Change toolkit for digital building permit

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Contents

1. Executive Summary

Deliverable **D4.9 – Software Documentation and Workshops**, reports the activities carried out in Task 4.7 of the CHEK project, supporting the dissemination of the digital tools developed under WP2, WP3 and WP4. Originally D4.9 was intended to document only software from WP4. However, it was further extended to software in WP2 and WP3 as the software outcome of those work packages is also related to the Digital Building Permit workflow and plays a key role setting up the information to be used during the checking process. The documentation effort covers both core platform features and complementary tools integrated into the CHEK ecosystem. The documentation is composed by software training videos, live and recorded workshops, including tool-specific webinars delivered by project partners. Live training workshops were conducted during the project about the state of the art of the tools (at the beginning of the project) as well as to showcase the new developments (towards the end). These sessions introduced the tools, demonstrated their use within the digital building permit workflow, and gathered feedback to inform future iterations and updates in the software development tasks.

These tools include: Digital Building Permit (DBP) platform and Open API, CYPEURBAN, IfcGref, BIM2GEO, VCMap CHEK Plugin, IFC Exporter, CityGML Checker, IFC Checker, GIS to BIM, Verify3D and IFC Digital signature. The objective of this task was to ensure that these tools are accessible and (re-)usable by municipalities, designers, and software developers within and outside the project.

Overall, D4.9 ensures that the technical innovations developed in WP2, WP3 and WP4 are supported by documentation and outreach activities, facilitating their adoption during pilot activities in WP6 and contributing to the long-term sustainability and replicability of CHEK outcomes.

1.1 Relation with other Tasks and WPs

The activities described in Deliverable D4.9 – 'Software Documentation and Workshops' are deeply interrelated with the development outputs of Work Packages 2, 3, and 4 of the CHEK project. The tools documented and presented through videos and workshops were not isolated deliverables, but rather the result of coordinated efforts across multiple WPs that contributed to the creation of a functional and interoperable ecosystem for digital building permits. This task has a direct relation with the outcomes of deliverables: D2.2 'CHEK IFC specification', D2.3. 'CHEK CityGML specification', D3.1. 'Geo to BIM tool/procedure', D3.2. 'IFC georeferencing tool', D3.3. 'BIM to Geo conversion tool and procedure to integrate the to-Geo-converted BIM into existing 3D city model', D.4.3 'CHEK process and data management platform', D4.4. 'Open API for CHEK platform and integration manual', D.4.5 'IFC Digital Signature', D4.6. 'Set of desktop-based and web-based tools for urbanism and accessibility based on BIM', D4.7. '3D City Model Viewer for pilot use cases' and D4.8. 'Set of tools to check the CHEK regulations based on 3D city model and set of functions to visualize regulations and CHEK results in a 3D city model environment'.

2. Software workshops and documentation

2.1 Preparation of workshops and documentation

To ensure consistency, accessibility, and high quality across all software documentation and training materials produced within Task 4.7, a shared set of templates**,** technical guidelines**,** and recording standards was developed and distributed to all contributing partners.

2.1.1 Standardization of Video Documentation

A dedicated CHEK video template was prepared in PowerPoint format to provide a common structure for all software video tutorials. This included standardized opening and closing slides with CHEK and EU branding, video metadata (title, tool name, sequence number), and recommended placeholders for additional references or next steps. Each video begins with an introduction to the tool's purpose and ends with key takeaways and future actions, ensuring a pedagogically coherent flow across different tools and topics.

Detailed technical instructions were provided in a project-wide guidance document to ensure consistency across all video materials. Each video was expected to last approximately 3 to 5 minutes, with flexibility allowed for more complex topics. All content was to be produced in English, in 1080p HD resolution, with a 16:9 aspect ratio and a frame rate of 30 frames per second to guarantee visual clarity. High-quality audio was essential, requiring the use of a clear microphone and consistent volume levels throughout the video. Additionally, presenters were advised to zoom in on critical areas of the interface during demonstrations to improve viewer comprehension and engagement.

These unified standards allowed partners to prepare training content tailored to their tools while maintaining a coherent visual and structural identity across the project's outputs.

2.1.2 User feedback mechanism

As part of the documentation and training activities under Task 4.7, a standardized feedback questionnaire was developed to collect user input on the software tools after viewing the associated training videos. The objective was to systematically capture stakeholder experiences, identify usability challenges, and support the iterative improvement of the tools developed in WP2, WP3, and WP4.

The questionnaire was made available online and was shared with stakeholders who engaged with the video tutorials. It includes questions designed to assess various aspects of the tools, such as ease of use, clarity of documentation, perceived usefulness, and suggestions for further enhancements. The responses were collected and analysed by the responsible partners and feedback into the relevant development tasks to inform technical refinements and prioritisation of improvements.

This feedback mechanism contributed to ensuring that tool development remained responsive to user needs and that the training materials effectively supported tool adoption and usability across the CHEK pilot sites in WP6.

The questionnaire included both **quantitative** and **qualitative** questions, focusing on: Ease of use and installation of the tool, clarity and usefulness of the video documentation, perceived value and applicability of the tool in real-world workflows, suggestions for improvement or additional features.

Responses collected across all partners involved indicate a generally positive reception of both the tools and the training materials:

- 88% of respondents rated the videos as clear or very clear in explaining tool functionality.
- 85% found the tools useful or highly useful for their professional tasks (e.g., validation, design, or data conversion).
- Common suggestions included adding more step-by-step examples, improving subtitle availability, and offering guidance on integration between tools.
- Several respondents requested longer tutorials or follow-up sessions for more complex tools such as Verifi3D or the GIS-BIM converters.
- Some users within the municipalities noted challenges with initial setup or installation, which led to minor improvements in user guides and onboarding instructions.

The feedback collected through this mechanism was shared with the relevant partners and integrated into subsequent development cycles under WP2, WP3, and WP4, contributing directly to iterative tool refinement and improved usability for pilot deployments under WP6.

2.1.3 Workshop Planning and Execution

In parallel with the production of the video content, a series of live workshops were planned to facilitate direct interaction with consortium partners (municipalities, designers, developers). Workshops were coordinated with WP6 to ensure alignment with ongoing tool testing and evaluation. Each session followed a similar structure: Introduction of the tool and use case, live or recorded demonstration, interactive Q&A. Workshops were recorded when possible to support reuse and ensure accessibility for stakeholders unable to attend live. These sessions were integrated into the overall dissemination strategy and supported the onboarding of pilot users.

3. Documentation

All the documentation presented below is available in CHEK YouTube Channel Change toolkit for digital building permit - YouTube. and organized by playlist.

3.1 DBP Platform – BIMserver.center

Tool	DBP Platform	Partner	CYPE	Link tool	https://bimserver.center/en
nº	Name of the Video	Short description			YouTube video
1	CHEK - BIMserver.center 01 – Features overview	This video introduces the main features of BIMserver.center, a collaborative platform developed by CYPE for managing BIM-based projects. It presents its key capabilities, including model visualization, contribution management, team coordination, integrated messaging. The video outlines how users can organize projects, upload contributions in various formats (e.g., IFC, GLTF, PDF), and interact with 3D models in an intuitive environment. BIMserver.center supports interoperability through open standards and provides a structured workspace for multidisciplinary collaboration in the architecture, engineering, and construction sectors.			https://youtu.be/w6twaQtygaw
2	CHEK - BIMserver.center 02 - Overview of DBP Workflow	This video provides an overview of the Digital Building Permit (DBP) workflow as implemented on the BIMserver.center platform within the CHEK project. It outlines the sequential process followed by designers and municipal reviewers, including model preparation, validation using checking tools, and final submission through the platform. In addition to presenting the overall workflow logic.			https://youtu.be/wF8RjUirMH8
3	CHEK - BIMserver.center 03 - Corporate accounts	This video focuses on the Corporate accounts used by designers and project teams within the BIMserver.center platform to manage building projects as part of the Digital Building Permit (DBP) process. Corporate accounts allow			https://youtu.be/h0uyNGWVIOw

		organizations to structure their teams, assign roles, and control access to project data. The video demonstrates how users can create and manage projects, upload model contributions in various formats, and coordinate work through integrated tools such as messaging, issue tracking, and project history. Importantly, Corporate accounts can be connected to other tools in the CHEK workflow, including BIM and GIS viewers, checking tools (e.g., Verifi3D, CYPEURBAN), and the IFC digital signature module, supporting a fully integrated and traceable digital permitting process.	
4	CHEK - BIMserver.center 04 - Validation accounts	This video presents the Validation accounts developed within the CHEK project to support municipalities and regulatory bodies in reviewing and approving building permit applications. These accounts offer specialized functionality for managing submitted projects, assigning reviewers, and tracking the validation process through predefined workflow states (e.g., pending review, accepted, rejected). The video also highlights tools specific to regulatory review, such as access to project contributions, rule-based checking results, and the issue management system. Validation accounts are designed to work in conjunction with certified checking software and other CHEK-integrated tools, enabling efficient coordination between designers and public authorities within a structured, auditable review environment.	https://youtu.be/46M9uCIM07o

Other documentation links		
BIMserver.center Blog	Blog	Blog BIMserver.center - BIMserver.center Blog
BIMserver.center API REST	Documentation	EN - BIMserver.center API REST Documentation v1.0
BIMserver.center API REST	Swagger specification	SwaggerUI

3.2 CYPEURBAN

Tool	CYPEURBAN	Partner	CYPE	Link tool	CYPEURBAN - BIMserver.center Store
nº	Name of the Video	Short description			YouTube video
1	CHEK – CYPEURBAN 01 - Overview	This video introduces the main objectives and functionalities of CYPEURBAN. It presents how the software enables the evaluation of urban planning compliance directly on IFC models, covering key parameters such as plot dimensions, occupancy, buildability, and heights. It also situates CYPEURBAN within the broader DBP process as a regulatory checking tool.			https://youtu.be/N56xeo2I754
2	CHEK – CYPEURBAN 02 - Loading a project	This tutorial demonstrates the process of importing an IFC model into CYPEURBAN. It guides users through connecting to BIMserver.center, selecting a project, and loading the relevant model files. The video emphasizes the importance of preparing accurate models for regulatory checking and sets the stage for subsequent validation steps.			https://youtu.be/byRkIbzk0vk
3	CHEK – CYPEURBAN 03 - Regulations	This video explains how users can define and configure urban planning regulations within CYPEURBAN. It covers the input of rule parameters such as plot limits, height constraints, and setbacks. These settings form the regulatory basis for the automatic compliance checks performed by the tool.			https://youtu.be/7SB9wXDRmkQ
4	CHEK – CYPEURBAN 04 -	This tutorial focuses on how CYPEURBAN takes into account the			https://youtu.be/t_F2b6W1V4E

	Surrounding buildings	surrounding urban context when performing compliance analysis. It demonstrates how to include adjacent buildings or plot boundaries in the analysis to ensure checks are sensitive to spatial relationships such as distance to nearby constructions or property lines.	
5	CHEK – CYPEURBAN 05 - Checks	This video illustrates the execution of the automated compliance checks within the software. It shows how the tool analyses the loaded BIM model against the configured urban regulations, and how results are displayed through interactive visualizations and rule summaries. Users can identify which criteria have been met or violated.	https://youtu.be/-7rFAuoJ7Mo
6	CHEK – CYPEURBAN 06 - Exports	The final video demonstrates how to export the results of the compliance checks for further use. It presents options for generating output reports, sharing validated models, and submitting results to the DBP platform via integration with BIMserver.center. This step is essential for initiating the formal validation process by municipal authorities.	https://youtu.be/6ysBpCc1Hi0

Other documentation links		
CYPEURBAN product web	Web	CYPEURBAN
CYPEURBAN learning resources	Videos, manual, faq	CYPEURBAN - Learning | Cype

3.3 IFC Georeferencing

Tool	IFCGref	Partner	TUD	Link tool	-
nº	Name of the Video	Short description			YouTube video
1	CHEK – IFC Georeferencing 01 - Introduction	Introducing the main concepts of IFC georeferencing and how to bridge BIM and GIS data by enabling accurate georeferencing of IFC files using IfcGref.			https://youtu.be/wMaETpw_BnQ
2	CHEK – IFC Georeferencing 02 – Web Tool Workflow	This is a step-by-step walkthrough of how to georeference an IFC file using IfcGref tool via web interface, including uploading the file, choosing georeferencing method, entering optional additional geo data and downloading the georeferenced file.			https://youtu.be/c5vuBKKoEE0
3	CHEK – IFC Georeferencing 03 - Visualization	This video shows how to visualize a geo-referenced IFC file using the IfcGref web tool, checking geo-attributes, and displaying the model on OpenStreetMap, 3D, or Satellite views. It also explains how to adjust vertical rendering for accurate placement.			https://youtu.be/YT2FJR2q5Cw

Other documentation links		
IfcGref website	Web	https://ifcgref.bk.tudelft.nl/
User Guide	General User Manual	https://ifcgref.bk.tudelft.nl/templates/guid.html

3.4 BIM2GEO

Tool	BIM2GEO	Partner	TUD	Link tool	-
nº	Name of the Video	Short description			YouTube video
1	CHEK – BIM2GEO	The video covers how to acquire the tool and gives a brief overview of its functionality. This is followed by a step-by-step explanation of settings available in the GUI at the time of recording. The supplied information enables a non-programmer user to get a running start and process their own models.			https://youtu.be/3bJyBj61a-Y

3.5 VC Map CHEK plugin

Tool	VC Map CHEK plugin	Partner	VCS	Link tool	-
nº	Name of the Video	Short description			YouTube video
1	CHEK – VC Map CHEK plugin 01 – Introduction to VC Map	This video provides a brief introduction to main elements of the VC Map user interface. VC Map is a JavaScript framework and API for building dynamic and interactive map applications on the web. It can display 2D geospatial data, oblique imagery and massive 3D geospatial data making it easy for users to explore and interact with the data in an integrated and high-performance map application. The VC Map framework offers ready-to-use map tools and plugins that can be flexibly combined in a VC Map app to meet the needs and demands of end-users and the target audience. Further, VC Map provides a strong programming API for developers that makes it easy to build customised applications, to integrate VC Map apps into any web page and to extend its functionalities with own plugins.			https://youtu.be/viS5rJfFlz0
2	CHEK – VC Map CHEK plugin 02 – Prepare project	This video talks about the prerequisites for compliance checking: A machine-readable ruleset needs to be imported into the DBP project to provide a checklist applicable to the plot.			https://youtu.be/Ow6Xv-sZuiA
3	CHEK – VC Map CHEK plugin 03 – Connection to DBP platform	This video illustrates how to connect to the CHEK DBP platform from VC Map via the CHEK plugin to browse and interact with DBP projects and data from the VC Map interface.			https://youtu.be/2BH6ehzcVYc
4	CHEK – VC Map CHEK plugin 04 – Export city model data	The video demonstrates how to export a subset of the 3D City Model from VC Map to the CHEK DBP platform for the collection of urban information as a basis for the architectural design. For an integrated workflow, it can be queried by other software solutions from the DBP platform using the Open API of BIMserver.center.			https://youtu.be/OeSg9zxV14c
5	CHEK – VC Map CHEK plugin 05 –	The video shows how to run a conversion from BIM (IFC) files to a			https://youtu.be/fqBse--IjYs

	Visual Inspection of BIM model	visualization model from the VC Map interface that can be integrated into the geospatial context for visual inspection and manual assessment of a building design.	
6	CHEK – VC Map CHEK plugin 06 – Convert to semantic model	The video illustrates how to run the IFC envelope extractor, developed by TU Delft, from the VC Map interface and examine its results in the map. This converts BIM data in IFC format to a semantic geospatial model based on CityGML for integration and further analysis in the geospatial context.	https://youtu.be/BjLsHJVPR3Y
7	CHEK – VC Map CHEK plugin 07 – Compliance checking	The video demonstrates the geospatial compliance checking workflow in VC Map, based on CityGML and developed as a prototype for the CHEK project.	https://youtu.be/5XlCLynX0p4
8	CHEK – VC Map CHEK plugin 08 – Validation report	The video covers the step of sending a validation report to the municipalities via the CHEK plugin of VC Map once a project is ready to be handed in for review. This will trigger the DBP validation workflow of municipalities.	https://youtu.be/fQTLcKOkjhE
9	CHEK – VC Map CHEK plugin 09 – Project validation by municipalities	The video demonstrates the validation workflow of municipalities to review geospatial compliance checks from VC Map. This concludes the DBP workflow.	https://youtu.be/Jrl6LSVlvLw

3.6 IFC Exporter

Tool	**IFC Exporter**	**Partner**	**DIR**	**Link tool**	
nº	Name of the Video	Short description			YouTube video
1	CHEK - Revit IFC Exporter 01 - Installer	Video showing the process to install the Revit plugin.			https://youtu.be/Y2uvQeZN9PY
2	CHEK - Revit IFC Exporter 02 – Application use	Video showing the process using the Revit IFC exporter.			https://youtu.be/Dere_wnazRM
3	CHEK - Archicad IFC Exporter 01 - Installer	Video showing the process to install the Archicad plugin.			https://youtu.be/A6uAdqp6x7A

4	CHEK - Archicad IFC Exporter 02– Application use	Video showing the process using the Archicad IFC exporter.	https://youtu.be/s-ntLH97zEc

3.7 CityGML Checker

Tool	CityGML Checker	Partner	OGC	Link tool	
nº	Name of the Video	Short description			YouTube video
1	CHEK - CityGML Checker – CHEK Data Completeness Checking Service	Application to define and run model semantic validation of the data requirements e.g. have all the buildings at least a wall? Or do they have a proper Level Of Detail?. Custom data requirements can be defined as SHACL rules or composed from the available building blocks. The tool is provided as a docker container and as a hosted version. Execution is possible from the UI and though the standardised OGC API Processes.			https://youtu.be/RAd4Iiq0zlk
2	RDF and SPARQL	This is the recording of the 2 hours workshop 'Using RDF and SPARQL for data integrity checking'. It shows how to use the CityGML uplift tool converts the CityJSON/GML model into the semantic representation in RDF. This representation of the city model with the proposed canonical model allows to write GeoSPARQL queries on the data. Such queries templates can be also used in the validator profiles definition			https://youtu.be/sersQAKKZIs

Other documentation links		
Validation rules as building blocks reference	Web resource/github	https://ogcincubator.github.io/chek-profiles-bblocks/bblock
Hosted demonstrator of the validator	Web browser/docker	https://defs-dev.opengis.net/chek-validator/#rule-generator

3.8 IFC Checker

Tool	IFC Checker	Partner	RDF	Link tool	
nº	Name of the Video	Short description			YouTube video
1	CHEK - IFC Checker	The CHEK IFC checker allows validation of any IFC (or more generic STEP) file against the EXPRESS schema, following ISO 10303-11 EXPRESS language. The IDS checker allows an IFC file to be validated against any available IDS 1.0 file. The Property Set Definition (PSD) checker allows validation for an IFC file against containing correct predefined PSet property sets as defined as part of the IFC standard.			https://youtu.be/YuDz8t69m5w

Other documentation links		
Viewer Application	Windows 32/64 bit	https://rdf.bg/ifcenginedll/ifcviewer.zip
Solution and Source Code	Visual Studio 2019/2022	https://rdf.bg/ifcenginedll/ifcviewerpackage.zip

3.9 GIS to BIM

Tool	GIS to BIM	Partner	RDF	Link tool	
nº	Name of the Video	Short description			YouTube video
1	CHEK - GIS to BIM	This solution converts any GML, CityGML or CityJSON file towards an CHEK IFC file (i.e. IFC4 ADD2 TC1). All geometry is converted, reused geometry exported as mapped items, classifications if available in CityGML / CityJSON kept and mapped towards the classification in IFC. All properties are converted; however, a user-definable mapping table allows users to map certain CityGML semantics to certain IFC properties, allowing conformation to IDS. Also colours are kept, however this can be overruled by the user that can apply default colours or override colours for each individual classification entity recognized.			https://youtu.be/-B-QUi_QF7M

Other documentation links		
Converter on GitHub	GitHub source code / solution	https://github.com/peterrdf/gml2ifc
Fixed version (well tested)	Solution and executables	https://rdf.bg/download/CityGML2IFC-20250414.zip
Online version	Limited Web Assembly based version	https://rdf.bg/CHEK/gml2ifc.html

3.10 Verifi3D

Tool	Verifi3D	Partner	XNP	Link tool	
nº	Name of the Video	Short description			YouTube video
1	CHEK – Verifi3D 01 – Getting an account	How request a trial account and set up credentials using the invitation mail.			https://youtu.be/MERTCQiqBMk
2	CHEK – Verifi3D 02 – Loading a project	How to connect to a project on a third-party platform, demonstrated on BIMserver.center			https://youtu.be/qycdqomyCiw
3	CHEK – Verifi3D 03 – Predifined rule	How to add and run a predefined Verifi3D Rule Set			https://youtu.be/brIo4z9KE3Q
4	CHEK – Verifi3D 04 – Import rules	How to import a predefined Verifi3D Rule set using a file in .json format			https://youtu.be/z6KYAI7IVTM

Other documentation links		
CHEK - Verifi3D - 05 Prague_Building Regulations UPDATE (v0.3).json	Verifi3D Rule Set for Prague Building Regulations	https://chekdbp.eu/wp-content/uploads/2025/06/CHEK-Verifi3D-05-Prague_Building-Regulations-UPDATE-v0.3.json
CHEK - Verifi3D - 06 Ascoli_Piceno Regulations (v0.1)	Verifi3D Rule Set for the regulations in Ascoli	https://chekdbp.eu/wp-content/uploads/2025/06/CHEK-Verifi3D-06-Ascoli_Piceno-Regulations-v0.1.json

3.11 IFC Digital Signature

Tool	IFC Digital Signature	Partner	DiRoots	Link tool	
nº	Name of the Video	Short description			YouTube video
1	CHEK – IFC Digital Signature 01 – Accounts creation	Required steps to create user accounts before signing a file			https://youtu.be/oFoijJV6Nj0
2	CHEK – IFC Digital Signature 02 – Sign IFC file	Digitally sign the IFC file and review the signature data.			https://youtu.be/nacqDauexRQ
3	CHEK – IFC Digital Signature 03 – Integration with BIMserver.center	Upload the IFC file with the signed data associated to BIMserver.Center			https://youtu.be/9VAJGlgqKmE

4. Conclusions

Through the activities carried out in Task 4.7, a wide range of documentation and training resources were developed to ensure the usability and accessibility of the CHEK ecosystem for municipalities, designers and interested users. These resources included structured video tutorials, live and recorded workshops, and tool-specific webinars, all designed to facilitate the integration of the tools into real-world workflows.

A key achievement of this deliverable was the development and implementation of standardized documentation formats. The materials were designed to be visually coherent and pedagogically sound, which significantly improved the learning experience for users across the consortium and pilot sites.

To ensure responsiveness to stakeholder needs, a user feedback mechanism was embedded into the documentation process. Feedback collected through a standardized questionnaire indicated a high level of user satisfaction, with most of participants finding the tools useful and the training materials clear and effective.

The organization and execution of live workshops further enhanced engagement with target audiences. These sessions provided valuable opportunities for users to interact directly with tool developers, ask questions, and observe practical demonstrations of the tools in action.

Importantly, the deliverable underscored the interconnectedness of Work Packages 2, 3, and 4, from which the tools originated. By presenting these tools in a coherent, user-friendly manner, D4.9 facilitated a seamless integration of the various components of the CHEK digital permitting workflow. This integration supports not only the technical functionality of the system but also its broader objectives of regulatory compliance, transparency, and efficiency.

5. References

5.1 List of used abbreviations

API	-	Application Programming Interface
BIM	-	Building Information Modelling
D	-	Deliverable
DBP	-	Digital Building Permit
EU	-	European Union
GIS	-	Geographic Information System
T	-	Task
WP	-	Work Package