Use of US Bridge Design-to-Construction IDS

v.1.0.202503

Summary:

The file "usBridge_Design-to-Construction_v1-0_202503.ids" is a master template IDS which can be adapted for use on concrete or steel girder workhorse bridges. This document explains usage of the IDS in IFC file exchanges for ADCMS pilot projects, as well as further data exchange development in pooled funds TPF-5(523) and TPF-5(480). The IDS file is a further refinement of the TFP-5(372) BIM for Bridges and Structures (Phase I) effort, reflecting the official IDS v1.0 standard, as well as further feedback from ADCMS pilot project stakeholders and TPF-5(523) Year 1 development.

In addition to the IDS, the file "US Bridge – IFC mapping tables.xlsx" is a primary reference document, alongside the TPF-5(372) IDM. A report generated from the ACCA software usBIM.IDSeditor application "IDSv1_0-202503-Report.pdf" is a human-readable version of the IDS xml file and an appropriate source for feedback on potential revisions.

Usage Notes:

The template contains data checking rules for all spatial hierarchies/containers and elements for both steel and concrete bridge types. The structure of the template closely reflects the US Bridge – IFC mapping tables document.

1. Users can strip out the elements that are NOT needed AND add further, more detailed requirements on individual elements (e.g., specific values, additional properties, additional objects, etc.). Reporting usage of the IDS and results on applied projects to the TPF-5(523) technical team will help improve further revisions and future data exchange developments.

2. Some properties from the TPF-5(372) IDM are reflected in this version, including Project, Site, and Bridge custom properties (e.g., "usBridge_"). Some "QTO_" IFC4.3 schema-defined properties for specific elements are included. Further scrutiny of these QTO properties is warranted and feedback on their usefulness appreciated.

3. The current state of use of MUST and MAY cardinality in the template IDS is open to interpretation and editing by pilot project users as they adapt the IDS to their specific projects. In some cases, changing this cardinality might have an effect on the validity of the IDS file according to the bSI IDS Audit Tool, which in our case is built into the usBIM.IDSeditor software. Some combinations of requirements and filters cause an error in the MAY/MUST cardinality settings, but case-by-case adjustments can rectify overall errors.

More info about the creation and usage of IDS files can be found in the official bSI IDS User Manual.

Any further questions or feedback about the usage of the IDS can be directed to Jeffrey Ouellette jwouellette@gmail.com and Grant Schmitz grant.schmitz@hdrinc.com. Further input will be incorporated into the TPF-5(523) Year 2 efforts, as noted below.

Exclusions:

The items listed below are currently excluded from this initial working version of the Design-to-Construction IDS but are planned for further development under Task 1.3.1 of TPF-5(523) Year 2, where the IDM and US Bridge Data Dictionary from TPF-5(372), along with this version of the IDS, will be reviewed and revised based on subsequent feedback from this exercise and ADCMS pilot projects.

1:1 mapping to the IDM data exchange requirements

During the process of polishing the IDS for pilot project use, it was determined that the Chapter 4 Exchange Requirements (ERs) tables from the original IDM was not as clear as they could be and require further examination and revision. Formal revisions to the official IDM will be proposed so that there can be 1:1 mapping between the IDS and the IDM ERs.

Links to the "usBridgeDD"

During the review of the IDS and subsequent changes, it was determined that a substantial number of revisions (e.g., new terms, revised terms, revised IFC mappings, etc.) are needed to the US Bridge Data Dictionary before links via the bSDD can be included in the IDS. There are links to some IFC4.3 properties but more are anticipated during the subsequent developments.

Alignment

It was determined that Alignment data originated outside the Bridge Engineer's design modeling workflow but is important referenced information. Further clarification on where this data originates, in what form, and how it is exchanged is needed. Also, more guidance and development on the use of referencing to this alignment for a variety of elements (e.g., piers, abutments, foundations, edges of bridge, etc.) is needed. More input is needed from TPF-5(480) and TPF-5(523) DOTs and consultants on workflows and provenance of the data.

Materials

The details of material association and checking require more input and further development. Pilot project stakeholders are free to add more detailed material facets to the IDS to test options, providing feedback to the TPF-5(523) team.

Reinforcing details

ACI PRC 131.2-24 will be used as the baseline reference for mapping IFC to reinforcing elements and properties. At present, basic mapping is indicated. Pilot project stakeholders are free to add more detail to test options, providing feedback to the TPF-5(523) team.

Common Buried Structures

Culvert/3-Sided bridge designs require further detailed input. Discussions and examples of modeling conventions and best practices will help determine the best IFC mapping methods.

MSE, Soil Nail, and Soldier Pile Walls

More input is needed to determine the proper modeling conventions, details, and exchange requirements.

Holes and Keyways

It is not clear that these are within the scope of the bSI AbV base MVD and require more input on need and options for modeling and exchange. It is optional for pilot projects to try to model and exchange them, but it is not clear what is the best IFC mapping for these, if they are to be identified uniquely from the objects they are part of (e.g., pier columns, pier caps, footings/pile caps, etc.).

Properties

Not all properties, as depicted as ERs in Chapter 4 of the IDM, are included. Upon review and development of this IDS version, it was found that a good number of the originally proposed ERs were misinterpreted as custom properties (either in the wrong element, pset, or overall context) and needed further review and development. Further work needs to be done to determine which ERs are suited for model-based IFC exchange and which ones are best served in another format. This has already been addressed as part of the Year 1 tasks of TPF-5(523) where a new data exchange development methodology was formalized for all subsequent related data exchanges.

While this may appear to be a long list, the basic functionality of the IDS is still viable. Application to pilot project exchanges will help us troubleshoot content and implementation in a meaningful way, improving the template for future standardized use and adaptation/reference for other future exchange developments. Feedback from all stakeholders, including DOTs, consulting engineers, contractors, and software vendors is appreciated and crucial to success.