Stichting USPI-NL
Arnhemseweg 6
3817 CH Amersfoort
The Netherlands
Tel: +31(0)33 4657679
Fax: +31(0)33 4450357
E-mail: stichting@uspi.nl
Web: www.uspi.nl

Facility Lifecycle 3D Model Standard (FL3DMS)

Specification Document

Document Title	FL3DMS Specification Document
Document Number	F-SP-001
Document Revision	1.2
Document Status	Version for release
Issue Date	2 September 2024

© 2024 FL3DMS

Revision History

Version	Date	Comments/History/Main Changes
1.0	29 October 2021	The first official release
1.1	1 June 2023	Intermediate release to include unique numbering system
1.2	2 September 2024	Clarified potentially confusing statements, added definitions, repositioned the 3D model content requirements table, and made some parts easier to read.

Acknowledgements

This specification was prepared by the Facility Lifecycle 3D Model Standard (FL3DMS) Project organized by USPI-NL, in which specialists from several companies in the process and energy industry participated and provided their input.

Disclaimer

Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither USPI-NL nor any of its Members past, present, or future warrants its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms. This publication is made available for information purposes and solely for the private use of the user. USPI-NL will not directly or indirectly endorse, approve or accredit the content of any course, event or otherwise where this publication will be reproduced.

Copyright notice

The copyright of the contents of the downloadable documents is assigned to the author of the document concerned. The content may be freely distributed or copied, in full or in part, provided due acknowledgement is made, the content of the documents is not modified in between, and provided that the copied contents are not used for commercial publications. In the latter case, prior permission must be obtained from the author.

The contents of these pages are © Uitgebreid Samenwerkingsverband ProcesIndustrie-Nederland (USPI). Permission is given to reproduce this report in whole or in part provided (i) that the copyright of USPI and (ii) the sources are acknowledged. All other rights are reserved. Any other use requires the prior written permission of USPI.

Foreword

The Facility Lifecycle 3D Model Standard (FL3DMS) is an industry-standard that provides a specification developed to standardise how 3D models are configured, its content, and what is to be handed over to optimize the return on the investment in a 3D model. This includes the definition of the objects in the 3D Model.

FL3DMS is being developed collaboratively by Principal (Owner/Operator) companies, EPC contractors, software providers, service providers, and equipment suppliers (incl. sub-contractors and/or packaged unit suppliers) as a practical standard.

This first version of the specification has been developed based on good and open cooperation between the participants and based on current best practices and capabilities within the participants' organisations and relevant industry data standards such as CFIHOS.

FL3DMS Participants

FL3DMS Members
AVEVA
Baker Hughes
bp
Bentley
Cohesive Group
Equinor
ExxonMobil
Hexagon ALI
McDermott
Shell
Talent Swarm
Technip Energies
TotalEnergies
Yara International

USPI Partners
DEXPI
IOGP-CFIHOS
Standards Norway

© 2024 FL3DMS

Table of Contents

Foreword 3
FL3DMS Participants 3
1 Introduction 6
1.1 Scope & Intended Use 6
1.2 Content 6
2 References 8
2.1 Normative References 8
2.2 Informative References 8
3 Abbreviations, Terms & Definitions 10
3.1 Abbreviations 10
3.2 Terms & Definitions 10
4 3D Model Configuration 13
4.1 Configuration 13
4.1.1 Plant Grid System and Datum Point 13
4.1.2 Language Characters 13
4.2 Naming Conventions 13
4.2.1 Tagged Objects 13
4.2.2 Non-Tagged Objects 13
4.2.3 Discipline Code 13
4.2.4 Plant Breakdown Structure and Area Coding 13
4.3 Hierarchy 14
4.4 Tagged Objects 14
4.5 Requirements for Soft Volumes 14
4.5.1 Introduction 14
4.5.2 General Requirements 14
4.5.3 Escape and Access Routes 14
4.5.4 Maintenance and Access Volumes 14
4.5.5 Fire Water Nozzle Coverage Elements 15
4.5.6 Coverage and Line of Sight 15
4.5.7 Crane Radius 15
4.5.8 Moveable and Material Handling Equipment 15
4.6 Temporary Objects 15
5 3D Model Content 16
5.1 3D Model Content Requirement Matrix 16
5.2 3D Model - General Requirements 16
5.3 Object Representation in the 3D Model 16

© 2024 FL3DMS

5.4 As-built Tolerance 16
5.5 Supplier Packages/Vendor Engineering 17
5.6 Laser and Photogrammetry Survey Data....17
5.7 Model Attributes 17
6 3D Model Deliverables & Handover....19
6.1 Reports Generated from the 3D Model....19
6.2 Drawings Generated from the 3D Model 19
6.3 Clash Status....19
6.4 Handover: Format 20
6.4.1 Handover report 20
6.4.2 Drawing(s) of the Plant Including the Plant Breakdown Structure....20
6.4.3 Area and Sub-area Coordinates....21
6.4.4 3D Vendor Package Models....21
6.4.5 Laser and Photogrammetry Survey Data....21

© 2024 FL3DMS

1 Introduction

This document specifies requirements for the 3D Model on greenfield and brownfield projects to be developed and handed over in the process and energy industries.

1.1 Scope & Intended Use

The name Facility Lifecycle 3D Model Standard indicates that the focus is on the lifecycle use of 3D models. This means that, although this specification is project-related, requirements are specified with lifecycle use in mind. This is, for example, the case for the as-built requirements, where having an accurate 3D model is a good basis for a trusted Digital Twin.

This specification is based on a set of general principles such that the facility 3D model can be:

- Efficiently and effectively used throughout the lifecycle of the facility.
- Used to visualise the design and validate the layout of the facility.
- Used for design reviews.
- Used as the basis for fabrication and construction documentation.
- Issued to contractors carrying out subsequent work on the facility.
- Received from multiple contractors and consolidated into a single 3D model irrespective of the engineering contractor(s) that have worked on the design.
- Efficiently maintained throughout the lifecycle of the facility.

Out of the scope of this specification are procedural steps for developing the 3D Model by Contractor, specific application tools for 3D model development, how Company maintains the 3D Model, and how it will be integrated with other software applications and data repositories.

This specification is not a replacement for contractor specific 3D model requirements for performing work execution.

Note: The term 3D model will refer to the facility 3D model in the remainder of this specification. If reference is made to other types of 3D models this made explicit.

1.2 Content

This document specifies the requirements for 3D model content, its representation method, and accuracy of the objects, including relationships with and references to disciplines. Both tagged and non-tagged objects are included from a 3D model content point of view. Elements that are included are generic in nature, irrespective of application areas.

It is assumed that users of this specification are familiar with the project and application-related terminology used in this specification. An example would be obstruction areas, which is commonly used concerning 3D model development.

The requirements are detailed categorized in three main sections being 3D Model Configuration in section 4, 3D Model Content in section 5, and 3D Model Deliverables & Handover in section 0.

© 2024 FL3DMS

Note: The development of this specification is being executed in an agile manner. This release is based on the knowledge and information available in the participating organisations at the time of its development but considered as minimum viable product with a view to continuously improve the content and level of details in future releases.

The FL3DMS project encourages all the users of this specification to suggest improvements to this specification. This can be done through a change request procedure. The change request procedure and the related form to submit change requests can be found here.

© 2024 FL3DMS

2 References

2.1 Normative References

- **Capital Facility Information Handover Specification (CFIHOS)**: The aim is to offer practical standardized specifications for information handover that work for:
  - Anyone involved in designing, constructing, operating, maintaining, or decommissioning industrial facilities.
  - Everyone in the information supply chain – Operators, contractors and equipment manufacturers and suppliers.

  CFIHOS organizes data and documents in a structured way so users:
  - Have the information they need to operate, maintain and decommission a facility.
  - Can share information easily with other users/systems.
  - Can find information quickly.

  Elements relevant to this version of the FL3DMS 3D model specification include:
  - CFIHOS data model
  - CFIHOS Reference Data Library (RDL).

2.2 Informative References

- **ISO 10303**: Titled “Industrial automation systems and integration - Product data representation and exchange,” it is a standard for the computer-interpretable representation and exchange of industrial product data. The objective is to provide a mechanism capable of describing product data throughout the life cycle of a product, independent from any particular system. It is also known as STEP or the “Standard for the Exchange of Product model data.”

  For FL3DMS, **ISO 10303-21** that provides a data exchange form of STEP with an ASCII structure, is relevant.

- **ISO 15926**: It is titled: "Industrial automation systems and integration—Integration of lifecycle data for process plants including oil and gas production facilities." The purpose of ISO 15926 is to facilitate the integration of data to support production facilities' lifecycle activities and processes. Elements it provides that are relevant for FL3DMS include a conceptual data model for computer representation of technical information about process plants and a Reference Data Library (RDL).

- **ISO 16739**: Titled Industry Foundation Classes, it specifies a conceptual data schema and an exchange file format for Building Information Model (BIM) data. The conceptual schema is defined in EXPRESS data specification language or XML Schema definition language (XSD). Alternative exchange file formats may be used if they conform to the data schemas. It is a platform-neutral, open file format specification that is not controlled by a single vendor or group of vendors.

- **ISO 19650**: It is titled: “Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling.” The purpose of ISO 19650 is to provide recommendations for a framework to manage information, including exchanging, recording, versioning, and organizing for all actors. An interesting aspect of ISO 19650 is that it includes a lifecycle perspective regarding the detail, granularity, content, and structure of the engineering and design data, including 3D models.

© 2024 FL3DMS

Note: The focus of this specification is on the 3D model requirements and not on the process of the development of the 3D model. It can be useful for actors involved in 3D modelling to combine the use of ISO 19650 and FL3DMS.

- **DEXPI P&ID Specification**: This specification by the DEXPI group (Data EXchange for the Process Industry) provides a general method for data exchange, data interoperability, and data integration for the process industry covering all phases of the lifecycle of a (petro-)chemical plant, ranging from specification of functional requirements to assets in operation. It covers both formats and content.

  The underlying DEXPI information model is a conceptual model that describes the objects that appear in a P&ID from an engineering point of view.

  P&ID's and 3D models are important elements in the development of facilities. The process-related objects represented in both models should be aligned.

  The DEXPI P&ID Specification is relevant for FL3DMS for cross-referencing purposes (e.g., in Digital Twin environments), cross-checking purposes, or object recognition purposes (creating object-oriented 3D model from point cloud from laser scanning).

© 2024 FL3DMS

3 Abbreviations, Terms & Definitions

3.1 Abbreviations

	Description
3D-CAD	Three Dimensional Computer-Aided Design
CAD	Computer-Aided Design
CFIHOS	Capital Facilities Information Handover Specification
DEXPI	Data EXchange in the Process Industry
ENS	Engineering Numbering System
EPC	Engineering, Procurement, and Construction
FL3DMS	Facility Lifecycle 3D Model Standard
IFC	Industry Foundation Classes (described in ISO 16739)
HVAC	Heating, Ventilation and Air-Conditioning
MEL	Master Equipment List
MoC	Management of Change
MTO	Material Take-Off
RDL	Reference Data Library
STEP (STP)	Standard for the Exchange of Product model data (described in ISO 10303)
USPI(-NL)	Uitgebreid Samenwerkingsverband ProcesIndustrie - Nederland

3.2 Terms & Definitions

	Description
3D datum point	The reference point in the 3D model. It ensures accurate coordinates that are consistent with one another
3D model	A three-dimensional representation of an object or a group of objects
3D modelling software	A class of 3D computer graphics programs used to produce 3D models
As-built tolerance	Deviation between the actual installation/assembly position of an object compared to the object's position in the 3D Model
Battery limit	A defined boundary between two areas of responsibility, which could be physical (i.e., flange on pipe) or represented by a map coordinate
Capital Facilities Information Handover Specification	It aims to make information handover quicker, easier and safer for operators, contractors, equipment manufacturers, and suppliers by using standardized specifications and changing how projects and facilities manage their data. The goal of Capital Facilities Information Handover Specification is to give you the tools to get the right information to start, operate, maintain
Clash	The result of two elements in the design taking up the same space
Company	The legal entity ordering the delivery of the 3D Model from Contractor
Computer-Aided Design	The use of computers to aid in the creation, modification, analysis, or optimization of a design

© 2024 FL3DMS

	Description
Contractor	The legal entity delivering the ordered 3D Model to Company
Element	Object (solid and soft volumes) included and visualized in the 3D Model that forms part of the integrated design
Engineering Numbering System	The system that allows for identification of the objects being engineered
EPC contractor	An EPC contractor is made responsible for all the activities from design, procurement, construction to commissioning and handover of the Project to the End-User or Owner
Exact geometry	The representation with a level of detail that matches the geometry of the object represented by the 3D Model as closely as possible
Facility	Process and utility plants, tanks, buildings, marine structures, pipe racks and roads located within a site boundary. For example, a refinery
Facility 3D model	3D model at facility level to be delivered by Contractor to Company based on the requirements defined in this specification
Facility Lifecycle 3D Model Standard	An industry-standard being developed to improve how 3D models are developed, integrated, handed over, and maintained during the lifecycle of a facility to optimize the return on the investment in a 3D Model
Facility project	Project to develop a facility or considerably modify the facility
Field weld	Weld made at a location other than a shop or the place of initial construction
Formal model review	A review of the 3D model between Contractor and Principal at the milestone of 30%, 60% or 90% progress as applicable and in accordance with the contract
Generic geometry	The representation with the minimum level of detail that allows the identification of the objects and critical interfaces.
Incremental numeric identification	Method through which unique identifiers are created for objects based on incrementing a number used for the unique identifier each time a new object is added.
ISO metric units	Derived from a system of measurement that is a decimal system based on the International System of Units.
Layout	One or more of the following deliverables: site master plan, plot plans and mechanical general arrangement drawings
Material Take-Off	Refers to a list of materials with quantities and types that are required to build a designed structure or element
Mechanical General Arrangement Drawings	Overall spatial arrangement of equipment within the available unit boundaries
Non-tagged objects	Objects to which no tag is assigned following the naming convention in accordance with Project's Engineering Numbering System (ENS)
Plot plan	Overall spatial arrangement drawing of one or more units and related general facilities within a plot boundary, showing the arrangement of equipment within units
Project	A project is a set of tasks which must be completed in order to arrive at a deliverable. In the context of this standard Project is defined as the project for which this specification is used

© 2024 FL3DMS

	Description
Shop weld	Weld made in the workshop before delivery to the construction site
Site	Plot of land with defined boundaries
Soft volumes	Volumes in the 3D Model representing reserved areas such as personnel access, escape- and equipment maintenance requirements. During normal operation, soft volumes will be free of obstructions
Sub- Contractor	A legal entity delivering part of the facility to Contractor. The related scope may include 3D model scope or a complete 3D model
Tag	A unique functional identifier in the facility, which is a keyword, number or label that is assigned for identification and reference purposes
Tagged object	Object to which a tag is assigned following the naming convention in accordance with Project's Engineering Numbering System (ENS)
Uitgebreid Samenwerkingsverband ProcesIndustrie-Nederland	USPI-NL is a non-profit association. The mission of USPI is to enable companies in the process industry to share or exchange electronically the information needed to design, build, operate and maintain process and power plants using internationally accepted standards

© 2024 FL3DMS

4 3D Model Configuration

4.1 Configuration

4.1.1 Plant Grid System and Datum Point

a. [FSP001-0001-01] The overall plant grid lines/system(s) developed by Contractor and approved by Company during project execution shall be defined in the 3D Model.

b. [FSP001-0002-01] The 3D Model shall use a local coordinate system, which has been agreed upon with Company.

c. [FSP001-0003-02] Each 3D datum point shall be related to the real-world coordinate system.

d. [FSP001-0004-02] The Contractor shall document each 3D datum point.

e. [FSP001-0005-01] The axes convention for the positive direction shall be East, North, and up.

f. [FSP001-0006-01] The coordinates in the 3D Model shall be consistent with the datum coordinates shown on the facility's plot plan.

4.1.2 Language Characters

[FSP001-0007-01] Characters used in the 3D Model shall be in accordance with the governing procedure and language agreed upon for the Project.

4.2 Naming Conventions

4.2.1 Tagged Objects

[FSP001-0008-01] All tagged objects shall follow the naming convention in accordance with Project's Engineering Numbering System (ENS).

4.2.2 Non-Tagged Objects

a. [FSP001-0009-02] For non-tagged objects, Contractor shall submit a naming convention for agreement with Company.

b. [FSP001-0010-02] For non-tagged items, the naming convention shall be applied consistently throughout the Model.

c. [FSP001-0011-02] Each non-tagged item shall be assigned a unique identifier.

d. [FSP001-0013-02] The unique identifier for non-tagged items shall not be based on a method using incremental numeric identification.

4.2.3 Discipline Code

[FSP001-0014-01] Discipline codes used by Contractor in the 3D Model shall be in conformance with CFIHOS RDL unless otherwise instructed by Company.

4.2.4 Plant Breakdown Structure and Area Coding

a. [FSP001-0015-02] Contractor shall base the Plant Breakdown Structure on CFIHOS unless instructed otherwise by Company.

b. [FSP001-0016-01] Area codes in the 3D Model shall be in accordance with Project's ENS.

© 2024 FL3DMS

4.3 Hierarchy

a. [FSP001-0017-02] Contractor shall define and execute a 3D model hierarchy such that there is clear alignment with the plant breakdown structure defined in section 4.2.4.

b. [FSP001-0018-02] The 3D model hierarchy shall be representative of the physical plant.

c. [FSP001-0019-02] Users shall be able to find objects and groups of objects based on the 3D model hierarchy.

d. [FSP001-0020-02] Users shall be able to identify the objects within specific volumes.

4.4 Tagged Objects

a. [FSP001-0021-01] All tagged objects shall hold a position, geometry, and orientation according to section 4.1.1.

b. [FSP001-0022-01] Object datum points for tagged objects in the 3D Model shall be located such that they provide correct dimensional measures when shown on a general arrangement drawing or equipment layout drawing.

c. [FSP001-0023-01] For tagged objects that are modelled from vendor documentation (e.g., catalogues that do not contain datum positions), the location of the datum coordinates shall be according to the Contractor's guideline that covers standard shapes.

d. [FSP001-0024-02] For tagged objects that are not modelled from vendor documentation, the datum coordinates shall be a fixed point on the object or the centre of the object.

e. [FSP001-0025-01] Tagged mobile equipment without a fixed position, but located onboard/inside the facility asset battery limits, shall be placed in the storage position in the 3D Model.

4.5 Requirements for Soft Volumes

4.5.1 Introduction

[FSP001-0027-01] The requirements in section 4.5 use soft volumes to represent areas in the facility that will be empty during normal operation.

4.5.2 General Requirements

[FSP001-0028-02] Soft volumes shall be made visible by turning the related level of detail within the 3D Model software on and off.

4.5.3 Escape and Access Routes

Escape routes shall be represented in the 3D Model as soft volumes with at least two equipment primitive boxes as follows:

a. [FSP001-0029-01] An opaque footprint box with height 20 mm above the top of the deck or finished floor level

b. [FSP001-0030-01] A headroom box with 50% transparency above the footprint box with the escape route's actual height

c. [FSP001-0031-01] The footprint box and headroom box are of the same width.

4.5.4 Maintenance and Access Volumes

a. [FSP001-0085-01] Elements representing maintenance and access volumes shall be identified as soft volumes with a 50% transparency.

© 2024 FL3DMS

b. These maintenance and access volumes reserve space for:
    1. [FSP001-0032-02] Personnel access to operate/maintain equipment
    2. [FSP001-0033-02] Removal/extraction volumes
    3. [FSP001-0034-02] Equipment laydown areas.

4.5.5 Fire Water Nozzle Coverage Elements

[FSP001-0035-02] The volume and area covered by a fire water nozzle shall be indicated as soft volumes that are represented in the 3D Model as cone and pyramid graphical elements.

4.5.6 Coverage and Line of Sight

[FSP001-0036-01] Soft volumes representing the coverage shall be included where equipment functionality requires line of sight.

Note: Examples of soft volumes covering line of sight include CCTV cameras, fire and gas detectors, and nodes in a Wi-Fi network.

4.5.7 Crane Radius

[FSP001-0037-01] Design elements used to represent the radius of movement of a crane in the facility shall be included as soft volumes.

4.5.8 Moveable and Material Handling Equipment

a. [FSP001-0038-01] Soft volumes covering the complete range of moveable and material handling equipment shall be included.
b. [FSP001-0039-02] If moveable equipment already exists in the as-built 3D Model, all updates shall be based upon existing coordinates.

4.6 Temporary Objects

a. [FSP001-0040-01] Temporary objects, e.g., representing studies during design or temporary construction objects, shall be identifiable.
b. [FSP001-0041-01] It shall be possible to switch temporary objects on and off during model review.

© 2024 FL3DMS

5 3D Model Content

5.1 3D Model Content Requirement Matrix

[FSP001-0042-02] A matrix for 3D Model content is provided as a separate deliverable of FL3DMS. Company shall instruct which content requirements shown in the matrix shall be fulfilled within the 3D Model.

Note: The list of content requirements is comprehensive but is not fully exhaustive. It contains a detailed and an aggregated level of requirements. It is the responsibility of Company to identify the 3D model content required for its project. The scope of model content should be based on the requirements for construction of the project and future use of the 3D model for the lifecycle of the facility.

The matrix for 3D Model content addressed in this section is available in the spreadsheet file FL3DMS Facility 3D Model Content Requirement Matrix Rev 1_2.xlsx that is part of the FL3DMS deliverables.

For further details of the ‘Exact/Generic Geometry’ and ‘As-built Tolerance’, refer to Sections 5.3 and 5.4.

5.2 3D Model - General Requirements

The following general requirements shall apply:

a. [FSP001-0043-01] The complete scope of work represented by one consolidated 3D model.

b. [FSP001-0045-01] A native 3D model mapped to catalogues and specifications.

c. [FSP001-0046-01] The 3D Model is updated to as-built status as defined in 6.4 a2.

5.3 Object Representation in the 3D Model

a. [FSP001-0047-01] All objects shall be represented as geometric objects either with an exact geometry or a generic geometry (see section 3.2) for the type of object in the 3D model content-related requirement matrix in section 5.1.

b. [FSP001-0048-01] The dimension of an object modelled with a generic geometry shall represent the maximum dimension of that object to allow for clash checking.

c. [FSP001-0049-01] Equipment elements including more than one tag number shall be modelled as separate objects.

d. [FSP001-0050-01] All objects shall be visible by default in the graphical environment.

5.4 As-built Tolerance

[FSP001-0051-01] The as-built tolerance, as defined in the 3D model content requirement matrix in section 5.1, is indicative to the accuracy of the 3D model content in relation to the physical as-built position. If values are exceeded, the 3D model shall be updated unless instructed otherwise by Company.

NOTE: Brownfield modifications shall utilise scan technology to support the 3D model and identify the current physical status of the plant.

© 2024 FL3DMS

5.5 Supplier Packages/Vendor Engineering

a. [FSP001-0052-01] Objects that represent packaged equipment and skids in the 3D Model shall be modelled with the same level of fidelity as is applied outside of packaged equipment and skid boundaries.

b. [FSP001-0053-01] In the final handover model, all tagged and non-tagged objects shall be included in the 3D Model as objects with generic or exact geometry indicating "as-built" location as defined in the 3D model content requirement matrix in section 5.1.

c. [FSP001-0054-01] All interface points shall be aligned with the interface points from the remainder of the 3D Model.

5.6 Laser and Photogrammetry Survey Data

a. [FSP001-0055-01] Where a laser and photogrammetry survey has been conducted, the deliverables generated shall be converted by the Contractor into the point cloud format compatible with the applicable 3D model software agreed to be used for the Project by Company and Contractor.

b. [FSP001-0056-01] The point cloud's coordinate system and orientation shall be in accordance with the 3D Model coordinate system unless instructed otherwise by Company.

c. [FSP001-0057-01] The point cloud and photogrammetry data shall be in layers which can be turned on and off.

5.7 Model Attributes

a. [FSP001-0058-01] Company Attributes shall be set on all objects as instructed by Company.

b. [FSP001-0059-02] The Attributes in Table 5-1 shall be set when a new object is created.

Table 5-1: Model Attributes

Nr.	Attribute Name	Description
1	Project code	Project identifier
2	Project name	Project name
3	Site name	Site name
4	Site code	Site code
5	Plant name	Plant name
6	Plant code	Plant code
7	Tag name	Object tag name
8	Process unit code	Process Unit (System) code
9	Area code	Area code
10	Discipline code	Discipline code
11	Tag status	Object (Tag) status
12	Safety critical item indicator	Safety critical item indicator
13	Operating weight	Operational Weight
14	Dry weight	Dry weight
15	Centre of gravity x	The X-axis of the centre of gravity
16	Centre of gravity y	The Y-axis of the centre of gravity
17	Centre of gravity z	The Z-axis of the centre of gravity
18	Commissioning unit code	Commissioning unit code
19	Construction assembly code	Construction work pack
20	Construction work area	Construction work area
For Piping, HVAC, Supports:		
21	Piping/HVAC line number	Piping/HVAC line number

© 2024 FL3DMS

22	Piping and instrumentation diagram document number	Piping and Instrument Diagram drawing number – P&ID
23	Ducting and instrument diagram document number	Ducting and Instrument Diagram drawing number – D&ID
For Structures, Pipe Supports, and Cable Ladders/Trays:		
24	Company drawing document number	Primary Company drawing number
For post-start-up (brownfield) modifications		
25	Management of Change number	Management of Change number

c. [FSP001-0060-01] Referential integrity for attributed data shall be maintained throughout the information management system in which the 3D Model is used or developed.

   Note: As an example, the value of attributes shall be referenced from the corresponding tag or drawing number in the central tag and document database(s).

d. [FSP001-0061-01] For post-start-up (brownfield) modifications, all changes in the Model shall reference the number associated with the approved change according to the Management of Change (MoC) procedure.

© 2024 FL3DMS

6 3D Model Deliverables & Handover

6.1 Reports Generated from the 3D Model

a. [FSP001-0062-01] All reports that are generated from the 3D Model shall not require any manual editing.

b. [FSP001-0087-01] All reports that are generated from the 3D model shall be kept consistent with the 3D model.

Note: Such reports can be but are not limited to:

a. Modelled Object Status
b. Material Take-Off (MTO)
c. Clash statistics
d. Weight and Centre of Gravity
e. Battery Limit/Module Interfaces
f. Model quality verification reports

6.2 Drawings Generated from the 3D Model

a. [FSP001-0063-01] For all drawings that are generated from the 3D Model, enhancements of content and additional annotation shall not compromise the single source of truth of the 3D Model.

b. [FSP001-0088-01] All drawings that are generated from the 3D model shall be kept consistent with the 3D model.

Note: Such drawings can be but are not limited to:

a. Plot plan
b. Discipline area layouts
c. Piping and system isometrics
d. Cable tray/ladder drawings (layouts or isometrics)
e. HVAC ducting drawings (layouts/isometrics)
f. Pipe support details
g. Inspection isometrics.

6.3 Clash Status

a. [FSP001-0064-01] The final handed-over 3D model shall be clash-free.

b. [FSP001-0065-01] Contractor shall include clash management detail in its 3D modelling work procedure as part of the Contractor’s overall project implementation plan.

c. The clash management detail shall:

1. [FSP001-0066-01] Contain the methodology for identifying, allocating, and resolving clashes to deliver a clash-free design.
2. [FSP001-0067-01] State when the clash system is employed, the frequency of clash checks, and statistics to be reported to Company.

© 2024 FL3DMS

6.4 Handover: Format

On completion of all modelling, at the end of detailed design and construction phases of the Project,

a. Contractor shall handover to Company a 3D model:
    1. [FSP001-0068-01] Containing all 3D model databases/files and supporting reference data (e.g., piping/valve specifications, catalogues, and external references).
    2. [FSP001-0069-01] Updated to as-built status with all field modifications and changes in accordance with as-built content, object representation, and as-built tolerance requirements stated in this document, including the 3D model content-related requirement matrix referred to in section 5.1.
    3. [FSP001-0070-01] Such that the Model will open, function, and be editable with full intelligence on the same standard software and release the 3D Model was developed on without further development by Company.
    4. [FSP001-0071-01] With all required detailed specifications (e.g., on the operating system, database, and software versions).
    5. [FSP001-0072-01] With required instructions to restore the 3D Model within the Companies' environment (setup based on the specifications mentioned in 6.4 a4) for continued maintenance and support of the 3D Model.
    6. [FSP001-0073-01] With additional specifications to incorporate the 3D Model into a different environment (using backup and restore procedures).
    Note: These specifications need to be agreed as part of the project-specific hand-over requirements between Contractor and Company.
    7. [FSP001-0074-01] With the content and all required elements as specified in section 5.
    8. [FSP001-0075-02] With content and related data quality validation checks performed and resolved.
    9. [FSP001-0076-01] Without any database discrepancies.

b. [FSP001-0078-01] The final 3D Model for handover shall not contain temporary objects that are not used for plant operation and maintenance.

6.4.1 Handover report

a. [FSP001-0079-02] A final handover report shall be provided to the Company.

b. [FSP001-0086-01] The final handover report shall include all of the following:

1. Final state of the model content;
2. Model configuration;
3. Restoring instructions;
4. Administrator username and password.

6.4.2 Drawing(s) of the Plant Including the Plant Breakdown Structure

[FSP001-0080-02] The following drawings of the plant shall be provided to the Company:

1. Plant Breakdown Structure;
2. Illustrations of the geographical area;
3. Sub-area codes in plan and elevation, including coordinates and gridlines.

Note: Actual detail required will be outlined by Company.

© 2024 FL3DMS

6.4.3 Area and Sub-area Coordinates

[FSP001-0081-01] Area and sub-area coordinates shall be handed over in spreadsheet format containing the area's edges, boundaries, and borders.

6.4.4 3D Vendor Package Models

a. [FSP001-0082-02] Any vendor package 3D Models that were created using detailed Mechanical CAD applications shall be handed over to Company as separate models.

b. [FSP001-0083-02] Vendor package 3D Models shall be handed over either in the native format or in a neutral file format agreed upon with Company.

6.4.5 Laser and Photogrammetry Survey Data

[FSP001-0084-01] Any point cloud/laser scan file generated during the Project shall be handed over to Company during handover according to Company procedure.

© 2024 FL3DMS