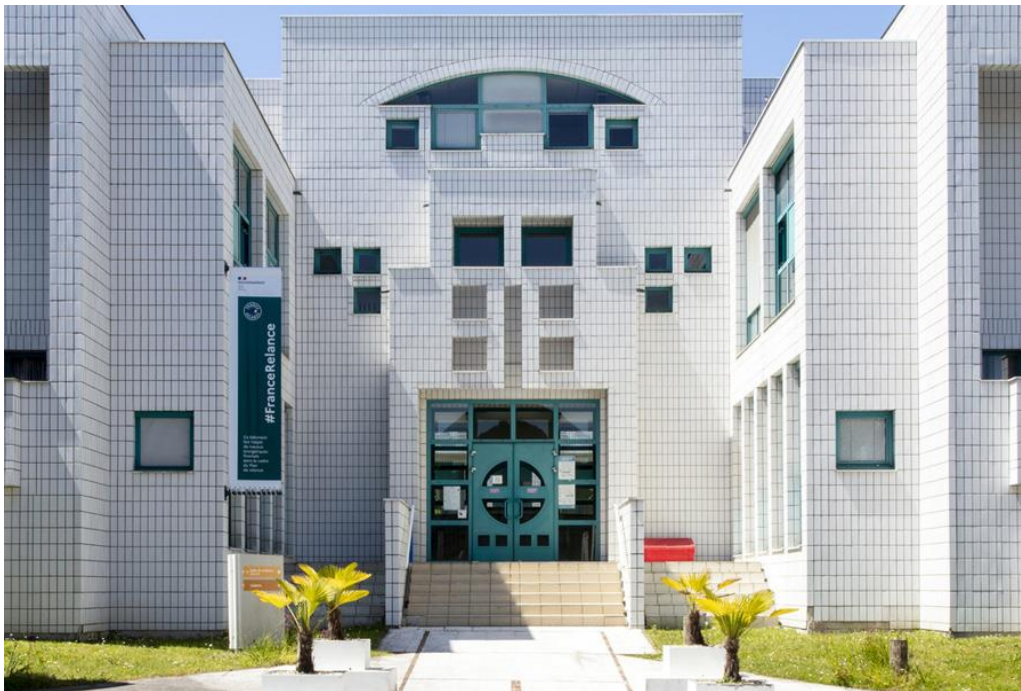


Secure same-site reuse via a methodology for evaluating technical performance

Refurbishment of a CSTB office building



Source: CSTB, <https://www.cstb.fr/fr/actualites/detail/grands-chantiers-renovation-energetique-sur-lessites-cstb-rapport-rse-2020-2021-09/>

The project: the purpose of the project is the refurbishment, densification and extension of B38 building on CSTB's site in Champs-sur-Marne. As the building's thermal performance observed during its operation was mediocre, the main objective of this renovation is to improve its performance and to comply with the regulation. As the project benefits from the French government's Recovery Plan, the building is scheduled for completion by the end of 2023. The execution schedule was not tight but the repair phases were.

The challenge: undertake an exemplary circular economy approach (same-site reuse) based on the development of a methodology for evaluating the technical performance of several categories of reclaimed materials identified after a reclamation audit.

Reclaimed materials: toilet bowls, metal water radiators, fine-gravel tiles, roofing gravel, decorative lights.

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The project

B38:

- **Construction year** : 1982/1984 - **Surface**: 4 247 m² - **Levels**: Ground floor + 3 floors with a partially buried ground floor
- **Use**: devoted to offices and laboratories.
- **Objectives of the refurbishment** : complying with building regulations (asbestos, fire, accessibility and PRM), increasing user capacity to 300 people via a change of the internal structure of the building (flex office). This change is based on the dismantling of non-load-bearing elements, the creation of open spaces, and a surface extension.

Integrating the search for material outlets into the general schedule of the operation

- **Pre-project phase**: defining reuse objectives and conducting the reclamation audit
- **PRO – DCE Phase** (tender consultation file): Organisation of reuse in the construction work contracts
- **ACT Phase** (Assistance for the publication of the call, opening and selection of the bids): evaluation and notification of the tenders and signature of the construction work contracts
- **Execution phase**: validation of the reclaimed materials and site visits

Phasing and batches concerned by re-use:

- **Phase 1**: implementation of the construction work contract concerning site cleaning, asbestos removal and deconstruction
- **Phase 2**: implementation of the construction work contracts concerning 6 batches (several construction companies were awarded)
 - Core and Shell batch: reuse of fine-gravel tiles and roofing gravel
 - Electricity batch: reuse of lights
 - Plumbing/HVAC batch: reuse of toilet bowls and metal water radiators

Chronology of the project

- July 2021 – The reclamation audit is carried out by the client assistant.
- 03/01/2022 – Service order for the site cleaning (phase 1) and energy renovation (phase 2) contracts.
- January to March 2022 – Site cleaning works in the building / Site visits by the client (CSTB) / A careful dismantling approach is proposed by the awarded deconstruction company to the client and the design team.
- April 2022 – Careful dismantling of the reclaimed materials which will be considered for same-site reuse.
- April and May 2022 – Storage of the reclaimed materials/ A final inventory is proposed by the deconstruction company.
- May 2022 – Beginning of the thermal renovation works (phase 2).
- 12/05/2022 – First reuse study meeting : the ambitions of the client, the characteristics of the reclaimed material, the final inventory, the reuse methodology, and the initial report of the technical controller are presented to the selected companies for the various batches. The importance of contacting the insurers is reminded.
- May 2022 to May 2023 – The technical performance of the reclaimed materials are examined by the awarded contractors.
- October 2022 to July 2023 – Installation of the reclaimed materials / Transmission of the nominative insurance certificates.
- September 2023 – Delivery of the building.

Carrying out the reclamation audit

The Environment and Circular Economy client assistant conducted a reclamation audit to meet the reuse objectives of the project:

- Initial objectives: the reuse of 3 or 4 significant materials present on site before site cleaning (materials from the original building are reused on site or in another building or are sent to a reclamation platform) and integration of 3 or 4 significant reclaimed materials coming from a different source.
- Among the reclaimed materials that were identified, six were the subject of "material sheets": laboratory equipment, aluminium joinery, metal radiators, toilet bowls, fine-gravel tiles, lights (self-contained emergency lighting units, wall lights, circular lights).

Fiche descriptive n°3 Cuvettes WC



Caractéristiques	Description
Lot	Plomberie
Nature	Cuvette WC : Céramique
Etat ●●●	Bon état (selon année de pose)
Localisation	Sanitaires
Dimensions	40 cm de hauteur 70 cm de profondeur
Quantité présente sur site	44 U (quantité recherchée : 39 U)
Piste de réemploi	Réemploi in situ
Dépose ●●●	Dépose propre à prévoir
Contact	Baticycle (prise en charge de la dépose propre, du nettoyage et de la logistique)
Coût réemploi ●●●	Réalisation d'économies importantes sur l'achat et la pose de WC neuves
Autres informations	Références identifiées : - type 1 : PORCHER Ulysse - type 2 : JACOB DELAFON

Source: Artelia, Example of a material sheet on toilet bowls

For more information: *"The reclamation audit – A guide to creating an inventory before demolition of potentially reusable construction products"* - [FCRBE Project](#)

TABLEAU DU REEMPLOI DANS LE PROJET

Zone	Lot	Dépose par qui / CCTP spécifique ou curage général	Gisement (nomenclature DPGF)	Localisation	Type de réemploi	Action sur la matière	Quantité recherchée pour le projet	Quantité disponible sur site	Encombrement pour le stockage	Contact réemploi / Interlocuteur pressenti	Date de disponibilité de la ressource / Date de réservation	Observations (assurances, REX réemploi, perf acoustiques,...)
Sanitaires bureaux	Plomberie	Clause réemploi à intégrer pour une dépose soignée	Vasques	Tous niveaux	Réemploi ex situ	Nettoyage					-	-
	Plomberie	Clause réemploi à intégrer pour une dépose soignée	Cuvettes	Tous niveaux	Réemploi in situ	Nettoyage	39 U	44U	16,2 m3	Tricycle	A définir selon planing du curage (courant 2022)	-
Equipements techniques	Electricité	Curage dépose soignée	Luminaires	Tous niveaux								
	Electricité	Curage dépose soignée	BAES	Tous niveaux	Réemploi in situ	Contrôle révision						
	Electricité	Curage dépose soignée	Chemins de cables	Circulations								
	CVC	INEX étudie la possibilité pour du réemploi in situ	Radiateurs à eau métalliques	Bureaux individuel	Réemploi in situ			> 90 U	13,1m3		A définir selon planing du curage (courant 2022)	
Extérieur	Espaces extérieurs	Curage dépose soignée	Dalles gravillonées	Terrasse et cour intérieure	Réemploi in situ	Nettoyage		232 m²	23,2 m3			

Extract from the reuse table planned for the project and proposed by Artelia in its reclamation audit

Source: Artelia, 2021

The process of controlling technical-insurance risks

1/ Methodology proposed by the Environment and Circular Economy client assistant

The client assistant proposed a specific methodology to encourage reuse in the project.

- **Search for material outlets**
 - This search had to be launched as early as possible by the awarded company of the site cleaning batch.
 - The reclaimed materials are validated by the Environment client assistant. This validation is possible only if the final outlet of the reclaimed material is secured.
- **Selective deconstruction and careful dismantling**
 - The selective dismantling requires more time for the deconstruction companies and generates extra cost for most of the materials. Thus, it will be only launched for the products and materials that have been reclaimed.
- **Prescriptions to be integrated into the construction works contracts:**
 - The technical specifications can require tenderers to propose variants. The first alternative is to price the supply and installation of imported reclaimed materials and then the installation of same-site reclaimed materials. The variant concerns the supply and installation of new materials. The aim is to anticipate a failure to provide reclaimed materials.
 - The selected contractors for the different batches :
 - ✓ Would be responsible for the supply of reclaimed materials.
 - ✓ Could propose reclaimed materials that were not initially identified. These proposals had to be validated by project stakeholders.
 - ✓ Would provide the supply and installation of reclaimed materials. In the case of same-site reuse, only the installation was concerned.
 - A milestone date was set for the sourcing and validation of reclaimed materials. Beyond this date, new materials would be ordered.
- **Storage and reconditioning:**
 - The materials that were reclaimed for same-site reuse had to be stored in a dedicated and secure space. Therefore, CSTB (the client) had to make sure that such a storage space was available.

In the actual conditions of the construction site, some of the recommendations expressed by the client assistant were not followed by the awarded contractor of the site cleaning batch.

2/ Careful dismantling

Among the reclaimed materials identified, five were retained by the client for same-site reuse:

- Fine-gravel tiles
- Roofing gravel
- Toilet bowls
- Lights
- Metal water radiators

For each reclaimed material, the site cleaning contractor (phase 1 of the project) proposed a specific dismantling methodology.

For metal water radiators, the HVAC design office was also integrated into the discussions concerning reuse.

5.1 Dalles gravillons

MATERIEL UTILISE	• Pelle
RISQUES PROPRES	<ul style="list-style-type: none"> • Heurts • Chute de hauteur • Effondrement • Inhalation de poussières • Bruit • Chute de plain pieds • Electrocutioin
RISQUES EXPORTEES	<ul style="list-style-type: none"> • Nuisances sonores • Chocs contre mitoyen
RISQUES LIES A L'ENVIRONNEMENT DU CHANTIER	•
RISQUES IMPORTES	•
EQUIPEMENT DE PROTECTION INDIVIDUELLE	<ul style="list-style-type: none"> • Chaussures de sécurité • Casque • Vêtements de travail • Lunettes de protection
EQUIPEMENT DE PROTECTION COLLECTIVE	<ul style="list-style-type: none"> • Balisage • Extracteurs d'air si travail en présence d'un engin en milieu confiné
TRAVAUX PREPARATOIRES	<ul style="list-style-type: none"> • S'assurer des consignations du bâtiment • Balisage de la zone
METHODOLOGIE	<ol style="list-style-type: none"> 1. Etablir un périmètre de sécurité 2. Nettoyer sa zone de travail 3. Vérifier la bonne conformité des outils électriques 4. Je nettoie les dalles au nettoyeur haute pression 5. Je dépose les dalles 6. Je pose les dalles sur une palette 7. Je dépose les plots 8. Permettre la circulation dans la zone en toute sécurité (balayage) 9. Manutention des talles au chariot télescopique
TRAITEMENT DES DECHETS	<ul style="list-style-type: none"> • Stockages des dalles sur des palettes sur le parking

Example of the dismantling methodology proposed by the gutting company for the reuse of fine-gravel tiles

Source: Prodemo, 2021

3/ Final inventory transmitted by the site cleaning company

Source	Units removed	Packaging
Circular lights	20 units	Protection with a cardboard box
Lights	30 units	Protection with a cardboard box
Toilet	9 units	On pallets
Fine-gravel tiles	200 m ²	On pallets
Metal radiators	44 units	On pallets
Terrace roofing gravel	1100 m ²	In big bags



Extract of the final inventory forwarded by the site cleaning company "Re-use listing for Building B38 – 27/04/2022"

4/ Reclaimed materials storage



The sources identified for same-site reuse were stored in specific conditions: big bags for roofing gravel, filmed pallets for toilet bowls and strapped fine-gravel tiles, cardboard boxes for lights.



Examples of dismantled and reconditioned sources
Source: CSTB photographs

5/ Methodology for evaluating the technical performance of reclaimed building materials - Example of radiators

A methodology for evaluating the technical performance of reclaimed radiators was set up by the selected contractor of the HVAC batch managing the installation of the metal water radiators (phase 2 of the project):

1. Analysis to examine how the power of the available stock of radiators fits with the needs of the renovated office building.
2. First sorting of the radiators via a visual diagnosis to identify corrosion points and evaluate the quality of the tubes.
3. Listing of the dimensions of the available radiators after this first selection.
4. Second selection after a water seal test (under a pressure of about 5 bars) to identify potential leaks.
5. Sending the radiators to a service provider for painting.
6. Calculation of the power of the radiators and adaptation to the new heating system (low temperature).
7. Sizing of the radiators to adapt them to the new characteristics of the building.

6/ Exchanges with the insurers

- No comments were made by the technical controller in his initial report on reclaimed materials.
- The case of B38 highlights the situation where the contractors concerned by reclaimed materials, must inform their insurance that they will deal with reclaimed materials.
- CSTB asked contractors to inform their respective insurers in order to be sure that they were covered for reuse.
- The contractors followed CSTB's request. They received a nominative certificate stipulating that the ten-year guarantees were extended to reclaimed materials.
- This request did not lead to an increase in insurance premiums. Several explanations can justify this:
 - The installation of reclaimed materials was part of the competences and know-how of the contractors.
 - The contractors checked the quality of the reclaimed materials before re-installing them by following a methodology that was formalised in the technical clauses.
 - Surface areas and/or amounts concerned by reuse were limited. Conversely, the insurance excess was high, thus not requiring additional justifications.

For example, the insurance considered that for non-certified concrete slabs (case with reclaimed slabs), it would have been advisable “*to test bending resistance and tensile strength* ». However, the surface area concerned was limited to 214 m², and the amount of the excess was high. Consequently, such justification was not requested. The insurer considered that the ten-year guarantees also covered reclaimed materials. Reuse did not modify the insurance contract initially signed by the contractor.

Assessment

Reuse was included in the DCE (tender file for contractors) of the site cleaning and deconstruction contract. The aim was that the project stakeholders get to grips with reuse issues and propose methodologies that spur same-site reuse:

- A reclamation audit was carried out.
- The technical specifications mentioned reuse targets and methodologies to follow in to integrate reclaimed materials identified in the reclamation audit.
- A selective dismantling was carried out by the cleaning site company.
- A specific storage space was created for same-site reuse.
- Methodologies for evaluating the technical performance of reclaimed materials were proposed.

For some reclaimed materials (toilet bowls, for example), the reuse rate was lower than expected because the methodology for careful dismantling was not always followed by the cleaning site contractor.

For other reclaimed materials such as radiators, the reuse rate was also lower because the characteristics of the radiators did not correspond to the client's requirements (poor condition, dimensions not suitable for the future project, tightness not assured).

The regulatory framework, such as the thermal and electrical regulation, has evolved over time. This rules out the reuse of old equipment since the required performance level has increased. To circumvent this obsolescence, the client identified areas with less strict requirements. For example, some reclaimed lighting fixtures were installed in technical rooms instead of offices.

It was also decided to gather some reclaimed materials belonging to the same category in the same area to facilitate the future maintenance and operation of the building. For example, reclaimed toilet bowls were installed in the same zone.

Reuse did not modify the initial project planning, but it generated extra costs of about 5% for the concerned batches. As for the contractors, they did not pay any extra insurance premiums.

Conclusion on good practices related to insurance

Reuse of construction products is still considered as an uncommon practice by insurers. It is necessary to demonstrate that reuse practices are not riskier when they follow a rigorous and supervised process. In the case of the refurbishment of B38, several actions were implemented to structure the reuse related approaches:

- The client called upon an assistant to implement reuse practices. The first step of this collaboration was the initiation of a reclamation audit to locate the most relevant reclaimed materials.
- The design team proposed detailed technical specifications and the tender file for contractors requested them to answer by proposing solutions to integrate reclaimed materials.
- The client indicated to his insurer that same-site reuse would be implemented in the project. He also informed him about the categories of materials that will be concerned by reuse.
- The client requested the awarded contractors of the batches concerned by reclaimed materials to inform their insurers and get a nominative insurance certificate stating that they were covered for the installation of reclaimed materials. The insurer of the client supported this request.
- The contractors developed a methodology for evaluating the performance of reclaimed materials in order to guarantee their performance in use. This methodology was specific to the renovation site. Information related to the first life cycle of the materials in the building were gathered and complementary tests were carried out to evaluate the performance of the materials, which guarantees the traceability of information.

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