Change Request (CR) for S-401

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| 0 | **Title:** Encoding of bridges  **CR number: 456** **Version:** 1 *(starting with 1)*  *The next available CR number can be found in the currently valid Change Request List under the following URL:* [*https://docs.google.com/spreadsheets/d/1darzMTlkqN4nDWOetW\_6vCuqbGukEvN\_9XYohwB\_QLE/edit?usp=sharing*](https://docs.google.com/spreadsheets/d/1darzMTlkqN4nDWOetW_6vCuqbGukEvN_9XYohwB_QLE/edit?usp=sharing%20)  Referring to edition 2.0.0 *(please enter the last published edition)* | |
| 1 | **Request for:**  **an amendment that does not affect the Feature and Portrayal Catalogues**  **an amendment that affects the Feature Catalogue edition**       *(last published edition)*  **an amendment that affects the Portrayal Catalogue edition**       *(last published edition)* | |
| 2 | Explanation, why this amendment/change is needed:  The encoding of bridges will differ enormously from the way it was done in S-57. This change request will adapt to the encoding of bridges as in S-101 by using different feature types (bridge, span opening, span fixed).  This new encoding procedure has already been discussed and agreed during the IEHG meeting of 2023.  ***“ACTION POINT****: COMEX² to finalize the CR for bridges as soon as the S-101 solution is stable. Multiplicity 1,\* for category of opening to allow the encoding of bridges that have different opening spans. Attribute category of opening span also for the opening span and Encoding instruction: category only encoded for opening span, if more than one span and more than one categories of those spans.”*  The change request is the formal approval. | |
| 3 | Proposed amendments to the Product Specification for Inland ENCs (main document):  --- | |
| 4 | Proposed amendments to the S-100 registry (for new elements see annex A1-A9))  Proposed amendments to the Concept Register:       (for new concepts see annex)  Proposed amendments to the Data Dictionary Register, S-401 domain:       (for new elements see annex)  Proposed amendments to the Portrayal Register, S-401 domain:       (for new symbols see annex) | |
| 5 | Proposed amendments to the Feature Catalogue:  The feature types **bridge**, **span opening** and **span fixed** will be copied from the S-101 Feature Catalogue but extended with inland specific attributes and associations (see encoding instruction DCEG in Annex I) | |
| 6 | Proposed amendments to the Data Classification and Encoding Guide (for new elements see annex B1):  see annex I | |
| 7 | Proposed amendments to the Portrayal Catalogue: | |
| 8 | Proposed amendments to the Recommended Validation checks for IENCs: | |
| 9 | Proposed amendments to the Conversion Guidance:  TBD | |
| 10 | Proposed amendments to the Interoperability Standard:  TBD | |
| 11 | Proposed applicability: *mark all applicable boxes*  US  Europe (without Russia)  Russia  South America  Asia        *(description of another area of applicability, e.g. a country)* | |
| 12 | Name of sender: Gert Morlion  Name of authority or company: De Vlaamse Waterweg  e-mail address: gert.morlion@vlaamsewaterweg.be  Date *(20250512):* | Deadline for comments 23062025 (6 weeks)  To be filled in by a member of the Core Group:  Proposal adopted/  Proposal rejected  Will become part of edition       of the EG. |

The file name should start with “CR\_IEHG\_”, followed by the number and version (nr-XXX\_vX) of the change request, followed by a reference to a page of the DCEG or the content (e.g. X\_X\_X or Special\_Purpose\_Buoy), and include the year (YYYY).   
Example: CR\_IEHG\_nr-001\_v1\_1\_1\_1\_2025.docx

## ANNEX I – DCEG Encoding instructions

## Bridge

|  |  |  |  |  |  |  |  |  |  |
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| IHO Definition: **BRIDGE**. A structure erected over a depression or an obstacle such as a body of water, railroad, etc., to provide a roadway for vehicles or pedestrians. (IHO Dictionary – S-32). | | | | | | | | | |
| **S-401 Geo Feature: Bridge (bridge) (M)** | | | | | | | | | |
| **Primitives: Curve, Surface, None** | | | | | | | | | |
| *Real World*  Bascule Bridge *Graphic_27*  Bridge with Bridge Arches *Graphic_323*  Fixed Bridge *Graphic_18*  Lift Bridge *Graphic_24*  Suspension Bridge *Graphic_30*  Swing Bridge *Graphic_21*  Foot Bridge / Catwalk *Graphic_Footbridge Graphic_catwalk*  Retractable (Draw) Bridge *Graphic_retractable_real*  *Graphic_retractable_real2*  Non-navigable Aqueduct *Graphic_aqua-real* | | *Paper Chart Symbol*  Bascule Bridge *Graphic_28*  Fixed Bridge  *Graphic_31*  Lift Bridge *Graphic_25*  Suspension Bridge *Graphic_31*  Swing Bridge *Graphic_22*  Retractable (Draw) Bridge *Graphic_retractable_chart*  Non-navigable Aqueduct *Graphic_aqua-chart* | | | | *Inland ECDIS or ECS Symbol*  Bascule Bridge *Graphic_29*  Bridge with Bridge Arches *Graphic_324*  Fixed Bridge *Graphic_20*  Lift Bridge *Graphic_26*  Suspension Bridge *Graphic_32*  Swing Bridge *Graphic_23*  Non-navigable Aqueduct *Graphic_aqua-ienc* | | | |
| **S-401 Attribute** | | | **S-57**  **Acronym** | | **Allowable Encoding Value** | | | **Type** | **Multiplicity** |
| bridge construction | | | *(CATBRG)* | | 1 : arch  2 : viaduct  3 : pontoon bridge  4 : suspension bridge  5 : transporter bridge | | | EN | 0,1 |
| bridge function | | | *(CATBRG)* | | 1 : vehicular  2 : rail  3 : pedestrian  4 : aqueduct | | | EN | 0,\* |
| category of opening bridge | | | (CATBRG) | | 3 : swing bridge  4 : lifting bridge  5 : bascule bridge  7 : drawbridge | | | EN | 0,1 |
| *colour* | | | (COLOUR) | | 1 : white  2 : black  3 : red  4 : green  5 : blue  6 : yellow  7 : grey  8 : brown  9 : amber  10 : violet  11 : orange  12 : magenta  13 : pink | | | EN | 0,\* (ordered) |
| *colour pattern* | | | (COLPAT) | | 1 : horizontal stripes  2 : vertical stripes  3 : diagonal stripes  4 : squared  5 : stripes (direction unknown)  6 : border stripe | | | EN | 0,1 † |
| condition | | | (CONDTN) | | 1 : under construction  2 : ruined  3 : under reclamation  5 : planned construction | | | EN | 0,1 |
| feature name | | |  | | See clause 2.5.8 | | | C | 0,\* |
| language | | |  | | ISO 639-2/T | | | (S) TE | 1,1 |
| name | | | *(OBJNAM)*  *(NOBJNM)* | |  | | | (S) TE | 1,1 |
| name usage | | |  | | 1 : default name display  2 : alternate name display | | | (S) EN | 0,1 † |
| *fixed date range* | | |  | | See clause 2.4.8 | | | C | 0,1 |
| date end | | | (DATEND) | |  | | | (S) TD | 0,1 † |
| date start | | | (DATSTA) | |  | | | (S) TD | 0,1 † |
| *height* | | | (HEIGHT) | |  | | | RE | 0,1 |
| interoperability identifier | | |  | | MRN (see clause 27.158) | | | URN | 0,1 |
| *nature of construction* | | | (NATCON) | | 1 : masonry  2 : concreted  6 : wooden  7 : metal  11 : latticed | | | EN | 0,\* |
| opening bridge | | | *(CATBRG)* | |  | | | BO | 0,1 † |
| *radar conspicuous* | | | (CONRAD) | |  | | | BO | 0,1 |
| reported date | | | *(SORDAT)* | | See clause 2.4.8 | | | TD | 0,1 |
| *status* | | | (STATUS) | | 1 : permanent  2 : occasional  4 : not in use  5 : periodic/intermittent  7 : temporary  12 : illuminated | | | EN | 0,\* |
| *visual prominence* | | | (CONVIS) | | 1 : visually conspicuous  2 : not visually conspicuous  3 : prominent | | | EN | 0,1 |
| scale minimum | | | (SCAMIN) | | [EUR: 90000; US: 300000]  or see clause 2.5.9 | | | IN | 1,1 |
| information | | |  | | See clause 2.4.6 | | | C | 0,\* |
| file locator | | |  | |  | | | (S) TE | 0,1 |
| file reference | | | *(TXTDSC)*  *(NTXTDS)* | |  | | | (S) TE | 0,1 † |
| headline | | |  | |  | | | (S) TE | 0,1 |
| language | | |  | | ISO 639-2/T | | | (S) TE | 1,1 |
| text | | | *(INFORM)*  *(NINFOM)* | |  | | | (S) TE | 0,1 † |
| pictorial representation | | | (PICREP) | | See clause 2.4.12.2 | | | TE | 0,1 |
| UN Location Code | | | (unlocd) | |  | | | TE | 0, 1 |
| Horizontal Distance Uncertainty | | | (HORACC) | | [xx.xx] (metres), e.g., 1.54 | | | RE | 0, 1 |
| Vertical Uncertainty | | | (VERACC) | | [xx.xx] (metres), e.g., 1.54 | | | C | 0, 1 |
| Uncertainty Fixed | | | (POSACC)  (SOUACC)  (VERACC) | |  | | | (S) RE | 1, 1 |
| Uncertainty Variable Factor | | |  | |  | | | (S) RE | 0, 1 |
| Category of Temporal Variation | | | (CATTEV) | | 4 : Likely to Change  5 : Unlikely to Change  6 : Unassessed | | | EN | 0, 1 |
| Reported Date | | | (SORDAT) | |  | | | TD | 0, 1 |
| Source Indication | | | (SORIND) | |  | | | TE | 0, 1 |
| Waterway Distance | | | (wtwdis) | | [xxxx.xxx] (units defined in hunits), e.g., 2451.732 | | | RE | 0, 1 |
| Height/Length Units | | | (hunits) | | 1 : Metres  2 : Feet  3 : Kilometres  4 : Hectometres  5 : Statute Miles  6 : Nautical Miles | | | EN | 0, 1 |
| **Feature Associations** | | | | | | | | | |
| **S-401 Role** | **Association Type** | | | **Associated to** | | | **Type** | | **Multiplicity** |
| The Collection | **Bridge Aggregation** (see clause  25.3) | | | **Cable Overhead, Communication Area, Lateral Buoy, Notice Mark, Pipeline Overhead, Pontoon,** **Pylon/Bridge Support, Radio Calling-In Point, Shoreline Construction, Signal Staion Traffic, Signal Station Warning, Span Fixed**, **Span Opening**, **Two-Way Route Part, Waterway Gauge** | | | Aggregation | | 0,1 |
| The Structure | **Structure/Equipment** (see clause  25.12) | | | **Daymark**, **Distance Mark**, **Fog Signal**, **Light Air**  **Obstruction**, **Light All**  **Around**, **Light Sectored**, **Notice Mark,** **Physical AIS Aid to Navigation**, **Radar Transponder Beacon**, **Sensor, Signal Station Traffic**, **Signal**  **Station Warning** | | | Composition | | 0,1 |
| The Component | **Lock Aggregation** (see clause 25.23) | | | **Lock Basin** | | | Association | | 0,\* |
| The Component | **Aids to Navigation Association** (see clause 25.2) | | | **Fairway System**, **Traffic**  **Separation Scheme**, **TwoWay Route** | | | Association | | 0,\* |
| The Updated Object | **Updated Information** (see clause  25.16) | | | **Update Information** | | | Association | | 0,1 |
| The Position Provider | **Text Association** (see clause 25.13). | | | **Text Placement** | | | Composition | | 0,\* |
|  | **Additional Information** (see clause  25.1) | | | **Contact Details**, **NonStandard Working Day**,  **Service Hours**, **Nautical**  **Information** | | | Association | | 0,1 |
| - | **Spatial Association** (see clause 25.10) | | | **Spatial Quality** | | | Association | | 0,\* |
| † For bridges encoded over navigable water, the attribute **opening bridge** is mandatory.  The sub-attribute **colour pattern** is mandatory for bridges that have more than one value populated for the sub-attribute **colour**.  Complex attribute **feature name**, sub-attribute **name usage** is mandatory if the name is intended to be displayed when display of names is enabled by the boatmaster. See clause 2.5.8.  For each instance of **fixed date range**, at least one of the sub-attributes **date end** or **date start** must be populated.  For each instance of **information**, at least one of the sub-attributes **file reference** or **text** must be populated. 6.6.1 Bridges If it is required to encode a bridge, it should be done using the feature **Bridge**. Bridges may be encoded over water that is navigable or non-navigable at the optimum display scale of the IENC data. Where the bridge is encoded over navigable water, associated features such as spans, pylons and pontoons of the bridge must be associated with the **Bridge** feature using the association **Bridge Aggregation** (see clause 25.3) (that is, the **Bridge** feature has geometry of type curve or surface, or has no geometry). Where the bridge is encoded over non-navigable water, then it must be encoded, where required, using a **Bridge** feature having no component features (that is, the **Bridge** feature has geometry of type curve or surface); or as a **Landmark** feature (see clause 7.2) if the bridge has geometry of type point.  The value of the vertical clearance between (high) water level and any fixed overhead obstruction must always be given, where known, on the largest optimum display scale IENC data intended for navigation under the bridge, and for detailed passage planning. The datum above which clearances are given must be a high water level, preferably Highest Astronomical Tide (HAT), where the tide is appreciable. For bridges over navigable water, the value for the vertical clearance(s) must be encoded using the features **Span Fixed** or **Span Opening** (see clauses 6.7 and 6.8), with the clearance(s) populated using the complex attributes **vertical clearance fixed**, **vertical clearance closed** and/or **vertical clearance open**, and sub-attributes populated relevant to the span.  Remarks:   * If it is required to encode the name of a bridge over navigable water, the **Bridge** should be encoded using geometry of type curve or surface, associated with all relevant components of the bridge using the association **Bridge Aggregation**. The extent of the geometry of the **Bridge** should utilise the geometry of all the components of the bridge so as to cover its full extent. * If it is required to encode the extent of an unnamed bridge over navigable water, this may be done using a **Bridge** feature having no geometry, associated with all relevant components of the bridge using the association **Bridge Aggregation**. * Water under a bridge must be encoded using the features **Depth Area**, **Dredged Area** or **Unsurveyed Area** (and appropriate **Depth Contour** and **Sounding** features) if the waterway is navigable at the optimum display scale for the IENC data, or using the feature **Land Area** if the waterway is not navigable at the optimum display scale for the IENC data. * When there is a fixed vertical clearance, closed vertical clearance, or open vertical clearance given for a bridge, it should be applied only to the portion of the bridge to which the clearance refers, using the features **Span Fixed** or **Span Opening** (see clauses 6.7 and 6.8). All encoded bridge spans must be associated with the **Bridge** feature using the association **Bridge Aggregation** (see clause 25.3). See examples in the Figures below. If there are no vertical clearances given for a bridge and it is over water that is navigable at the optimum display scale of the IENC data, a single **Span Fixed** or **Span Opening** feature must be encoded covering the area of the bridge, having mandatory vertical clearance attributes populated with an empty (null) value. * The attribute **height** is used, where required, to encode the height of the highest point on the bridge structure (see clause 2.5.7). * If it is required to encode a bridge for which part or the entire span is moved aside or backwards, it must be done using a **Bridge** feature, with attributes **opening bridge** = *True* and **category of opening bridge** = *7* (drawbridge). * If it is required to encode a pontoon bridge where a pontoon section may be temporarily removed or rotated so as to allow passage of vessels, this must be done using a **Bridge** feature, with attributes **bridge construction** = *3* (pontoon bridge), **opening bridge** = *True* and **category of opening bridge** = *3* (swing bridge) or *7* (draw bridge). * If it is required to encode a distance mark that is included on or associated with a bridge, this must be done using the feature **Distance Mark** (see clause 8.10). * In navigable water, bridge supports must be encoded, where possible, using a **Pylon/Bridge Support** feature (see clause 6.12), with attribute **category of pylon** = *4* (bridge/pylon tower) or *5* (bridge pier) or if the bridge is a pontoon bridge as **Pontoon** features (see clause 8.19). * It is not mandatory to encode roads or railways on bridges.  6.6.2 Examples of Encoding Common Bridge Types **BASCULE BRIDGE**  Afbeelding met tekst, schermopname, diagram, lijn  Door AI gegenereerde inhoud is mogelijk onjuist.  ***Figure 6-2 – Bascule bridge - Example***  **PONTOON BRIDGE (Opening)**  **Pontoon**  **Bridge** feature (surface): Geometry of all components  bridge construction = *3* (pontoon bridge)  category of opening bridge = *3* (swing bridge)  feature name = *Koningin Emmabrug*  opening bridge = *True*  *The Component(s)*  *(associated by Bridge Aggregation)*  **Span Opening**  vertical clearance open  vertical clearance unlimited = *True*  vertical clearance closed  vertical clearance value = *0.0*  information  text = *Span pivots at western end*  **Span Fixed**  vertical clearance fixed  vertical clearance value = *0.0*  ***Figure 6-3 – Pontoon bridge (opening) – Example***  **PONTOON BRIDGE (Fixed)**  **Pontoon**  **Bridge** feature (surface): Geometry of all components  bridge construction = *3* (pontoon bridge)  feature name = *Grolsch Bridge*  opening bridge = *False*  *The Component(s)*  *(associated by Bridge Aggregation)*  **Span Fixed**  vertical clearance fixed  vertical clearance value = *0.0*  ***Figure 6-4 – Pontoon bridge (fixed) – Example***  **SWING BRIDGE**  **Span Opening**  vertical clearance open  vertical clearance unlimited = *True*  vertical clearance closed  vertical clearance value = *7.0*  vertical uncertainty = *0.5*  horizontal clearance fixed  horizontal clearance value = *60.0*  vertical datum = *3* (Mean Sea Level)  **Pylon/Bridge Support**  category of pylon = *4* (bridge pylon/tower)  **Span Fixed**  vertical clearance fixed  vertical clearance value = *6.5*  vertical uncertainty = *0.5*  vertical datum = *3* (Mean Sea Level)  **Bridge** feature (surface): Geometry of all components  category of opening bridge = *3* (swing bridge)  feature name = *Draaibrug Sas van Gent*  opening bridge = *True*    *The Component(s)*  *(associated by Bridge Aggregation)*  ***Figure 6-5 – Swing bridge – Example***  **LIFTING BRIDGE**A bridge over water with a green field  Description automatically generated  **Span Fixed**  vertical clearance fixed  vertical clearance value = Unknown  information  text = *No passage permitted*  **Span Fixed**  vertical clearance fixed  vertical clearance value = Unknown  information  text = *No passage permitted*  **Pylon/Bridge Support**  category of pylon = *4* (bridge pylon/tower)  *The Component(s)*  *(associated by Bridge Aggregation)*  **Bridge** feature (surface): Geometry of all components  category of opening bridge = *4* (lifting bridge)  feature name = *Botlekbrug*  opening bridge = *True*  **Span Opening**  vertical clearance open  vertical clearance unlimited = *False*  vertical clearance value = *43.3*  vertical uncertainty = *0.5*  vertical clearance closed  vertical clearance value = *12.3* vertical uncertainty = *0.5*  horizontal clearance fixed  horizontal clearance value = *87.3*  vertical datum = *30* (HAT)  **Span Opening**  vertical clearance open  vertical clearance unlimited = *False*  vertical clearance value = *43.3*  vertical uncertainty = *0.5*  vertical clearance closed  vertical clearance value = *12.3*  vertical uncertainty = *0.5*  horizontal clearance fixed  horizontal clearance value = *87.3*  vertical datum = *30* (HAT)  ***Figure 6-6 – Lifting bridge – Example***  Distinction: Pipeline Overhead; Pontoon, Pylon/Bridge Support; Span Fixed; Span Opening. | | | | | | | | | |

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| Inland specific Encoding Instructions:  A) All bridge types:  i) Bridge approaches (over the bankline) should be encoded.  ii) Roads and railways on bridges shall not be encoded.  iii) Place **Light All Around, Sectored Lights or Light Air Obstruction** (LIGHTS) at appropriate position on bridge features and piers bounding navigable channel.  iv) The ISRS Location Code of a bridge is assigned to each single span feature of the entire bridge (refer to 2.4.13). If a MRN or RIS-ID is available, the attribute **interoperability identifier** must be encoded (refer to 2.4.14).  v) **category of bridge** (CATBRG) has to be encoded for the **Bridge** feature if all spans have the same category. If they have different categories the attribute has to be only encoded for the individual spans.  vi) For notice marks on bridges see clause 20.17.  xi) Use **pictorial representation** (PICREP).  US: **pictorial representation** (PICREP) is mandatory  EUR: **pictorial representation** (PICREP) is optional  xii) US: If separate spans are required, each span’s **information** (INFORM) should indicate whether it is the "Primary Navigation Span", "Secondary Navigation Span", or "Not to be used for Navigation."    B) Bridges with opening spans:  i) The portions of the bridge that approach the span opening from either shore are to be encoded as span fixed (separate features). Only that portion of the bridge that is actually movable is to be encoded as a span opening.  C) Swing Bridge  i) US & EUR: Add a **Caution Area** (CTNARE) feature (**information text** (INFORM) = Swing Area) around the swing area that is showing the actual swing area of the swinging bridge span. |
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## Span fixed

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| IHO Definition: **SPAN FIXED**. A fixed component of the deck of a bridge spanning successive bridge piers. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2013). | | | | | | | | | |
| **S-401 Geo Feature: Span Fixed *(bridge)* (M)** | | | | | | | | | |
| **Primitives: Curve, Surface** | | | | | | | | | |
| *Real World*  See 6.6 bridge | | *Paper Chart Symbol*  See 6.6 bridge | | | | *Inland ECDIS or ECS Symbol*  See 6.6 bridge | | | |
| **S-401 Attribute** | | | **S-57**  **Acronym** | | **Allowable Encoding Value** | | | **Type** | **Multiplicity** |
| *fixed date range* | | |  | | See clause 2.4.8 | | | C | 0,1 |
| date end | | | (DATEND) | |  | | | (S) TD | 0,1 † |
| date start | | | (DATSTA) | |  | | | (S) TD | 0,1 † |
| horizontal clearance fixed | | |  | |  | | | C | 0,1 |
| horizontal clearance value | | | (HORCLR) | | [xx.x] (metres), e.g., 34.2 | | | (S) RE | 1,1 |
| horizontal distance uncertainty | | | (HORACC) | | [xx.xx] (metres), e.g., 1.54 | | | (S) RE | 0,1 |
| interoperability identifier | | |  | | MRN (see clause 27.158) | | | URN | 0,1 |
| vertical clearance fixed | | |  | |  | | | C | 1,1 |
| vertical clearance value | | | (VERCLR) | |  | | | (S) RE | 1,1 |
| vertical uncertainty | | | *(VERACC)* | |  | | | (S) C | 0,1 |
| uncertainty fixed | | |  | | [xx.xx] (metres), e.g., 1.54 | | | (S) RE | 1,1 |
| uncertainty variable factor | | |  | |  | | | (S) RE | 0,1 |
| vertical datum | | | (VERDAT) | | 3 : mean sea level  10 : Approximate Lowest Astronomical Tide  12 : Mean Lower Low Water  13 : Low water  16 : mean high water  17 : mean high water springs  18 : high water  19 : approximate mean sea level  20 : high water springs  21 : mean higher high water  23 : lowest astronomical tide  24 : local datum  25 : international great lakes datum 1985  26 : mean water level  28 : higher high water large tide  29 : nearly highest high water  30 : highest astronomical tide  31 : Local Low Water Reference Level  32 : Local High Water Reference Level  33 : Local Mean Water Reference Level  34 : Equivalent Height of Water (German GlW)  35 : Highest Shipping Height of Water (German HSW)  36 : Reference Low Water Level According to Danube Commission  37 : Highest Shipping Height of Water According to Danube Commission  38 : Dutch River Low Water Reference Level (OLR)  39 : Russian Project Water Level  40 : Russian Normal Backwater Level  41 : Ohio River Datum  43 : Dutch High Water Reference Level  44 : baltic sea chart datum 2000  45 : Dutch Estuary Low Water Reference Level (OLW) | | | EN | 0,1 |
| scale minimum | | | (SCAMIN) | | [EUR: 90000; US: 300000]  or see clause 2.5.9 | | | IN | 1,1 |
| information | | |  | | See clause 2.4.6 | | | C | 0,\* |
| file locator | | |  | |  | | | (S) TE | 0,1 |
| file reference | | | *(TXTDSC)*  *(NTXTDS)* | |  | | | (S) TE | 0,1 † |
| headline | | |  | |  | | | (S) TE | 0,1 |
| language | | |  | | ISO 639-2/T | | | (S) TE | 1,1 |
| text | | | *(INFORM)*  *(NINFOM)* | |  | | | (S) TE | 0,1 † |
| pictorial representation | | | (PICREP) | | See clause 2.4.12.2 | | | TE | 0,1 |
| bridge construction | | | *(CATBRG)* | | 1 : arch  2 : viaduct  3 : pontoon bridge  4 : suspension bridge  5 : transporter bridge | | | EN | 0,1 |
| UN Location Code | | | (unlocd) | |  | | | TE | 0, 1 |
| Horizontal Distance Uncertainty | | | (HORACC) | |  | | | RE | 0, 1 |
| Category of Temporal Variation | | | (CATTEV) | | 4 : Likely to Change  5 : Unlikely to Change  6 : Unassessed | | | EN | 0, 1 |
| Vertical River Datum Reference Level Value | | | (vcrval) | | [xx.xx] (metres), e.g., 1.15 | | | RE | 0, 1 |
| Name of Vertical River Datum Reference Level | | | (vcrlev) | |  | | | TE | 0, 1 |
| Elevation of Water Level | | | (elevwl) | | [xx.xx] (metres), e.g., 12.46 | | | RE | 0, 1 |
| Reference Gauge | | | (refgag) | |  | | | TE | 0, 1 |
| Reference Gravitational Level | | | (reflev) | | 1 : Baltic Datum  2 : Adriatic Level  3 : Amsterdam Ordnance Datum (NAP)  4 : Mean Sea Level  5 : Other Datum  6 : National Geodetic Vertical Datum - NGVD29  7 : North American Vertical Datum - NAVD88  8 : Mean Sea Level 1912  9 : Mean Sea Level 1929  10 : Tweede Algemene Waterpassing | | | EN | 0, 1 |
| Reported Date | | | (SORDAT) | |  | | | TD | 0, 1 |
| Source Indication | | | (SORIND) | |  | | | TE | 0, 1 |
| Waterway Distance | | | (wtwdis) | | [xxxx.xxx] (units defined in hunits), e.g., 2451.732 | | | RE | 0, 1 |
| Height/Length Units | | | (hunits) | | 1 : Metres  2 : Feet  3 : Kilometres  4 : Hectometres  5 : Statute Miles  6 : Nautical Miles | | | EN | 0, 1 |
| **Feature Associations** | | | | | | | | | |
| **S-401 Role** | **Association Type** | | | **Associated to** | | | **Type** | | **Multiplicity** |
| The Component | **Bridge Aggregation** (see clause  25.3) | | | **Bridge** | | | Association | | 0,\* |
| The Collection | **Bridge Arch Association** (see clause 25.20) | | | **Span Fixed** | | | Aggregation | | 0,1 |
| The Component | **Bridge Arch Association** (see clause 25.20) | | | **Span Fixed** | | | Association | | 0,\* |
| The Component | **Lock Aggregation** (see clause 25.23) | | | **Lock Basin** | | | Association | | 0,\* |
| The Structure | **Structure/Equipment** (see clause  25.12) | | | **Daymark**, **Distance Mark**,  **Fog Signal**, **Light Air**  **Opstruction**, **Light All**  **Around**, **Light Sectored**, **Notice Mark, Physical AIS Aid to Navigation**, **Radar**  **Transponder Beacon**,  **Sensor, Signal Station Traffic**, **Signal**  **Station Warning** | | | Composition | | 0,1 |
| The Component | **Aids to Navigation Association** (see clause 25.2) | | | **Fairway System**, **Traffic**  **Separation Scheme**, **TwoWay Route** | | | Association | | 0,\* |
| The Updated Object | **Updated Information** (see clause  25.16) | | | **Update Information** | | | Association | | 0,\* |
| The Position Provider | **Text Association** (see clause 25.13). | | | **Text Placement** | | | Composition | | 0,1 |
|  | **Additional Information** (see clause  25.1) | | | **Contact Details**, **NonStandard Working Day**,  **Service Hours**, **Nautical**  **Information** | | | Association | | 0,\* |
| - | **Spatial Association** (see clause 25.10) | | | **Spatial Quality** | | | Association | | 0,\* |
| † For each instance of **fixed date range**, at least one of the sub-attributes **date end** or **date start** must be populated.  For each instance of **information**, at least one of the sub-attributes **file reference** or **text** must be populated. 6.7.1 Span fixed If it is required to encode the clearance characteristics (vertical or horizontal) for any fixed part of a bridge between piers or supports, it must be done using the feature **Span Fixed**, which must be associated with the feature **Bridge** (see clause 6.6) using the association **Bridge Aggregation** (see clause 25.3). See clause 6.6 for examples of **Span Fixed** features aggregated to **Bridge**.  The value of the vertical clearance between (high) water level and any fixed overhead obstruction must always be given, where known, on the largest optimum display scale IENC data intended for navigation under the overhead obstruction, and for detailed passage planning. The datum above which clearances are given must be a high water level, preferably Highest Astronomical Tide (HAT), where the tide is appreciable. Clearances must be populated using the complex attribute **vertical clearance fixed** and sub-attributes populated relevant to the feature. Remarks:   * **Span Fixed** features should only be encoded if the span is entirely or partly over navigable water at the optimum display scale for the IENC data. * Where the optimum display scale of the IENC data is such that individual spans on a fixed bridge over navigable water cannot be indicated, the entire bridge should be covered by a single **Span Fixed** feature, having attributes populated according to the most navigationally important span. * Value *13* (low water) for attribute **vertical datum** is only applicable to enclosed (inland) waterways; and must not be used to indicate the reference datum for vertical clearances in tidal waters. * Where encoded, an associated instance of the cartographic feature **Text Placement** (see clause 23.1) relates to the positioning of the vertical and/or horizontal clearances for the span, where encoded.If available and considered important for route planning and/or monitoring, the vertical uncertainty associated with encoded vertical clearance values should also be encoded.   Distinction: Bridge; Cable Overhead; Conveyor; Pipeline Overhead; Span Opening. | | | | | | | | | |

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| Inland specific Encoding Instructions:A) All bridge types:  i) Bridge approaches (over the bankline) should be encoded.  ii) The ISRS Location Code of a bridge is assigned to each single span feature of the entire bridge (refer to 2.4.13). If a MRN or RIS-ID is available, the attribute **interoperability identifier** must be encoded (refer to 2.4.14).  iii) Use **vertical datum** (VERDAT) only if vertical datum differs:  - from DSPM VDAT subfield and  - from Metadata feature **Vertical Datum of Data** (m\_vdat) attribute.  iv) If there is no vertical clearance indicator at a bridge, but there is a gauge which can be used to calculate the vertical clearance of the bridge depending on the water level, it should be encoded in accordance with clause 22.15.  v) EUR: If there is a gauge which can be used to calculate the vertical clearance of the bridge, the ISRS Location Code of the gauge shall be encoded in the attribute **reference gauge** (refgag).  vi) Use **name of vertical river datum reference level** (vcrlev) and **vertical river datum reference level value** (vcrval) if the local value and name of vertical river datum reference level (design waterlevel ) is known.  vii) **bridge construction** (CATBRG) has to be encoded for the **Bridge** feature if all spans have the same category. If they have different categories the attribute has to be only encoded for the individual spans.  viii) **Vertical clearance value** (VERCLR), **horizontal clearance value** (HORCLR), **waterway distance** (WTWDIS) and **height/length units** (HUNITS) must be encoded for spans over navigable water. **Vertical clearance value** (VERCLR) should not be encoded for spans over non-navigable water.  C) Bridge with Bridge Arches  i) The following instructions are only necessary if the available space according to the beam and air-draft of the vessel shall be indicated.  - This is only possible if the arch of the span can be separated into different single pieces with known vertical clearances or if the arc is mathematically known.  - Create several span fixed features with **bridge construction** (CATBRG) = 1 (arch) for one bridge arch.  - The number of the span fixed features depends on the resolution of the different vertical clearances which shall be provided. The width of the element with the biggest vertical clearance should not be less than the typical width of vessels (12 m for European waterways of CEMT class IVa and above).  - The areas must not overlap.  - All of the span fixed features of one arch which are situated within the allowed passage must be aggregated by a **Bridge Arch Association**.  ii) **Bridge Arch Association** must NOT be included in the **Bridge Aggregation**.  Illustration_G  . |

## Span opening

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| IHO Definition: **SPAN OPENING**. An opening component of the deck of a bridge spanning successive bridge piers. (Adapted from Defence Geospatial Information Working Group; Feature Data Dictionary Register, 2013). | | | | | | | | | |
| **S-401 Geo Feature: Span Opening *(bridge)* (M)** | | | | | | | | | |
| **Primitives: Curve, Surface** | | | | | | | | | |
| *Real World*  See 6.6 bridge | | *Paper Chart Symbol*  See 6.6 bridge | | | | *Inland ECDIS or ECS Symbol*  See 6.6 bridge | | | |
| **S-401 Attribute** | | | **S-57**  **Acronym** | | **Allowable Encoding Value** | | | **Type** | **Multiplicity** |
| *fixed date range* | | |  | | See clause 2.4.8 | | | C | 0,1 |
| date end | | | (DATEND) | |  | | | (S) TD | 0,1 † |
| date start | | | (DATSTA) | |  | | | (S) TD | 0,1 † |
| horizontal clearance fixed | | |  | |  | | | C | 0,1 |
| horizontal clearance value | | | (HORCLR) | |  | | | (S) RE | 1,1 |
| horizontal distance uncertainty | | | (HORACC) | | [xx.xx] (metres), e.g., 1.54 | | | (S) RE | 0,1 |
| interoperability identifier | | |  | | MRN (see clause 27.158) | | | URN | 0,1 |
| vertical clearance closed | | |  | |  | | | C | 1,1 |
| vertical clearance value | | | *(VERCCL)* | | [xx.x] (metres), e.g., 13.2 | | | (S) RE | 1,1 |
| vertical uncertainty | | | *(VERACC)* | |  | | | (S) C | 0,1 |
| uncertainty fixed | | |  | | [xx.xx] (metres), e.g., 1.54 | | | (S) RE | 1,1 |
| uncertainty variable factor | | |  | |  | | | (S) RE | 0,1 |
| vertical clearance open | | |  | |  | | | C | 1,1 |
| vertical clearance unlimited | | |  | |  | | | (S) BO | 1,1 |
| vertical clearance value | | | *(VERCOP)* | | [xx.x] (metres), e.g., 23.4 | | | (S) RE | 0,1 † |
| vertical uncertainty | | | *(VERACC)* | |  | | | (S) C | 0,1 |
| uncertainty fixed | | |  | |  | | | (S) RE | 1,1 |
| uncertainty variable factor | | |  | |  | | | (S) RE | 0,1 |
| vertical datum | | | (VERDAT) | | 3 : mean sea level  10 : Approximate Lowest Astronomical Tide  12 : Mean Lower Low Water  13 : low water  16 : mean high water  17 : mean high water springs  18 : high water  19 : approximate mean sea level  20 : high water springs  21 : mean higher high water  23 : Lowest Astronomical Tide  24 : local datum  25 : international great lakes datum 1985  26 : mean water level  28 : higher high water large tide  29 : nearly highest high water  30 : highest astronomical tide  31 : Local Low Water Reference Level  32 : Local High Water Reference Level  33 : Local Mean Water Reference Level  34 : Equivalent Height of Water (German GlW)  35 : Highest Shipping Height of Water (German HSW)  36 : Reference Low Water Level According to Danube Commission  37 : Highest Shipping Height of Water According to Danube Commission  38 : Dutch River Low Water Reference Level (OLR)  39 : Russian Project Water Level  40 : Russian Normal Backwater Level  41 : Ohio River Datum  43 : Dutch High Water Reference Level  44 : baltic sea chart datum  2000  45 : Dutch Estuary Low Water Reference Level (OLW) | | | EN | 0,1 |
| scale minimum | | | (SCAMIN) | | EUR: 90 000, US: 300 000 or see clause 2.5.9 | | | IN | 1,1 |
| information | | | (INFORM) | | See clause 2.4.6 | | | C | 0,\* |
| file locator | | |  | |  | | | (S) TE | 0,1 |
| file reference | | | *(TXTDSC)*  *(NTXTDS)* | |  | | | (S) TE | 0,1 † |
| headline | | |  | |  | | | (S) TE | 0,1 |
| language | | |  | | ISO 639-2/T | | | (S) TE | 1,1 |
| text | | | *(INFORM)*  *(NINFOM)* | |  | | | (S) TE | 0,1 † |
| pictorial representation | | | (PICREP) | | See clause 2.4.12.2 | | | TE | 0,1 |
| bridge construction | | | *(CATBRG)* | | 1 : arch  2 : viaduct  3 : pontoon bridge  4 : suspension bridge  5 : transporter bridge | | | EN | 0,1 |
| category of opening bridge | | | (CATBRG) | | 3 : swing bridge  4 : lifting bridge  5 : bascule bridge  6 : pontoon bridge  7 : drawbridge | | | EN | 1,1 |
| UN Location Code | | | (unlocd) | |  | | | TE | 0, 1 |
| Horizontal Distance Uncertainty | | | (HORACC) | |  | | | RE | 0, 1 |
| Category of Temporal Variation | | | (CATTEV) | | 4 : Likely to Change  5 : Unlikely to Change  6 : Unassessed | | | EN | 0, 1 |
| Vertical River Datum Reference Level Value | | | (vcrval) | | [xx.xx] (metres), e.g., 1.15 | | | RE | 0, 1 |
| Name of Vertical River Datum Reference Level | | | (vcrlev) | |  | | | TE | 0, 1 |
| Elevation of Water Level | | | (elevwl) | | [xx.xx] (metres), e.g., 12.46 | | | RE | 0, 1 |
| Reference Gravitational Level | | | (reflev) | | 1 : Baltic Datum  2 : Adriatic Level  3 : Amsterdam Ordnance Datum (NAP)  4 : Mean Sea Level  5 : Other Datum  6 : National Geodetic Vertical Datum - NGVD29  7 : North American Vertical Datum - NAVD88  8 : Mean Sea Level 1912  9 : Mean Sea Level 1929  10 : Tweede Algemene Waterpassing | | | EN | 0, 1 |
| Reference Gauge | | | (refgag) | |  | | | TE | 0, 1 |
| Reported Date | | | (SORDAT) | |  | | | TD | 0, 1 |
| Source Indication | | | (SORIND) | |  | | | TE | 0, 1 |
| Waterway Distance | | | (wtwdis) | | [xxxx.xxx] (units defined in hunits), e.g., 2451.732 | | | RE | 0, 1 |
| Height/Length Units | | | (hunits) | | 1 : Metres  2 : Feet  3 : Kilometres  4 : Hectometres  5 : Statute Miles  6 : Nautical Miles | | | EN | 0, 1 |
| **Feature Associations** | | | | | | | | | |
| **S-401 Role** | **Association Type** | | | **Associated to** | | | **Type** | | **Multiplicity** |
| The Component | **Bridge Aggregation** (see clause  25.3) | | | **Bridge** | | | Association | | 0,\* |
| The Component | **Lock Aggregation** (see clause 25.23) | | | **Lock Basin** | | | Association | | 0,\* |
| The Structure | **Structure/Equipment** (see clause  25.12) | | | **Daymark**, **Distance Mark**,  **Fog Signal**, **Light Air**  **Opstruction**, **Light All**  **Around**, **Light Sectored**, **Notice Mark, Physical AIS Aid to Navigation**, **Radar**  **Transponder Beacon**,  **Sensor, Signal Station Traffic**, **Signal Station Warning** | | | Composition | | 0,1 |
| The Component | **Aids to Navigation Association** (see clause 25.2) | | | **Fairway System**, **Traffic**  **Separation Scheme**, **TwoWay Route** | | | Association | | 0,\* |
| The Updated Object | **Updated Information** (see clause  25.16) | | | **Update Information** | | | Association | | 0,\* |
| The Position Provider | **Text Association** (see clause 25.13). | | | **Text Placement** | | | Composition | | 0,1 |
|  | **Additional Information** (see clause  25.1) | | | **Contact Details**, **NonStandard Working Day**,  **Service Hours**, **Nautical**  **Information** | | | Association | | 0,\* |
| - | **Spatial Association** (see clause 25.10) | | | **Spatial Quality** | | | Association | | 0,\* |
| † For each instance of **fixed date range**, at least one of the sub-attributes **date end** or **date start** must be populated.  The sub-attribute **vertical clearance value** for the complex attribute **vertical clearance open** is mandatory if the sub-attribute **vertical clearance unlimited** is set to *False*.  For each instance of **information**, at least one of the sub-attributes **file reference** or **text** must be populated. 6.8.1 Span opening If it is required to encode the clearance characteristics (vertical or horizontal) for an opening part of a bridge between piers or supports, it must be done using the feature **Span Opening**, which must be associated with the feature **Bridge** (see clause 6.6) using the association **Bridge Aggregation** (see clause 25.3). See clause 6.6 for examples of **Span Opening** features used in conjunction with **Bridge** features.  The value of the vertical clearance between (high) water level and any opening overhead obstruction must always be given, where known, on the largest optimum display scale IENC data intended for navigation under the overhead obstruction, and for detailed passage planning. The datum above which clearances are given must be a high water level, preferably Highest Astronomical Tide (HAT), where the tide is appreciable. Clearances must be populated using the complex attributes **vertical clearance closed** and **vertical clearance open** for the span and sub-attributes populated relevant to the feature. Remarks:   * **Span Opening** features should only be encoded if the span is entirely or partly over navigable water at the optimum display scale for the IENC data. * Where the optimum display scale of the IENC data is such that individual spans over navigable water cannot be indicated, the entire bridge should be covered by a single **Span Opening** feature, having attributes populated according to the opening span. * The complex attributes **vertical clearance closed** and **vertical clearance open** must be encoded for both the opening (vertical open) and closed (vertical closed) clearance values. Where the open vertical clearance is unlimited, the Boolean sub-attribute **vertical clearance unlimited** must be set to *True*. * Where it is required to encode time schedule information relating to the opening and closing times for the span, including any scheduled closure times or amended schedules for festivals or national holidays, this should be done using an associated instance of the information types **Service Hours** (see clause 24.2) and/or **Non-Standard Working Day** (see clause 24.3. * Value *13* (low water) for attribute **vertical datum** is only applicable to enclosed (inland) waterways; and must not be used to indicate the reference datum for vertical clearances in tidal waters. * Where encoded, an associated instance of the cartographic feature **Text Placement** (see clause 23.1) relates to the positioning of the vertical and/or horizontal clearances for the span, where encoded.If available and considered important for route planning and/or monitoring, the vertical uncertainty associated with encoded vertical clearance values should also be encoded.   Distinction: Bridge; Cable Overhead; Conveyor; Pipeline Overhead; Span Fixed. | | | | | | | | | |

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| Inland specific Encoding Instructions:  A) All bridge types:  i) Bridge approaches (over the bankline) should be encoded.  ii) The ISRS Location Code of a bridge is assigned to each single span feature of the entire bridge (refer to 2.4.13). If a MRN or RIS-ID is available, the attribute **interoperability identifier** must be encoded (refer to 2.4.14).  iii) Use **vertical datum** (VERDAT) only if vertical datum differs:  - from DSPM VDAT subfield and  - from Metadata feature **Vertical Datum of Data** (m\_vdat) attribute.  iv) For time schedule (general) see clause 24.6.  v) If there is no vertical clearance indicator at a bridge, but there is a gauge which can be used to calculate the vertical clearance of the bridge depending on the water level, it should be encoded in accordance with clause 22.15.  vi) EUR: If there is a gauge which can be used to calculate the vertical clearance of the bridge, the ISRS Location Code of the gauge shall be encoded in the attribute **reference gauge** (refgag).  vii) Use **name of vertical river datum reference level** (vcrlev) and **vertical river datum reference level value** (vcrval) if the local value and name of vertical river datum reference level (design waterlevel ) is known.  viii **bridge construction** (CATBRG) and **category of opening bridge** (CATBRG) have to be encoded for the **Bridge** feature if all spans have the same type. If they have different types the attribute has to be only encoded for the individual spans.  ix) **Horizontal clearance value** (HORCLR), **vertical clearance closed** (VERCCL) and/or **vertical clearance open** (VERCOP), **waterway distance** (WTWDIS) and **height/length units** (HUNITS) must be encoded for spans over navigable water. **Vertical clearance value** (VERCLR) should not be encoded for spans over non-navigable water. |