





#### ADAPTED SENIOR TRAINING PROGRAM ON BIM METHODOLOGIES FOR THE INTEGRATION OF EPD IN SUSTAINABLE CONSTRUCTION STRATEGIES 2020-1-ES01-KA204-083128

# Module 10

#### The Construction Manager: BIM Environmental Manager.







Warsaw University of Technology



Module 10. The Construction Manager: BIM Environmental Manager.





#### 10.1 The environmental BIM Manager.

# 10.2 Regulation of CDW in construction works.

#### 10.3 CDW management planning.







MAIN FUNCTION OF THE BIM MANAGER.

BIM MANAGER RESPONSIBILITIES.

QUALITIES OF A BIM MANAGER.

ENVIRONMENTAL BIM MANAGER.

GREEN JOBS.





Throughout the life cycle of a BIM project, whether it is a building or infrastructure project, there are different roles and responsibilities.

The first step in managing a project with BIM methodology is to create a project team in which roles and responsibilities are defined in the BIM Execution Plan (BEP) that will be reflected in the contract.









The management of a BIM project is carried out by the entire project team:

- Roles in BIM project management are not positions in the company, they are roles and responsibilities assigned in the work team.
- A role can be performed by more than one member of the team.
- A team member can assume more than one role.
- Task team members must be competent and have the authority to perform the assigned role.
- Roles can move from one activity to another during the life cycle of a BIM project.



#### BIM TECHNICAL DIRECTOR OR BIM MANAGER

- Person appointed by the Project Management Team (PMT) at any stage of the life cycle and at the approval of the Developer or Client.
- He/she manages the information coming from all the agents involved in the BIM process.
- Is fully responsible for the digital quality and structure of the content for the BIM project.
- Leads the correct implementation and use of the BIM methodology, coordinating the modelling of the project and the resources in collaboration with all the agents involved, ensuring the correct integration of the models and their disciplines with the global vision of the project, coordinating also the generation of contents, with the capacity to communicate the benefits and difficulties of BIM.
- Operates at Operational Level (Technical and Systematic).





# MAIN FUNCTION OF THE BIM MANAGER.

The BIM manager will integrate the shared discipline models for coordination and collision detection. In the coordination meetings between all the agents, scheduled in the BEP, the BIM manager will assign the resolution of incidents to the corresponding BIM coordinators. These review activities are carried out using IFC open format models. As a summary of the coordination and collision management tasks, the BIM manager will prepare the final model report of each phase to give traceability to the decisions taken.







### MAIN FUNCTION OF THE BIM MANAGER.

The BIM manager will integrate the shared discipline models for coordination and collision detection. In the coordination meetings between all the agents, scheduled in the BEP, the BIM manager will assign the resolution of incidents









# **BIM MANAGER RESPONSIBILITIES.**

- Propose and coordinate the definition, implementation and compliance of the BIM Execution Plan (BEP).
- Apply project workflows and requirements management.
- Application and validation of BIM protocols.
- BIM user manual.
- Support collaborative work and coordinate the Integrated Design Team (IDPT).
- Establish in the Collaborative Environment (CDE) the fulfilment of client information requirements (IRs).



# **BIM MANAGER RESPONSIBILITIES.**

- Standardisation and normalisation.
- Software and platforms.
- Establishing levels of detail and information LOD.
- Model and model quality and change management.
- Attendance at Integrated Design Project Team (IDPT) and Promoter/Client meetings.
- Ensuring interoperability.
- Technical support in collision detection.







#### QUALITIES OF A BIM MANAGER.

- Technical profile. Must know the BIM tools that are being used as well as have knowledge of information technology (must know how to deal with compatibility issues, formats, hardware issues, networks, and a whole series of things that are specific to information technology).
- Construction experience and knowledge. The BIM Manager needs to understand the information he/she is handling, to be able to determine whether or not it is correct and whether or not it meets the requirements.
- Planning, order and synthesising. Successful BIM information management requires that things happen in a controlled way, following established processes.
- Ability to delegate as well as to listen.
- Ability to manage teams, processes and people skills.





### **ENVIRONMENTAL BIM MANAGER.**

The figure of the Environmental BIM Manager, as **Environmental Site Manager**, is created as a result of the decentralisation of the environmental tasks of the Site Management of a specific project, especially when we are talking about large-scale works (the Environmental BIM Manager will follow the instructions of the BIM manager in this case), or, if not, this is assumed by the BIM manager or his technical team.

In this way, there is a person/team that assumes responsibility for the identification and control of the environmental requirements of the work, the environmental monitoring and surveillance of the work, the management of conflicts with the Administration and with public or private interests that could be affected by these works, as well as in the design, project and supervision of specific environmental management plans such as noise control plans, water waste or environmental restoration plans (for large infrastructures).





#### **ENVIRONMENTAL BIM MANAGER.**

This is an architect or engineer (technical or higher) with knowledge of BIM coordination who ensures the correct environmental management of construction processes. He/she may be involved in the design phase, new construction, restoration or demolition/deconstruction.

He is responsible for the management of the different factors that have an environmental impact on the work: raw materials and natural resources, dust, noise, emissions, effects on soil and vegetation and all aspects related to the natural environment.

In both construction and demolition, he is responsible for BIM and environmental management and assessment of the different waste fractions produced, as well as the main contact with the site BIM manager for the flow of information.







# **GREEN JOBS.**

The Environmental BIM Manager will be a future source of employability in the environmental sector, both nationally and internationally.

For example, the International Labour Organization (ILO) points out that climate change and its consequences on employment can only be addressed if there is a transition to a greener economy, so "it is essential that people acquire new skills for new jobs that emerge and for adapting existing ones", according to the report Skills for a greener future (2019), prepared by this body.







MANAGEMENT PLANNING.

DEFINITION OF CDW.

ORIGIN OF CDW.

CDW MANAGEMENT EFFICIENCY INDICATOR.

SITUATION IN EUROPE.

SITUATION IN EACH COUNTRY.

REGULATIONS APPLICABLE TO CDW.











#### Construction consumes 45 - 60% of raw material extractions.











#### Quarries

**Environmental problems:** 

Derived from extraction work;

- Underground flow
- Contamination of aquifers
- Wells, springs and rivers
- Water pollution by dissolved material

Derived from the cessation of activity

- Used as unauthorised landfill sites
  - Settlement of marginal families





#### **EXPLANATORY NOTE**

Quarries, where the main mining materials for construction are extracted, such as marble, granite, limestone, slate, etc., as well as aggregates, have a **useful life**, and once exhausted, the abandonment of the quarrying activity usually generates serious **environmental problems**, mainly related to the destruction of the landscape.

Environmental problems derived from **<u>quarrying</u>**:

- Deformation of the underground flow
- Contamination of aquifers
- Drying up of wells, springs and rivers.
- Contamination of water by dissolved material

#### Environmental problems derived from the *cessation of the activity*:

- Used as unauthorised landfill sites.
- Settlement of marginal families. Those quarries close to population centres are usually occupied by marginal families dedicated to the informal recycling of rubbish, accumulating waste in the same cavities of the quarry where they have their settlement. In addition to this, there is a lack of sewage and waste collection systems, which means that sanitary conditions and soil contamination are significant.





Almost **50% of CO2 emissions** into the atmosphere are caused by the construction industry and the use of buildings.







Almost **50% of CO2 emissions** into the atmosphere are caused by the construction industry and the construction industry and the construction



#### EXPLANATORY NOTE

Almost **50% of CO2 emissions** into the atmosphere are caused by the construction industry and the use of buildings.

It is therefore essential to significantly **reduce** the **energy demand of our buildings**. In order to do this, we must **analyse the emissions of each of the processes** linked to the **construction and use** of buildings.





The sector generates **1.1 tonnes of waste per inhabitant** per year in our country, which, despite having great recycling potential, ends up in landfills. Solid urban waste is around 0.6 tonnes per inhabitant per year.





#### **MANAGEMENT PLANNING.**





#### **MANAGEMENT PLANNING.**

#### EXPLANATORY NOTE

For a correct management of CDW, it is necessary to carry out a correct planning, for which the following questions must be answered:

- WHAT is CDW, according to the definition of RD 105/2008. We must know how to identify the waste produced.
- WHERE the waste is produced, what is its origin within the process of the construction work and what destination will be given to this waste.
- HOW MUCH Q: how much (volume) of CDW is generated and how much will eventually be reused and/or recovered (recycled).
- HOW this waste is to be sorted and managed.
- WHO is obliged to carry out this management?
- QUANTUM C: what is the cost of this correct management of CDW, what is the budget.



26

# **DEFINITION OF CDW.**



According to RD 105/2008

Any **substance or object**, which the **holder intends or is obliged to dispose of**, generated on a construction or demolition site.Custom integrations from XML, JSON, web services and other sources.





# **DEFINITION OF CDW.**



According to RD 105/2008

Any **substance or object**, which the **holder intends or is obliged to dispose of**, generated on a construction or demolition site.Custom integrations from XML, JSON, web services and other sources.







- Reception of components
  - Rejections due to low quality
  - Breakages (transport, unloading)
- Stockpiles
  - Packaging
  - Losses
    - Atmospheric conditions
    - Storage time (shelf life)
  - Breakages
- Internal transports





#### EXPLANATORY NOTE

On-site CDW begins to be produced as soon as it is received on site:

#### - Re

Std

Inte

W

#### Reception on site, due to:

- Rejections because of the low quality of the material
- Breakage during transport or unloading

#### **Stockpiles**

- Containers or packaging whose purpose is to reduce the percentage of breakages during transport or to avoid the increase in weight and deterioration that occurs as a result of rainwater in some materials.
- Losses of material due to
  - Inadequate Atmosph. Inadequate atmospheric conditions (unpredictable, unavoidable cause).
  - High stockpiling time, resulting in expiry (foreseeable, avoidable cause).
  - Breakages during stockpiling.

**Internal transport** from the stockpile to the pits and other internal movements.





- Execution of processes
  - Demolitions
    - Included in the project.
    - Poorly executed elements.
  - Surplus
    - Earth from excavations.
    - Preparation of concrete, etc.
- Losses and breakages
  - Cuts
  - Faulty handling of materials



Module 10

WF

Exe



ORIGI

EXPLANATORY NOTE

#### **Execution of processes**

- Demolitions: A high volume of very heterogeneous waste is generated, they must be:
  - Collected in the project if they are specific works of demolition of buildings or parts of buildings. They can also be
  - Poorly executed elements. In this case, these tasks must be annexed to the original project as well as the estimate of the waste produced.
- Surplus
  - Earth from excavations when it is not used as backfill.
  - Concrete and mortar processing on site
- Losses and breakages
  - Cuts
  - Faulty handling of materials

Los

We must generate a list of the waste generated on site, coded according to order MAM/304/2002 and separating hazardous waste from non-hazardous waste.





HOW Q













# CDW MANAGEMENT EFFICIENCY INDICATOR.

- The % recycling of CDW is the best indicator of efficiency in CDW management.
- Environmental benefits of CDW management:
- Reduction of landfill volumes
- Reduced consumption of natural resources

Improved waste management conditions

Apparent annual aggregates consumption (EU-15) : 2000 MT

Total annual amount of inert CDW generated: 180 MT. Assuming recycling of all this material  $\rightarrow$  8%.



#### SITUATION IN EUROPE.





### SITUATION IN EUROPE.

#### Recycling of CDW in the EU. (Source: Eurostat)

1t	×	TIME	2010 \$	2012 \$	2014 \$	2016 \$	2018 \$
	GEO \$						
	European Union - 27 countries (from 2020)		:	:	87	87	88
	European Union - 28 countries (2013-2020)		:	:	89	89	90
	Euro area - 19 countries (from 2015)		:	:	:	:	:
	Belgium		17	18	32	95	97
	Bulgaria		62	12	96	90	24
	Czechia		91	91	90	92	: (bc)
	Denmark		:	91	92	90	97
	Germany (until 1990 former territory of the FRG)		95	94	: (c)	: (c)	93
	Estonia		96	96	98	97	95
	Ireland		97	100	100	96	100
	Greece		0	0	0	88	97 (p)
	Spain		65	84	70	79	75
	France		66	66	71	71 (e)	73
	Croatia		2	51	69	76	78
	Italy		97	97	97	98	98
	Cyprus		0	60	38	57	64
	Latvia		:	:	92	98	97
	Lithuania		73	88	92	97	99
	Luxembourg		98	99	98	100	98
	Hungary		61	75	86	99	99
	Malta		16	100	100	100	100
	Netherlands		100	100	100	100	100
	Austria		92	92	94	88	90
	Poland		93	92	96	91	84
	Portugal		58	84	95	97	93
	Romania		47	67	65	85	74
	Slovenia		94	92	98	98	98
	Slovakia		:	:	54	54	51
	Finland		5	12	83	87	74
	Sweden		78	81	55	61	90
	Iceland		75	100	99	99	99
	Liechtenstein		:	:	:	:	:
	Norway		44	75	77	71	63
	Switzerland		:	:	:	:	:
	United Kingdom		96	96	96	96	98
	Montenegro		:	:	:	0	0 (p)
	North Macedonia		:	0	0	:	100
	Albania		:	:	:	:	:
	Serbia		:	:	:	80	81
	Turkey		:	:	:	:	0
	Kosovo (under United Nations Security Council Re	esolu	:	:	:	:	:





#### SITUATION IN EUROPE.

What can be done to improve these figures?

Imitate the actions being taken by those EU member states whose figures are higher:

- Landfill restrictions
- Landfill taxes
- Prevention and recycling strategy


## SITUATION IN EUROPE.

#### Landfill tax

- Denmark : 45 €/T as a general rule for all waste (1997)
- Sweden : 30 €/T (2000)
- Netherlands : National tax 13 €/T. Thereafter landfill taxes vary in each province 23-90 €/T (1997)
- Finland: 15 €/T (1997)
- Austria: 7 €/T (2004)
- Italy: 1 €/T
- France, Spain, Ireland, Portugal and Greece do not charge landfill tax on CDW.



## SITUATION IN EUROPE.

Prevention and recycling strategies. Netherlands

- 90% Recycled
- 18 M Ton CDW
  - 16.2 M Ton Recycled/recovery
  - 1.2 M Ton Landfill
  - 0.2 M Ton Incineration
- Large market for recycled products
- Low demand for primary construction materials



### SITUATION IN EUROPE.

Prevention and recycling strategies. Netherlands

- 90% Recycled
- 18 M Ton CDW
  - 16.2 M Ton Recycled/recovery
  - 1.2 M Ton Landfill
  - <u>0 2 M Ton Incinoration</u>

#### **EXPLANATORY NOTE**

The Netherlands is the most advanced country in the EU in this area, proof of this is that they are able to recycle 90% of the waste they generate annually, of the 18 MTon of CDW they produce annually, they recycle and recover 16.20MTon. This means that the Netherlands has achieved a large market for recycled products and a low demand for primary building materials, which means a decrease in the consumption of natural resources.



### SITUATION IN EUROPE.

Prevention and recycling strategies. Netherlands

#### Strategies

- Easy separation in-situ
- Develop easy disassembly elements
- Healthy markets for recycled products
- Improve quality of construction materials produced from CDW
- Incentivise recycling. Raise landfill rates
- Prevent landfill





# SITUATION IN EACH COUNTRY.

#### SPAIN

**Waste of** limited mineral resources and environmental impact of nonminimised extractions.

**Uncontrolled dumping** on the territory, leading to soil and groundwater contamination and visual impact





# SITUATION IN EACH COUNTRY.

#### SPAIN

**Waste of** limited mineral resources and environmental impact of nonminimised extractions.

**Uncontrolled dumping** on the territory, leading to soil and groundwater contamination and visual impact

#### EXPLANATORY NOTE

The disastrous Spanish figures for CDW production and reuse and/or recycling that we have seen are merely the logical result of the waste of limited mineral resources and the environmental impact produced by the non-minimised extraction of resources:

- Waste of limited mineral resources and environmental impact produced by the nonminimised extraction of resources.
- **Uncontrolled dumping** in the territory, which generates soil and groundwater pollution and deterioration of the landscape.



# SITUATION IN EACH COUNTRY.

#### SPAIN

Andalucía	25
Asturias	4
Aragón	4
Baleares	3
Canarias	3

#### EXPLANATORY NOTE

Spain: uncontrolled landfilling of 22 Mton, which represents 53.70% of the total waste. In the 107 controlled landfills, regulated according to RD 1481/2001 which regulates the disposal of waste by landfill, only 15.8 Mton were deposited, which represents 38.5% of the waste, while in the 82 authorised treatment plants existing in Spain, only 3.20MTon were deposited, i.e. 7.80% of the total of 41 Mton generated in Spain.

This means that a strategy needs to be studied to encourage the use of these treatment plants as is done in other European countries, either through landfill taxes or by doubling the number of plants.





# SPAIN

#### The CDW problem

50 M tonnes of CDW are generated each year.

How can the management of waste generated by construction sites and the construction sector in general be solved economically and ecologically?

### The CDW solution

- E COLOGIC" management:
- No harm to human health
- No harm to the environment

E-COONOMIC" management:

• Optimisation of material life cycle efficiency





# SPAIN

JIAN

#### The CDW problem

50 M tonnes of CDW are generated each year.

### The CDW solution

- E COLOGIC" management:
- No harm to human health
- No harm to the environment

How can generate the cons solved e ecologica

EXPLANATORY NOTE

The CDW solution

- E-COLOGICAL" management: Manage them in such a way that they do not cause damage to the environment or to people's health.
- E-COONOMIC" management: Manage them by optimising the efficiency of the life cycle of the materials.



## REGULATIONS APPLICABLE TO CDW. EUROPEAN:

- Waste Framework Directive 2008
- Directive 2018/850 on the landfill of waste
- Directive 2018/851 Waste Framework Directive
- CDW Management Protocol

SPANISH:

Module 10

- RD. on CDW 105/2008
- Law 22/2011. Waste and contaminated soils
- RD 180/2015. State waste shipment
- PEMAR 2016-22





Specific Regulations

## <u>European</u>

- Waste Framework Directive 2008
- Directive 2018/850 on the landfill of waste
- Directive 2018/851 Waste Framework
   Directive
- CDW Management Protocol





Regulations

European

Waste Framework Directive 2008

**Establishes** legislative framework for waste handling

**Defines** key concepts (Waste, Recovery and Disposal) and establishes essential requirements for its correct management (obligations of waste management companies).

Polluter pays principle = Waste holder pays for proper waste management
 Hierarchy:
 Waste holder pays for proper waste
 Optimal Management
 1\_ Prevention
 2\_ Re-use
 3\_ Recovery (recycling, energy)
 4\_ Disposal

Poor management





Regulations

European

Waste Framework Directive 2018/850

#### Article 5

**Member States** shall endeavour to **ensure** that, from **2030** onwards, all **waste suitable** for **recycling** or other **recovery**, in particular municipal waste, **is not accepted in landfills**, with the exception of waste for which landfilling provides the best environmental outcome, in accordance with Article 4 of Directive 2008/98/EC.

By 2035 the amount of municipal waste landfilled is reduced to 10% or less (by weight).

Ensure traceability of CDW.

Regulate the CDW Management Study and Management Plan.

Encourage selective **demolition and separation at source of the different types of CDW.** 





# Regulations

European

Waste Framework Directive 2018/851

#### **General considerations**

**Include** in the definition of **CDW** (construction and demolition waste) waste from small construction and demolition activities carried out in households.

Introduce definition of material recovery other than energy recovery and the transformation of waste into materials that are used as fuel.

**Introduce** definition of **backfilling** to clarify which **waste** is **suitable for reclamation** in excavated areas. Waste used for backfilling should be limited to the amount necessary to achieve these purposes.

**Establish detailed criteria** for **applying the end of waste status**. Specific end-of-waste criteria for at least aggregates, paper, tyres and textiles should be taken into account in this context.





# Regulations

European

Waste Framework Directive 2018/851

#### Article 3

Municipal waste does NOT include CDW, therefore minor household repair work is included in CDW.

**Recovery of materials**: any recovery operation **other than energy recovery** and **transformation** into **materials** to be used as fuels. It **includes**, among other operations, **preparation** for **re-use**, **recycling** and **backfilling**.

**Backfilling: waste used** for **backfilling** must **replace non-waste materials** and be **suitable** for the purposes mentioned above.





# Regulations

European

Waste Framework Directive 2018/851

#### Article 9. Waste prevention

The design, manufacture and use of products that are resource efficient, durable (including in terms of lifetime and freedom from planned obsolescence), repairable, reusable and upgradeable shall be encouraged.

The **re-use of products** and the implementation of **systems** promoting **repair and re-use** activities **will be encouraged**, in particular for electrical and electronic equipment, textiles and furniture, as well as **packaging and construction materials and products**.





Regulations

European

Waste Framework Directive 2018/851

#### Article 11

Member States shall take measures to promote selective demolition with a view to enabling the safe removal and handling of hazardous substances and facilitating re-use and high quality recycling through the selective removal of materials, and to ensure the establishment of sorting systems for CDW, as a minimum for wood, mineral fractions (concrete, bricks, tiles, ceramics and stone), metals, glass, plastic and gypsum.





Regulations

European

Waste Framework Directive 2018/851

Article 37

Member States shall report the amount of waste used for backfilling operations and for other material recovery operations separately from the amount of waste prepared for re-use or recycled.

Member States shall report as backfilling the transformation of waste into materials to be used for backfilling operations.





Regulations

European

Protocol for the management of CDW in the European Union

Due to the continuous increase of CDW, the European Commission is introducing a protocol for its correct management, which will be applied in 28 countries.

This process is included in the Construction 2020 Strategy and is part of the recent Circular Economy Package presented by the Commission.

The overall objective of this Protocol is to increase confidence in the CDW management process, as well as in the quality of the products obtained in the process.





Specific Regulations

# <u>Spanish</u>

- RD. of RCD 105/2008
- Law 22/2011. Waste and contaminated soils
- RD 180/2015. State waste shipment
- PEMAR 2016-22





Regulations

Spanish

Royal Decree on CDW 105/2008

**RD 105/2008,** of 1 February, which regulates the production and management of Construction and Demolition Waste.

The example of the Mancomunidad de los Alcores

Keys: Bonds and Correct Management

#### Justification : Uncontrolled waste generation

- Contamination of soils and aquifers in uncontrolled dumps.
- Deterioration of the landscape
- Disposal without use of its recoverable resources.





Regulations

Spanish

Royal Decree on CDW 105/2008

The **purpose** of RD 105/2008, defined in **Article 1** is:

- Prevent the generation
- Encourage reuse and recycling
- To ensure proper **disposal**

In order to:

- Protect people's health
- Environment and
- Contribute to sustainable development





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 2. Definitions

- Construction and demolition waste (CDW): Any substance or object generated in a construction or demolition site.
- Inert waste: Non-hazardous waste that does not undergo significant physical, chemical or biological transformations...

#### • Construction and demolition work:

- Construction, rehabilitation, repair, renovation, alteration, demolition of immovable property (building, road, airport, etc.).
- Works modifying the form or substance of the land (excavations, urbanisation, etc.).
- Any installation providing an exclusive service to the site (crushing plants, treatment plants for construction site CDW, etc.) shall be considered an integral part of the site.



Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 2. Definitions

- Minor work: Construction or demolition work in a private home, business, office or building in the service sector, of simple technical ...
   Not applicable to CDW from minor construction works MSW (local authorities)
- Waste producer: Holder of the planning permission; if no planning permission is required →owner of the building.

Person carrying out treatment operations resulting in a change in the nature of the waste.

Importer or purchaser of CDW from any EU state.

 Waste holder: Person in possession of the waste who does not have the status of waste manager.

Person carrying out the work, such as the builder, subcontractors or selfemployed workers.





Regulations

Spanish

Royal Decree on CDW 105/2008

Article 3. Scope of application

To all **CDW**, with the **exception** of:

- **Uncontaminated earth and stones**, provided that their reuse is accredited (Article 2\_Law 22/2011).
- Waste from extractive industries
- Non-hazardous degraded sludge

Waste generated in construction or demolition works and regulated by specific legislation, when mixed with other construction and demolition waste, will be subject to this royal decree.





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 4. Obligations of the waste PRODUCER.

**Producer:** Holder of the planning permission or of the property  $\rightarrow$  **Developer.** 

It is the obligation of the **producer** to include in the project an:

#### CDW management study.

- **Report** with the description of the operations
- **Specifications** with the specific requirements to be included
- **Plans** of the management facilities
- Integrated **budget** in a separate chapter



Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 4. Obligations of the waste PRODUCER.

In demolition/rehabilitation works you are obliged to:

- Inventory the hazardous waste to be generated (included in the Waste Management Study).
- Provide for their selective removal
- Ensure they are sent to hazardous waste managers
  - List of managers of the Department of the Environment: inert waste, hazardous waste, CDW treatment plants, landfills, nonhazardous waste (not special), recycling of paper, plastics, glass, recycling and reuse of wood, recycling and recovery of metals.
  - Prevention of occupational risks in operations and activities in which there is a risk of exposure to asbestos: Royal Decree 396/2006.





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 5. Obligations of the HOLDER of waste.

**Holder**: Person in possession of the waste (non-manager)  $\rightarrow$  **Contractor** Obligation of the holder to present a:

#### **CDW management plan:**

- Submitted by the builder to the developer
- Must be approved by the project management
- It will be a contractual document





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 5. Obligations of the HOLDER of waste.

The CDW shall be handed over to a waste manager.

Doc.
authenticated
Quantity (T and/or m3)
Type of waste (LER) according to order MAM/304/2002
Identification of the manager





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 5. Obligations of the HOLDER of waste.

Where CDW is delivered to a point collector who only carries out **storage**, **collection**, **transport or transfer operations**, the delivery document shall also indicate the subsequent **recovery or disposal operator** to whom the waste will be destined.

Waste management fees ALCOREC

For excavated soil 1.67 €/t

For clean construction waste (sorted) 6.62 €/t

For unsorted construction waste (mixed) 13.84 €/m3





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 5. Obligations of the HOLDER of waste.

#### Waste must be separated on site

Waste must be separated by type when, individually for each type of waste, the expected amount of waste to be generated for the total construction site exceeds the following quantities:

- 80T concrete
- Bricks, tiles, ceramics 40T
- Metal 2T
- Wood 1T
- Glass 1T
- Plastic 0.5T
- Paper and cardboard 0.5 T

Obliged to bear management costs and to provide the producer with supporting documentation. 67



Regulations

Spanish

Royal Decree on CDW 105/2008

Article 6. System for controlling the production, possession and management of construction and demolition waste.

1. The legislation of the ACs may require the provision of a security or other guarantee.

2. In those works whose project includes a site waste management study, the calculation of the amount of the security shall be based on the budget of said study.

#### Article 8. Activities for the recovery of construction and demolition waste

Authorisation:

Prior authorisation by the competent body.

Granted for a specific period of time, renewable for successive periods.

After inspection of the installations





Regulations

Spanish

Royal Decree on CDW 105/2008

#### Article 8. Activities for the recovery of construction and demolition waste

Recycled aggregates obtained as a product of a CDW recovery operation shall comply with the technical and legal requirements for their intended use.









Regulations

Spanish

Royal Decree on CDW 105/2008

Article 9. Activities for the recovery of construction and demolition waste on the site where it is produced.

On-site recovery of NHCDW:

- Exempt from authorisation by the Regional Ministry of the Environment.
- The following will appear in the project
- On-site recovery procedures, approved by the project management.







Regulations

Spanish

Royal Decree on CDW 105/2008

Article 11. Disposal activities of construction and demolition waste by landfill.

1. The landfilling of CDW that has not undergone any pre-treatment operation is prohibited.

This would not apply to inert waste for which treatment is not feasible.

2. The Autonomous Regions may exempt landfills of NPPW or inert waste in isolated settlements from this obligation (Royal Decree 1481/2001).





Regulations

Spanish

Royal Decree on CDW 105/2008

# Article 13. Use of inert waste in restoration, upgrading or backfilling works.

Use of Inert Waste in restoration works on degraded sites considered as a recovery operation, when it is carried out by a waste manager subject to administrative authorisation for recovery of Waste.






Regulations

Spanish

Royal Decree on CDW 105/2008

Article 13. Use of inert waste in restoration, upgrading or backfilling works.

Use of recov

EXPLANATORY NOTE

admir

In the diagram we can observe the life cycle of the aggregates used in construction in order to consider this cycle closed, that is to say, to achieve the longed-for feedback of the system.

Aggregates from quarries are used as raw material in the construction sector for their implementation on site. The correct management of inert waste from the construction sector is revalued in the CDW treatment plants, part of these recycled aggregates will be reused on site in the form of recycled material and the other part will be used for the restoration of degraded areas, i.e. quarries.



Regulations

Spanish

Royal Decree on CDW 105/2008

### Synthesis of the model:

- 1. The producer (developer) commissions the project.
- 2. The designer prepares the CDW Management Study.
- 3. The producer applies for a licence and deposits the deposit.
- 4. The producer contracts the holder (builder).
- 5. The holder delivers the CDW to an authorised transporter and pays.
- 6. The transporter delivers the CDW to the authorised manager.
- 7. Authorised manager performs tasks and collects from the holder.
- 8. The authorised manager delivers certification to the holder.
- 9. The holder hands over the certification to the producer and gets paid.
- **10**. The producer delivers the certificate and recovers the deposit.











Regulations

Spanish

Royal Decree on CDW 105/2008

#### Keys to success:

- 1. Illegal dumping prohibited  $\rightarrow$  authorised treatment plants.
- 2. Price and quality  $\rightarrow$  regulated by authorities
- 3. Distribution of plants  $\rightarrow$  population density





Spanish

Regulations

Law 22/2011 on waste and contaminated soils

Article 1. Object

-To regulate the management of waste by promoting measures to:

- Prevent its generation
- Mitigate the impacts on health and the environment associated with its generation and management.

-Regulate the legal regime for contaminated land.







#### Waste:

Any substance or object which the holder discards or intends or is required to discard.



#### Household waste:

Waste generated in households as a result of domestic activities.

Also included in this category is debris from minor construction and household repair work.







#### Waste producer:

Any natural or legal person whose activity produces waste (initial waste producer) or any person who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of that waste.



### Waste holder:

The waste producer or other natural or legal person who is in possession of waste.







### **Collection:**

Operation consisting of the collection of waste, including initial sorting and storage for transport to a treatment facility.

#### Re-use:

Any operation by which products or components of products that are not waste are re-used for the same purpose for which they were conceived.









Regulations

Spanish

Law 22/2011 on waste and contaminated soils

Article 3. Definitions

**Treatment:** Recovery or disposal operations, including preparation prior to recovery or disposal.

**Recovery:** Any operation the main result of which is that the waste serves a useful purpose by replacing other materials.

Annex II: List of recovery operations

- Recycling/reclamation of metals
- Recycling/reclamation of other inorganic materials









Regulations

Spanish

Law 22/2011 on waste and contaminated soils

### Article 3. Definitions

#### **Preparation for re-use:**

Recovery operation consisting of testing, cleaning or repair, whereby products or components of products that have become waste are prepared so that they can be reused without further processing.









### **Recycling:**

Any recovery operation by which waste materials are transformed back into products, materials or substances, whether for the original purpose or for any other purpose. It does not include energy recovery or transformation into materials to be used as fuels or for backfilling operations.







Regulations

Spanish

Law 22/2011 on waste and contaminated soils

Article 4. By-products

Substance or object, resulting from a production process, may be considered as a by-product and not as waste, when the following conditions are met:

- a) It is certain to be used at a later date.
- b) it can be used directly without undergoing processing
- c) it is produced as an integral part of a production process
- d) the use complies with all relevant requirements relating to the protection of human health and the environment.

The waste coordination committee shall evaluate the consideration of these substances or articles as by-products.





Spanish

Regulations

Law 22/2011 on waste and contaminated soils

Article 5. End of waste status.

Specific criteria may be established so that certain types of waste, which have undergone a recovery operation, may cease to be considered as such. Provided that the following conditions are met:

- (a) the resulting substances or objects are normally used
- (b) there is a demand for such substances or objects
- (c) they comply with the technical requirements for specific purposes, existing legislation and applicable standards
- (d) Their use does not give rise to environmental or health impacts.

The substances or articles concerned shall be counted as recycled and recovered waste.







The competent administrations, in the development of policies and legislation on waste prevention and management, shall apply, in order to achieve the best overall environmental result, the waste hierarchy in the following order of priority:

- 1. Prevention; reduction of volume and toxicity.
- 2. Preparation for re-use
- 3. Recycling
- 4. Other type of recovery, e.g. energy recovery (incineration)
- 5. Disposal.





Regulations

Spanish

Law 22/2011 on waste and contaminated soils

Article 12. Administrative powers

### **General State Administration**

Authorisation of shipments of waste from or to third countries outside the European Union.

### **Autonomous Communities**

Authorisation, supervision, inspection and sanctioning of waste production and management activities.

Authorisation of shipments of waste from or to countries belonging to the European Union, as well as shipments within the Spanish territory.

### Local authorities

Collection, transport and treatment of domestic waste.





Spanish

Regulations

Law 22/2011 on waste and contaminated soils

# Article 29. Notification prior to the commencement of waste production and management activities.

A notification must be submitted prior to the commencement of their activities to the competent environmental body of the Autonomous Community for those entities or companies that:

- Produce hazardous waste or generate more than 1000 t/year of Non-hazardous waste.
- Collect waste without an associated facility, transport waste on a professional basis and dealers or agents.

Companies that have obtained authorisation for the treatment of waste are exempted from submitting a notification.

The notification shall have the content indicated in Annex VIII and shall be valid throughout the national territory.





Regulations

Spanish

Law 22/2011 on waste and contaminated soils

### **ANNEX VIII. Content of communications**

- a) Data identifying the undertaking
- b) Data identifying the producer site
- c) Estimated quantity of waste per year
- d) Waste produced in each process characterised according to Annex III of this Law and identified according to Annex 1 of Order/MAM/304/2002.
- e) The storage conditions at the place of production
- f) Planned treatment operations





Regulations

Spanish

Law 22/2011 on waste and contaminated soils

### TITLE IV:

Extended product producer liability

### Article 31. Concept and obligations

In application of extended responsibility and with the aim of promoting prevention and improving the re-use, recycling and recovery of waste, producers have (among others) the following obligations:

- a. Design products in such a way that throughout their life cycle they reduce their environmental impact and the generation of waste.
- b. Develop, produce, label and market products that are suitable for multiple uses and that, after having become waste, are easy and clear to separate for reuse or recycling
- c. Accepting the return of reusable products,
- d. Use materials from waste in the manufacture of products.





Regulations

Spanish

Law 22/2011 on waste and contaminated soils

### TITLE IV:

Extended product producer liability

### Article 31. Concept and obligations

In application of outended reconnibility and with the sim of promoting preve

#### produ EXPLANATORY NOTE

a.

b.

- "Extended Product Producer Responsibility". Although it cannot be said that this regulation is introduced ex novo, it should be noted that it establishes for the first time a systematised and coherent legal framework, by virtue of which the producers of products that become waste through their use are involved in the prevention and organisation of waste management, promoting reuse, recycling and recovery.
- c. A
- d. Use materials from waste in the manufacture of products.





Regulations

Spanish

RD 180/2015. Shipment of state waste

Repeals 833/1988

Hazardous and non-hazardous waste.

No distinction is made between hazardous and non-hazardous waste.

#### Movements between and within Autonomous Regions.

It is limited to waste shipments between Autonomous Regions. They must have an identification document, a treatment contract and prior notification.





Regulations

Spanish

RD 180/2015. Shipment of state waste

**Treatment contract** (Article 2(h) and 5)

Required from operators and managers of destination facilities. It replaces the Application for Admission and Acceptance Document defined in 833/1988.

It shall contain at least the following aspects:

- Estimated quantity of waste
- LER coding
- Estimated periodicity of shipments
- Waste treatment (Annexes I and II Law 22/2011)
- Obligations of the parties in relation to the possibility of rejection of the waste by the consignee.





Regulations

Spanish

RD 180/2015. Shipment of state waste

#### Identification document

**RP**: Control and Monitoring Document (DCS) (electronic).

**RNP**: Identification Document for INTER CCAA shipments of RNP (electronic in Andalusia).

**OP** will be in charge of filling it in and handing it over to the transporter. The receiving manager will have a maximum of 30 days from receipt of the waste to send the document to the operator indicating whether he accepts or rejects the waste.

### **Shipment notifications (Article 8)**

**PR:** Advance Shipment Notifications

**RNP:** Advance shipment notification between RNP ACs (electronic).





Regulations

Spanish

PEMAR 2016-22: State Framework Plan on Waste Management

- Structures to which regional plans must conform.
- Minimum targets to be met in prevention, preparation for reuse, recycling, recovery and disposal of CDW.







WASTE MANAGEMENT PLAN.

CDW BUDGETS.

INSTRUMENTS FOR ADAPTATION TO THE MODEL.





Spanish



establishes a number of **obligations** for the **producer** and **holder** of the waste:

Producer Obliged to include in the project one:

### **CDW management study**

Report with the description of the operations Specifications with the specific requirements to include Drawings of the management facilities Budget integrated in a separate chapter



RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

Report	1_ Estimation of the quantity (in T and m3 )
	2_ Waste prevention measures
	3_ Re-use, recovery or disposal operations
	4 Measures for separation
Plans -	5_ Plans of the planned storage, handling and sorting
	facilities
Specifications -	6_ Particular PT specifications of the project
Budget -	7_Assessment of the foreseen cost



#### EXPLANATORY NOTE

#### Article 4. Obligations of the producer of construction and demolition waste.

In addition to the requirements demanded by the legislation on waste, the producer of construction and demolition waste must comply with the following obligations:

Include a construction and demolition waste management study in the project for the execution of the work, which shall contain as a minimum:

1. An estimate of the quantity, expressed in tonnes and cubic metres, of construction and demolition waste that will be generated on the site, coded in accordance with the European list of waste published by Order MAM/304/2002, of 8 February, which publishes waste recovery and disposal operations and the European list of waste, or the standard that replaces it.

#### 2. The measures for the prevention of waste in the project's work.

3. The reuse, recovery or disposal operations to which the waste generated in the work will be put.

4. The measures for the separation of waste on site, in particular, for compliance by the waste holder with the obligation established in section 5 of Article 5.





# RD 105 / 2008

#### EXPLANATORY NOTE

5. The plans of the facilities planned for the storage, handling, separation and, where appropriate, other operations for the management of construction and demolition waste on site. Subsequently, these plans may be adapted to the particular characteristics of the work and its execution systems, subject to the agreement of the site management.

6. The requirements of the specific technical specifications of the project, in relation to the storage, handling, separation and, where appropriate, other management operations for construction and demolition waste on site.

7. An assessment of the estimated cost of construction and demolition waste management, which shall form part of the project budget in a separate chapter.



Article 4. Obligations of the PRODUCER of waste.

Spanish

**Content of the EGR** 

RD 105 / 2008

**Report** 

1. Estimate of the quantity (in t and m3) of CDW to be generated on site.

- Coded in accordance with the European List of Waste (ELW) published in Order MAM 304/2002, which publishes the waste recovery and disposal operations and the European waste list, or the standard that replaces it.



RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

### **Report**

- 2. Waste prevention measures:
- Waste characterisation and assessment
- Contracts with waste managers
- Proper storage of materials



RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

### **Report**

- **3.** Reuse, recovery or disposal operations:
- Reuse of land
- Reuse of construction elements
- On-site recycling
- Sending materials to landfill
  - Gypsum, asbestos...



RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

### **Report**

#### 4. Measures for waste separation

For compliance by the waste holder with the obligation established in RD 105/2008, in article 5, section 5, paragraph 5.

Individually for each type of waste, the expected amount of generation exceeds the following quantities:

- Concrete 80T
- Bricks, tiles, ceramics 40T
- Metal 2T
- Wood 1T
- Glass 1T
- Plastic 0.5T
- Paper and cardboard 0.5 T





RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

### <u>Plans</u>

**5.** Plans of the facilities planned for the storage, handling, separation and other management operations of construction and demolition waste on site.

These plans may be adapted to the particular characteristics of the work and its execution systems, subject to the agreement of the site management.





RD 105 / 2008

Spanish

### Article 4. Obligations of the PRODUCER of waste.

**Content of the EGR** 

### **Specifications**

6. Prescriptions of the specific technical specifications of the project, in relation to the storage, handling, separation and other management operations of construction and demolition waste on site.



#### **Specifications**

### How and with what resources?

The Specific Technical Specifications must provide an answer to how and with what resources the waste is going to be managed from its generation on site to its reuse or destination in a recovery plant or in a controlled landfill. To this end, it is necessary to define:

### 1. Training

- 2. Waste collection at source
- 3. Waste collection
- 4. Transport of waste
- 5. Hazardous and municipal solid waste management
- 6. Reuse, recovery and landfill of waste



Article 4. Obligations of the PRODUCER of waste.

The BASIC project for obtaining the licence must contain at least documents 1,2,3,4 and 7 of the EGR and everything related to RP.

Spanish

### **Basic Project: EGR**

RD 105 / 2008

- 1. Estimated quantity (in T and m3)
- 2. Waste prevention measures
- 3. Re-use, recovery or disposal operations
- 4. Measures for separation
- 5. Drawings of the planned storage, handling and sorting facilities
- 6. PPT requirements particular to the project

#### 7. Estimated cost assessment




RD 105 / 2008

Spanish

RD 105 / 2008 establishes a series of obligations for producers and holders of waste:

Producer  $\rightarrow$  Obliged to submit a:

CDW management plan: Submitted by the builder to the developer Must be approved by the project management It will be a contractual document



RD 105 / 2008

Spanish

RD 105 / 2008 establishes a series of obligations for producers and holders of waste:

#### Prody

**EXPLANATORY NOTE** 

Article 5. Obligations of the holder of construction and demolition waste.

1. In addition to the obligations provided for in the applicable regulations, the natural or legal person carrying out the work shall be obliged to submit to the owner of the work a plan reflecting how they will carry out their obligations in relation to the construction and demolition waste to be produced in the work, in particular those set out in article 4.1. and in this article. The plan, once approved by the project management and accepted by the owner, shall become part of the contractual documents for the works.



RD 105 / 2008

Spanish

#### 1. Report

- Technical, construction and installation report
- Estimate of the quantity (in T and m3) of CDW to be generated on site, coded according to the LER (EGR. Art. 4.1)
- Waste prevention measures (EGR. Art. 4.2)
- Operations for reuse, recovery or disposal (EGR. Art. 4.3)
- Measures for waste separation on site, (EGR. Art. 4.4)

#### **2. Technical Specifications**

- The storage, handling, separation and, where appropriate, other CDW management operations on site (EGR. Art. 4.6).
- List of standards (R. D. 105/2008)



RD 105 / 2008

Spanish

#### 3. Plans

 Plans of the necessary facilities for the storage, handling, separation and, where appropriate, other CDW management operations within the works (EGR. Art. 4.5).

#### 4. Budget

- Assessment of the expected cost of CDW management which will be part of the project budget in a separate chapter (EGR. Art. 4.7).
- Chapter 17: New separate chapter for waste management. Take into account that negative prices may appear due to the recovery of waste.



Spanish

Competitive advantages provided by the Waste Management Study/Plan:

- Compliance with the current waste regulations.
- Greater degree of cleanliness and organisation on the construction site
- Reduction of the environmental impact of construction activity and increase in the recovery of materials.
- Reinforces concepts linked to quality and environmental systems.
- Optimisation of waste management costs: the greater the selection of waste, the lower the management fees.
- Improvement of the image of the developer/construction company.



### **CDW BUDGETS.**



#### **INTRODUCTION**

- Royal Decree 105/2008 regulating the production and management of Construction and Demolition Waste makes it compulsory to budget for the treatment of waste in a separate chapter.
- To do so, it is necessary to:
- 1st\_ To know how the costs of waste treatment are introduced in the budget up to that moment.
- 2nd\_ How the new chapter for the budgeting of waste treatment costs works.



















Direct allocation: Allocation of a cost by applying the price of a component to the quantity in which that component participates in the cost.

Indirect Allocation: Allocation of a cost by applying a percentage to a reference value.





# CDW BUDGETS. The Model

Spanish

### Waste treatment in the reference model



The waste occurs in the items where its share is significant.

The waste is produced in the normal course of work.



# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference model

It is therefore common for waste removal to appear in budgets intermingled with the unit price components and as part of the indirect cost percentage.

#### Waste costs integrated in the CDE/CIE

#### **CDW management : CDE**

Chapter 01. Demolitions and preliminary works Chapter 02. Land development Chapter 04. Refurbishment Chapter 15. Urban development

#### **CDW management : CIE**

C122 Auxiliary means C125 Miscellaneous



# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference mode

#### Waste costs integrated in the CDE

- 1. Demolitions and preliminary works
  - The criterion followed for demolitions is to include in the unit prices the possible use of the waste obtained and the transport to landfill of the surplus.

Forms of expression used in the descriptions :

- 1. "...including p.p. for recovery and transport of surplus material to landfill".
- 2. "...including p.p. for the transport of surplus material to landfill.



# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference mode

#### Waste costs integrated in the CDE

1. Demolitions and preliminary works

*The use of these expressions seeks the application of two fundamental assumptions for all prices in Chapter 01:* 

- The material obtained remains the property of the builder.

- The use of the material compensates the associated costs.

#### Example:

Hypothesis: material resulting from demolition has no use, performance includes the activities necessary to carry out the activity. The compressor and special labourer times correspond to demolition, and the ordinary labourer and dump truck times to internal movements, loading and transport to landfill.





# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference mode

Waste costs integrated in the CDE

1. Demolitions and preliminary works

01RSH00101	m2 Demolition of 7 cm hydraulic mortar pavement						
Demolition of 7 cm hydraulic mortar paving including transport of surplus material to landfill.							
Measure the init	ial surfac	e					
CODE	CONCEPT QUANTITY PRICE AMOUN						
TP00100	h specia	al labourer	0.100	9.70	0.97		
TP00200	h ordinary labourer		0.250	9.02	2.26		
MK00002	h tipper truck		0.035	25.24	0.88		
MC00100	h hamm	ner compressor	0.050 7.21		0.36		
Assigned to waste removal		Direct Costs 4					
		13	0.58				
		Total					



## CDW BUDGETS.

**The Model** 

### Waste treatment in the reference mode

#### Waste costs integrated in the CDE

#### 4. . Refurbishment

In underground sewerage items it is common to include earthworks as part of the unit prices, which means that waste removal items with CDE treatment will also appear here.

#### Example:

In this example, waste removal is a complementary activity to the main activity (manhole construction), so the RDCs dedicated to waste removal would be the part of the ordinary labourer's time corresponding to full truck loading and truck time.



### **CDW BUDGETS.**

**The Model** 

Spanish

04EAP00002	u	Manhole 63 x 63 cm, depth 1.00 m and excavation of earth.
------------	---	---

Manhole of 63 x 63 cm, depth 1.00 m, consisting of 15 cm thick mass concrete slab, brickwork, rendered and burnished, reinforced concrete cover and connection of inlet and outlet pipes, including excavation of earth, backfilling and **transport of surplus earth to landfill.** 

Measured the executed unit

CODE	CONCEPT	QUANTITY	PRICE	AMOUNT
FL01300	mu Perforated brick	0.200	51.09	10.22
AGM00500	m3 mortar of M-4 cement and river sand	0.110	37.00	4.07
AGM00200	m3 mortar of M-8 cement and river sand	0.025	49.28	1.23
CH00300	m3 concrete HM-20	0.136	36.90	5.02
SA00700	m2 Reinforced concrete cover	0.450	23.74	10.68
MK00002	h tipper truck	0.450	25.24	11.36
ATC00100	h Bricklaying crew OF. 1 <sup>a</sup> and p.e	3.200	30.57	65.82
TP00200	h ordinary labourer	3.900	9.02	35.18
Assigned to waste removal		Direct Costs		143.58
	Assigned to waste removal *	13% Indirect costs		18.67
			Total	162.25





# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference model

Waste costs integrated in the CIE

The largest relative volume of waste produced is from Demolition Works.

	Concept	%	m3/m2
CDE	05. Structures	45.53	0.6705
	06. Factories	23.25	0.3424
	07. Covers	6.54	0.0963
	10. Coatings	17.79	0.2620
	Other	6.89	0.1015
	Totals	100.00	1.4727





## CDW BUDGETS.

**The Model** 

### Waste treatment in the reference model

#### Waste costs integrated in the CIE

At the New Plant works, the largest volume of rubble corresponds to excavated earth.

	Concept	%	m3/m2
CDE	02. Land	85.76	0.4099
CIE	03. Foundations	4.23	0.0202
	05. Structures	3.79	0.0181
	06. Factories	3.06	0.0186
	07. Covers	0.94	0.0045
	10. Coatings	1.63	0.0076
	Other	0.59	0.0028
	Totals	100.00	0.4779



# CDW BUDGETS.

**The Model** 

### Waste treatment in the reference model

#### Waste costs integrated in the CIE

Waste generated as a result of loss and breakage of materials and the packaging in which they arrive on site.

	Concept	%	m3/m2
1F	05. Structures	8.49	0.0071
	06. Factories	31.27	0.0262
	07. Covers	2.64	0.0022
	10. Coatings	15.39	0.0129
	11. Carpentries	1.40	0.0012
	13. Glass	35.59	0.0298
	Other	5.22	0.0044
	Totals	100.00	0.0838





### **CDW BUDGETS.**

**The Model** 

Spanish

### Waste treatment in the reference model

**SUMARY** 

#### RCD cost treated as CDE

CDE

**Demolition waste** 

85.76 % New Plant Waste (02. Land)

#### RCD cost treated as CE

CIE 14.24% New Plant Waste

100.00% Packaging waste



**Objectives** of the new budgeting model:

- Individualised treatment of the waste obtained.

- **Separating waste from the budget**, as independent units, by type and class of waste (metallic, concrete, ceramic...).

In order to facilitate their economic management according to the characteristics and destination of the waste.





### **Budget. Reference model**

**Definition:** Estimate of the Expected Cost of the work, in traditional models it is the result of the successive aggregation of the estimated costs of all the items into which the whole is divided.

### **Classical Formulation:**

$$P = \sum_{i} ECE_{i}$$

#### **Remarks:**

#### In the reference model:

There is no room for atypical revenues; the only revenue stream is the payment of the amounts agreed in the budget. Waste costs are randomly distributed in the budget.



**Integrated Budget** 

**Definition:** Integration of the expected unit revenues from the reuse or sale of waste in the calculation of the costs of the work units providing the waste. .

### **Formulation:**

$$P = \sum_{i} ECE_{i}$$

#### **Remarks:**

Integration can be achieved without modifying the structure of the model, the formulation is the same as the classical model, being necessary:

-Extend the scope of application of the concepts Supply Price and Basic Price, in order that the income received from the sale of waste is considered as a negative price, this means; Expansion of the budget structure.



**Negative Prices** 

In order to effectively achieve individualised waste treatment, it is essential to know the destination of the waste.

**Fundamental assumption:** 

**Income = Negative Cost** 

In the following table, waste treatment activities that represent an economic cost in the budget are represented by a plus sign (+) and those activities that represent a revenue in the budget are represented by a minus sign (-).



### Phases of the new treatment

### 1\_ Data collection

In this phase, the data that will be needed to develop the budget for Chapter 17 is collected.

Measurement of waste removal items is best done using indirect methods, through transfer of measurement, which can be done by using measurements from other budget items, or items from the list of commodities and ancillary items.

Therefore the data available at the start of Chapter 17 budgeting will be:

- List of waste generating budget items.
- List of Commodity requirements
- List of Ancillary Commodity requirements





### Phases of the new treatment

2\_ List of items Chapter 17

17.	WASTE
17A.	Metals and Alloys
17F.	Asphalt, Tar and other tarred products
17H.	Concretes, Bricks, Roof tiles, Ceramic materials and gypsum-based materials
17 <b>I</b> .	Insulation materials
17 <b>M</b> .	Wood, Paper, Cardboard, Plastics, Synthetics and Glass
17R.	Mixed waste
17T.	Land
17W.	Various





### Phases of the new treatment

3\_ Detailed measurement of Chapter 17

# Indirect measurement LIST OF REQUIREMENTS

List containing the codes, summary descriptions and quantities of the basic and auxiliary products necessary to carry out the work, respectively. Basic components Auxiliary components



Phases of the new treatment

3\_ Detailed measurement of Chapter 17

### Indirect measurement

### TRANSFORMATION COEFFICIENTS







### Phases of the new treatment

3\_ Detailed measurement of Chapter 17

### SUMMARY

Transfers Origin Waste generating items Component requirement lists







### Phases of the new treatment

3\_ Detailed measurement of Chapter 17

### SUMMARY

Transfers Origin Waste generating items Component requirement lists

#### **EXPLANATORY NOTE**

Measurement transfer: tool to simplify the development of the measurement. It consists of the use of complete or partial measurements of work units already carried out or pending to be carried out, for the measurement of other units through the transfer of their results.





### Phases of the new treatment

4\_ Chapter 17 prices

#### Calculation of CDE:

Application of the calculated prices to the result of the detailed measurement of the items of the chapter.

BUDGET: DETAIL							
IDENTIFICATION		DIMEN	DIMENSIONS		IMPORT		
Code	Concept	Measurement	Price	Partial	Total		
17.	Waste						
17A.	Metals and alloys			_			
17AHA00001	t removal of steel waste .	4,06	-38,50	-156,35			
					-156,35		
17F.	Asphalt, tar etc.						
17FAA00001	t removal of asphalt waste	0,10	35,39	3,54			
				17F.	3,54		



### Phases of the new treatment

4\_ Chapter 17 prices

The sum of the amounts of the remaining chapters of the budget, the ESS and Chapter 17 determines the Total Implementation Amount.

IDENTIFICATION		DIMENSIONS		IMPORT	
Code	Concept	Measurement	Price	Partial	Total
17.	Waste				
17A.	Metals and alloys			17A.	-156,35
17F.	Asphalt, tar etc.			17F.	3,54
17H.	Concrete, bricks, roof tiles, etc.			17H.	10.419,71
17M.	Wood, paper, cardboard, etc.			17M.	1.226,78
17R.	Mixed waste			17R.	34.209,04
17T.	Land			17T.	21.673,81
			Amount	Implementation	67.376,53





**Comprehensive budgeting** 

Individualised treatment of CDW

**Model adaptation** 

Extension of classification systems PB, PA and PU Redefinition of concepts PSU, PB, PA and PU (±) Measurement transfers Coefficients: CR, CC and CT





### SOURCES

Base de Costes de la Construcción de Andalucía (2010).

https://www.juntadeandalucia.es/organismos/fomentoinfraestructurasyordenaciondelterritorio/areas/vivienda-rehabilitacion/planesinstrumentos/paginas/bcca-sep-2010.html

BEP BIM EXECUTION PLAN: PLAN DE EJECUCIÓN BIM. 24STUDIO BIM. https://24studiobim.com/bep-bim-execution-plan-de-ejecucion-bim/

BIMchannel. Guía BIM para la gestión de proyectos y obras (Traducción parte 2). https://bimchannel.net/es/quia-bim-gestion-proyectos-obras/

DECISIÓN DE LA COMISIÓN de 18 de diciembre de 2014 por la que se modifica la Decisión 2000/532/CE, sobre la lista de residuos, de conformidad con la Directiva 2008/98/CE del Parlamento Europeo y del Consejo. <u>https://www.boe.es/doue/2014/370/L00044-00086.pdf</u>

FORMACIÓN & IMPLEMENTACIÓN BIM EMPRESA. 24STUDIO BIM. <u>https://24studiobim.com/formacion-implementacion-empresa/</u>

Infografía: Common Data Environment (CDE) y la gestión colaborativa de documentos de un proyecto BIM. Seys. <u>https://seystic.com/infografia-common-data-environment-cde-y-la-gestion-colaborativa-de-documentos-de-un-proyecto-bim/</u>

La figura del BIM Manager: ¿qué es y cómo formarse para ello? https://www.factoria5hub.com/que-es-un-bim-manager-2

Ley 22/2011 de 28 de julio, de residuos y suelos contaminados. https://www.boe.es/eli/es/l/2011/07/28/22/con

Fuentes-Bargues, J. (2014). Metodología para la Dirección Ambiental de Obra en Obras de Edificación. CONAMA 2014, Congreso Nacional del Medio ambiente. <u>http://www.conama2012.conama.org/conama10/download/files/conama2014/CT%202014/1896711453.pdf</u>

Presupuestación de obras. A. Ramírez de Arellano. Universidad de Sevilla. Sevilla, 2010. http://grupo.us.es/garditec/tomo01.pdf

ORDEN MAM/304/2002, valorización y eliminación de residuos y la lista europea de residuos. <u>https://www.boe.es/diario\_boe/txt.php?id=BOE-</u><u>A-2002-3285</u>

Real Decreto 105/2008, de 1 de Febrero, por el que se regula la producción y gestión de los residuos de construcción. https://www.boe.es/eli/es/rd/2008/02/01/105/con

Real Decreto 1481/2001, eliminación de residuos en vertedero. <u>https://www.boe.es/buscar/act.php?id=BOE-A-2002-1697</u>

Real Decreto 180/2015, de 13 de marzo, por el que se regula el traslado de residuos en el interior del territorio del Estado. https://www.boe.es/buscar/pdf/2015/BOE-A-2015-3715-consolidado.pdf

Real Decreto 833/1988. Residuos peligrosos. Envasar y etiquetar. <u>https://www.boe.es/eli/es/rd/1988/07/20/833</u>

Retirada selectiva de residuos: modelo de presupuestación. A. Ramírez de Arellano y otros. Fundación Aparejadores. Sevilla, 2002. https://books.google.es/books/about/Retirada\_selectiva\_de\_residuos.html?id=sag9uwEACAAJ&redir\_esc=y

BIM in the LCA calculation <u>https://www.bimandco.com/es/blog/25-what-role-does-bim-play-today-in-lca</u>



Co-funded by the Erasmus+ Programme of the European Union







iED



M

Warsaw University of Technology





