchanges are not included in this IDM.

The authors of this IDM anticipate that a Model View Definition (MVD) will be created using the IDM, enabling the interoperable exchange of supported bridge and structure information using Version 4.3 of the Industry Foundation Classes (IFC) schema¹. The resulting MVD would enable software developers to implement consistent and accurate exchanges of the exchange requirement contained in this IDM within their applications. This would fulfill the primary objective of this IDM.

¹ At the time of writing, IFC 4.3 was a candidate standard and still in active development. For more information, refer to the buildingSMART International page that tracks IFC versions: <https://technical.buildingsmart.org/standards/ifc/ifc-schema-specifications/>

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The authors acknowledge that this IDM built on preceding work by the AASHTO/NSBA Steel Bridge Collaboration Task Group 15. In particular, this IDM built upon information summarized in the draft document, “Information Delivery Manual for Steel Bridge Detailing for Fabrication Part 1: Industry Use Narrative” from 2021. This included a process map, an initial exchange requirement for steel fabrication, and definitions of terms. The authors of this IDM adopted and built upon the efforts of Task Group 15 and shared the outcomes with Task Group 15 so that continuing work by Task Group 15 is in harmony with this IDM.

The IFC (Industry Foundation Classes) Standard is a community standard developed, managed, and owned by buildingSMART International. The IFC 4.3 standard is the copyright © 2022 of buildingSMART International. All rights reserved. It is licensed under Creative Commons BY ND 4.0 license. For more information, please refer to the IFC Specifications Database at <https://technical.buildingsmart.org/standards/ifc/ifc-schema-specifications/>.

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INTRODUCTION

This Section provides an orientation to this Information Delivery Manual. It explains the purpose and organization of the IDM; the target audience of the IDM; the IDM's provenance; and how to use the IDM.

1.1—PURPOSE

The United States (U.S.) highway bridge community desires increased interoperability of digital design data. Specifically, the primary interest is in providing repeatable, reliable, and systematic exchange of design information for use in construction applications. An Information Delivery Manual (IDM) is a core element of building a solution for interoperability. An IDM defines the requirements to fulfill a specific digital information exchange.

This IDM is associated with a specific business use case that is part of the overarching lifecycle of the bridge or structure. The business use case is documented on a process map that identifies the exchange of information. The purpose of the IDM is to define and characterize the information that is required for that exchange to effectively execute the business use case. This IDM provides a human-readable set of information requirements for the exchange of model-based information to execute the construction of highway bridges in the U.S. There are subtasks that are supported, including preparing a bid package and initiating the fabrication phase.

The IDM could support the development of a range of technical solutions for computer-interoperable information exchange. The authors of this IDM intend for this document to support mapping the exchange requirement to Version 4.3 of the Industry Foundation Classes (IFC) schema to develop a Model View Definition (MVD) that can be implemented primarily in commercial off-the-shelf software. An MVD enables software developers to create a mechanism to send and receive bridge information using the open IFC schema, significantly improving the interoperability of bridge models.

1.2—ORGANIZATION

This IDM provides an industry-use narrative to derive the information exchange requirement in a human-readable format. This narrative describes the information needed to support the business use case that the IDM supports. First, the IDM defines the business use case that is supported, including the business processes, phases, and actors involved in the information exchange. Then, the IDM identifies the structure and material types that are included and documents what information is to be delivered. Finally, the IDM provides the information exchange requirement to specify what information to produce (for an initiator of a supported exchange) and what information to expect to receive (for a recipient).

1.3—TARGET AUDIENCE

This IDM is intended for the owners of highway bridges and related structures as well as for design and construction professionals. Specifically:

- **Bridge Owners and design and construction professionals** will be able to determine how highway bridge and structure information is delivered using the IFC format when read or written by software that supports the associated MVD.
- **Bridge Owners' Automation Engineers** (sometimes called Methods Development or Standards Engineers) will be able to set up software workspaces and design standards to support the creation and exchange of the information requirements.