

Facade Leasing Demonstrator Project
2.7.3.FLD D4. Final Dissemination Activities Report

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Facade Leasing Demonstrator Project

2.7.3.FLD D4. Final Dissemination Activities Report

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Facade Leasing Demonstrator Project Final Dissemination Activities Report

Annex 2.7.3. FLD D4

December, 2019

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Project partners:

Co-funder:



Scientific partners:



Industry partners:



Scientific and professional dissemination of the Facade Leasing Demonstrator Project.

This technical report is an annex to the Facade Leasing Demonstrator Project 2019 performance report (2.7.3.FLD.D1). For general information on the Facade Leasing research project, its process, and objectives please refer to the aforementioned document.

The focus of the present report is the dissemination and expansion of knowledge related to the FLD project. This includes academic work such as scientific publications, conferences, and master graduate thesis; as well as professional knowledge-sharing and networking events addressing the knowledge triangle of academy, industry, and research.

The sensitive political and strategic nature of the CiTG building demonstrator case throughout the decision-making and execution period in 2018 and 2019 has prevented the external dissemination of specific information regarding the case-study. A draft plan has been set out, however, for a broader dissemination of the case as a large scale success story in early 2020, now that the project's construction has been successfully finalised.

2018



Word lid en maak zo onafhankelijk vastgoedonderzoek mogelijk

>> WORD LID

VOGON HEADLINES

Unilateral supply of shops leads to more shop vacancy ...



PROPTech

Façade Leasing: Drivers and barriers to the delivery of integrated Facades-as-a-Service

OCT. 18, 2018

NEWS

Real Estate Research Quarterly publishes online now

EVENTS

VOGON SYMPOSIUM 2018

LIVING

Self-building of homes increases social

OFFICES

Effects of multiple destination on

RETAIL

Unilateral supply of shops leads to more

LIVING

The offer-from-price method in a recovering housing market

1. Scientific conferences and publications |

The early findings of the Facade Leasing Demonstrator Project regarding systemic innovation and multi-disciplinary collaboration models for facade-as-a-service delivery were condensed in the scientific publication "Façade Leasing: Drivers and barriers to the delivery of integrated Facades-as-a-Service." (Azcarate-Aguerre, et al., 2018).

Presented in an initial format at the VIII International Congress on Architectural Envelopes, in San Sebastian, Spain, in June 2018, the paper was then expanded into a full journal article. The paper has been structured around four stakeholder perspectives: Supplier readiness, demand drive, financing, and governance, and analyses the current state of the Dutch facade value chain proposing necessary changes to facilitate the short-term implementation of Facade Leasing contracting models.

The original conference presentation and the more recent publication conclude with a description of drivers and barriers to the delivery of Facades-as-a-Service, from the perspective of the four key stakeholders/disciplines, and lays out the schematic "Facade Leasing" model which is further described in annex "4.2.6.FLD.D3 Business Delivery Report".

Having been presented at a conference targeting the international architecture, engineering, and facade manufacturing sector, the expanded version of the paper was instead targeted towards the Dutch real estate sector, therefore attempting to cover as many of the academic and professional stakeholders involved in the innovation as possible. In late 2018 the paper was published in the Real Estate Research Quarterly, the journal of the Dutch Association of Real Estate Researchers (VOGON in Dutch) (Annex 4.2.6.FLD.KPI.CKIC13).

The publication has also acted as reference for the preparation work that has been carried out in 2018 for the CiTG demonstrator project. It has provided scientific and professional visibility and validity to the topic, and helped to engage new actors and stakeholders interested in becoming part of the project.

The scientific paper "Façade Leasing: Drivers and barriers to the delivery of integrated Facades-as-a-Service." Featured on the homepage of the new website of the Dutch Association of Real Estate Researchers (VOGON in Dutch), in November 2018.

Azcarate-Aguerre, J. F., et al. (2018). "Façade Leasing: Drivers and barriers to the delivery of integrated Facades-as-a-Service." Real Estate Research Quarterly 17(3).

2. Master student graduation topics related to Facade Leasing

The Facade Leasing project plays a key role in the Circular Economy-related research carried out at TU Delft's Faculty of Architecture and the Built Environment, Departments of Architectural Engineering + Technology and Management in the Built Environment. A number of master students have completed or started projects related to the Facade Leasing Demonstrator Project in 2018. Below is a brief overview of these research projects and their completed or expected outputs:

Design for modularity and flexibility of facade components, by Aashish Ravindra Vipat. The thesis focused on the technical design of facade systems to facilitate their disassembly and reuse without the need for major reprocessing and/or recycling. Addressing the need for more flexible facade solutions which, for example, could accommodate a change in architectural programme of the target building from office to residential use, the aim of the research was to develop circular fabrication and installation techniques to allow for quick adaptation of facade systems in response to changes in building typology or technology.

Circular Facade Refurbishment, by Quirine Henry. Inspired by the 2nd Skin and Facade Leasing research projects, the thesis developed refurbishment solutions for improved facade performance by focusing on both the technical and biological cycles of the Circular Economy theory. The thesis also implemented a number of circularity evaluation methods which helped develop a better and more critical understanding of circular design and engineering through

a practical and technical approach.

An evaluation of vacant office transformations to housing in the Netherlands, and the suitability of leasing facades as a way to increase the technical quality and user comfort of such projects, by Finn Dahlke. A collaborative project between the Management and Architectural Engineering departments, the thesis centered on the problem of transforming office building into residential applications. This issue is highly relevant in the Dutch real estate sector, as office vacancy rates remain over 10% of the stock, and residential supply remains way below the required, leading to the need to develop a million new homes in the coming years. The thesis focused on whether, and under which circumstances, the facade leasing model could support such building transformation projects.

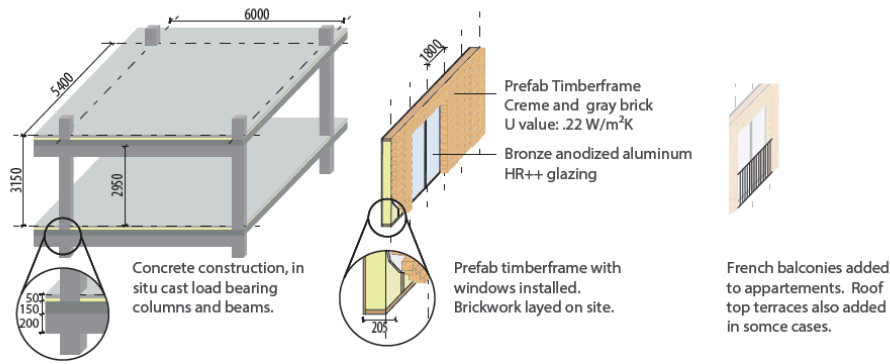
The Performance of Façade Components in a Circular Economy (ongoing honors programme research), by Tania Cortes Vargas. A brief report analyzing existing cases of facades designed for circularity.

Micro-grid integration of smart facade, (ongoing masters thesis) by Jiuhui Cai. This ongoing study looks at technological and managerial implications in the design of an automated and interactive system for the smart control and monitoring of facade-integrated components. Smart operation and reverse logistics of facade components through Internet of Things (IoT) technologies is deemed a crucial topic towards the development of effective circular solutions.

Extract from "An evaluation of vacant office transformations to housing in the Netherlands, and the suitability of leasing facades as a way to increase the technical quality and user comfort of such projects", a master graduation thesis by Finn Dahlke.

6.3 Design implementation

van Vollenhoven Kwartier current design

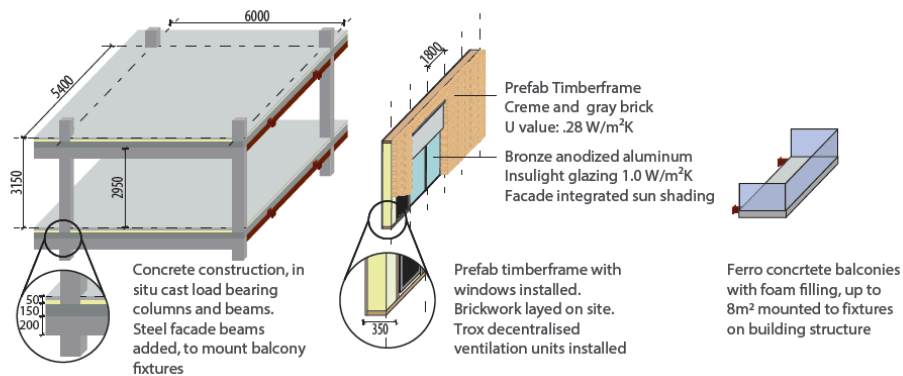


The main issues which become clear when looking at the *Van Vollenhoven Kwartier* is the lacking facade integration, and the unwillingness of the investors to pay for extra functionality.

The implementation of the proposed facade features which allows future owners and users of the building to upgrade the building skin based on their current demands. The features presented can lead to an increased

technical quality of the project, as facade integrated ventilation units can be installed post completion. Furthermore the addition of external sun shading decreases the heating load experienced by the users. Finally the replacement of the French balconies and inwards opening doors with outwards opening folding doors, and balconies, also increases the user comfort of the users. Based on these alterations, the apartments construction are likely more valuable to investors, and users.

van Vollenhoven Kwartier with upgradeable features



BauHow5 Event

Approaches to Circularity

11th June 2018, 9.00 - 17.00

TU Delft BK, Berlagezaal

An open dialogue between academy, industry, and governance towards a Circular Economy transition.

For info and registration visit: www.tudelft.nl/circularbuitenvoorbuit



BauHow5

CHALMERS
UNIVERSITY OF TECHNOLOGY



ETH zürich



The "Approaches to Circularity" event held at TU Delft in June 2018 brought together partners from the 5 universities members of the BauHow5 group - as well as speaker and attendants from industry, banking, and governance - to discuss approaches, drivers, and barriers to the Circular Economy transition.

As part of the knowledge creation and dissemination activities surrounding the FLD project the research team organized or participated in a number of "knowledge triangle" events between academy, industry, and research institutes. The events varied in scope and scale but aimed to broaden the target audience of the project to include potential partners in other geographic areas or fields of knowledge with whom further upscaling activities could be organized. A summary of the three main event held is provided below:

BauHow5: Approaches to Circularity, TU Delft, Netherlands | 11th June 2018.

The event, organized as an open symposium between the five largest faculties of architecture in Europe (TU Delft, Chalmers, ETH Zurich, TU Munich and UCL London), aimed to establish viable approaches in the transition towards a circular built environment. The list of attendants numbered approximately 110, with more than 10 speakers with diverse fields of expertise in architecture, construction, banking, governance, and business (Annex 4.2.6.FLD.KPI.CKIC4).

Circular Economy and Built Environment: A themed meeting involving UCL Estates and Academics, and TU Delft Estates and Academics. UCL, United Kingdom | 7th November 2018.

The event brought together professors from both universities' faculties of architecture, portfolio managers

3. Knowledge triangle events |

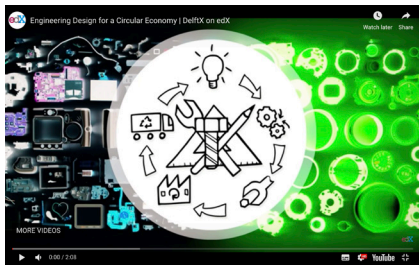
from their campus real estate groups, and professional experts from global consultancy groups such as Arup and AECOM. A follow-up to the BauHow5 event, this gathering aimed to define strategic and practical collaborations paths for both estate groups with the support and mediation of academic staff and external consultants. Both institutions share similar challenges such as the energy and circularity transitions, need for flexibility, and overall future-proofing of their real estate portfolios. By joining efforts between institutions and between professional property managers and academy experts new models can be explored and developed as examples of the positive influence public procurement can have on new economic and business models such as Facade Leasing.

Edinburgh Centre for Carbon Innovation (ECCI) visit. TU Delft, Netherlands | 11th December 2018.

The visit consisted of representatives from six large contractors involved in the Edinburgh £1.1 billion City Deal. The visitors were shown the Facade Leasing prototype at the EWI building (developed during an earlier pathfinder face of this project), and shown the plans and findings developed under the current project stage. The goal of the meeting was to exchange information regarding innovation and best practices tied to public procurement and service-based contracting models, which they can then implement in their upcoming projects.



4. Other dissemination activities



Cover image of the Massive Open Online Course (MOOC): *Engineering Design for a Circular Economy*. Freely accessible in most countries around the world at <https://www.edx.org/course/engineering-design-for-a-circular-economy>

Circular Economy and Built Environment: A themed meeting involving UCL Estates and Academics, and TU Delft Estates and Academics. UCL, United Kingdom, 7th November 2018.

Other dissemination activities related to the Facade Leasing project in 2018 have included:

Interview for the Massive Open Online Course: Engineering Design for a Circular Economy, on EdX.org. Developed by TU Delft's Faculty of Architecture and the Built Environment, together with Leiden-Delft-Erasmus Centre for Sustainability, TU Clausthal, and Swerea Research, and funded by a grant from EIT Raw Materials, this Massive Open Online Course explores the topic of design for Reuse, Repair, Remanufacture, and Recycle. It's currently on its second run on the EdX platform and has reached around 6.000 online learners around the world. An interview with the Facade Leasing research team is featured on the course, discussing the importance of business model innovation as a catalyst for Circular Economy-based design and engineering.

Presentation at the Ecobuild 2018 construction industry trade fair in London, UK, on the 6th of April 2018. Recently re-branded to Futurebuild, the event is one of the largest of its kind in the UK market. Facade Leasing was part of a conference panel on Building Performance, a discussion focusing on the energy and circularity transition with members of the audience representing academy, industry, and governance.

Disruptive Innovation Festival, organized by the Ellen MacArthur Foundation (<https://www.thinkdif.co/>). The online festival, organized by one of the leading organizations supporting the Circular Economy transition, brings together experts and audience from around the world over an 18-day open presentation and discussion programme. Facade Leasing was presented in the 2018 edition of the festival, during a panel on CE innovation, together with other projects from TU Delft's Circular Built Environment Hub.

EIT Climate-KIC EU-PUBREP Workshop: Retrofitting of public buildings in European perspectives. Budapest 28.11.2018. A workshop organized by EIT Climate-KIC and oriented towards public procurement representatives in the Eastern European region. Facade Leasing was presented during the event as an example of business and procurement model innovation particularly targeting early adopters in the public commissioning sector.

2019

5. Scientific conferences and publications

The CiTG prototype was successfully completed in December 2019 after a long planning, design, and engineering process taking almost one and a half year, followed by a six-month construction schedule. As a result of this timeline, objective scientific data related to this large-scale demonstrator prototype has only become available in recent months, and in some cases (such as the ongoing energy and indoor comfort performance monitoring) will only become available by late summer 2020. For this reason many of the scientific publication expected to be submitted for publication in 2019 could not be finalized. The structure of these articles, however, has been defined, and is summarised below:

1. The Technological dimension (Fig.1) – What is the role of emerging building technologies on the design, setup, and operation of a FaaS model? *Target journal: Journal of Industrial Ecology*

The chapter describes the technological readiness level of the façade industry to meet the increasing technical and logistical demands presented by full servitisation. The influence of emerging technologies on the provision of FaaS is described. A roadmap is proposed highlighting the relevance of new systems and processes to reach full performance-based contracting of service-integrating facades.

2. The Economic dimension (Fig. 2) – How can a PSS alternative to façade contracting be financially evaluated – against the traditional benchmark – and the investment justified? *Target journal: Journal of Construction Management and Economics*

The chapter proposes a methodology to calculate the financial attractiveness of a FaaS investment, from the perspective of the real estate operator (client). Existing methodologies for assessing investment value and Total Cost of Ownership are described and their inadequacy in the case of FaaS is discussed. A new integral approach to Total Value of Ownership estimation is proposed.

3. The Legal dimension (Fig. 3) – How do current building law standards hinder the implementation of performance contracting and other Circular Business Models? *Target journal: Building and Construction Law*

The chapter describes the main legal barriers to implementation of a FaaS model, according to the Dutch building law case and based on literature review and legal precedent. The impact of such barriers is described. Solutions are proposed based on lessons learnt during the CiTG case-study's contract negotiation process.

4. The Management dimension (Fig. 4) – How do traditional real estate development and management processes hinder the implementation of circular – or even energy efficient – solutions? *Target journal: International Journal of Strategic Property Management*

The chapter discusses the effect of project and property managers, and the traditional processes they are used to carrying out, on the implementation of FaaS models or other performance-based contracts. Literature and case-study references are used to describe the linear nature of the project procurement and building operation process. A new contract-integration approach to the management of Buildings-as-a-Service is described.

Key figures for each of the four specialised scientific papers scheduled for submittal in 2020. They summarise the findings from the CiTG large-scale demonstrator prototype according to the main identified scientific and practice fields relevant to the "Facades-as-a-Service" model implementation.

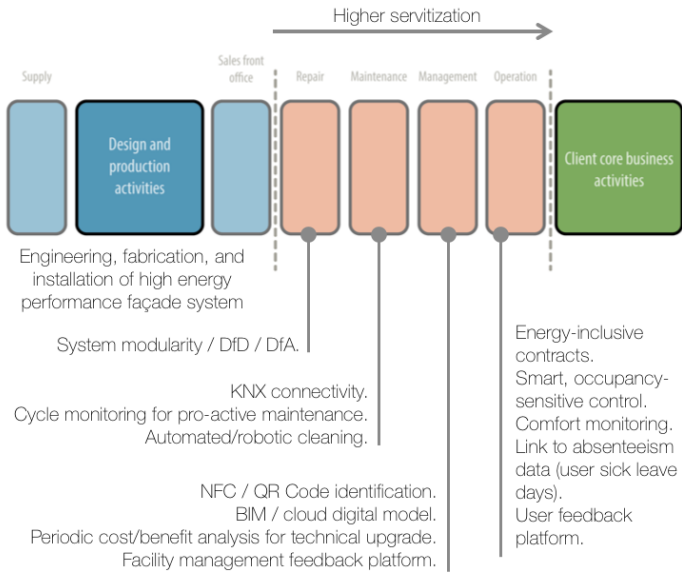


Fig 1. The Technological Dimension



Fig 2. The Economic Dimension

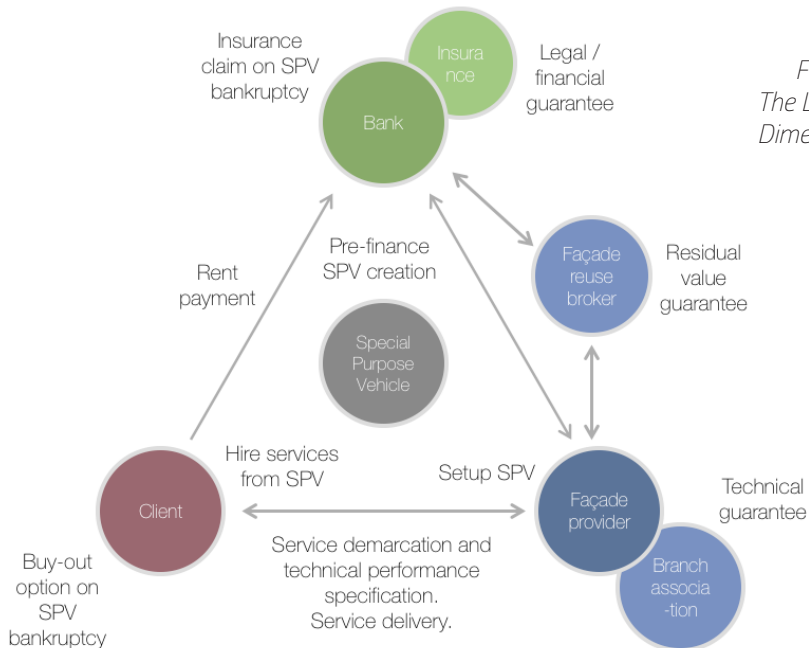


Fig 3. The Legal Dimension



Fig 4. The Managerial Dimension



Panel discussion during the event "Let's Go Circular", in Munich, Germany.



Discussion at the industry Circulaire Maakindustrie event in Nieuwegein, the Netherlands.



Presentation and workshop at the NRP Academie in Rotterdam, the Netherlands.

NRP Academie | 02.04.2019, Rotterdam, NL

The NRP Academie is a platform for the professional education of practitioners in the Dutch construction and real estate sectors. The platform's one-year part-time educational programme focuses on the renovation and transformation of existing buildings, as a sustainable alternative to new constructions. One module in the course was dedicated to presenting the Façade Leasing Demonstrator project as a case study of circular renovation strategies through the use of renewable components and long-term financing and business models.

KIINKO | 29.05.2019, Delft, NL

Similar to NRP Academie, Kiinko provides life-long, professional educational programmes to practitioners in the Finnish real estate sector. During a visit to TU Delft a group of learners and faculty members were presented with the Façade Leasing Demonstrator Project and provided feedback on its possible implementation in the Finnish context.

Circulaire maakindustrie (Circular Manufacturing Industry) | 10.12.2019, Nieuwegein, NL

The event was a chance to have the Façade Leasing project and the CiTG large-scale demonstrator prototype featured and discussed in the context of a broad manufacturing sector transition towards a Circular Economy. Project partner Alkondor Hengelo BV presented

their work on the CiTG case, followed by discussions and brainstorming on upscaling and adaptability to other sectors with event attendees.

Circularity in the Built Environment event. Let's Go Circular! | 09.10.2019, Munich, Germany

Let's Go Circular was an event organised by the Dutch consulate in Munich, and aiming to create foundational awareness on topics of Circularity in the Bavarian construction and manufacturing sectors. Façade Leasing was presented as an example of systemic innovation leading to new business opportunities, followed by a discussion with the audience.

ESCL Annual Conference 2019 Legal implications of climate change: the case for circularity | 24.10.2019, Delft, NL

The European Society of Construction Law is the umbrella organisation combining 18 regional construction law associations across the EU. Its members include practicing lawyers and legal firms, governance experts, and members of the European Construction Law academy. Façade Leasing was presented as a project aiming to tackle (and in most cases succeeding) the contradictions on the European legal framework which complicate or even block the implementation of circular solutions.

7. Other dissemination activities

CiTG large-scale demonstrator prototype video

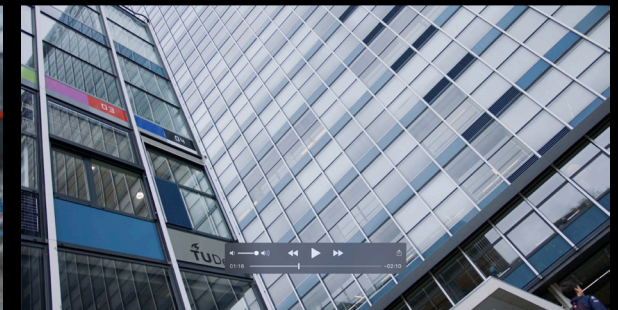
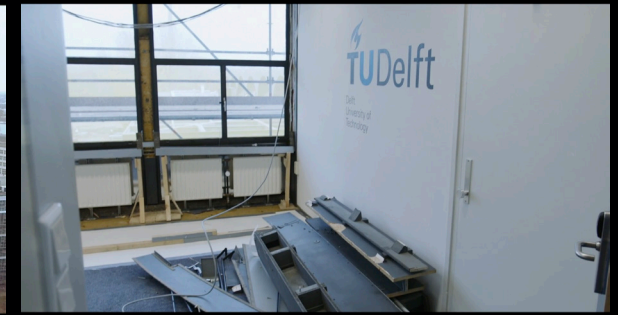
Commissioned by Circulaire Maakindustrie (Circular Manufacturing Industry) for their conference organised in December 2019, the video showcases the CiTG large-scale renovation prototype as an example of systemic innovation to enable the Circular Economy transition in the Dutch manufacturing sector.

The video includes shots of the installation process of the CiTG facade, and interviews with representatives from facade fabricator and Facades-as-a-Service provider Alkondor Hengelo BV, TU Delft Campus Real Estate and TU Delft Faculty of Architecture and the Built Environment, and EIT Climate-KIC.

The video will be used as a commercial and scientific dissemination tool, after arranging the necessary ownership and distribution rights, and is for now included as a confidential contribution to the success story and dissemination package resultant from the FLD Project.

A link to the full video can be found below:

<https://youtu.be/H3xafliC4fA>



Online Education

The Facade Leasing project is featured in two online education courses on Circular Economy, co-produced by TU Delft and publicly available on the EdX website (www.edx.org). The courses “Engineering Design for a Circular Economy” produced in 2018 but running also in 2019, and “Circular Economy for a Sustainable Built Environment”, produced and running in 2019, showcase the project as an example of cross-disciplinary innovation tackling the diverse barriers to the implementation of Circular Economy business models.

The screenshot shows the EdX website interface. At the top, there are navigation links for 'Courses', 'Programs & Degrees', 'Schools & Partners', and 'edX for Business'. A search bar and 'Sign In'/'Register' buttons are also visible. The main content area features the course title 'Circular Economy for a Sustainable Built Environment' with a brief description: 'Learn how the principles of the Circular Economy can be applied to the built environment ranging from products and buildings to metropolitan and regional development strategies.' Below this is the TU Delft logo and a green 'Enroll' button with the text 'Started Sep 25, 2019'. A checkbox option is present: 'I would like to receive email from DelftX and learn about other offerings related to Circular Economy for a Sustainable Built Environment.' At the bottom, a section titled 'About this course' shows a clock icon and the text 'Length: 6 Weeks'.

Technical reports

Three technical reports, part of the FLDP 2018-2019 reporting package, will be made publicly available via TU Delft’s PURE system, as a reference for scientific dissemination and practical replication. The reports focus on 1. Technical design, engineering, and execution process of the CiTG large-scale renovation prototype,

and the innovative technologies and processes tested (often for the first time in the industry) in this project; 2. Business and financial modeling for the “Facades-as-a-Service” circular contracting model. This includes legal and financial aspects of the innovation, and is meant to support replication in other sectors by describing the drivers and barriers to implementation, and the steps taken by the FLDP consortium to address them; 3. Dissemination report with general communication strategy and dissemination output of the project.

Professional articles and success stories

One success story is being prepared for submission to EIT, summarising the value proposition developed by the FLD Project, and the process followed in 2018 and 2019 to solve identified implementation barriers.

A journalistic article has been prepared for communication of the innovation to the general public, using accessible language and describing the benefits of the system in terms of Circular Economy potential, energy-savings and indoor comfort improvement. The article will be published in early 2020 as part of the Circular Economy week co-organized by TU Delft and many other Dutch organisations and companies.

A professional article has been published by member of legal office Houthoff, legal advisors to the FLD Project, in which they identify the legal barriers to implementation of “Facades-as-a-Service” and the legal mechanisms they have found to overcome these barriers.

Screenshots from the CiTG large-scale demonstrator prototype dissemination video.

Copyright: Circulaire Maakindustrie, 2019.

