FL3DMS
LEVERAGING YOUR 3D MODEL

FL3DMS

Facility Lifecycle 3D Model Standard

Foundation for the digital twin

Agenda

- Objectives & ways of working
- What's new in FL3DMS
- What's in FL3DMS
- What are we working on now
- Call for action

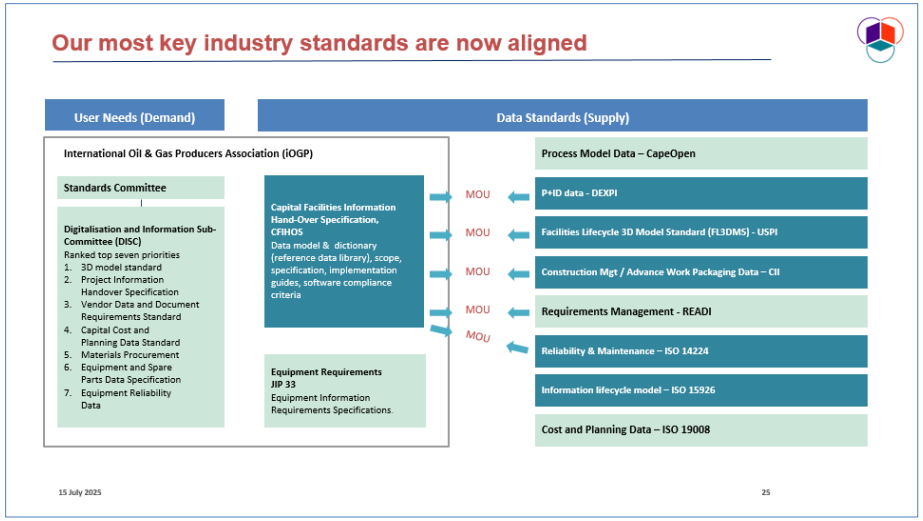
Objectives and Ways of Working

FL3DMS Objectives

- To create a **practical specification** for 3D models to be used by Owner Operators in the contracts with EPCs, to optimize the return on the investment in a 3D model
- Capture **current best practice** of owner-operators to optimize the value of the 3D model throughout the execution of a capital project and subsequently in the operate phase
- Enable the creation of a "**digital twin**", allowing real time data to be projected upon the 3D model
- The specification will initially be software neutral and **applicable to proprietary 3D modelling systems**, but may evolve into a neutral format over time

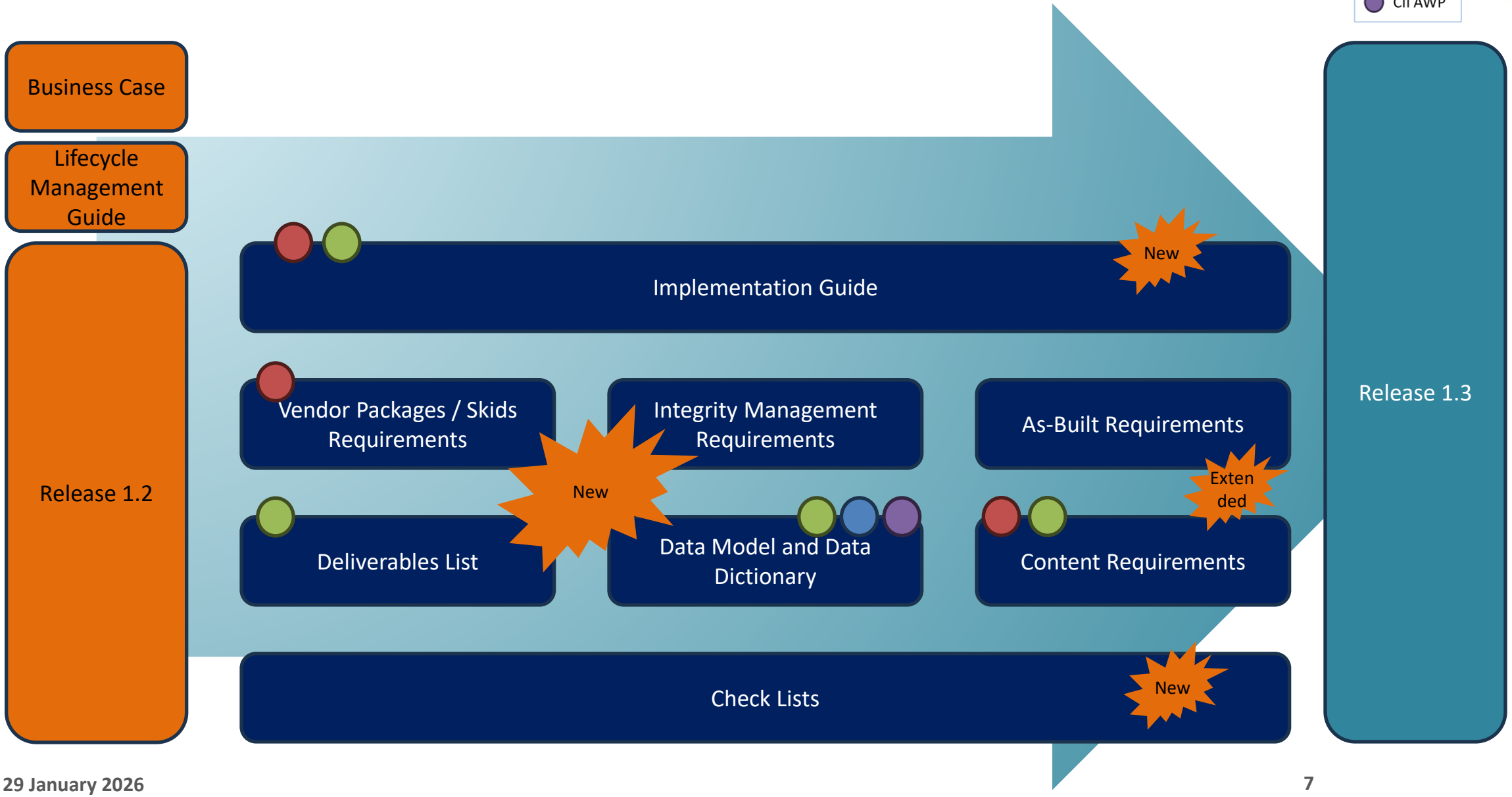
FL3DMS Working method

- **Bi-Weekly team teleconference** of 60-90 minutes to update on progress and align content
- **Off-line work** on content by work groups and individual contributors, ad hoc as required
- **Annual Face to Face meeting** for 2-3 days
- **Participants**
  - Owner Operators: Yara, bp, ExxonMobil, Shell, TotalEnergies
  - EPCs / Contractors: McDermott, Baker Hughes, Technip Energies, Bechtel, Aker Solutions, Wood, Fluor
  - Software Providers: AVEVA, Bentley, Hexagon, DMS, Gizil, Twintech
  - Service Provides: Revisionz, Mitosis Digital Technologies, xclerate
  - MoU Partners: IOGP-CFIHOS (JIP-36), DEXPI, NORSOK
- **MOU Partners**
  - NORSOK
  - CFIHOS
  - DEXPI
  - CII



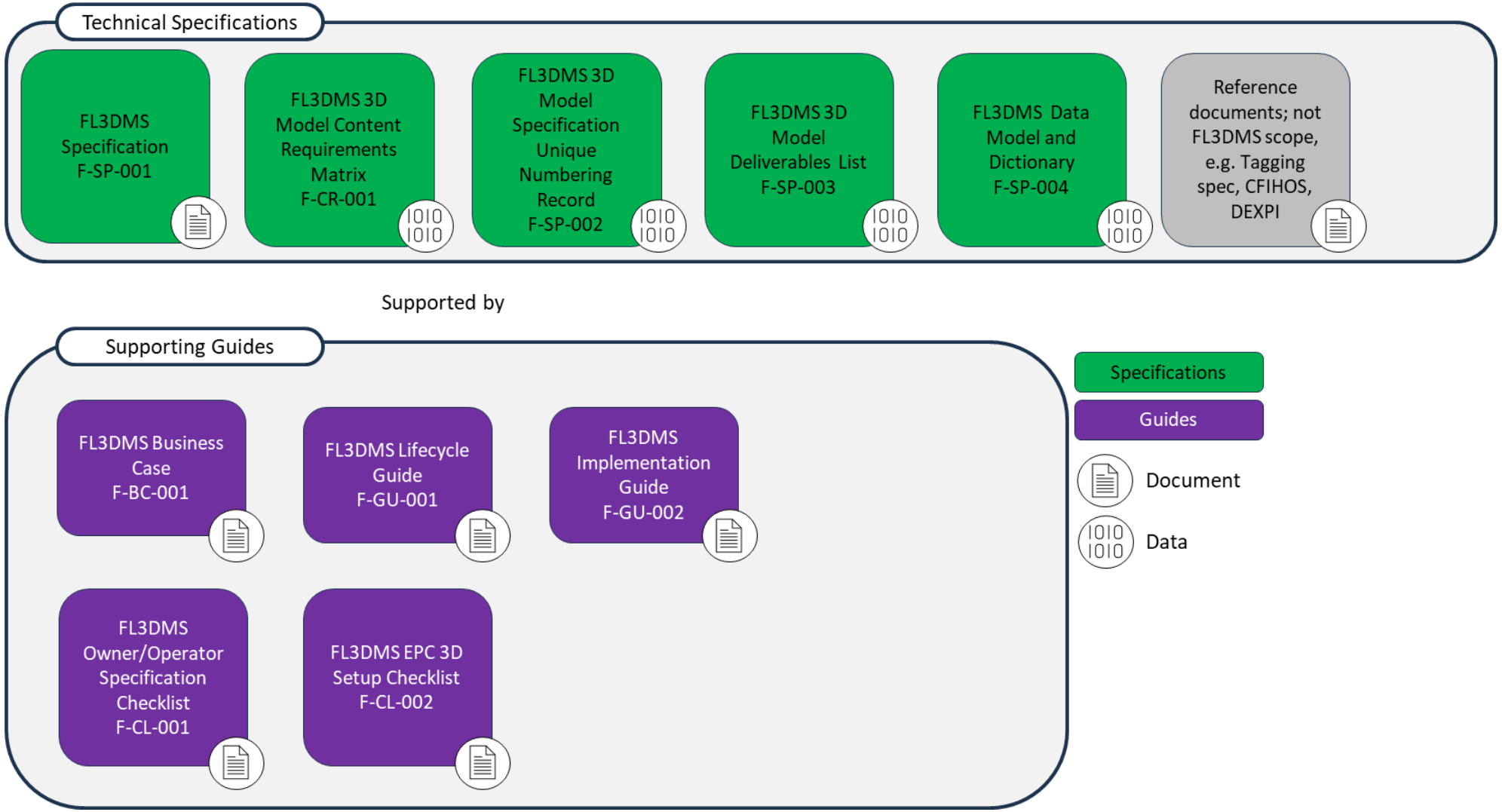
What’s new in FL3DMS

FL3DMS Release 1.3 is a major update



What’s in FL3DMS

FL3DMS Documentation



3D Model Standardisation Business Case

Background

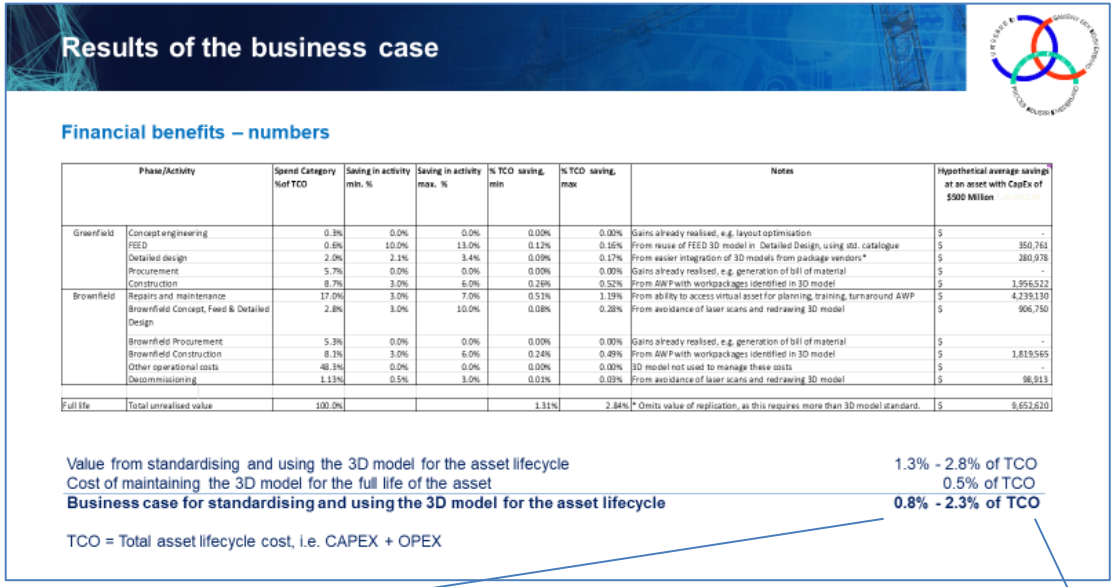
After the transition from project phase to operating of a facility, the native 3D model/data is rarely maintained and often not used to its full potential.

Project delivery benefits

- Makes life easier – faster integration of packages, replication
- Makes delivery more cost effective (reduced rework, better resource planning)
- Enables advanced work packaging

Operations benefits

- Enables remote working - reduces HSSE exposure, costs and time for repairs (unplanned downtime)
- Reduces rework – avoids laser scans, accelerates Brownfield projects
- Facilitates maintenance and integrity management – turnarounds, corrosion isometrics, cathodic protection
- Higher employee satisfaction – training time reduced, consistency, modern workforce demands digital solutions
- Foundation for digital twin integration of supporting IT systems incl. remote monitoring systems
- Economy of scale benefits from standardisation



Results of the business case

Financial benefits – numbers

Phase/Activity		Spend Category %of TCO	Saving in activity min. %	Saving in activity max. %	% TCO saving, min	% TCO saving, max	Notes	Hypothetical average savings at an asset with CapEx of $500 Million
Greenfield	Concept engineering	0.3%	0.0%	0.0%	0.00%	0.00%	Gains already realised, e.g. layout optimisation	$ -
	FEED	0.6%	10.0%	13.0%	0.12%	0.16%	From reuse of FEED 3D model in Detailed Design, using std. catalogue	$ 350,761
	Detailed design	2.0%	2.1%	3.4%	0.09%	0.17%	From easier integration of 3D models from package vendors*	$ 280,978
	Procurement	5.7%	0.0%	0.0%	0.00%	0.00%	Gains already realised, e.g. generation of bill of material	$ -
	Construction	8.7%	3.0%	6.0%	0.26%	0.52%	From AWP with workpackages identified in 3D model	$ 1,956,522
Brownfield	Repairs and maintenance	17.0%	3.0%	7.0%	0.51%	1.19%	From ability to access virtual asset for planning, training, turnaround AWP	$ 4,239,130
	Brownfield Concept, Feed & Detailed Design	2.8%	3.0%	10.0%	0.08%	0.28%	From avoidance of laser scans and redrawing 3D model	$ 906,750
	Brownfield Procurement	5.3%	0.0%	0.0%	0.00%	0.00%	Gains already realised, e.g. generation of bill of material	$ -
	Brownfield Construction	8.1%	3.0%	6.0%	0.24%	0.49%	From AWP with workpackages identified in 3D model	$ 1,819,565
	Other operational costs	48.3%	0.0%	0.0%	0.00%	0.00%	3D model not used to manage these costs	$ -
	Decommissioning	1.13%	0.5%	3.0%	0.01%	0.03%	From avoidance of laser scans and redrawing 3D model	$ 98,913
Full life	Total unrealised value	100.0%			1.31%	2.84%	* Omits value of replication, as this requires more than 3D model standard.	$ 9,652,620

Value from standardising and using the 3D model for the asset lifecycle	1.3% - 2.8% of TCO
Cost of maintaining the 3D model for the full life of the asset	0.5% of TCO
Business case for standardising and using the 3D model for the asset lifecycle	**0.8% - 2.3% of TCO**

TCO = Total asset lifecycle cost, i.e. CAPEX + OPEX

Business case

0.8-2.3% of Total Cost of Ownership (OPEX & CAPEX)
is typically lost on a project and asset portfolio by

- not using 3D Model during operations and
- not standardising 3D model development

Specification Document

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8.2 Drawings Generated from the 3D Model 30
8.3 Clash Status 30
8.4 Handover: Format 30

- The Specification Document is the core document of FL3DMS
- These 5 sections contain 190 requirements that can be included in contracts
- Requirements follow IOGP Requirements Writing Guidelines
- All requirements have a unique reference number

Unique Numbering Record

Nr.	Unique Numbe	Section	List i	Sub-list	Requirement	Revision Number	Added in Release	Last Changed in Release	Status (Active / Discarded)	Discarded in Release	Change Request Ic	Change Description	Source (Author) of Change or Addition
1	FSP001-0089-01	4	a		The 3D modelling application to be used by the Contractor shall be a multi-discipline design tool that meets the requirements of this specification, including interference checking, drawing and report creation, material procurement details and quantities.	1	1.3	1.3	A			Added as part of Roadmap implementation	Workstream Specification
2	FSP001-0090-01	4	b		Contractor shall provide details of the application and version of software to be used for the project prior to start of work.	1	1.3	1.3	A			Added as part of Roadmap implementation	Workstream Specification
3	FSP001-0091-01	4	c		Contractor shall provide details of the 3D model database naming convention to be applied to the project prior to start of work.	1	1.3	1.3	A			Added as part of Roadmap implementation	Workstream Specification
4	FSP001-0092-01	4	d		Contractor shall provide details of the supporting reference data to be used on the project, e.g. catalogues and specifications for piping, steel, cable tray, etc.	1	1.3	1.3	A			Added as part of Roadmap implementation	Workstream Specification
5	FSP001-0093-01	4	e		Contractor shall provide details of any workshare and division of work.	1	1.3	1.3	A			Added as part of Roadmap implementation	Workstream Specification
6	FSP001-0193-01	4	f		Contractor shall provide details of the units of measure used for NPD and dimensions.	1	1.3	1.3	A			Review amendment	
7	FSP001-0001-01	5.1.1	a		The overall plant grid lines/system(s) developed by Contractor and approved by Company during project execution shall be defined in the 3D Model.	1	1.0	1.1	A				

- All the requirements are also available in this file
- The file can be used to populate requirements management systems
- The file also contains Discarded requirements from previous versions
- The file allows for tracking of changes of requirements

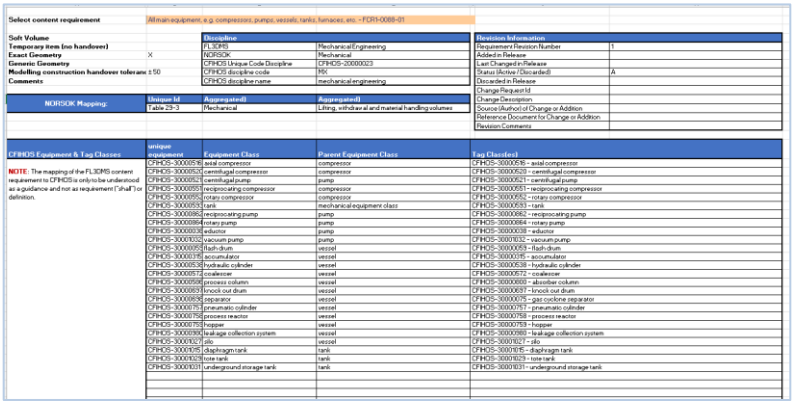
Model Content Requirements

- The MCR identifies the FL3DMS 3D Model content requirements, including object representation and CFIHOS Equipment Class mapping
- Tracking of changes over the various FL3DMS releases is provided

FL3DMS Content Matrix			Object Representation			CFIHOS Mapping to equipment classes NOTE: The mapping of the FL3DMS content requirement to CFIHOS is only to be understood as a guidance and not as requirement ("shall") or definition.	Further indications		Release information									
FL3DMS Content Matrix ID	Discipline	Content Requirement	Exact Geometry	Generic Geometry	Modelling construction handover tolerance (mm)	CFIHOS Equipment Class Mapping (Unique code – Equipment Class / Parent Equipment Class Unique code – Class name)	Soft Volume	Temporary item (no handover)	Requirement Revision Number	Added in Release	Last Changed in Release	Status (Active / Discarded)	Discarded in Release	Change Request Id	Change Description	Source (Author) of Change or Addition	Reference Document for Change or Addition	Revision Comments
FCR1-0001-01	Architectural Engineering	Architectural stairs and lift/elevator cases		X	±50	CFIHOS-30000598 – elevator / CFIHOS-30000583 – lifting device CFIHOS-30000937 – staircase / CFIHOS-30000097 – infrastructure			1			A						
FCR1-0002-01	Architectural Engineering	Architectural walls, ceilings, floors incl. blast & fire walls, ceilings & floors		X	±50	No CFIHOS Equipment Class Mapping			1			A						
FCR1-0003-01	Architectural Engineering	External and internal doors and windows		X	±50	CFIHOS-30000301 – door / CFIHOS-30000230 – other mechanical equipment CFIHOS-30000935 – window / CFIHOS-30000097 – infrastructure			1			A						
FCR1-0004-01	Architectural Engineering	Fire doors		X	±50	CFIHOS-30000050 – fire door / CFIHOS-30000230 – other mechanical equipment			1			A						
FCR1-0005-01	Architectural Engineering	Furniture		x	±200	No CFIHOS Equipment Class Mapping			1			A						
FCR1-0007-01	Architectural Engineering	Potable water supply and sanitary sewer lines		X	±50	CFIHOS-30000973 – foul water drainage / CFIHOS-30000097 – infrastructure			1			A						

- There is also a mapping provided from the FL3DMS content requirements to the **NORSOK Z-020** content requirements and vice versa:

- Single Content Requirement View is provided to view all available data on a single requirement
- A view with Deactivated Requirements is also provided



Deliverables List

	A	B	C	D	E	F	G
1			Manual Input				
2			FL3DM Deliverables List				FL3DMS Content Requirements Reference
3	FL3DMS Requiremer	Deliverable	Description	FEED	EXECUTE	Safety Critical Indicator	Model Requirements
4	FSP3-0001-01	Pipe Support Layout Diagram	Plan view of an area showing exact location of pipe supports, labelled with the project tag name and elevation.		X	No	Pipe Supports
5	FSP3-0002-01	Pipe Support Bill of Quantities	List of supports with type and location (E,N,U co-ordinates) details		X	No	Pipe Supports
6	FSP3-0003-01	Primary Steel General Arrangement	Plan/elevation view of an area showing the main features and locations of primary steel structures. Usually has some dimensions to convey spatial relationships but is generally inadequate for construction. Primary steel is designed to carry the main vertical and horizontal loads of the entire structure.	X	X	No	Primary steel for equipment support structures, stair towers, flares, pipe racks, major pipe supports
7	FSP3-0004-01	Secondary Steel General Arrangement	Plan/elevation view of an area showing the main features and locations of secondary steel structures. Usually has some dimensions to convey spatial relationships but is generally inadequate for construction. Secondary steel is used for smaller, functional components and attachment and transfers its loads to these primary elements. It provides stability, access, and support for ancillary components.	X	X	No	Secondary steel for equipment support structures, stair towers, flares, pipe racks, major pipe supports
			Plan/elevation view of an area showing the main features and locations				Tertiary steel for equipment support

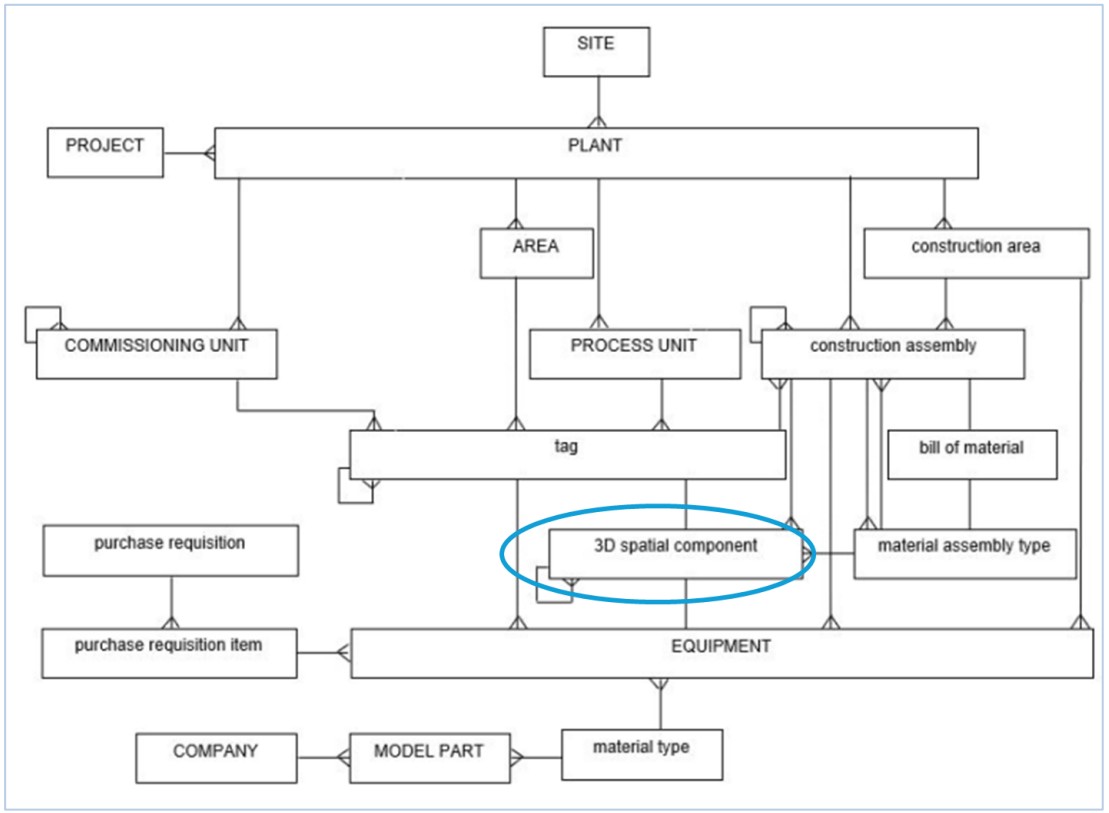
- The deliverables are all linked to CFIHOS disciplines and document types
- All items are uniquely numbered to allow for correct referencing as well as management of change tracking

- The Deliverables List specifies all the potential deliverables generate from the 3D Model
- The Owner/Operator need to make the selection (is linked to one of the requirements in the Specification)
- Applicability for the phase of the project is provided as well what kind of content is required to be in the model

	Lookup Values		Manual Input	Lookup values						
	CFIHOS Mapping									
discipline CFIHOS unique code	discipline code	discipline name	document type CFIHOS unique code	document type short code	document type name	discipline document type CFIHOS unique code	discipline document type short code	Revision Number	Added in Release	Last Changed in Release
CFIHOS-20000020	MP	piping engineering	CFIHOS-70000277	4033	layout diagram	CFIHOS-20001011	MP4033	1	1.3	
CFIHOS-20000020	MP	piping engineering	CFIHOS-70000029	3309	bill of quantities	CFIHOS-20001575	MP3309	1	1.3	
CFIHOS-20000006	CS	structural engineering	CFIHOS-70000153	4018	general arrangement diagram	CFIHOS-20000643	CS4018	1	1.3	
CFIHOS-20000006	CS	structural engineering	CFIHOS-70000153	4018	general arrangement diagram	CFIHOS-20000643	CS4018	1	1.3	
CFIHOS-20000006	CS	structural engineering	CFIHOS-70000153	4018	general arrangement diagram	CFIHOS-20000643	CS4018	1	1.3	

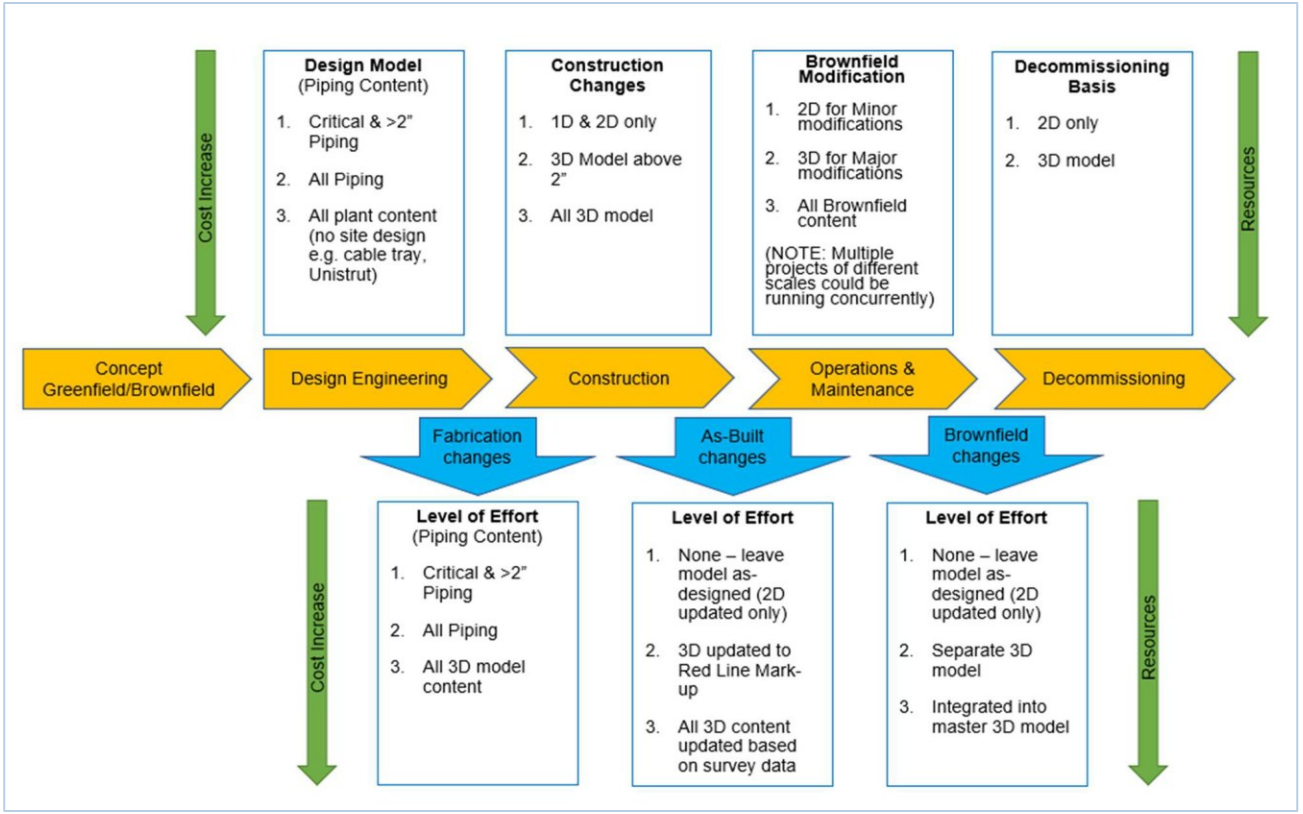
Data Model and Dictionary

- This deliverable provides key information for 3D Tool Admins to configure their application
- The data model has been aligned with the **CFIHOS and CII AWP data models**
- Added: **3D spatial component** as extra table
- The data dictionary defines the properties for this table, reflecting the relationships and typical 3D properties
  - Linked to CFIHOS Unique IDs
- Properties are based on key deliverables from the **Deliverables List**. Mapping between properties and deliverables are provided
- Every item has a unique FL3DMS ID and version control is included



Lifecycle Management Guide

- FL3DMS aims to cover the whole lifecycle of (process) facilities
- The Lifecycle Mgt Guide objective is to enable owners of 3D models to manage and use their 3D models for the full facility lifecycle, thereby optimizing the business value generated from the 3D model
- Topics covered:
  - Intent of 3D Models
  - Lifecycle Strategy
    - Lifecycle Options
    - Development Options
    - Construction Options
    - Lifecycle Usage
  - Governance & Ownership
  - 3D Model Environment (Modelling Application and Multi-Contractor Development
  - Cost Implications
  - Elements of a 3D Model Standard



Implementation Guide

- Focus on Owner/Operator and EPCs as both can act as a Contract Principal
- Guiding topics covered:
  - Ambitions and Strategy
  - Contract Requirements
  - Maturing the model during the facility's lifecycle
- Informatives on the requirements in the Specification (Section 5)
  - Same order as in the Specification
- Informative on the Data Model and the Data Dictionary

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6.4 FL3DMS Data Dictionary ... 39

Checklists

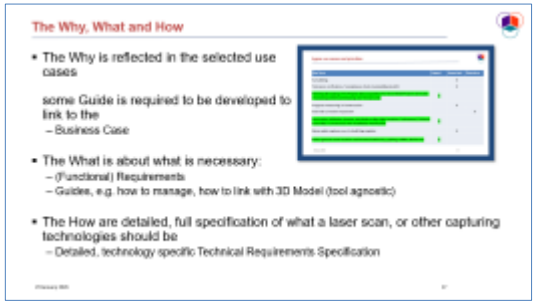
- The checklists' purpose aims to support the QA/QC around the development of the 3D Model
- 2 checklists are provided in Release 1.3
  - Owner/Operator 3D Model Specification Checklist
  - EPC 3D Model Setup Checklist
- The objectives for the checklists are to help:
  - the Owner/Operator to verify during contract specification all the necessary requirements are included in the contract
  - the EPC to verify that the 3D Model setup covers all the necessary elements to support the lifecycle management
- Both Checklists provide room for adding company specific verifications (following the envelope model as explained in the Implementation Guide)
- The Owner/Operator 3D Model Specification Checklist provides cross references to the Specification document

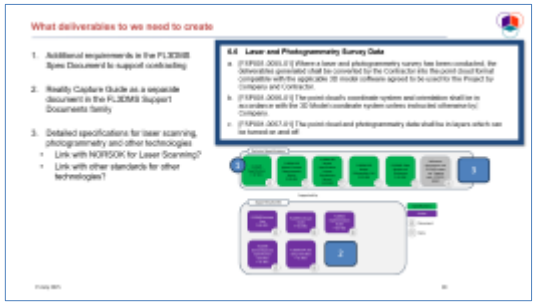
What are we working on now

4 Core Activities to build the next FL3DMS Release

Reality Capture

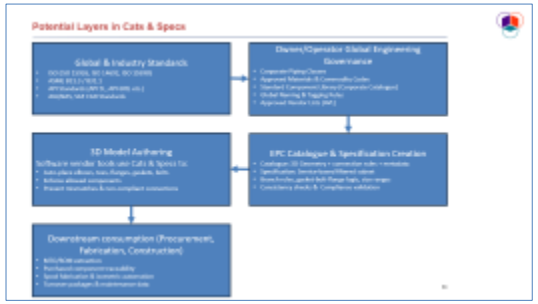
- Use Case Driven
- Based on provided priorities by Owner/Operators
- Provide Guidelines for implementation
- Define industry specification for reality capture requirements





Catalogues & Specifications

- Terminology definition and scoping
- Contractual Requirements, e.g. for handover, using Owner/Operator's catalogue items
- Guiding principals for O/O's and EPC's



Change Requests

- 21 Change Requests as a result of Release 1.3 reviews
- Alignment of terminology with DEXPI, CFIHOS and USPI Tagging & Coding Project

Roadmap Development

- Seek input from industry
- Update the current items on the roadmap
- Prioritize and agree way forward by FL3DMS members

FL3DMS Release 1.4 - 2026 Plan On A Page

Deliverable	Lead	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Reality Capture - Specifications - Guides	RZ/ HB	Develop the requirements for the selected uses cases				Full team	Create release candidate			2nd set of uses cases: development of requirements and guides			
Cats & Specs - TOR - Specifications - Guides	??/ HB		Review TOR; collect input		Develop the requirements			Full team	Create release candidate				
Change Requests - Prioritization - Work in General Meetings & FTF	HB				Update th documentation		Full team	Create release candidate					
Mapping Content Requirement Matrix and Deliverables List (CR-20/21)	??				Update th documentation		CFIHOS & Team	Create release candidate					
Release 1.4 - Release notes - Updated presentation pack - Final package	HB								Based on drafts		Full team	Create release candidate	
Marketing - Snippets - Testimonials - Conferences, present where possible	EG												

20-22, DEXPI, GE

21-23, FL3DMS F2F, McDermott, NL

Legend: Create draft, Review draft, Draft, Implement comments, Final

Call for Action

What can you do?

- ❑ Become FL3DMS member (as a company)
  - Check out the website: www.fl3dms.com to find more information on membership
  - Send email to: stichting@uspi.nl

- ❑ Start using the FL3DMS standard for developing your 3D Model requirements on projects
  - Check out the website: www.fl3dms.com to find the Release 1.3 package
  - Share FL3DMS information within your organization, customer-base and through conferences

- ❑ Follow FL3DMS on LinkedIn to learn about updates
  - See LinkedIn

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