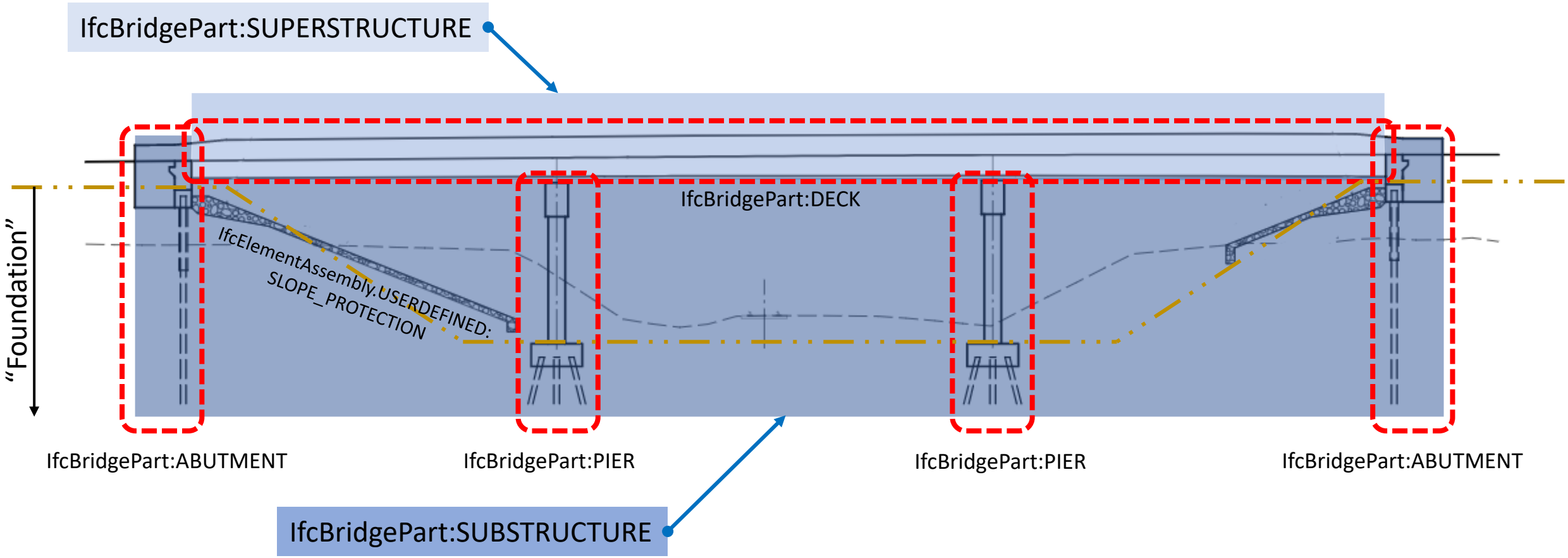
TPF-5(372) Bridge IFC Hierarchy Proposal

Discussion with bSI TI Bridge and IFC4.x IF

Proposed General Spatial Hierarchy Diagram



TPF-5(372) Bridge IFC Hierarchy Proposal

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Proposed General Spatial Hierarchy Diagram

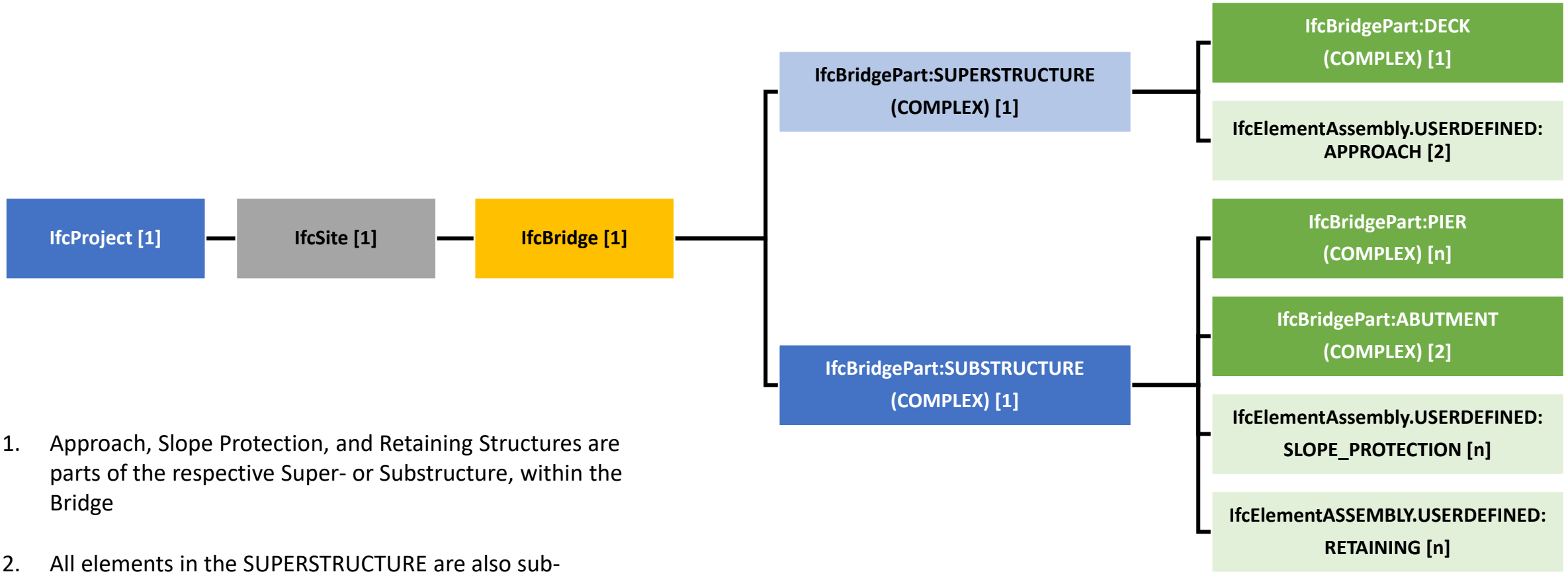
Notes:

- Purpose -> Provide a spatial/logical organization that is adaptable to most/all bridge types within the Alignment-based Reference View (AbRV). This enables consistency across software implementations and managing user expectations
- Our feedback, coordinated with the bSI TI Bridge project and the IFC4.x Implementers Forum (IF) will help establish consistency, just like the previous Implementers Agreements (IA) from earlier schema versions
- The concept of “FOUNDATION” is not a separate functional or spatial concept, but functional elements (IfcPile, IfcFooting) are part of PIER or ABUTMENT concepts/instances and their overall description/composition.
- These elements (IfcPile, IfcFooting, etc.) of the general “FOUNDATION concept” might be logically grouped across multiple PIERS/ABUTMENTS, but they are not a functional whole/group because they are not physically contiguous as an element, instead directly connected to the BridgePart they serve.
- One could still query IfcPile and IfcFooting as part of a “foundation QTO” in analysis

TPF-5(372) Bridge IFC Hierarchy Proposals – OPTION #1

Discussion with bSI TI Bridge and IFC4.x IF

Proposed Spatial Hierarchy



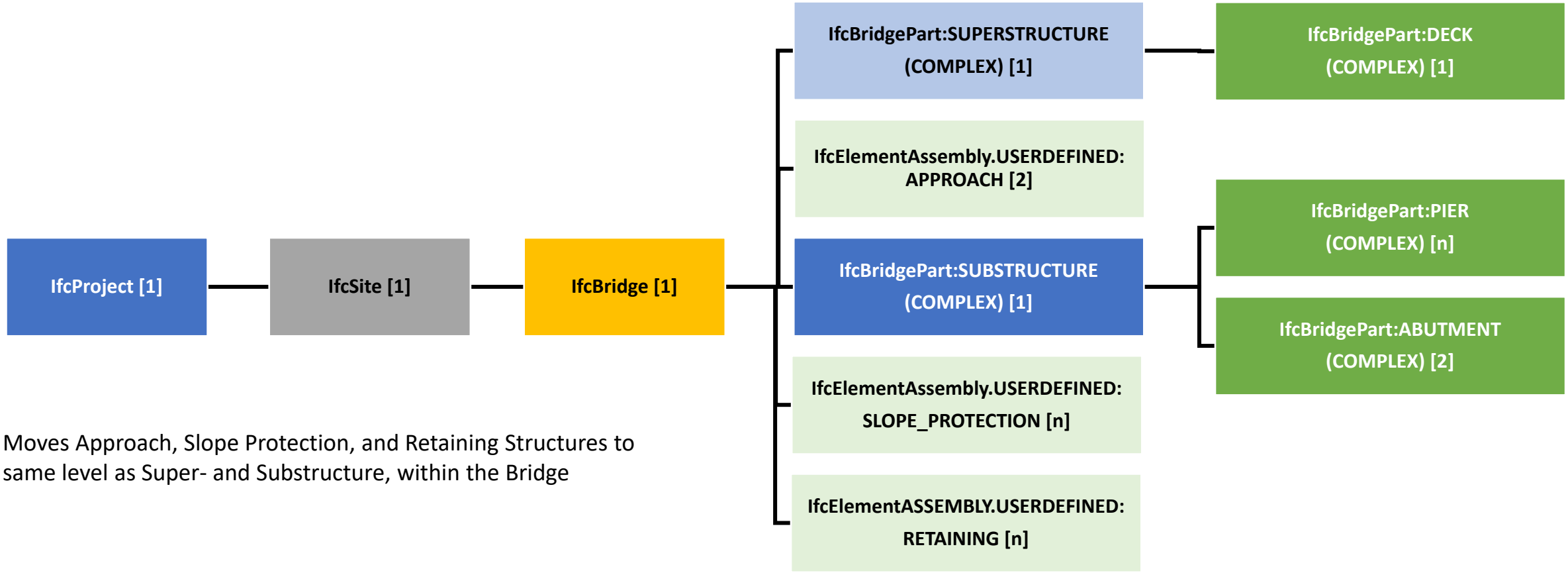
1. Approach, Slope Protection, and Retaining Structures are parts of the respective Super- or Substructure, within the Bridge

2. All elements in the SUPERSTRUCTURE are also sub-elements of the DECK

TPF-5(372) Bridge IFC Hierarchy Proposals – OPTION #1b

Discussion with bSI TI Bridge and IFC4.x IF

Proposed Spatial Hierarchy

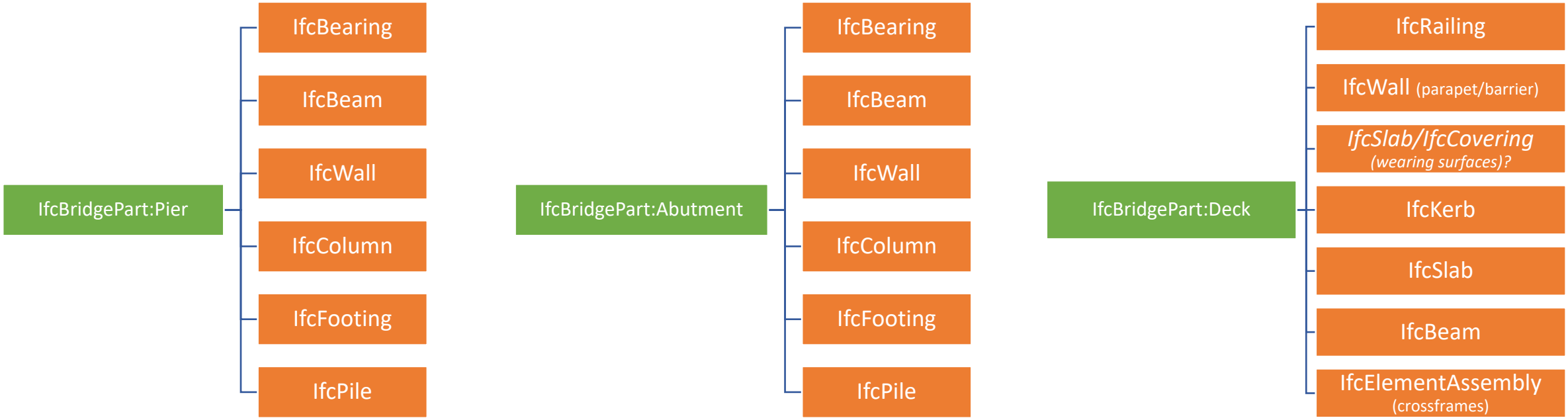


Moves Approach, Slope Protection, and Retaining Structures to same level as Super- and Substructure, within the Bridge

TPF-5(372) Bridge IFC Hierarchy Proposal – Option #1

Discussion with bSI TI Bridge and IFC4.x IF

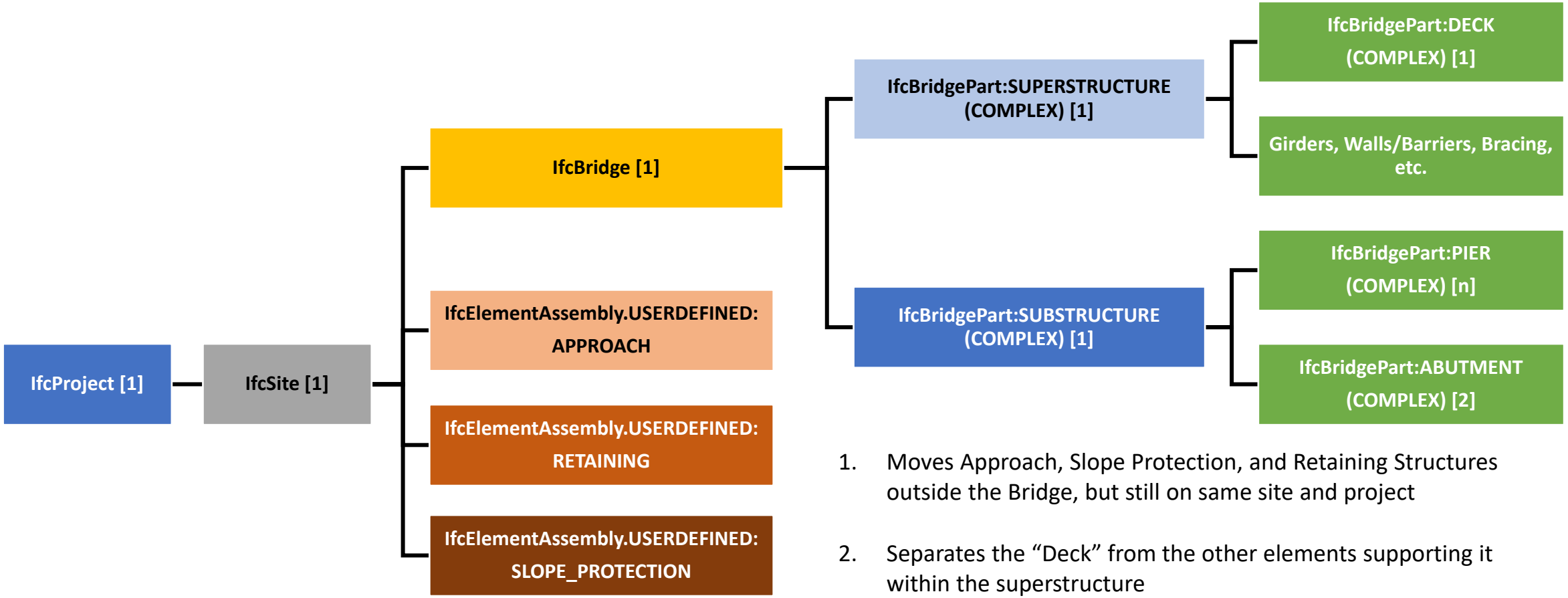
Proposed Logical Hierarchies



TPF-5(372) Bridge IFC Hierarchy Proposals – OPTION #2

Discussion with bSI TI Bridge and IFC4.x IF

Proposed IFC Spatial Hierarchy

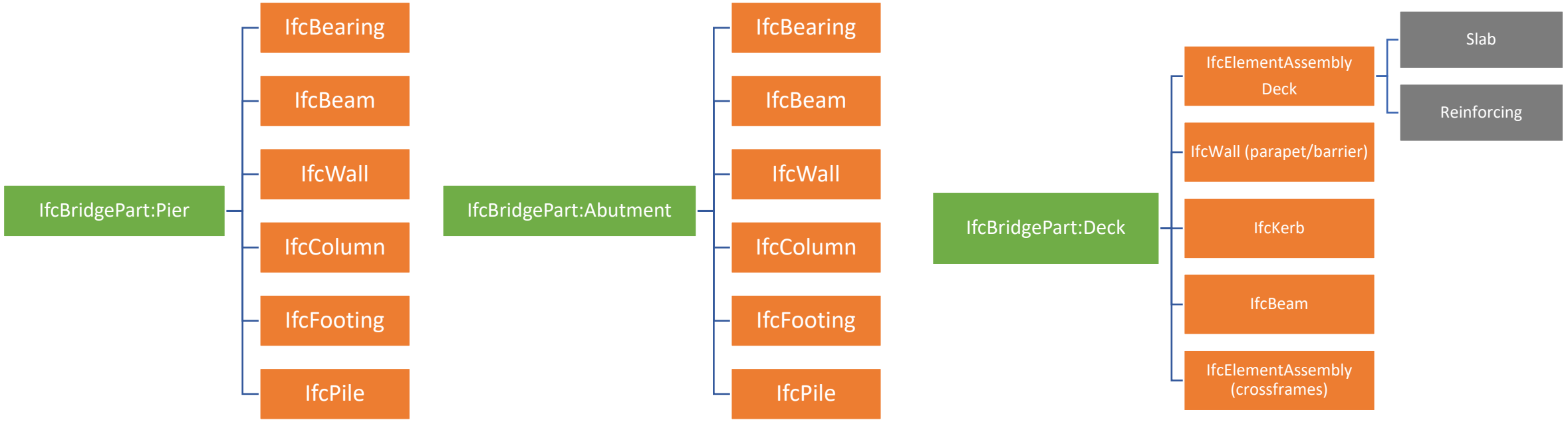


1. Moves Approach, Slope Protection, and Retaining Structures outside the Bridge, but still on same site and project
2. Separates the “Deck” from the other elements supporting it within the superstructure

TPF-5(372) Bridge IFC Hierarchy Proposal – Option #2

Discussion with bSI TI Bridge and IFC4.x IF

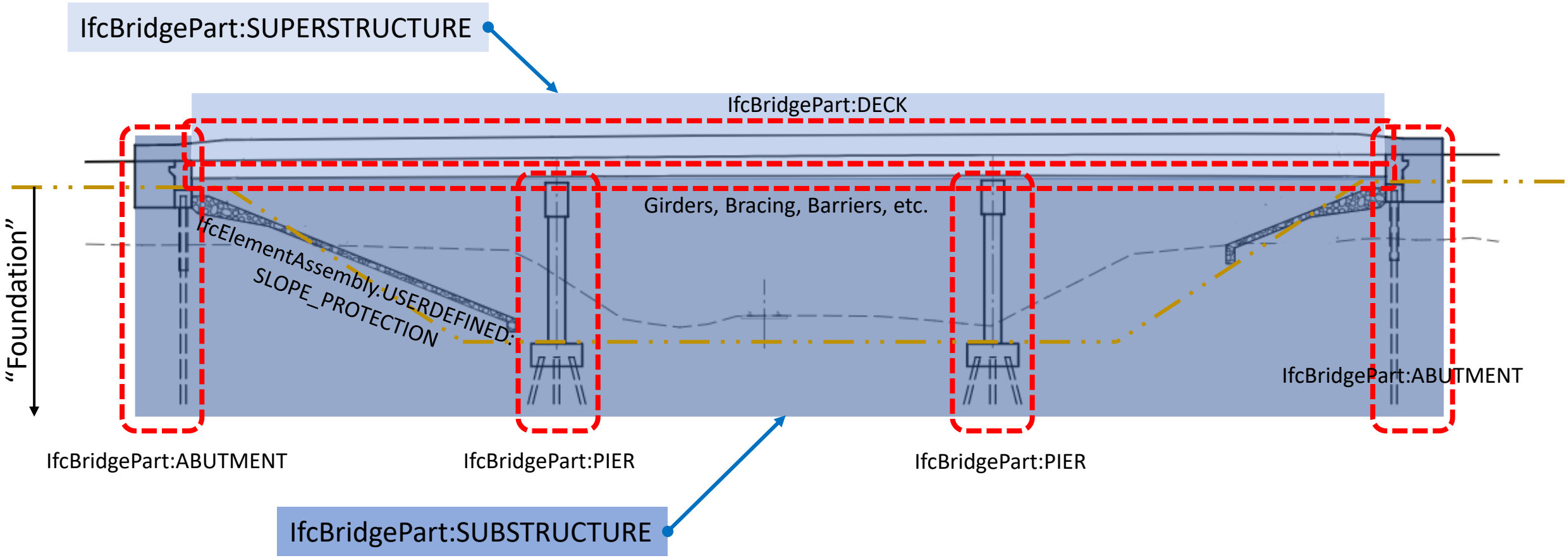
Proposed Logical Hierarchies



TPF-5(372) Bridge IFC Hierarchy Proposal – Option #2

Discussion with bSI TI Bridge and IFC4.x IF

Proposed Spatial Hierarchy



TPF-5(372) Bridge IFC Hierarchy Proposal

Aggregated elements/systems (1/2):

Pier

- Wall(s)
  - Reinforcing
  - Keyways
- Column(s)
  - Reinforcing
  - Keyways
- Pile(s)
  - Reinforcing
  - Casing
- Pile Cap / Footing
  - Reinforcing
  - Keyways
- Pier Cap
  - Reinforcing
  - Keyways
- Bearing

Abutment

- Wall(s)
  - Reinforcing
  - Keyways
- Pile Cap / Footing
  - Reinforcing
  - Keyways
- Pile
  - Reinforcing
  - Casing
- Bearing

Approach Slab

- Slab
- Sleeper Slab / Footing
- Reinforcing
- Shear connection to Abutment

Deck

- Slab(s)
- Reinforcing
- Kerb
  - Reinforcing
- Wearing surface (optional)
- Wall (Barriers)
  - Reinforcing
- Railings
- Conduits / Piping
  - Junction boxes
- Joints
- Girders
  - A mess of stuff depending on material and construction type
- Crossframes/Diaphragms
  - Multiple items
- Drainage
  - Drain
  - Pipes
- Supports for signage and lighting

TPF-5(372) Bridge IFC Hierarchy Proposal

Aggregated elements/systems (2/2):

Slope Protection

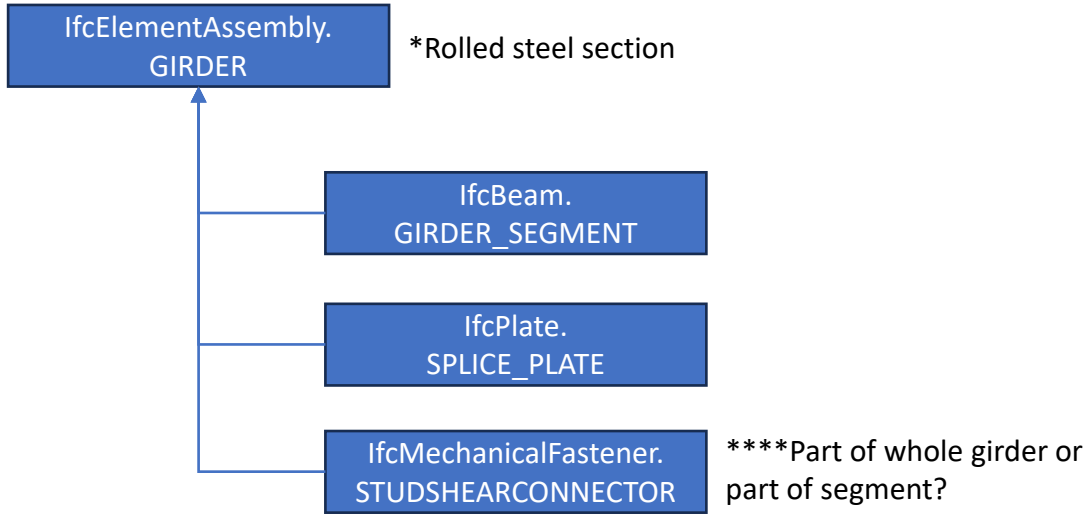
- Slab(s)
- Drainage

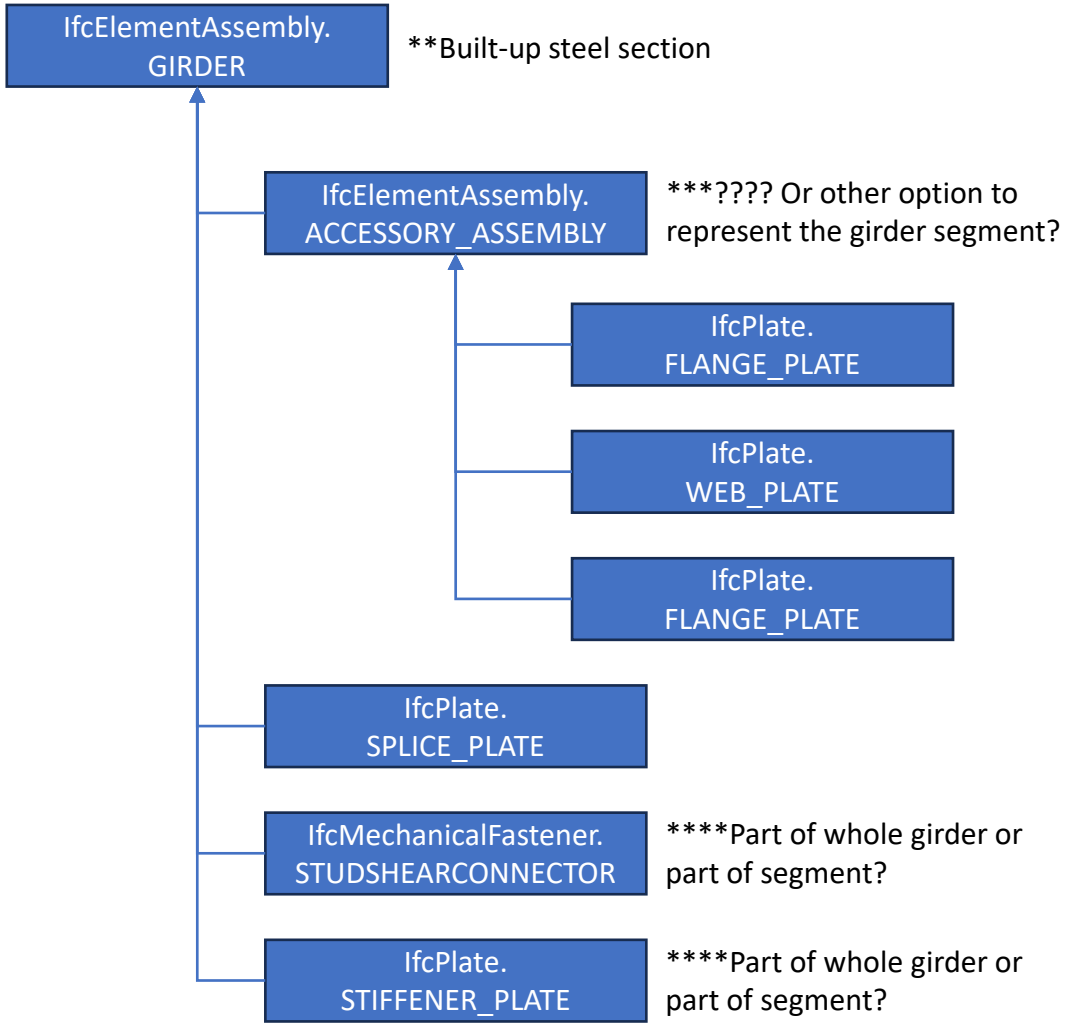
Retaining Structures

- Wall
  - Reinforcing
- Connections
- Pile / Soil Nails

TPF-5(372) Bridge IFC Hierarchy Proposal

Example 1: Steel girder options





IfcElementAssemblyGirder represents the entire length of the continuous girder along its structural grid line. It is then broken down into its segments and splices

TPF-5(372) Bridge IFC Hierarchy Proposal

Example 2: Precast, prestressed concrete girders

WIP

TPF-5(372) Bridge IFC Hierarchy Proposal

Questions:

1. Should “foundations” be a modelled concept or ignored?
    a. If included/modelled, would have to be a further “BridgePart” of parent “BridgePart” (e.g. A Pier’s Foundation would contain Piles and Pile Cap/Footing)
    b. If ignored, all elements would be directly connected to higher level BridgePart (Pier, Abutment, Deck)

2. Should Deck Joints be modelled?
    a. Impacts parametric feature of Deck
    b. Construction vs. expansion joints

3. Are Bolts (along with washers and nuts) modelled or just the Bolt Holes?
    a. Impacts complexity of model
    b. Fabricator typically models this level of detail downstream

4. Should all aggregations be IfcElementAssembly, or just have sub-elements use IfcRelAssociates?