Escuela Técnica Superior de
Ingeniería de Caminos, Canales y Puertos
UNIVERSIDAD DE CANTABRIA

GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF ROAD CA-811

VILLANUEVA DE LA PEÑA-HERRERA DE IBIO

FINAL DEGREE PROJECT

Project carried out by:
Jorge Sáenz Fernández

Directed by:
Mª Antonia Pérez Hernando

Degree:
Grado en Ingeniería Civil

Santander, July of 2025

RESUMEN DEL PROYECTO:

MEJORA DE TRAZADO Y AMPLIACIÓN DE PLATAFORMA DE CARRETERA CA-811. TRAMO: VILLANUEVA DE LA PEÑA - HERRERA DE IBIO.

Autor: Jorge Sáenz Fernández

Director: Mª Antonia Pérez Hernando

Convocatoria: Julio de 2025

Palabras Clave: Proyecto, Construcción, Carretera, Trazado, Mejora, Ampliación, Villanueva de la Peña, Herrera de Ibio

OBJETO Y DEFINICIÓN DEL PROYECTO:

La finalidad de realizar este proyecto es mejorar las condiciones existentes en la carretera CA-811, considerando un nuevo trazado y una ampliación de plataforma incluyendo un carril bici. Se considera la misma como de nueva construcción.

La mejora de trazado y ampliación de plataforma de CA-811 supone una sustancial mejora a la calidad de la vía existente, el cual se encuentra en una situación inaceptable. La incorporación de un carril bici en la carretera CA811, entre Villanueva de la Peña y Herrera de Ibio, no solo aumentará la seguridad y la calidad de la vía para todos los usuarios, sino que también fomentará un estilo de vida más saludable y sostenible, mejorando significativamente la calidad de vida de la comunidad local

DESCRIPCIÓN DE LAS OBRAS:

Se diseña el nuevo trazado de la carretera con una velocidad de proyecto de 60 km/h. La carretera tiene un total de 1640 metros de longitud, con una única calzada de dos carriles de circulación (uno por sentido) además de un carril bici. El proyecto de mejora consiste en:

• Mejora del trazado en planta y en alzado, aumentando los radios de las curvas y cambiando los acuerdos verticales para adecuarlos a la normativa vigente.

• Ampliación de la calzada original, disponiendo una sección formada por dos carriles de 3,50 m, arcenes de 1,00 m y 0,3 m y un carril bici de 2,00 m

• Dimensionamiento del nuevo firme, considerando un suelo de tipo tolerable y una categoría de tráfico T41.

Sección de firme:

- 50 cm de suelo adecuado
- 30 cm de suelo estabilizado con cemento (S-EST-3)
- Riego de Curado C60B3 CUR
- 20 cm de Zahorra superficial
- Riego de imprimación C60BF4 IMP
- 10 cm de Mezcla Bituminosa AC22 BIN 50/70 S CALIZA
- Riego de adherencia C60B3 ADH
- 5 cm de Mezcla bituminosa AC16 SURF 50/70 D.

• Mejora del sistema de drenaje longitudinal, disponiendo los siguientes elementos:

- Obras de drenaje transversal con colectores de 1.8m de diámetro.
- Pozos de registro
- Aletas
- Cunetas prefabricas tipo VA-75.

• Colocación de señalización vertical, horizontal, balizamiento y barreras de contención de vehículos para dotar a la vía de la seguridad y nivel de servicio adecuado.

• Restauración de la vegetación en taludes mediante hidrosiembra.

• Por último, se redacta un Plan de Gestión de Residuos, un Estudio de Impacto Ambiental y un Estudio de Seguridad y Salud, puesto que todos ellos son de obligado cumplimiento.

PLAN DE OBRA:

El plazo previsto de ejecución de las obras es de 10.32 meses.

PRESUPUESTO:

El Presupuesto Base de Licitación de la obra es de 3.291.000,54 €.

Si añadimos a esta cifra el presupuesto de las expropiaciones (148.238,78 €) y de los servicios afectados (30.000€), obtenemos el Presupuesto para Conocimiento de la Administración, ascendiendo este de 3.469.239,32 €.

EL AUTOR DEL PROYECTO

Fdo.: Jorge Sáenz Fernández

PROJECT SUMMARY:

GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF CA-811. VILLANUEVA DE LA PEÑA – HERRERA DE IBIO

Author: Jorge Sáenz Fernández

Director: Mª Antonia Pérez Hernando

Call: July of 2025

Keywords: Project, Construction, Road, Alignment, Improvement, Widening, Villanueva de la Peña, Herrera de Ibio

OBJECTIVE AND DEFINITION OF THE PROJECT:

The purpose of this project is to improve the existing conditions of the CA-811 road, by proposing a new alignment and a platform widening that includes the addition of a bicycle lane. The intervention is considered as new construction. The improvement of the alignment and the widening of the CA-811 platform represents a substantial enhancement in the quality of the existing road, which is currently in an unacceptable condition. The inclusion of a bicycle lane on the CA-811 road, between Villanueva de la Peña and Herrera de Ibio, will not only increase safety and road quality for all users, but will also promote a healthier and more sustainable lifestyle, significantly improving the quality of life for the local community.

DESCRIPTION OF THE WORKS

The new road alignment is designed for a project speed of 60 km/h. The road has a total length of 1,640 meters, consisting of a single carriageway with two traffic lanes (one per direction) plus a bike lane. The improvement project consists of:

- Improvement of the horizontal and vertical alignment, increasing curve radii and adjusting vertical grades to comply with current regulations.
- Widening of the original carriageway, providing a cross-section composed of two lanes of 3.50 m each, shoulders of 1.00 m and 0.30 m, and a 2.00 m bike lane.
- Dimensioning of the new pavement, considering a tolerable soil type and a traffic category of T41.

Firm section:

- 50 cm of Acceptable Soil
- 30 cm Cement-Stabilized Soil (S-EST-3)

-Adhesion tack coat C60B3 CUR

- 20 cm of Granular Base(ZA 20)

- Priming bituminous spray C60BF4 IMP

- 10 cm of Bituminous Mixture AC22 BIN 50/70 S

- Adhesion tack coat C60B3

- 5 cm of Bituminous Mixture AC16 SURF 50/70 D.

Improvement of the longitudinal drainage system, including the following elements:

- Transverse drainage works with 1.8 m diameter collectors.
- Inspection chambers (manholes)
- Wing walls
- Prefabricated VA-75 type ditches

• Installation of vertical and horizontal signage, delineation, and vehicle containment barriers to provide the road with adequate safety and service level.
• Restoration of vegetation on slopes through hydroseeding.
• Finally, a Waste Management Plan, an Environmental Impact Study, and a Safety and Health Study are prepared, as all of these are mandatory.

CONSTRUCTION SCHEDULE:

The planned construction period is 10.32 months.

BUDGET:

The Base Tender Budget for the project amounts to €3,291,000.54.

If we add to this amount the budget for expropriations (€148,238.78) and for affected services (€30,000), we obtain the Budget for Administrative Review, which totals €3,469,239.32.

PROJECT AUTHOR:

Signed.: Jorge Sáenz Fernández

UNIVERSIDAD DE CANTABRIA

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS CANALES Y PUERTOS

ÁREA DE PROYECTOS

TYPE	**PROYECTO FIN DE CARRERA INGENIERO DE CAMINOS, CANALES Y PUERTOS**
TITTLE in Spanish	**MEJORA DE TRAZADO Y AMPLIACIÓN DE PLATAFORMA DE CARRETERA CA-811. TRAMO: VILLANUEVA DE LA PEÑA – HERRERA DE IBIO**
TITTLE in English	**GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF ROAD CA-811. VILLANUEVA DE LA PEÑA – HERRERA DE IBIO**
PROVINCE	**CANTABRIA**
MUNICIPALTY	**MAZCUERRAS**
VOLUME	**I (AND ONLY)**
DOCUMENTS	**PROJECT DESCRIPTION DOCUMENT Nº1 INTRODUCTION DOCUMENT Nº2 PRELIMINARY STUDIES DOCUMENT Nº3 PROJECT DESIGN DOCUMENT Nº4 TECHNICAL SPECIFICATIONS DOCUMENT Nº5 BUDGET DOCUMENT Nº6 EXECUTION PLAN DOCUMENT Nº7 APPENDICES**
GROUP	**CIVIL CONSTRUCTION**
AUTHOR	**JORGE SÁENZ FERNÁNDEZ**

BUDGET **T.B.B 2.719.835,16€**	DATE **JULY of 2025**

FIRMAS DEL DOCUMENTO

UNIVERSIDAD DE CANTABRIA	**DATE:**	**JULY 2025**	
	Área de Proyectos de Ingeniería		
	Escuela Técnica Superior de Ingenieros de Caminos Canales y Puertos		
UNIVERSIDAD DE CANTABRIA			

FIRMA DEL ALUMNO AUTOR DEL PROYECTO

JORGE SÁENZ FERNÁNDEZ

PROJECT DESCRIPTION

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1. INTRODUCTION

The development of this construction project is part of the Final Degree Project in Civil Engineering at the Universidad de Cantabria, carried out at the Escuela Tecnica Superior de Caminos, Canales y Puertos de Santander.

The purpose of this project is to improve the existing conditions of the CA-811 road, by proposing a new alignment and a platform widening that includes the addition of a bicycle lane. The intervention is considered as new construction.

The improvement of the alignment and the widening of the CA-811 platform represents a substantial enhancement in the quality of the existing road, which is currently in an unacceptable condition. The inclusion of a bicycle lane on the CA-811 road, between Villanueva de la Peña and Herrera de Ibio, will not only increase safety and road quality for all users, but will also promote a healthier and more sustainable lifestyle, significantly improving the quality of life for the local community.

2. PROJECT DESCRIPTION

2.1. INTRODUCTION

2.1.1 BACKGROUND AND PROJECT PURPOSE

The road project involves the improvement of the alignment and widening of CA-811 road between Villanueva de la Peña and Herrera de Ibio.

The alignment is designed for a design speed of 60 km/h. The roadway consists of two lanes, each 3.5 meters wide, one for each direction of traffic. Shoulders of 1 meter and 0.3 meters are planned, along with a 2-meter-wide bike lane.

The alignment starts at the intersection of road CA-811 with road CA-812, which runs through Villanueva de la Peña, and extends 1,640 meters towards Herrera de Ibio, ending a few meters before the bridge over the Ceceja stream.

The horizontal and vertical alignments feature gentle curves to enhance driving comfort and safety, fully complying with current regulations.

The volumes of embankment and cut are fairly balanced, with cut volumes slightly exceeding embankment. The excess material will be sent to a landfill. Vegetation will be restored on embankment and cut slopes by hydroseeding.

Drainage elements will be installed, including longitudinal drainage (ditches for roadway and shoulder drainage) and transverse drainage works to manage watershed runoff. Horizontal and vertical signage, as well as vehicle containment elements, will also be installed. No lighting will be provided, as the alignment is outside the urban area.

The following works will be carried out:

- **Execution of earthworks:** The typical section includes two 3.5-meter lanes, shoulders of 1 and 0.3 meters, and a 2-meter bike lane. Both cut and fill sections will be constructed.
- **Drainage installation:**
  - *Transverse drainage:* Three transverse drainage structures are planned along the bypass.
  - *Longitudinal drainage:* VA-75 type ditches will be built along the cut sections.
- **Pavement layer placement:** Starting from a tolerable soil and traffic category T41, 50 cm of suitable soil will be placed, followed by 30 cm of cement-stabilized soil, 20 cm of aggregate base, and the following pavement layers to achieve an E3 subgrade:
  - Intermediate layer: AC22 BIN 50/70 S, 10 cm.
  - Wearing course: AC16 SURF 50/70 D, 5 cm.
- **Installation of signage and containment systems:** Vertical signage will include retroreflective signs RA-2 and panels RA-3; horizontal signage will include road markings and islands. Vehicle containment barriers N2-W1 will also be installed.
- **Environmental integration:** Slope revegetation will be carried out through hydroseeding.

2.1.2 AREA DESCRIPTION

Regional Context:

The project is entirely located within the Autonomous Community of Cantabria, situated in northern Spain. It borders the Cantabrian Sea to the north, the provinces of León, Burgos, and Palencia to the south, the Principality of Asturias to the west, and the province of Vizcaya to the east. The city of Santander, located in the northern part of the autonomous community, is the capital and most populous city of Cantabria, with a population of 590,851 inhabitants (data from December 2024, INE), mainly concentrated in the northern half of the territory.

Comarcal Context:

The planned road will run through the municipality of Mazcuerras, located in the Saja-Nansa comarca. This comarca extends from the Besaya comarca to the western autonomous community boundary and from La Marina to the Cordel and Peña Labra mountain ranges. It comprises the municipalities of Cabezón de la Sal, Cabuérniga, Herrerías, Lamasón, Mazcuerras, Peñarrubia, Polaciones, Reocín, Rionansa, Ruente, Los Tojos, and Tudanca. The comarca has a total population of 24,036 inhabitants (INE, 2017).

Municipality of Mazcuerras:

The planned road passes through the municipality of Mazcuerras. It borders the municipalities of Cabezón de la Sal and Reocín to the north, Ruente and Cabezón de la Sal to the west, Cieza and Ruente to the south, and Cartes and Los Corrales de Buelna to the east. The municipality covers an area of 55.65 km² and has a population of 2,093 inhabitants (INE, 2024), distributed among the localities of Cos, Herrera de Ibio, Ibio, Mazcuerras, Riaño de Ibio, Sierra de Ibio, and Villanueva de la Peña.

Traditionally, the local economy has been based mainly on cattle farming and flower cultivation. However, these activities are currently in decline, with the majority of the population now engaged in tertiary sector activities, notably rural tourism and hospitality.

Regarding sectoral employment, the primary sector accounts for 15.5% of the municipality's population, construction 20.8%, industry 25.9%, and the services sector 37.8%.

Notable municipal heritage sites include the Casona-Torre de Hoyos, the Palacio Gómez de la Torre, and the Ermita de Cintul. The town of Mazcuerras received the "Pueblo de Cantabria" award in 2008.

2.1.3 CARTOGRAPHY AND TOPOGRAPHY

For basic topographic cartography, the Harmonized Topographic Base at a 1:5,000 scale based on 2007 aerial surveys will be used, specifically the following sheets:

- 0057-01-01
- 0057-01-02
- 0058-01-01
- 0058-01-02

Orthophotos obtained from the same source, the 2007 Cantabria Orthophotogrammetry (PNOA 0.25m), will also be used:

- 0057-0801
- 0057-0802
- 0058-0101
- 0058-0102

Detailed topographic and cartographic information of the project area is provided in Introduction 3 – Cartography and Topography

2.1.4 URBAN PLANNING

In accordance with the land classification defined by Ley 5/2022, de 15 de julio, de Ordenación del Territorio y Urbanismo de Cantabria, the alignment runs entirely through rural land with special protection.

Information regarding the urban planning of the project area is provided in Introduction 4 – Urban Planning.

2.2. PRELIMINARY STUDIES

2.2.1 GEOLOGY

The study area is located between sheet 57 – Cabezón de la Sal and sheet 58 – Corrales de Buelna of the National Geological Map, at a scale of 1:50,000. The geology of the project area is characterized by the predominance of Triassic and Quaternary terrains

Detailed information regarding the geology of the project area is provided in Preliminary Studies 1 – Geology.

2.2.2 SEISMIC EFFECT

According to "Norma de Construcción Sismorresistente: Parte general y Edificación (NCSR-02)", t is not necessary to consider the potential impact of seismic activity in the project design, given the low seismic hazard in the area.

Information regarding seismic effects in the project area is detailed in Preliminary Studies 2 - Seismic Effect.

2.2.3 CLIMATE AND HYDROLOGY

The project is located in a region with a Cfb oceanic climate, characterized by mild temperatures, no dry seasons and mild summers

The climatic characterization is based on data collected from the Santander Airport and Terán meteorological stations, covering the period from 1997 to 2023. These data include average daily monthly maximum and minimum temperatures, as well as average, maximum, and minimum daily precipitation.

The road alignment runs between the towns of Villanueva de la Peña and Herrera de Ibio, ending the new route a few meters before the Ceceja stream. This stream, important for water drainage, has a bridge that lies outside the project scope. Additionally, the entire area is outside zones classified as flood risk areas.

The main natural catchment basins of the terrain are identified, along with those generated by the construction of the road platform and its margins.

Detailed information regarding the climatology and hydrology of the project area is provided in Preliminary Studies 3 – Climatology and Hydrology.

2.2.4 GEOTECHNICAL STUDIES

The project alignment is located within sheet 11 – Reinosa of the National Geotechnical Map, at a scale of 1:200,000. The work is carried out on terrain predominantly composed of detrital materials of clayey nature, with limestone intercalations. This terrain does not present unfavorable geotechnical constraints for the execution of the infrastructure.

Consequently, a uniform slope typology is planned along the bypass, adopting slopes of 3H:2V for both cuts and fills.

Detailed information regarding the geotechnical characteristics of the corridor is provided in Preliminary Studies 4 – Geotechnical Studies

2.2.5 TRAFFIC STUDY

Se Traffic data corresponding to coverage station 811-01, provided by Universidad de Cantabria indicate that the Average Daily Traffic (ADT) in 2023 was 512 vehicles per day, with 7% heavy vehicles. Considering an annual growth rate of 1.44% and taking 2026 as the year of infrastructure commissioning, the projected ADT for that year is estimated at 534 vehicles per day.

To determine the level of service on the new road, the percentage of delayed vehicles was evaluated in four representative subsections, defined according to their geometric characteristics: sections with overtaking prohibited, sections with overtaking allowed, the section with the steepest gradient, and the section with the tightest curve radius.

In all analyzed subsections, the percentage of delayed vehicles remains below 2%, allowing the classification of the level of service as type A, the most favorable according to current regulations.

Detailed information regarding the traffic analysis in the project area is provided in Preliminary Studies 5 – Traffic Studies

2.2.6 SOLUTIONS TO TRAFFIC

The traffic regulation solutions during the execution of the works have been defined in accordance with the provisions established in Norma 8.3-IC "Señalización de obras" and "*Manual de ejemplos de señalización de obras fijas"*, published by Dirección General de Carreteras.

For this purpose, the use of vertical signage, road markings, and delineation elements is planned, aiming to ensure safe and orderly traffic flow in areas affected by the construction works.

Information regarding the proposed traffic solutions in the Project is provided in Preliminary Studies 6 – Solutions to Traffic

2.2.7 ENVIRONMENTAL STUDIES

In accordance with the provisions of Anexo II de Ley 21/2013, the project is subject to a Simplified Environmental Assessment, which identifies the potential impacts that the project may generate on the environment during both the construction and operational phases.

The evaluation of these impacts has been carried out using a semi-quantitative numerical method, allowing the quantification of the degree of environmental impact.

For those impacts assessed as moderate, specific preventive and/or corrective measures have been defined. Additionally, the basis for the development and implementation of an Environmental Monitoring Plan is established to ensure the follow-up and control of the effects on the environment.

Detailed information regarding the Environmental Impact Study of the project area is provided in Preliminary Studies 7 – Environmental Studies

2.3. PROJECT DESIGN

2.3.1 EARTHWORKS

The previously established slope designs will be employed. The earthworks excavated from cut sections will be reused for the construction of embankments as much as possible. Any surplus volume will be sent to a landfill.

Below is a summary of the earthworks for the project:

VOLUME (m3)	
Cut	20705,68
Fill	18792,06
Excess material to landfill	1950,94

Table 1. Earthworks Summary.

Information regarding earthworks within the Project area is detailed in Project Design 1 - Earthworks.

2.3.2 DRAINAGE

El The drainage system design has been carried out in accordance with the criteria established in Norma 5.2-IC "Drenaje Superficial." In the area surrounding the bypass, three main catchment basins have been identified that drain their waters toward the alignment, as well as waters collected by the ditches generated by the platform itself and its margins.

No transverse drainage arrangement is planned from the highest elevation kilometer point onward, due to its proximity to the Ceceja stream, which acts as a natural receiving channel, ensuring the evacuation of runoff waters.

The following drainage elements are planned:

Transverse Drainage

- 3 transverse drainage structures (CDS) with circular sections of 1.8 m diameter.
- 4 inspection chambers.
- 2 wing walls with their respective outlets.

Longitudinal Drainage

- Triangular embankment foot ditches of type VA-75, lined with concrete.
- No use of collectors, drainage pipes, or channels will be required.

Further information regarding the Project's drainage system is provided in Project Design 2 - Drainage

2.3.3 GEOMETRIC DESIGN

The pavement sections are designed following the criteria defined by Norma 6.1-IC, "Secciones de Firme." Based on the available traffic data, a value of 18 heavy vehicles per day per lane is determined. The underlying soil is classified as tolerable (0). This results in a heavy traffic category of T41.

The aim is to achieve a subgrade category of E3.

For the construction of the road crown, 50 cm of suitable soil will be used, along with 30 cm of cement-stabilized soil (S-EST-3).

Pavement	**Bituminous Mixture AC16 SURF 50/70 D**	**5**
	Adhesion tack coat C60B3	-
	Bituminous Mixture AC22 BIN 50/70 S CALIZA	10
	Priming bituminous spray C60BF4 IMP	-
	Granular Base(ZA 20)	20
Subgrade	Adhesion tack coat C60B3 CUR	-
	Cement-Stabilized Soil (S-EST-3)	30
	Acceptable Soil (1)	50
	Tolerable Soil (0)	-

Table 2. Conclusion on Pavement Layers and Subgrade.

Information regarding the pavement design of the Project is detailed in Project Design 3 – Geometric Design

2.3.4 ROAD ALIGNMENT

The alignment of the bypass is designed for a project speed of 60 km/h, following Norma 3.1-IC "Trazado."

Horizontal Alignment

The horizontal alignment consists of 7 straight sections connected by circular curves and their corresponding transition curves. The alignments comply with the minimum characteristics established by the standard regarding lengths, radii, and minimum speeds, and have been designed to ensure good coordination between the horizontal and vertical profiles.

Vertical Alignment

The vertical alignment features a grade with gentle slopes. The road gradient will not exceed the maximum slope established at any point.

Cross Section

The cross section consists of two lanes of 3.5 meters each, a shoulder of 1 meter on one side, a 0.3-meter shoulder on the other, and a 2-meter bicycle lane.

Further information about the Project's alignment and staking out is provided in Project Design 4 – Road Alignment.

2.3.5 SIGNAGE, DELINEATION, AND CONTAINMENT SYSTEMS

Se Vertical signage will be installed in accordance with Norma 8.1-IC, "Señalización Vertical." The vertical signage will consist of signs with RA-2 retroreflectivity.

Horizontal signage will be installed in accordance with Norma 8.2-IC, "Señalización VIal."

For vehicle containment, N2-W1 safety barriers (containment level N2 and working width W1) will be installed following the recommendations of Orden Circular 35/2014, regarding Application Criteria for Vehicle Containment Systems.

Further information about the Project's Signage and Delineation is provided in Project Design 5 – Signage, Delineation and Containment Systems

2.3.6 ENVIRONMENTAL INTEGRATION

Before starting the earthworks corresponding to the leveling phase, the existing topsoil layer will be removed. This topsoil will be properly stored for later reuse in the planting of embankment and cut slopes.

The revegetation of the slopes will be carried out using hydroseeding techniques, with the aim of preventing erosion processes, improving soil stability, and reducing visual impact on the environment.

Further information regarding environmental integration in the Project area is provided in Project Design 6 - Environmental Integration.

2.3.7 STACKING OUT

The staking out of the project road is carried out from two reference points with intervals of 20 meters.

Information regarding the staking out in the Project is detailed in Project Design 7 – Stacking Out.

2.4. TECHNICAL SPECIFICATIONS

In 4-Technical Specifications of this Project, the laws and regulations applicable to the execution of the works are detailed. Additionally, the tasks to be performed, work units, construction procedures, measurement and payment criteria, as well as the materials to be used, are described.

2.5. BUDGET

2.5.1 BUDGET

The **Construction Budget** is **2.285.575,76€**

Applying General Expenses (**13%**), Industrial Profit (**6%**), and Value Added Tax (**VAT, 21%**), the **Base Tender Budget** amounts to **€3,291,000.54.**

Including the cost of expropriations and the relocation of affected utilities, the **Budget for Administrative Review** amounts to **€3,469,239.32.**

2.5.2 PRICE JUSTIFICATION

Based on the amounts provided by *Convenio Colectivo de Construcción y Obras Públicas de Cantabria del año 2024*, and applying the expected annual increase of 2.75%, the following hourly labor costs are determined:

	ANNUAL COST	HOURLY COST
	€	€/h
FOREMAN	46639,97	26,87
FIRST OFFICER	45331,70	26,11
ORDINARY LABORER	36974,34	21,30

Table 4. Labor Force Cost.

An indirect cost rate of 6% is estimated.

Information regarding the Price Justification appears in Budget 2 – Price Justification

2.5.3 BUDGET FOR ADMINISTRATIVE REVIEW

Budget for Administrative Review is calculated in the following table:

Concept		Price (€)	
		Parcial	Total
1	Construction Budget		2.285.575,76
2	General Spendings, 13%	297.124,85	
3	Industrial Benefit, 6%	137.134,55	
4	Tender Base Budget without TVA (1+2+3)		2.719.835,16
5	VAT, 21%	571.165,38	
6	Tender Base Budget (4+5)		3.291.000.54
7	Expropriations		148.238,78
8	Affected Services		30.000
9	**BUDGET FOR ADMINSITRATIVE REVIEW** (6+7+8)		**3.469.239,32**

Table 5. Budget for Administrative Review.

Information regarding Budget for Administrative Review appears in Budget 3 – Budget for Administrative Review

2.6. EXECUTION PLAN

2.6.1 HEALTH AND SAFETY PLAN

This document has been prepared in compliance with Real Decreto 1627/1997, del 24 de Octubre, which establishes the obligation to include a Safety and Health Study in public works projects.

The study details the planned activities and construction methods for the execution of the works, from which the associated potential risks are identified. Based on this, the necessary preventive measures are defined to eliminate or minimize these risks during the course of the work.

Additionally, the facilities intended to ensure the hygiene and welfare of workers on the construction site are described.

The corresponding Specifications document is also included, detailing the provisions related to Safety and Health.

Finally, the Safety and Health Budget is presented, which includes measurements, price schedule No. 1, breakdown by chapters, and the economic summary. The Material Execution Budget associated with this section amounts to €43,957.82, which is integrated into the general Project budget within the corresponding chapter.

The complete documentation related to the Safety and Health Study—including the Report, Drawings, Specifications, and Budget—is provided in Execution Plan 1 – Health and Safety Plan

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2.6.2 COORDINATION WITH OTHER AGENCIES

The following entities are affected by the execution of the construction works:

Public Entities:

- Gobierno de Cantabria.
- Ayuntamiento de Mazcuerras.
- Confederación Hidrográfica del Norte.
- Consejería de Fomento, Ordenación del Territorio y Medio Ambiente del Gobierno de Cantabria.
- Instituto de Hidráulica Ambiental.
- Instituto de Seguridad y Salud.

Service Provider Companies

- Electricity Supply Network (Viesgo Distribución)
- Telephone Network (Telefónica de España S.A.)
- Water Supply Network (Aqualia Gestión Integral del Agua S.A.)
- Gas Supply Network
- Transport Infrastructure Network

Information regarding Coordination with Other Agencies is detailed in Execution Plan 2 – Coordination with Other Agencies.

2.6.3 CONSTRUCTION SCHEDULE

The estimated construction period is 10.32 months, equivalent to 227 working days. A summary of the planned work schedule is attached below:

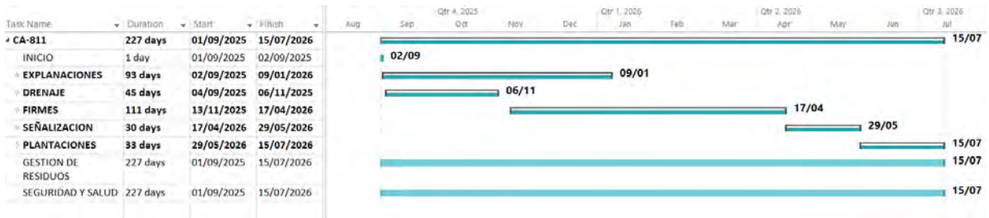

Figure 1. Construction Schedule

Information regarding Construction Schedule is detailes in Execution Plan 3 - Construction Schedule

2.6.4 WASTE MANAGEMENT

In compliance with Real Decreto 105/2008, del 1 de Febrero which regulates the production and management of construction and demolition waste, as well as Real Decreto 72/2010, del 28 de Octubre, applicable in the Autonomous Community of Cantabria, the types of construction waste that will be generated during the execution of the works are identified, and the corresponding preventive measures for their proper management are defined. The estimated cost for the management of this waste amounts to €29,278.49. Detailed information regarding the management of waste generated during the execution of the project is provided in Execution Plan 4 - Waste Management

2.7. APPENDICES

2.7.1 ACCESIBILITY

The design of the new road has been conceived following universal accessibility principles, with the aim of ensuring safe and efficient use by the greatest possible number of people, including both individuals with and

without disabilities.

Further information regarding accessibility in the Project is provided in Appendices 1 - Accesibility.

2.7.2 EXPROPRIATIONS AND COMPENSATIONS

The expropriation of land in the vicinity of the construction site is estimated at €148,238.78. Information regarding expropriations within the Project area is provided in Appendices 2 – Expropriations and Compensations.

2.7.3 AFFECTED SERVICES

The relocation of utilities in the area surrounding the construction site is estimated at €30,000.

Information regarding the affected utilities within the Project area is provided in Appendices 3 – Affected Services

2.7.4 CONTRACTOR CLASSIFICATION

These classifications will be required from the Contractor.

Group		Subgroup		Category
G	Viales y pistas	**4**	Con firmes de mezcla bituminosa	**5**

Table 3. Contractor Classification.

Information regarding Contractor Classification is detailed in Appendices 4 – Contractor classification

2.7.5 PRICE ADJUSTMENT FORMULA

In accordance with the provisions of Orden Circular 31/2012, de 12 de diciembre de 2012, regarding the proposal and establishment of polynomial formulas for price revision in roadworks projects under Dirección General de Carretera, this project will not be subject to price revision.

Information regarding the price revision of the Project is detailed in Appendices 5 – Price Adjustment Formula.

2.7.6 PHOTOGRAPHIC REPORT

The photographs corresponding to the Photographic Report of the Project area are included in Appendices 6 – Photographic Report

3. DOCUMENTS IN THE PROJECT

- **PROJECT DESCRIPTION**
- **DOCUMENTS**
  - 1-INTRODUCTION
    - 1- BACKGROUND AND PROJECT PURPOSE
    - 2-AREA DESCRIPTION
    - 3-CARTOGRAPHY AND TOPOGRAPHY
    - 4-URBAN PLANNING
  - 2-PRELIMINARY STUDIES
    - 1-GEOLOGY
    - 2-SEISMIC EFFECTS
    - 3-CLIMATE AND HIDROLOGY
    - 4-GEOTECHNICAL STUDIES
    - 5-TRAFFIC STUDY
    - 6-SOLUTIONS TO TRAFFIC
    - 7-ENVIRONMENTAL STUDIES
  - 3-PROJECT DESIGN
    - 1-EARTHWORKS
    - 2-DRAINAGE
    - 3-GEOMETRIC DESIGN
    - 4-ROAD ALIGNMENT
    - 5-SIGNAGE, DELINEATION AND CONTAINMENT SYSTEMS
    - 6-ENVIRONMENTAL INTEGRATION
    - 7-STACKING OUT
  - 4-TECHNICAL SPECIFICATIONS
  - 5-BUDGET
    - BUDGET
    - 1-PRICE JUSTIFICATION
    - 2-BUDGET FOR ADMINISTRATIVE REVIEW
  - 6-EXECUTION PLAN

- HEALTH AND SAFETY PLAN
    1. REPORT
    2. DRAWINGS
    3. TECHNICAL SPECIFICATIONS
    4. BUDGET
- 1-COORDINATION WITH OTHER AGENCIES
- 2-CONSTRUCTION SCHEDULE
- 3-WASTE MANAGEMENT

o 7-APPENDICES

- 1-ACCESIBILITY
- 2-EXPROPRIATIONS
- 3-AFFECTED SERVICES
- 4-CONTRACTOR CLASSIFICATION
- 5-PRICE ADJUSTMENT FORMULA
- 6-PHOTOGRAPHIC REPORT
- DRAWINGS

    1.1: Site Plan.

    1.2: Location Plan.

    2.1: Profile and Plan.

    2.2: Sheet Index.

    3.1: Stacking Out Plan.

    3.2: Longitudinal Profile.

    3.3: Plan View.

    3.4: Intersection View.

    4.1: Road Section.

    4.2: Drainage.

    5.1: Drainage Plan

    5.2: Cross Drainage Systems Plan.

    5.3: Drainage Details.

    6.1: Signage Plan

    6.2: Signage Details.

    7: Slope Vegetation.

4. CONCLUSION

Everything presented in this Report, Documents as well as the Drawings, the Special Technical Specifications, and the Budget, constitute sufficient justification for the present Construction Project. “GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF CA-811”.

Santander, July of 2025

Signed.: Jorge Sáenz Fernández

INTRODUCTION

INTRODUCTION 1 – BACKGROUND AND PROJECT PURPOSE

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1. BACKGROUND 2

2. PROJECT PURPOSE 2

1. BACKGROUND

The present construction project, titled “Geometric Realignment and Platform Widening of Road CA-811. Villanueva de la Peña - Herrera de Ibio” constitutes the Final Degree Project in Civil Engineering at the University of Cantabria, within the Escuela Técnica Superior de Caminos Canales y Puertos de Santander.

2. PROJECT PURPOSE

The purpose of this project is to improve the existing conditions of road CA-811 by implementing a new alignment and widening the platform to include a bicycle lane. It is considered as a new construction.
The realignment and widening of the CA-811 platform represents a substantial improvement to the quality of the existing road, which is currently in an unacceptable condition.

The addition of a bicycle lane on road CA-811, between Villanueva de la Peña and Herrera de Ibio, will not only increase safety and improve the quality of the road for all users but also promote a healthier and more sustainable lifestyle, significantly enhancing the quality of life for the local community.

The main technical characteristics of the planned work are as follows:

- Type: Construction project.
- Typical cross-section: Single carriageway road with one lane per direction.
- Design speed: 60 km/h.
- Carriageway: 7 meters wide, consisting of two lanes each 3.5 meters wide.
- Shoulders: One shoulder of 1 m on the right side (in the ascending direction of kilometer points) and a shoulder of 0.3 m on the left side.
- Bicycle lane: 2 meters wide, consisting of two lanes of 1 meter each on the left side of the carriageway.

INTRODUCTION 2 – AREA DESCRIPTION

Table of Contents

1. INTRODUCTION 2

2. AREA STUDY 2

2.1. REGIONAL CONTEXT 2

2.2. LOCAL CONTEXT 2

2.3. MUNICIPALITY OF MAZCUERRAS 2

1. INTRODUCTION

This annex describes the geographical area where CA-811 is located. It highlights aspects related to the population centers affected by the new road, the local economy, and the transportation infrastructure in the area

2. AREA STUDY

2.1. REGIONAL CONTEXT

The project is entirely located within the Autonomous Community of Cantabria, in northern Spain. Cantabria borders the Cantabrian Sea to the north, the provinces of León, Burgos, and Palencia to the south, the Principality of Asturias to the west, and the province of Vizcaya to the east. The city of Santander, located in the northern part of the region, is the capital and the most populous city of Cantabria, with a population of 590,851 inhabitants (as of December 2024, INE). The majority of its population is concentrated in the northern half of the territory.

Figure 1.2.1- Location of the Autonomous Community of Cantabria

2.2. LOCAL CONTEXT

The road passes through the municipality of Mazcuerras, located in the Saja-Nansa region. This region extends from the Besaya region to the western autonomous boundary and from La Marina to the Cordel and Peña Labra mountain ranges. It includes the municipalities of Cabezón de la Sal, Cabuérniga, Herrerías, Lamasón, Mazcuerras, Peñarrubia, Polaciones, Reocín, Rionansa, Ruente, Los Tojos, and Tudanca. The total population of this region is 24,036 inhabitants (INE, 2017).

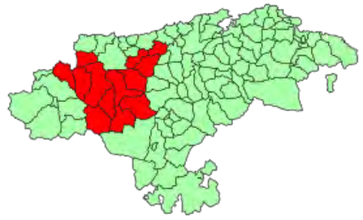

Figure 1.2.2 – Location of the Saja-Nansa region

2.3. MUNICIPALITY OF MAZCUERRAS

The planned road passes through the municipality of Mazcuerras. It borders the municipalities of Cabezón de la Sal and Reocín to the north, Ruente and Cabezón de la Sal to the west, Cieza and Ruente to the south, and Cartes and Los Corrales de Buelna to the east. The municipality covers an area of 55.65 km² and has a population of 2,093 inhabitants (INE, 2024), distributed across the localities of Cos, Herrera de Ibio, Ibio, Mazcuerras, Riaño de Ibio, Sierra de Ibio, and Villanueva de la Peña.

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Figure 1.2.3. Localization of the Municipality of Mazcuerras

Traditionally, the local economy has been based on cattle farming and flower cultivation. However, these activities have been in decline, with most of the population now engaged in the tertiary sector, particularly in rural tourism and hospitality.

Regarding economic activity distribution, 15.5% of the municipality's population is engaged in the primary sector, 20.8% in construction, 25.9% in industry, and 37.8% in services.

In terms of historical heritage, notable landmarks include the Casona-Torre de Hoyos, the Palacio Gómez de la Torre, and the Ermita de Cintul. The town of Mazcuerras was awarded the "Pueblo de Cantabria" prize in 2008.

INTRODUCTION 3 – CARTOGRAPHY AND TOPOGRAPHY

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1. INTRODUCTION 2

2. TOPOGRAPHY 2

3. ORTHOPHOTOGRAPHY 2

1. INTRODUCTION

The topographic cartography and orthophotography of the project area have been obtained through the Geographic Information Viewer of the Government of Cantabria (https://mapas.cantabria.es/) and the download center of the National Geographic Information Center (CNIG).

2. TOPOGRAPHY

For the development of the project, the basic cartography BTA 2007 (Harmonized Topographic Base) will be used, based on aerial surveys from 2007 at a scale of 1:5000. The following sheets will be utilized: 0057-8-1, 0057-8-2, 0058-1-1, and 0058-1-2.

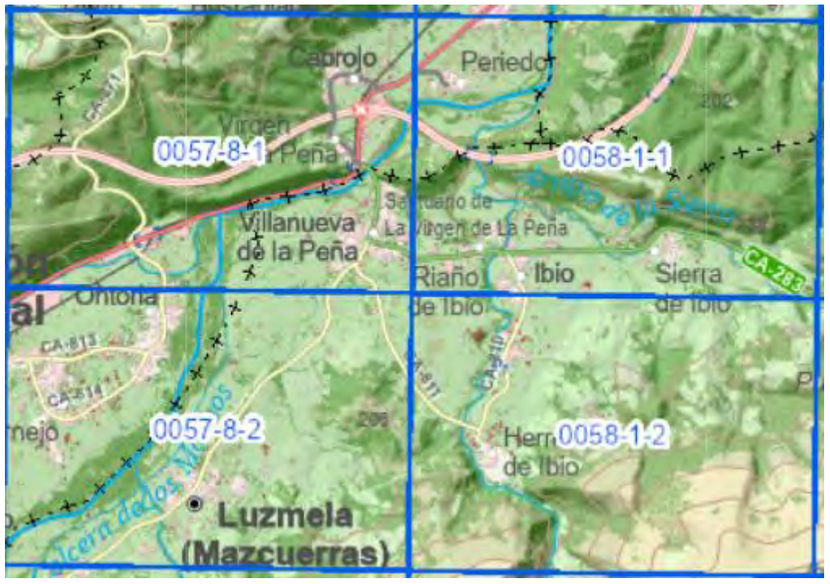

Figure 1.3.1. BTA 2007 1:5000 sheets over the municipality of Mazcuerras.

3. ORTHOPHOTOGRAPHY

The sheets 0057-0801, 0057-0802, 0058-0101, and 0058-0102, representing the project area and corresponding to the 2007 Cantabria Orthophotography Series (PNOA 0.25 m), will be used

Figure 1.3.2. 2007 PNOA Orthophotos (0.25 m) of the Municipality of Mazcuerras.

INTRODUCTION 4 – URBAN PLANNING

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2. URBAN PLANNING 2

2.1. Municipality of Mazcuerras 2

2.2. Conclusions 3

1. INTRODUCTION

This annex details the current Urban Planning framework that affects the use and management of land in the municipality of Mazcuerras. The objective of this analysis is to provide information on the urban conditions and territorial planning that must be considered when planning and executing the CA-811 road improvement project. Urban planning and zoning data will be obtained from the Geographic Information Viewer of the Government of Cantabria (Mapas Cantabria), as well as from the applicable laws and regulations governing land use in the project's area of influence.

The Ley de Cantabria 5/2022, dated July 15, concerning Territorial and Urban Planning in Cantabria, replaces the previous Ley 2/2001, dated June 25, on Territorial Planning and Urban Land Use in Cantabria and its amendment introduced by Ley 7/2007, dated December 27, on Fiscal and Financial Measures. This law defines three categories of land: urban, developable, and rural land (Artículo 34).

It is the responsibility of each Municipal Administration to adopt these land categories in their General Urban Development Plans (PGOU) or Subsidiary Planning Regulations and to classify the land within their municipal territory (Article 93). In the absence of municipal planning, the Regional Urban Regulations shall apply (Article 14), and the land shall be classified as urban land or rural land with special protection (Article 35).

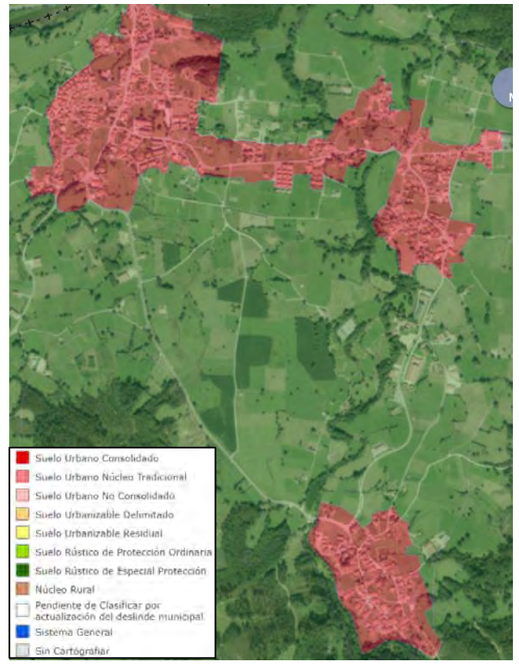

Figure 1.4.1.Land Use Classification in the Project Area.

2. URBAN PLANNING

2.1. MUNICIPALITY OF MAZCUERRAS

The alignment of the existing road runs between the towns of Villanueva de la Peña and Herrera de Ibio. From an urban planning perspective, the municipality of Mazcuerras is governed by the Municipal Subsidiary Regulations for the Ruente-Mazcuerras area, which were later modified in specific delimitations of the urban cores of Villanueva de la Peña, Ibio, and Herrera de Ibio (CRU 05/07/1983; BOC 07/08/1983). These regulations establish the urban planning framework adopted by the municipality, including its objectives, territorial planning criteria, growth hypotheses, and projected development needs for both the present and future years.

All planning measures must align with the principle of sustainability, as established in Ley 9/2006, of April 28, on Strategic Environmental Assessment, which was later replaced by Ley 21/2013.

2.2. CONCLUSIONS

It is concluded that the majority of the road's alignment traverses land classified as Rural Land with Special Protection. However, the first 80 meters of the alignment, upon leaving Villanueva de la Peña, are classified as Consolidated Urban Land.

According to Articulo 37 de Ley 5/2022 of Cantabria, land shall be classified as Consolidated Urban Land if it meets the following criteria:

- It has been developed in accordance with the provisions of the applicable territorial or urban planning instruments.
- It has road access and is connected to the drinking water supply network, wastewater disposal network, and electricity supply, provided that these networks and infrastructures are adequate to serve the existing buildings and developments connected to them.
- It can be connected to road access, water supply, wastewater disposal, and electricity supply without requiring additional works beyond simple connections to pre-existing infrastructure, provided that these are sufficient to serve both the existing buildings and those planned under urban regulations.
- It is occupied by buildings in the proportion of developable spaces established by the applicable urban planning regulations.

On the other hand, according to Articulo 46 de Ley 5/2022 of Cantabria, land shall be classified as Rural Land with Special Protection if it meets any of the following conditions:

- It is protected from urbanization under sectoral legislation concerning public domain, nature conservation, or cultural heritage.
- It is protected from urbanization under territorial planning regulations, as it is deemed incompatible with development due to its historical, archaeological, scientific, environmental, cultural, or landscape value, or due to documented natural or technological risks. Additionally, land may be protected if it possesses strategic economic value due to agricultural, livestock, forestry, or extractive resources.
- It is classified as such under General Urban Planning Instruments based on the need to preserve it from urban transformation at the time of approval, considering the values mentioned above. However, this classification must not contradict territorial planning instruments, in which case the latter shall prevail.

PRELIMINARY STUDIES

PRELIMINARY STUDIES 1 - GEOLOGY

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1. INTRODUCTION 2

2. GEOLOGY 2

2.1 GEOLOGICAL FRAMEWORK 2

2.2 STRATIGRAPHY 3

2.2.1 TRIASIC 3

2.3. TECTONICS 3

2.4. GEOMORPHOLOGY 3

2.5. HIDROGEOLOGY 3

2.6. NATIONAL GEOLOGICAL MAP 4

3. GEOLOGY DRAWING 6

1. INTRODUCTION

The purpose of this annex is to provide a geological description and a study of the materials present in the project area, as well as a geotechnical analysis aimed at identifying the most relevant characteristics of the ground. Regarding the geological component, the geological units will be identified, their characteristics described, and their influence on both the project area and the execution of the works assessed.

The geological information included in this annex has been obtained from the Geological and Mining Institute of Spain (IGME) and the Geographic Information Viewer of the Government of Cantabria.

2. GEOLOGY

2.1 GEOLOGICAL FRAMEWORK

Below is a brief description of the geology in the project area, as well as the origin of the various materials.

The project area is located on the northern slope of the Cantabrian Mountain Range, a region with a complex geological history shaped by glacial, periglacial, and fluvial processes. During the Pleistocene, glaciers sculpted the landscape, and upon their retreat, they left wide valleys which were subsequently filled with sediments during the Holocene.

The improvement of the road alignment and platform widening works on road CA-811, from Villanueva de la Peña to Herrera de Ibio, which are the subject of this project, take place—at both the beginning and end sections of the alignment—on Holocene and Pleistocene deposits. These formations belong to the current geological epoch, the Quaternary, and are composed of alluvial materials and fluvial terraces.

The central and widest section of the CA-811 route traverses Triassic terrain, specifically formations of the Keuper and Muschelkalk groups, which consist mainly of variegated clays, salt, and gypsum. Furthermore, based on data from the Geological Map Database of Cantabria, the geological unit in the area is described as comprising gravels, pebbles, and blocks within a silty-clayey matrix with significant sand content. This information is critical for defining the roadbed and determining cut and fill slope inclinations.

It is worth noting that the areas surrounding the towns of Villanueva de la Peña and Herrera de Ibio—both located within the Saja River Basin—are underlain by geological units corresponding to colluvial deposits and Holocene Quaternary valley floors and lower terraces.

Below are presented both the location and a description of these geological units, as shown in the legend and extracted from Sheets 57 (Eastern Zone) and 58 (Western Zone) of the MAGNA 50 Geological Map Series at a 1:50,000 scale.

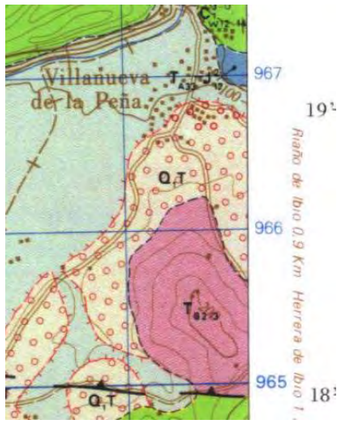

Figure 2.1.1. Sheet 57 -MAGNA50 Map

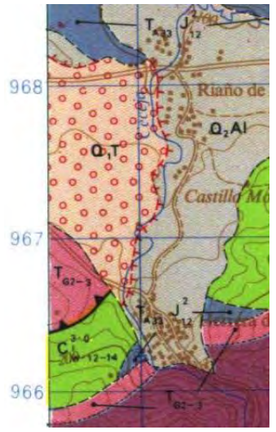

Figure 2.1.2. Sheet 58 - MAGNA50 Map

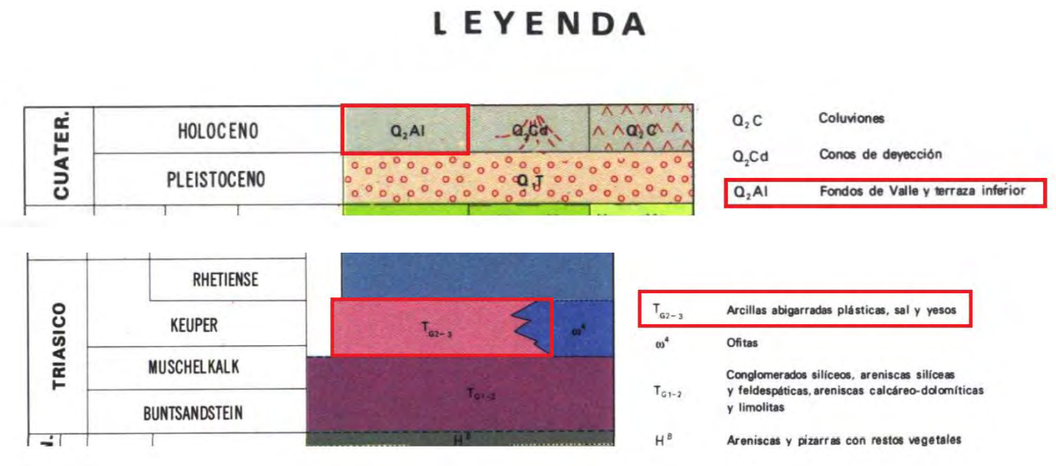

Figure 2.1.3. MAGNA50 Geological Units Leyend

2.2 STRATIGRAPHY

The project area is encompassed within Sheets 57 and 58 of the MAGNA 50 Geological Map Series. It includes geological units from the Triassic and Quaternary periods, which are described in detail below:

2.2.1 TRIASIC

2.2.1.1 KEUPLER

Outcrops appear at various points along the northern flank of the anticline in the "Thrust Belt of the Cabuérniga Shield," within the cores of isolated anticlines in the eastern half of the Coastal Mesotertiary Promontory, and also diapirically in the latter area (notably the Cabezón de la Sal and San Pedro diapirs). This unit is composed of variegated clays, sometimes foliated and generally plastic in nature, with interbedded gypsum layers. Subsurface saline formations, not visible at the surface, are present and exploited in the diapiric Keuper zones of Cabezón de la Sal. The estimated thickness, although difficult to quantify precisely, is approximately 150–200 meters.

Regarding the lithology of the Keuper in this area, it is characterized by the presence of clays and marls in a variety of colors—primarily reddish and greenish—along with evaporitic materials such as gypsum and anhydrite, which were deposited in high-evaporation environments.

The presence of gypsum within the project area is of particular relevance due to its high solubility and the associated risk of pavement collapse.

2.2.1.2 HOLOCENE

Fluvial terraces are among the most significant elements of the Quaternary Holocene deposits, particularly in the project area associated with the Saja River. They also serve as clear indicators of landscape and climate evolution during this period.

The lower terrace, corresponding to the incision of valley floor deposits, has been mapped together with current alluvial deposits as Alluvium (Q2AI). These materials have a somewhat finer grain size than those of the terraces and are highly heterogeneous, composed mainly of cobbles and pebbles within the active talweg zone.

The lithology of the terraces consists of rounded gravels, often overlying fine sands or silts, and pebbles derived from the local geological formations. In the region of Cantabria, limestones, sandstones, and quartzites are especially prevalent.

2.3. TECTONICS

The area of the Cantabrian Basin, encompassing both the Los Corrales de Buelna and Cabezón de la Sal map sheets, is structurally characterized by the presence of East–West and North–South trending alignments—one of the most distinctive features of the tectonics in this region. These structural trends, particularly prominent in the northwestern sector of the Cantabrian Mesotertiary Basin, largely reflect the tectonic inheritance of the Paleozoic structures of the Asturian Massif. The dominant E–W and N–S orientations of this massif have significantly influenced the geodynamic evolution and the current arrangement of the geological units in the area.

In the project area—especially in the southern sector near Herrera de Ibio—the regional structural unit known as the Thrust Belt of the Cabuérniga Shield is particularly noteworthy. It is characterized by the thrusting of Carboniferous and Buntsandstein materials over Mesozoic sedimentary units.

2.4. GEOMORPHOLOGY

The municipalities of Herrera de Ibio and Villanueva de la Peña are located in a geomorphologically complex region, situated between the mountainous zones of the Cantabrian Basin and the fluvial valleys that cross it. The terrain is predominantly mountainous, with slopes ranging between 15 and 25 degrees, especially in the areas near the boundaries of the Villanueva mountain ranges. The fluvial valleys—shaped by rivers such as the Saja—feature flatter areas, with elevations ranging from 200–400 meters in the lower zones and up to 900–1000 meters at the summits of the surrounding mountains.

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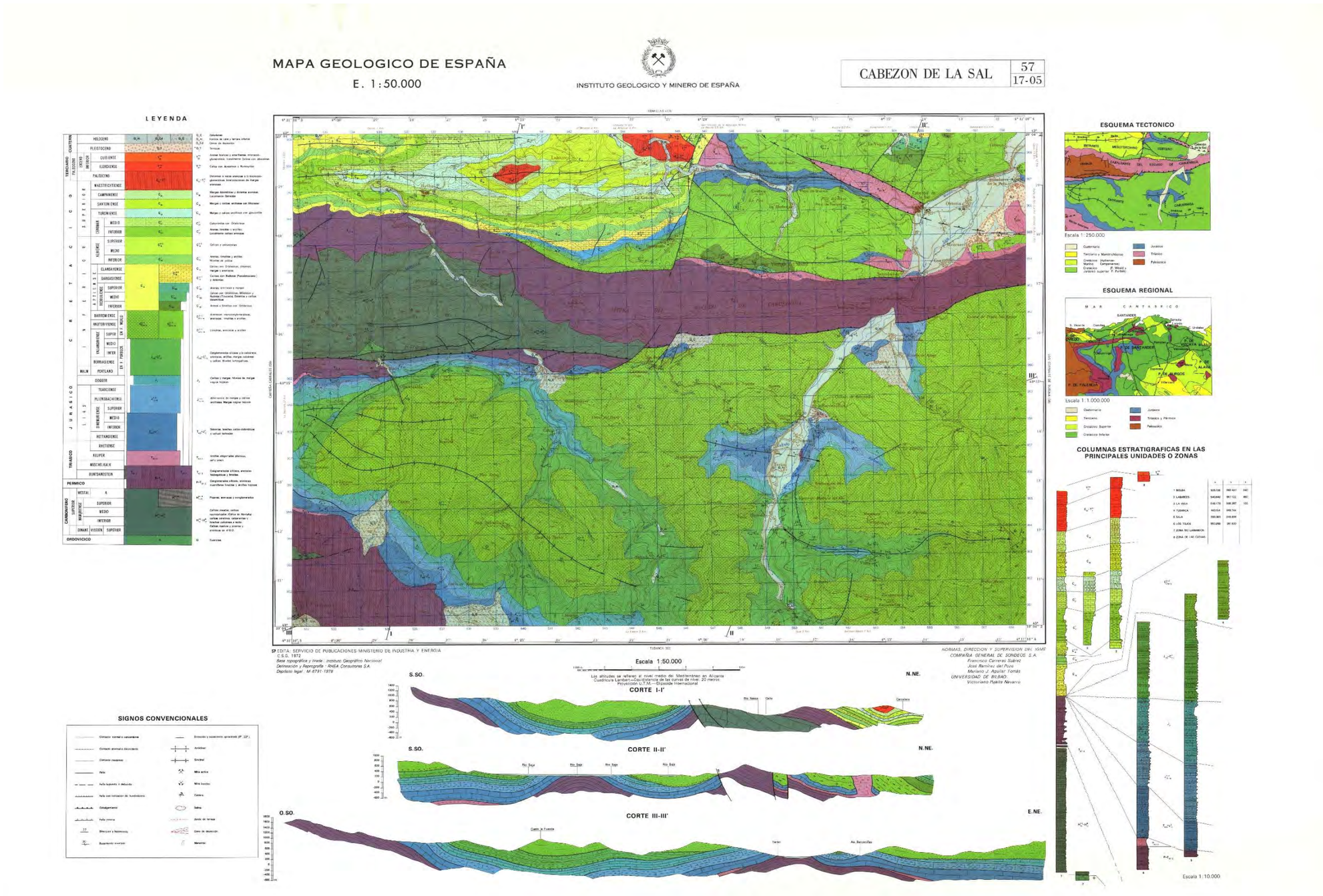
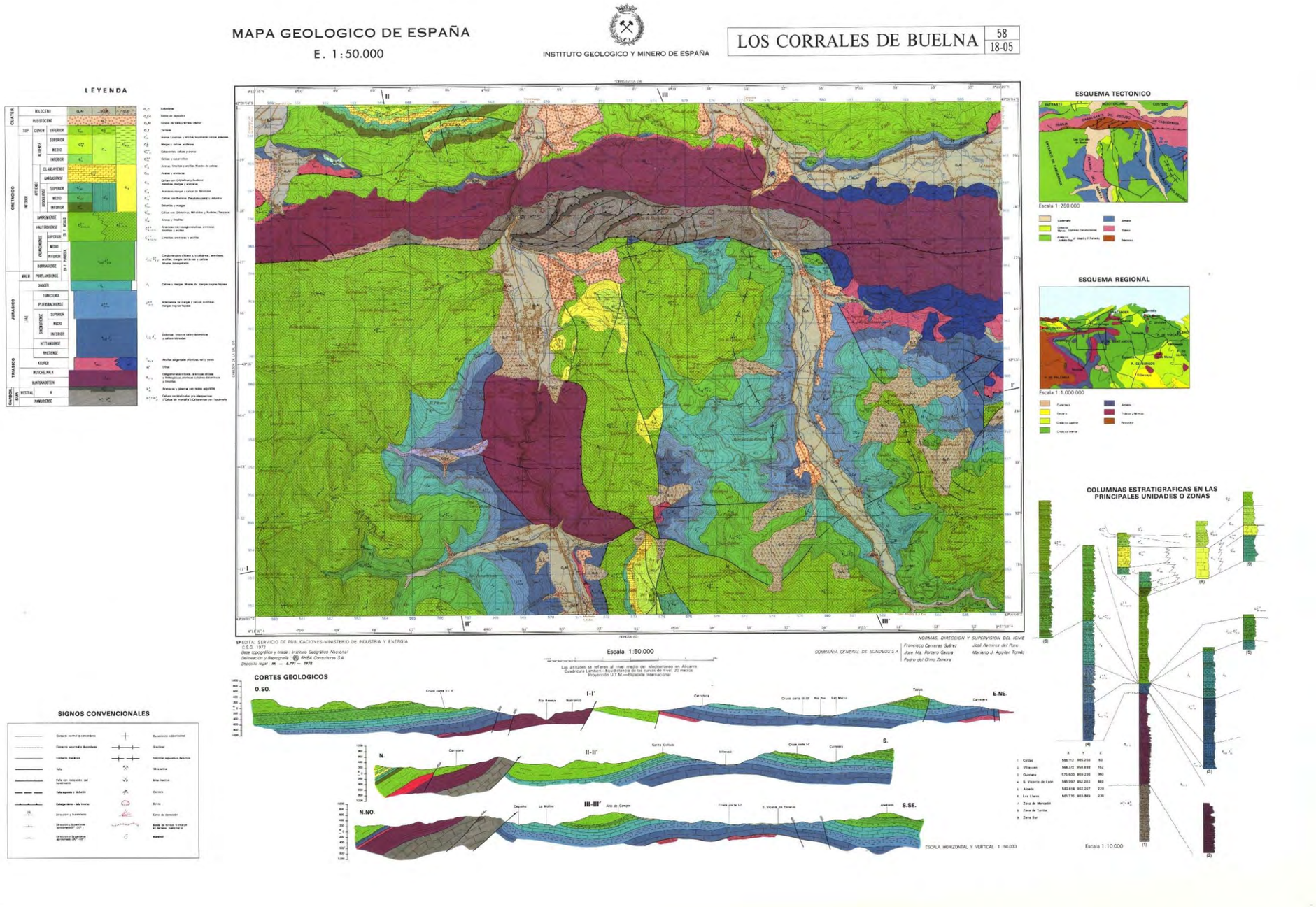
2.5. HIDROGEOLOGY

From a hydrogeological perspective, it can be considered that all the structural units within the project area have the potential to contain aquifers, both from a structural and lithological standpoint.

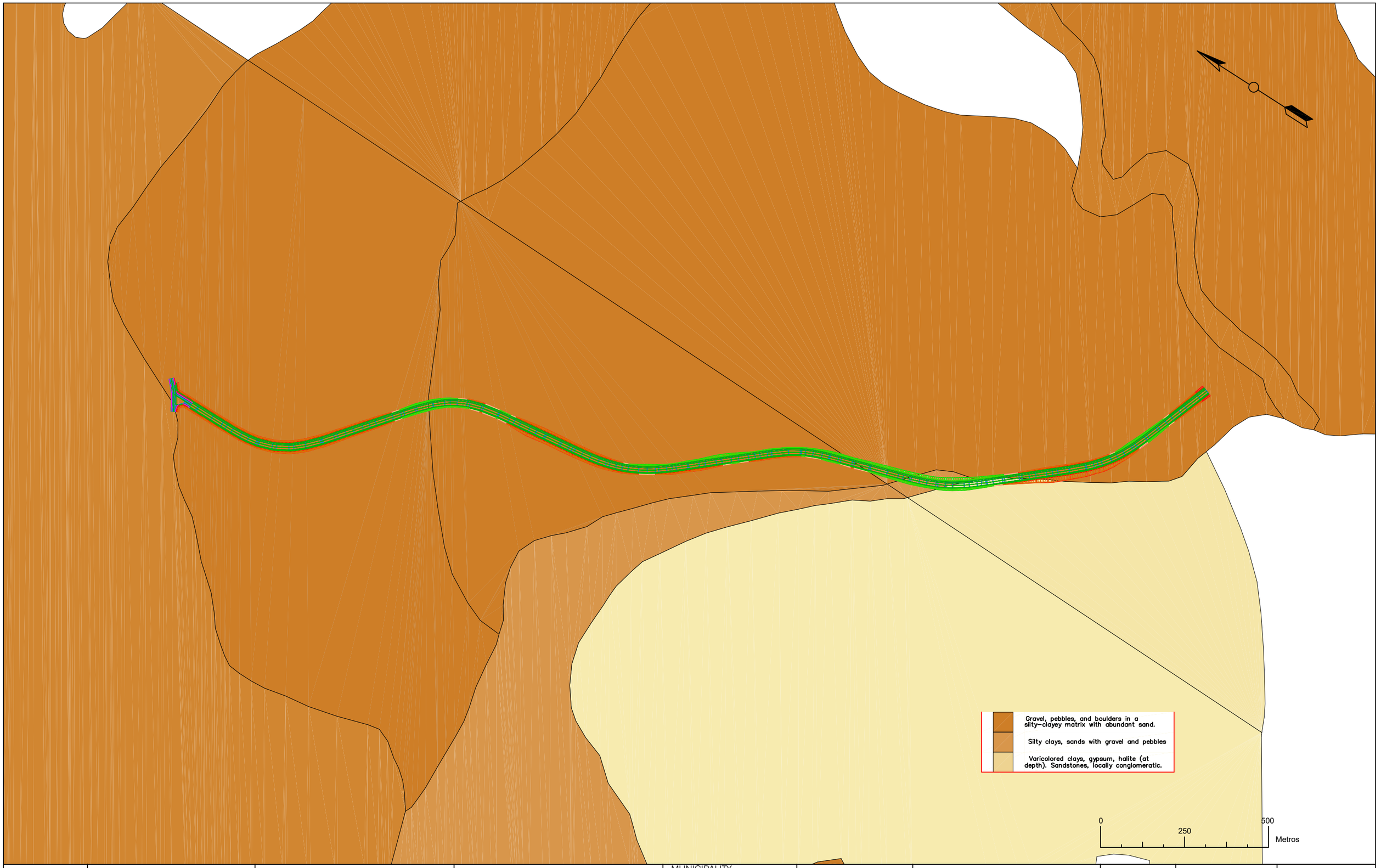
2.6. NATIONAL GEOLOGICAL MAP




MAPA GEOLOGICO DE ESPAÑA
E. 1:50.000
INSTITUTO GEOLOGICO Y MINERO DE ESPAÑA
LOS CORRALES DE BUELNA
58
18-05
LEYENDA
ESQUEMA TECTONICO
ESQUEMA REGIONAL
Escala 1:1.000.000
SIGNOS CONVENCIONALES
CORTES GEOLOGICOS
O.SO.
E.NE.
N.
S.
N.NO.
S.SE.
Escala 1:50.000
COLUMNAS ESTRATIGRAFICAS EN LAS PRINCIPALES UNIDADES O ZONAS
Escala 1:10.000

3. GEOLOGY DRAWING

A 1:2500 scale geological map of the project study area is attached below.



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE: Construction Project

TITLE: Geometric Realignment and Platform Widening of CA-811

MUNICIPALITY: Mazcuerras

REGION: Cantabria

DRAWING: Geology

AUTHOR: Jorge Sáenz Ferández

SCALE: 1:2500

DATE: July 2025

SHEET: SHEET 1 OF 1

PRELIMINARY STUDIES 2 – SEISMIC EFFECTS

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1. INTRODUCTION 2

2. SEISMIC HAZARD IN THE PROJECT AREA 2

3. CONCLUSIONS 2

1. INTRODUCTION

En In this annex, the seismic hazard of the area where the CA-811 road construction and improvement project is located will be assessed. The following seismic-resistant regulation currently in force is taken into account:

- "Norma de Construcción Sismorresistente: Parte general y Edificación (NCSE-02)", approved by el Real Decreto 997/2002 of September 27th and published on BOE on October 11 ,2002.

2. SEISMIC HAZARD IN THE PROJECT AREA

According to the application criteria established by the seismic design code, it is not necessary to consider seismic effects in the vicinity of the project as long as the basic horizontal seismic acceleration value (ab) does not exceed 0.04g, where *g* represents the acceleration due to gravity.

The seismic acceleration values for the area will be determined using the attached Seismic Hazard Map of Spain

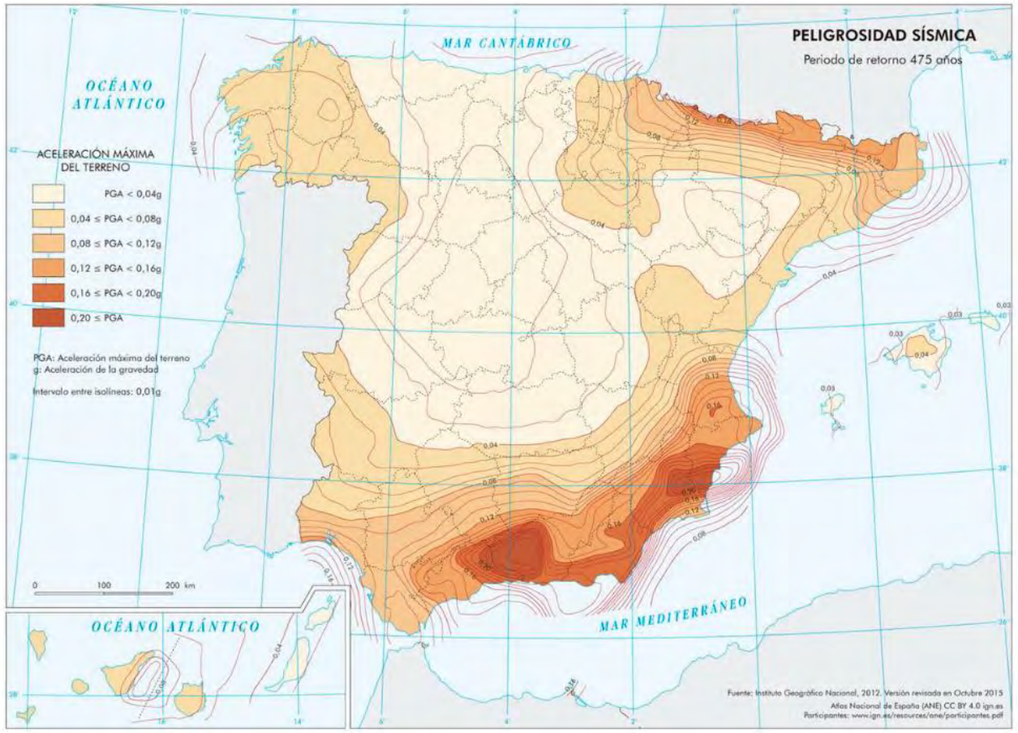

Figure 2.2.1. Seismic Hazard Mapo of Spain (IGN 2012, ANE).

3. CONCLUSIONS

According to the previously provided map, it is concluded that the project area is located within a region with a maximum acceleration lower than 0.04g. Therefore, it is not necessary to consider any type of seismic action for design or calculation purposes in any part of the project.

PRELIMINARY STUDIES 3 – CLIMATE AND HIDROLOGY

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1. INTRODUCTION

This annex compiles and analyzes data on climate, precipitation, temperature, and catchment areas in order to characterize the environmental conditions of the area where the project will be developed. This information is essential for the proper design of the drainage system, both longitudinal and transverse, to ensure effective rainwater runoff and to prevent water accumulation on the pavement, which could compromise the durability of the infrastructure and road safety.

The climatic characterization begins with a general overview of the regional climate using climate maps and rainfall estimates in the vicinity of the project. Subsequently, temperature and precipitation values recorded at the nearest meteorological stations are analyzed, with the aim of assessing hydrology and the behavior of local watercourses.

In addition, understanding the meteorological conditions will allow for the identification of the most suitable period for construction works, minimizing the risk of interruptions due to adverse weather conditions. The information used in this annex is primarily sourced from official agencies such as the Spanish State Meteorological Agency (AEMET).

2. CLIMATE

2.1. CLIME

For the climate study of the project area, data recorded by the Santander Airport meteorological station, as included in the “Iberian Climate Atlas” published by the Spanish State Meteorological Agency (AEMET), have been used. This atlas provides detailed information on temperatures and precipitation across the Iberian Peninsula for the reference period 1971–2000.

The analysis is based on the Köppen-Geiger climate classification, which categorizes different climate types according to temperature and precipitation ranges. The region where the project is located is classified as a **Temperate Climate (type C)**, specifically within the **Cfb subtype**. This subtype, which extends throughout the autonomous community and much of the northern coastal region of the peninsula, is characterized by:

- A temperate climate with no dry season.
- Mild summers, with moderate temperatures.
- Precipitation evenly distributed throughout the year.
- Average temperature of the coldest month between 0°C and 18°C.
- Average temperature of the warmest month above 10°C.

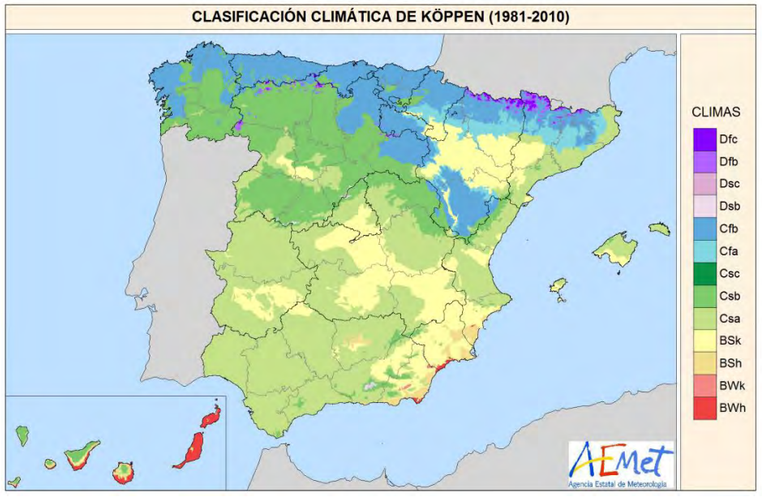


Figure 2.3.1. Köppen-Geiger Climate Map.

2.2. TEMPERATURE

Based on the data from the *Iberian Climate Atlas*, a series of maps provide information about the project area. These temperature values will be taken into account during the execution of various operations.

VARIABLE	VALUE
Annual average temperature	15ºC
Annual average of minimum temperatures	10ºC
Annual average of maximum temperature	20ºC
Average annual number of days with temperature below 0°C	15 days
Average annual number of days with temperature above 25°C	40 days

Table 2.3.1. Mean values for temperatura variables in the area.

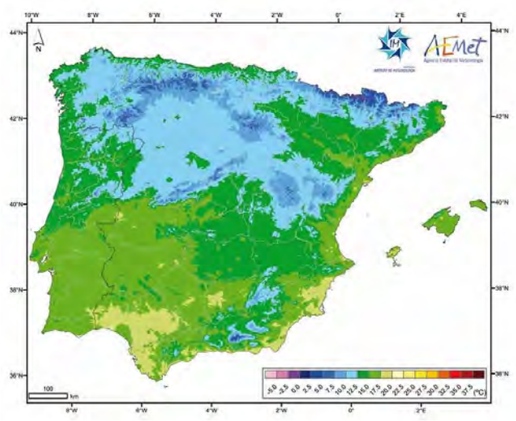
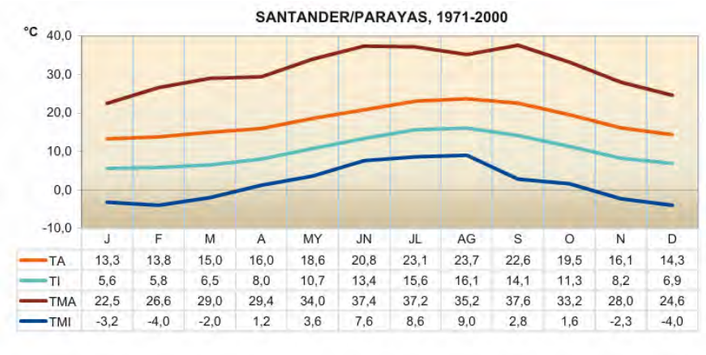


Figure 2.3.2. Average mean temperatura map.

The following chart, also provided by the Climate Atlas, presents monthly data for four different variables throughout the year. These are: TA, the average of maximum temperatures; TI, the average of minimum temperatures; TMA, the absolute maximum temperature; and TMI, the absolute minimum temperature. The data was obtained from the Santander/Parayas meteorological station.



	J	F	M	A	MY	JN	JL	AG	S	O	N	D
TA	13,3	13,8	15,0	16,0	18,6	20,8	23,1	23,7	22,6	19,5	16,1	14,3
TI	5,6	5,8	6,5	8,0	10,7	13,4	15,6	16,1	14,1	11,3	8,2	6,9
TMA	22,5	26,6	29,0	29,4	34,0	37,4	37,2	35,2	37,6	33,2	28,0	24,6
TMI	-3,2	-4,0	-2,0	1,2	3,6	7,6	8,6	9,0	2,8	1,6	-2,3	-4,0

Graph 2.3.1. Temperature variables evolution in years

2.3. PRECIPITATION

To obtain precipitation data, records from the Santander Airport meteorological station have been used. This station is located at an altitude of 3 meters, at a latitude of 43° 25' 43'' N and a longitude of 3° 49' 53'' W. The data presented corresponds to the period from 1997 to 2000. Precipitation is evenly distributed throughout the year, with annual values ranging between 1000 and 1500 mm. A graph is also included showing both the average total precipitation (P) and the maximum precipitation (PM) for each month, based on data from the Santander/Parayas station, which is near the project area and can be considered representative.

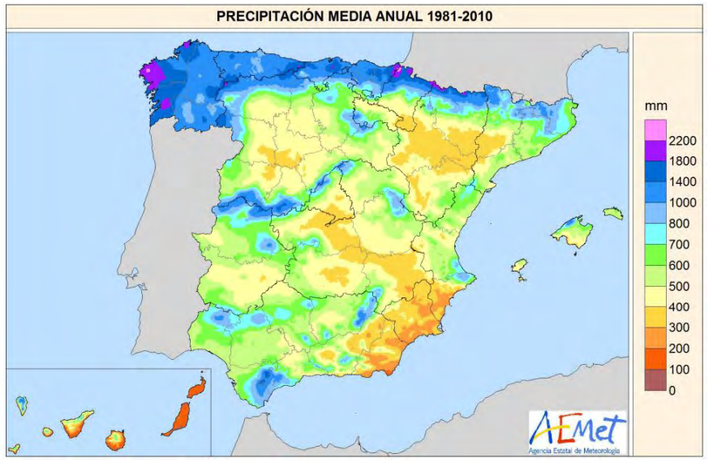
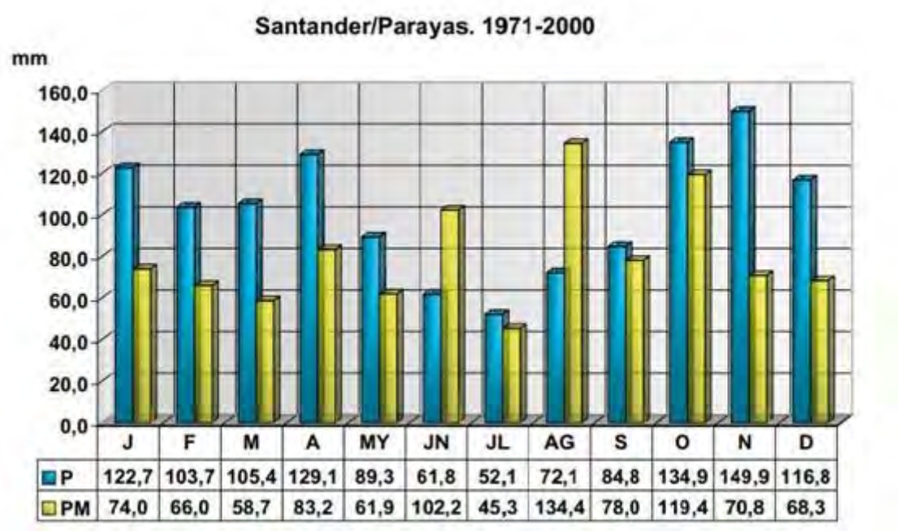


Figure 2.3.3. Average anual precipitation map.



Graph 2.3.2. Mean and máximum precipitations in a year.

2.4. OTHER RELEVANT CLIMATIC DATA

The website www.meteocantabra.es, using AEMET as its data source, provides access to various climatic variables from 1997 to 2023. It includes data on both temperatures and precipitation. Below, both tabulated data and a climograph are presented for the Santander CMT and Terán meteorological stations. The latter is located quite close to the project area, and its data can be considered more representative.

Month	Average of maximum temperatures (°C)	Average of minimum temperatures (°C)	Accumulated precipitation (l/m^2)
J	13.16	7.98	120.05
F	13.27	7.75	86.23
M	14.81	8.92	79.67
A	15.80	10	78.97
MY	17.7	12.32	64.92
JN	20.29	15.15	58.58
JL	22.27	17.07	47.69
AG	23.22	17.68	54.91
S	22.03	16.19	84.85
O	20.23	14.06	105.27
N	16.01	10.60	166.90
D	14.18	8.88	121.27
Year	17.83	12.3	1058.73

Table 2.3.1. Other relevant climatic data in Santander CMT.

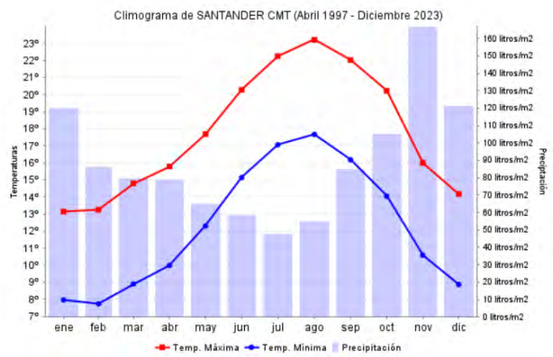


Figure 2.3.4. Climogram of Santander CMT.

Month	Average of maximum temperatures (°C)	Average of minimum temperatures (°C)	Accumulated precipitation (l/m^2)
J	13.07	2.67	174.22
F	13.85	2.93	153.2
M	16.19	4.72	131.2
A	17.56	6.54	106.53
MY	20	9.3	89.36
JN	22.72	12.45	73.69
JL	24.38	14.07	45.66
AG	25.35	14.25	52.29
S	24.14	12.24	62.14
O	21.25	9.64	94.48
N	15.76	5.75	202.25
D	14.15	3.45	133.8
Año	19.12	8.26	1302.04

Table 2.3.2. Other relevant climatic data in Terán.

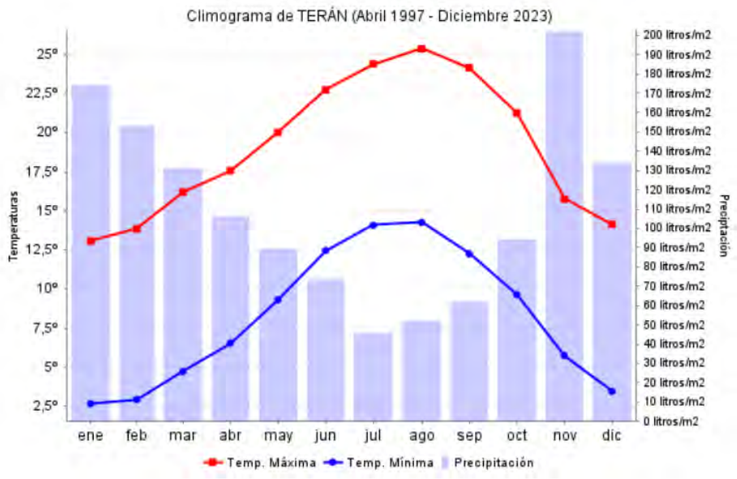


Figure 2.3.5. Climogram of Terán

3. HIDROLOGY

3.1. WATER COURSES

The project area lies within the hydrographic basin of the Saja River, which flows through the northern part of the town of Villanueva de la Peña. The influence of the Saja River, together with the meteorological characteristics described throughout this annex, has shaped the terrain over time, with particular relevance of the Quaternary alluvial terraces observed in the project area.

The planned roadway ends just a few meters before a small stone bridge that spans the Ceceja Stream. This stream will be taken into account for drainage and cross-water runoff management at the final chainages of the project road.

Figure 2.3.6. Hidrography on the Project area.

3.2. WATERSHED DEFINITION

3.2.1. MAIN WATERSHEDS

Three main watersheds have been identified within the project area, each contributing part of their flow to the roadway. These have been studied for the design of the cross drainage works. Several smaller primary watersheds have been grouped into three larger ones in order to simplify the calculations. A map of the main watersheds is included at the end of this annex is included in the Drainage document in Project Design

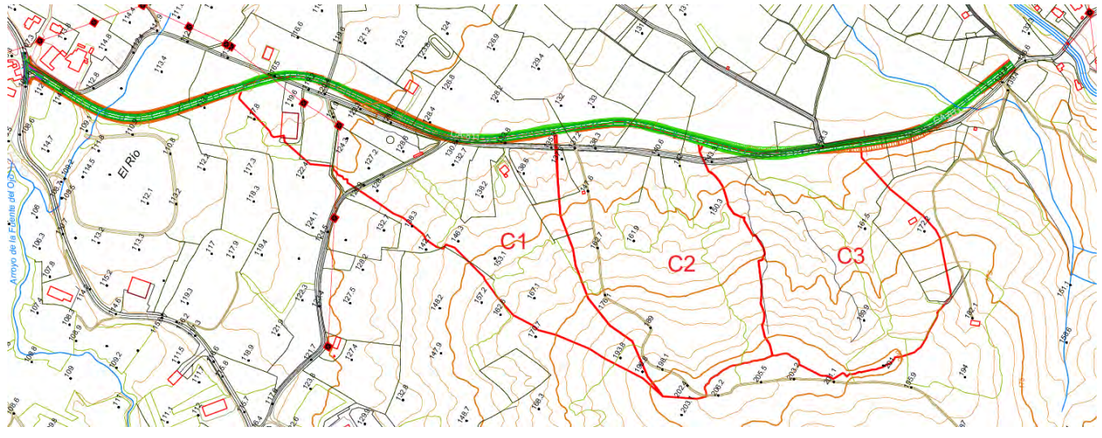


Figure 2.3.7. Main Watersheds.

Data for those watersheds appear in the following table:

Watershed Index	Area (km2)	Length of the main channel (km)	Elevation difference (m)	Average slope (%)
1	0,0956	0,773	85	10,99
2	0,0968	0,486	65	13,37
3	0,0914	0,413	54	13,07

Table 2.3.6.Main Watersheds data.

3.2.2. SECUNDARY WATERSHEDS

When sizing the longitudinal drainage works, the secondary catchment areas in the zone of the most restrictive cut have been taken into account, as well as the adjacent pavement surface. Accordingly, two drainage basins are defined, and their respective areas are shown below.

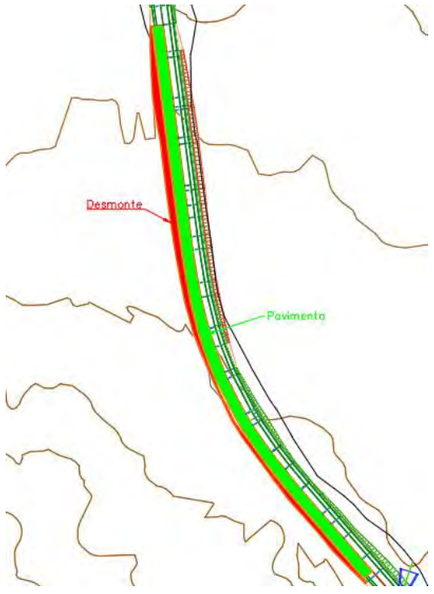


Figure 2.3.8. Secundary watersheds for longitudinal drainage systems design

The data for these secondary basins are detailed in the following table:

Watershed Denomination	Area (km2)
Cut	0,000755
Pavement	0,001847

Tabla 2.3.7. Secundary Watershed Data.

3.3. FLOOD-PRONE AREAS

The following maps, obtained from the geographic flood hazard map viewer, show that the project area road is not located within the flood-prone zones for events with return periods of 100 and 500 years. Therefore, it can be concluded that no special precautions are required in relation to flood-prone areas.

Figure 2.3.9. Flood-prone area with T=100 years.

Figure 2.3.10. Flood-prone area with T=500 years.

PRELIMINARY STUDIES 4 – GEOTECHNICAL STUDIES

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1. INTRODUCTION

In this annex, the geotechnical characteristics of the area where the CA-811 road is located will be defined. Based on these characteristics, the slopes of the cuttings and embankments to be applied along the alignment are specified according to the soil properties.

2. GEOTECHNY

2.1. GEOTECHNICAL CHARACTERIZATION OF MATERIALS

The 11-Reinosa sheet from the General Geotechnical Map of the IGME at a scale of 1:200,000 has been used as a reference to determine the geotechnical characteristics of the project area.

According to the map, the terrain is considered to have acceptable construction conditions, though it is identified as an area with potential lithological and hydrological issues. The area is classified as type II2, consisting mainly of detrital clay-rich materials with frequent interbedded limestone layers within the detrital mass. In the specific project zone, where the terrain is more gently sloped, clays and sands are predominant, which is typical for this region.

From a hydrological standpoint, the materials are classified as impermeable or semi-permeable with high runoff potential. The bearing capacity of the local soils is considered to be within the normal range (2 to 4 kp/cm²), and excavation of these materials is straightforward. It is also worth noting that a nearby zone is classified as type II3, comprising calcareous rock materials with high bearing capacity (>4 kp/cm²), which could be of interest for constructing a higher-quality roadbed.

Figure 2.4.1. Geotechnical detail in Project area.

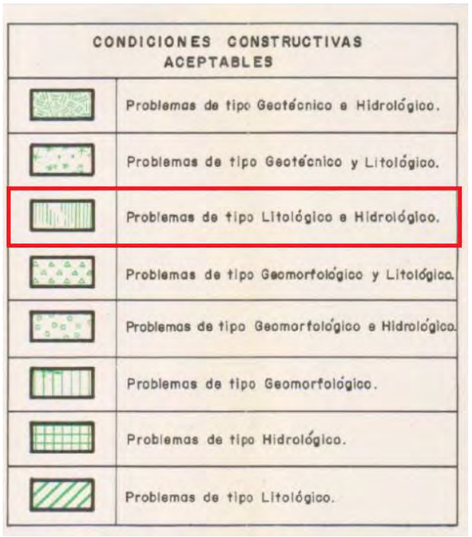


Figure 2.4.2. Construction Characteristics of the Project Area.

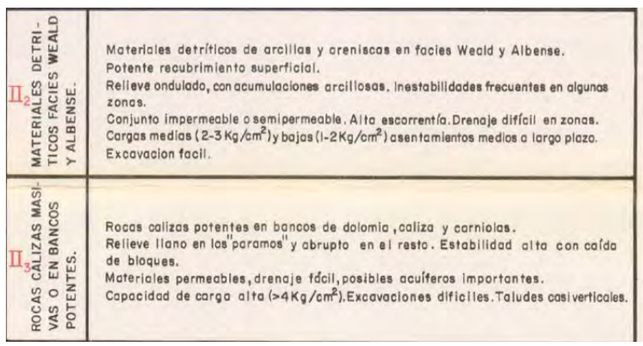
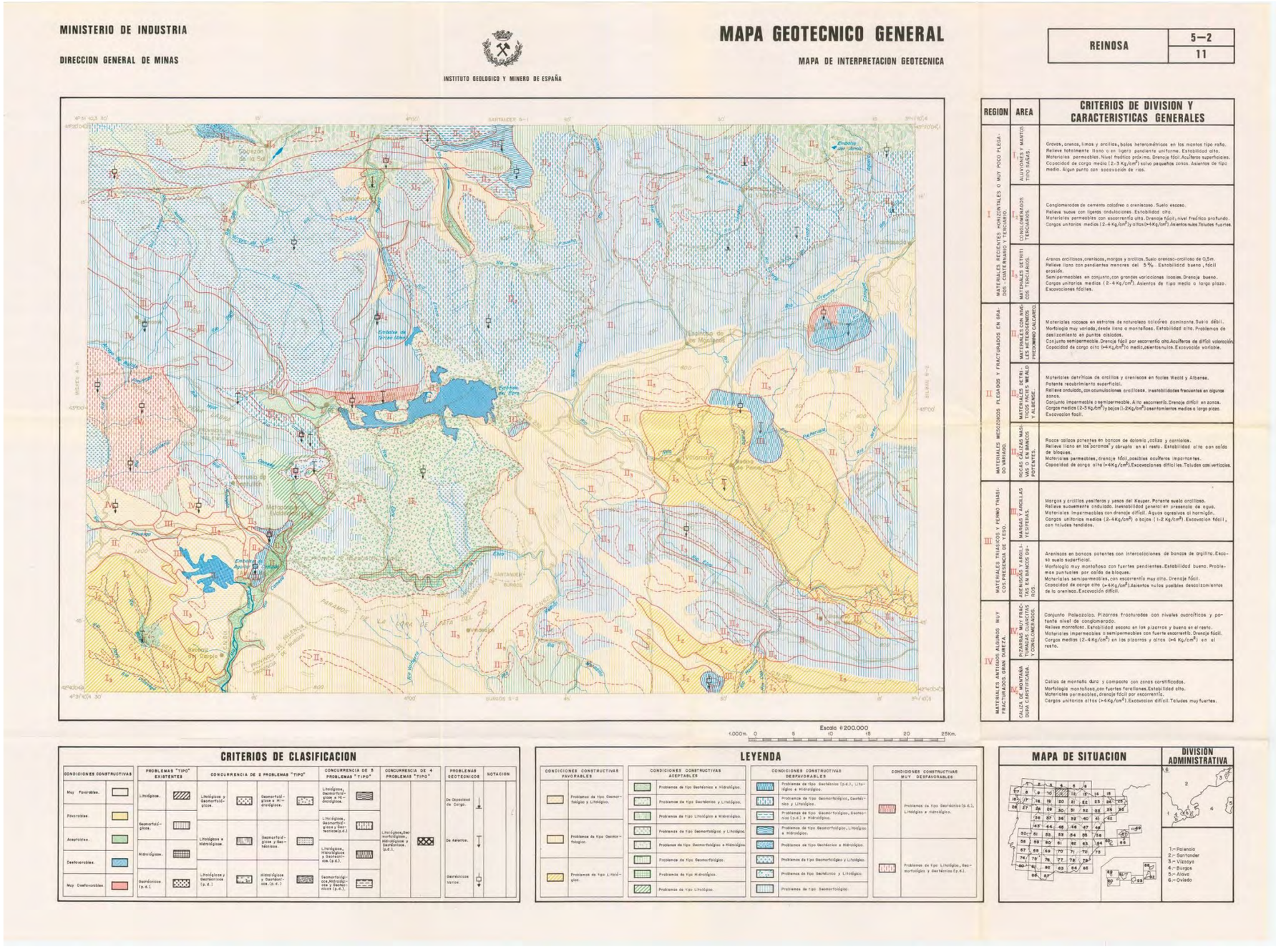


Figure 2.4.3. Criteria for Division and General Characteristics of the Project Area

2.2. NATIONAL GEOTECHNICAL MAP



MINISTERIO DE INDUSTRIA

DIRECCION GENERAL DE MINAS

INSTITUTO GEOLOGICO Y MINERO DE ESPAÑA

MAPA GEOTECNICO GENERAL

MAPA DE INTERPRETACION GEOTECNICA

REINOSA 5—2 / 11

REGION	AREA	CRITERIOS DE DIVISION Y CARACTERISTICAS GENERALES
I MATERIALES RECIENTES HORIZONTALES O MUY POCO PLEGADOS - CUATERNARIO Y TERCIARIO	1 ALUVIONES Y MANTOS TIO BAÑAS.	Gravas, arenas, limos y arcillas, bolos heterométricos en los montes tipo raña. Relieve totalmente llano o en ligera pendiente uniforme. Estabilidad alta. Materiales permeables. Nivel freático próximo. Drenaje fácil. Acuíferos superficiales. Capacidad de carga media (2-3 Kg/cm²) salvo pequeñas zonas. Asientos de tipo medio. Algun punto con socavación de ríos.
	2 CONGLOMERADOS TERCIARIOS.	Conglomerados de cemento calcáreo o arenáceo. Suelo escaso. Relieve suave con ligeras ondulaciones. Estabilidad alta. Materiales permeables con escorrentía alta. Drenaje fácil; nivel freático profundo. Cargas unitarias medias (2-4 Kg/cm²) y altas (>4 Kg/cm²). Asientos nulos. Taludes fuertes.
	3 MATERIALES DETRITICOS TERCIARIOS.	Arenas arcillosas, areniscas, margas y arcillas. Suelo arenoso-arcilloso de 0,5 m. Relieve llano con pendientes menores del 5%. Estabilidad buena, fácil erosión. Semipermeables en conjunto, con grandes variaciones locales. Drenaje bueno. Cargas unitarias medias (2-4 Kg/cm²). Asientos de tipo medio a largo plazo. Excavaciones fáciles.
II MATERIALES MESOZOICOS PLEGADOS Y FRACTURADOS EN GRADO VARIADO.	1 MATERIALES CON NIVELES HETEROGENEOS PREDOMINO CALCAREO.	Materiales rocosos en estratos de naturaleza calcárea dominante. Suelo débil. Morfología muy variada, desde llano a montañoso. Estabilidad alta. Problemas de deslizamiento en puntos aislados. Conjunto semipermeable. Drenaje fácil por escorrentía alta. Acuíferos de difícil valoración. Capacidad de carga alta (>4 Kg/cm²) o media, asientos nulos. Excavación variable.
	2 MATERIALES DETRITICOS FACIES WEALDEN Y ALBENSE.	Materiales detríticos de arcillas y areniscas en facies Weald y Albense. Potente recubrimiento superficial. Relieve ondulado, con acumulaciones arcillosas, inestabilidades frecuentes en algunas zonas. Conjunto impermeable o semipermeable. Alto escorrentía. Drenaje difícil en zonas. Cargas medias (2-3 Kg/cm²) y bajas (1-2 Kg/cm²) asentamientos medios a largo plazo. Excavación fácil.
	3 ROCAS CALIZAS MASIVAS O EN BANCOS POTENTES.	Rocas calizas potentes en bancos de dolomía, caliza y cornieles. Relieve llano en las "parameras" y abrupto en el resto. Estabilidad alta con caída de bloques. Materiales permeables, drenaje fácil, posibles acuíferos importantes. Capacidad de carga alta (>4 Kg/cm²). Excavaciones difíciles. Taludes casi verticales.
III MATERIALES TRIASICOS Y PERMO TRIASICOS CON PRESENCIA DE YESO.	1 MARGAS Y ARCILAS YESIFERAS.	Margas y arcillas yesíferas y yesos del Keuper. Potente suelo arcilloso. Relieve suavemente ondulado. Inestabilidad general en presencia de agua. Materiales impermeables con drenaje difícil. Aguas agresivas al hormigón. Cargas unitarias medias (2-4 Kg/cm²) o bajas (1-2 Kg/cm²). Excavación fácil, con taludes tendidos.
	2 ARENISCAS Y ARCILITAS EN BANCOS DUROS.	Areniscas en bancos potentes con intercalaciones de bancos de arcilita. Escaso suelo superficial. Morfología muy montañosa con fuertes pendientes. Estabilidad buena. Problemas puntuales por caída de bloques. Materiales semipermeables, con escorrentía muy alta. Drenaje fácil. Capacidad de carga alta (>4 Kg/cm²). Asientos nulos posibles desolizamientos de la arenisca. Excavación difícil.
IV MATERIALES ANTIGUOS ALGUNOS MUY FRACTURADOS, GRAN DUREZA.	1 PIZARRAS Y MUY FRACTURADAS CUARCITAS Y CONGLOMERADOS ROS.	Conjunto Paleozoico. Pizarras fracturadas con niveles cuarcíticos y potente nivel de conglomerado. Relieve montañoso. Estabilidad escasa en las pizarras y buena en el resto. Materiales impermeables o semipermeables con fuerte escorrentía. Drenaje fácil. Cargas medias (2-4 Kg/cm²) en las pizarras y altas (>4 Kg/cm²) en el resto.
	2 CALIZA DE MONTAÑA DURA CARSTIFICADA.	Calizas de montaña duras y compactas con zonas carstificadas. Morfología montañosa, con fuertes farallones. Estabilidad alta. Materiales permeables, drenaje fácil por escorrentía. Cargas unitarias altas (>4 Kg/cm²). Excavación difícil. Taludes muy fuertes.

Escala 1:200.000

1.000 m. 0 5 10 15 20 25 Km.

CRITERIOS DE CLASIFICACION

CONDICIONES CONSTRUCTIVAS	PROBLEMAS "TIPO" EXISTENTES	CONCURRENCIA DE 2 PROBLEMAS "TIPO"	CONCURRENCIA DE 3 PROBLEMAS "TIPO"	CONCURRENCIA DE 4 PROBLEMAS "TIPO"	PROBLEMAS GEOTECNICOS	NOTACION
Muy Favorables.	Litológicos.	Litológicos y Geomorfológicos. / Geomorfológicos e Hidrológicos.	Litológicos, Geomorfológicos y Hidrológicos (p.e.). / Litológicos, Geomorfológicos y Geotécnicos (p.e.). / Litológicos, Geomorfológicos y Geotécnicos (p.e.). / Geomorfológicos, Hidrológicos y Geotécnicos (p.e.).	Litológicos, Geomorfológicos, Hidrológicos y Geotécnicos (p.e.).	De Capacidad de Carga.	
Favorables.	Geomorfológicos.	Litológicos e Hidrológicos. / Geomorfológicos y Geotécnicos.			De Asientos.	
Aceptables.	Hidrológicos.				Geotécnicos Varios.	
Desfavorables.	Geotécnicos (p.e.).	Litológicos y Geotécnicos (p.e.) / Hidrológicos y Geotécnicos (p.e.).				
Muy Desfavorables.						

LEYENDA

CONDICIONES CONSTRUCTIVAS FAVORABLES	CONDICIONES CONSTRUCTIVAS ACEPTABLES	CONDICIONES CONSTRUCTIVAS DESFAVORABLES	CONDICIONES CONSTRUCTIVAS MUY DESFAVORABLES
Problemas de tipo Geomorfológico y Litológico.	Problemas de tipo Geotécnico e Hidrológico.	Problemas de tipo Geotécnico (p.e.), Litológico e Hidrológico.	Problemas de tipo Geotécnico (p.e.), Litológico e Hidrológico.
Problemas de tipo Geotécnico.	Problemas de tipo Geotécnico y Litológico.	Problemas de tipo Geomorfológico, Geotécnico y Litológico.	
Problemas de tipo Litológico y Geotécnico.	Problemas de tipo Litológico e Hidrológico.	Problemas de tipo Geomorfológico, Geotécnico (p.e.) e Hidrológico.	
	Problemas de tipo Geomorfológico y Litológico.	Problemas de tipo Geomorfológico, Litológico e Hidrológico.	
	Problemas de tipo Geomorfológico e Hidrológico.	Problemas de tipo Geotécnico e Hidrológico.	
	Problemas de tipo Geomorfológico.	Problemas de tipo Geomorfológico y Litológico.	Problemas de tipo Litológico, Geomorfológico y Geotécnico (p.e.).
	Problemas de tipo Hidrológico.	Problemas de tipo Geotécnico y Litológico.	
	Problemas de tipo Litológico.	Problemas de tipo Geomorfológico.	

MAPA DE SITUACION

DIVISION ADMINISTRATIVA

1.- Palencia
2.- Santander
3.- Vizcaya
4.- Burgos
5.- Alava
6.- Oviedo

3. SLOPE CALCULATIONS

Due to the lack of geotechnical data specific to the project area, the definition of soil properties will be based solely on the previously described geological and geotechnical characteristics. In addition, certain assumptions have been made based on prior experience with similar types of terrain.

3.1. CUT SLOPES CALCULATIONS

For the calculation of cut slopes, approximate angle values will be used, as presented below:

TIPO DE TERRENO		ALTURA DEL DESMONTE en metros.	
		H < 3	3 ≤ H ≤ 6
Granular	Gravas y zahorras Arenas gruesas y medias, no limosas	1,5:1	1,5:1
	Arenas finas limosas uniformes	1,5:1	1,75:1
Coherente	Limos y limos arenosos	1,5:1	1,5:1
	Arcillas arenosas y limos arcillosos de IP de 10 a 20	1,25:1	1,25:1
	Arcillas de IP de 20 a 30	1,25:1	1,5:1
	Arcillas de IP > 30	1,25:1	1,25:1

Table 2.4.1 Approximate Cut Slope Angle Values(H/V).

Considering that the planned cut slopes will be of low height and, based on the table, the terrain materials are of medium type—mainly clays with some granular elements—a slope of 3H:2V will be adopted.

3.2. ENMABNKMENT SLOPES

For the calculation of embankment slopes, approximate angle values will be used, as shown in the table below..

AASHTO	SUCS	CONDICIONES DE SITUACIÓN			
		No sujeto a inundación		Sujeto a inundación	
		Altura terraplén en m.	Pendiente del talud (H/V)	Altura terraplén en m.	Pendiente del talud (H/V)
A-1	GW, GP, SW	NO CRÍTICA	1,5:1	NO CRÍTICA	2:1
A-3	SP	NO CRÍTICA	1,5:1	NO CRÍTICA	2:1
A-2-4	GM, SM	< 15	2:1	< 10	3:1
A-2-5				3 < H < 10	3:1
A-2-6, A-2-7	GC, SC	< 15	2:1	< 15	3:1
A-4, A-5	ML, MH	< 15	2:1	< 15	3:1
A-6, A-7	CL, CH	< 15	2:1	< 15	3:1
A-8	Pt, OL, OH	NO CONVENIENTES			

Table 2.4.2. Approximate embankment slope angle values (H/V).

To determine the dimensions of the embankment slopes, it is necessary to know the AASHTO and SUCS classification of the soil type, as well as whether the project area is at risk of flooding.

3.2.1 AASHTO CLASIFICATION

Since there is no data from any boreholes nor information regarding the soil characteristics, granulometric analysis, or group index, it is not possible to use the general AASHTO classification table. Therefore, the following table will be used instead:

Clasificación	Composición del material	Permeabilidad	Capilaridad	Elasticidad	Cambios de volumen	Para capa de rodadura	Para base	Para subbase	Para terraplenes >de 15m	Para terraplenes <de 15m	Comportamiento después de compactado	Fallos que presenta el terreno
A-1	Mezcla de grava, arena, limo y arcilla, en cantidades bien proporcionadas	Baja	Baja	Casi nula	Muy pequeños	Excelente	Bueno a excelente	Bueno a excelente	Bueno a excelente	Excelente	Excelente. Estable en tiempo seco y húmedo	Prácticamente ninguno
A-2	Mezcla mal proporcionada de grava, arena, limo y arcilla. Tiene limo o arcilla en exceso	Baja a mediana	Baja a mediana. A veces perjudicial	Casi nula	A veces perjudiciales cuando son plásticos	Regular a bueno	Regular a excelente	Regular a excelente	Regular a bueno	Bueno	Bueno a excelente. Estable en tiempo seco. A veces polvoriento. Se reblandece en tiempo húmedo	Se reblandece cuando llueve. En tiempo seco se vuelve sucio y polvoriento
A-3	Arena o mezcla de grava y arena, con poco o nada de material fino	Mediana a elevada	Baja	Casi nula	Muy pequeños	Malo a regular	Regular a excelente	Regular a excelente	Regular a bueno	Bueno	Bueno a excelente. Es más estable en condiciones húmedas	Es inestable cuando se halla seco. Tiende a deslizarse cuando no está debidamente confinado. No tiene suficiente cohesión
A-4	Material limoso sin grava, ni arena gruesa. Contiene algo de arena fina y mediana. Su contenido de arcilla no es elevado	Baja a mediana	Muy elevada perjudicial	Baja	Regulares a grandes. Perjudiciales en época de heladas	Malo a pésimo	Malo a regular	Malo a regular	Malo a bueno	Malo a bueno	Regular en tiempo seco. Inestable en tiempo húmedo	Absorbe agua rápidamente perdiendo estabilidad. Susceptible de erosiones y lavados en época de lluvia. Posibilidad de hinchamientos de terreno
A-5	Material limoso semejante a A-4 pero con cierta cantidad de mica ó diatomáceas que le da elasticidad	Baja	Regular a elevada	Elevada perjudicial	Regulares a grandes. A veces perjudiciales cuando llueve	Pésimo	Malo	Malo	Pésimo	Malo a pésimo	Semejante al A-4	Presenta además una elasticidad perjudicial que impide una buena compactación
A-6	Terreno arcilloso sin material grueso. Poca arena fina. Rico en material coloidal	Prácticamente impermeable	Regular a elevada	Baja	Grandes. Pueden ser perjudiciales en época de lluvia	Malo a pésimo	Regular a pésimo	Pésimo a regular	Malo a pésimo	Regular a malo	Regular a bueno en tiempo seco. Malo en tiempo lluvioso	En épocas de lluvia se pone resbaladizo y los pavimentos fallan por falta de base firme.Cuando se humedece o seca sufre hinchamientos y contracciones perjudiciales
A-7	Terreno arcilloso semejante a A-6, pero no tan rico en material coloidal. Presenta propiedades elásticas	Baja	Regular a elevada	Elevada a perjudicial	Grandes. Pueden ser perjudiciales en época de lluvia	Malo a pésimo	Regular a pésimo	Regular a pésimo	Malo a pésimo	Malo a pésimo	Regular a bueno en tiempo seco. Malo en tiempo lluvioso	Los mismos inconvenientes que A-6.Presenta además una clasificación perjudicial que impide una buena compactación
A-8	Terreno turboso, suave y esponjoso. Puede contener arena y material fino en cantidades variables	Muy permeable	Muy elevada perjudicial	Muy elevada perjudicial	Grandes perjudiciales	Pésimo	Pésimo	Pésimo	Pésimo	Pésimo	El material debe retirarse.Compactándolo no se obtiene resultado satisfactorio alguno	Pésimo material para emplearlo en construcción. Su valor soporte es casi nulo

Table 2.4.3. AASHTO Classification of Soils.

According to the description of the material composition making up the terrain, as discussed in previous sections of this annex and in the geology annex, the soil could be classified as type A-1. This classification includes well-graded mixtures of gravel, sand, silt, and clay—consistent with the geological description of the area (gravels, pebbles, and boulders embedded in a silty-clayey matrix with significant sand content).

3.2.2 SUCS CLASSIFICATION

SÍMBOLO	TIPO DE SUELO	CAPACIDAD DE CARGA	RIESGO DE ASIENTOS	MODIFICACIÓN DE RESISTENCIA POR CAMBIOS DE HUMEDAD	COMPACTABILIDAD	RIESGO DE DESLIZAMIENTO DE TALUDES
GW	Gravas limpias bien graduadas	Muy alta	Bajísimo	Muy baja	Muy buena	Muy bajo
GP	Gravas limpias mal graduadas	Alta	Muy bajo	Muy baja	Buena	Bajo
SW	Arenas limpias bien graduadas	Muy alta	Bajísimo	Muy baja	Muy buena	Muy bajo
SP	Arenas limpias mal graduadas	Alta	Muy bajo	Muy baja	Buena	Bajo
GC	Gravas arcillosas	Alta	Bajo	Baja a media	Buena a media	Muy bajo
SC	Arenas arcillosas	Alta o media	Bajo	Baja a media	Buena a media	Bajo
GM	Gravas limosas	Alta	Bajo	Baja	Media	Bajo
SM	Arenas limosas	Alta a media	Bajo	Baja	Media	Bajo a medio
ML	Limos de baja plasticidad	Media a baja	Medio	Media a alta	Mala	Medio
CL	Arcillas de baja plasticidad	Baja	Medio	Media a alta	Media a mala	Medio a alto
MH	Limos de alta plasticidad	Baja	Alto	Alta	Muy mala	Medio a alto
CH	Arcillas de alta plasticidad	Muy baja	Muy alto	Alta	Mala	Alto
O	Suelos orgánicos	Bajísima	Altísimo	Altísima	Muy mala	-

Table 2.4.4. SUCS Classification of Soils.

According to the previous table and the soil type, a GC (Clayey Gravel) classification will be assigned.

3.2.3 CONCLUSION

In conclusion, considering that the project area is not located in a flood risk zone—as established in the hydrology annex—and given that all embankments will be less than 15 meters in height, it is determined that the embankment slopes will be **3(H):2(V)**, the same as the cut slopes.

4. RECOMMENDATIONS FOR THE EMBANKMENT

Considering the following table, a series of assumptions will be made in order to determine the category and type of subgrade material, with the aim of defining the pavement structure dimensions.

The soil in the project area is primarily composed of clays, along with some granular material such as sandstones. That is, non-granular sedimentary rocks, which exhibit very high bearing capacity, low water-induced degradability, medium to easy compactability, and low potential for alteration.

TIPOS DE ROCA	CAPACIDAD DE CARGA	MODIFICACIÓN DE RESISTENCIA EN PRESENCIA DE AGUA	COMPACTABILIDAD	ALTERABILIDAD POTENCIAL
Ígneas ácidas de grano grueso	Muy alta	Nula	Difícil	Muy baja
Ígneas básicas de grano grueso	Muy alta	Nula	Difícil	Muy baja
Ígneas ácidas de grano fino	Muy alta	Nula	Difícil	Muy baja
Ígneas básicas de grano fino	Muy alta	Nula	Difícil	Muy baja
Ígneas no granulares	Alta	Nula	Muy difícil	Baja
Sedimentarias de grano grueso	Alta	Muy baja	Media	Baja
Sedimentarias de grano fino	Alta	Media a baja	Media a fácil	Media
Sedimentarias no granulares	Muy alta	Baja	Media a fácil	Baja
Sedimentarias cristalinas	Baja	Muy alta	Irregular	Muy alta
Metamórficas de grano grueso	Alta	Nula	Difícil	Baja
Metamórficas de grano fino	Alta a media	Media a baja	Difícil a media	Alta
Metamórficas no granulares	Muy alta	Nula	Difícil	Muy baja

Table 2.4.5. Characteristics of the main types of rocks in terms of suitability for foundations.

Given the known characteristics of the soil and the lack of specific data such as the compressibility modulus in the second loading cycle or the CBR index, it can be assumed that the soil is tolerable due to its composition and the presence of gypsum and salts. The objective is to achieve an E3 category subgrade with high load-bearing capacity, primarily due to the presence of clays and sandstones. Ensuring proper compaction is crucial to achieving the desired subgrade category and obtaining high load-bearing performance.

PRELIMINARY STUDIES 5 – TRAFFIC STUDY

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1. INTRODUCTION

This appendix presents an analysis of the current traffic conditions on the CA-811 road and its nearby connecting roads. This will allow for an estimation of the expected traffic volume on the new road at the time of its commissioning (2026), a key parameter required for the pavement structure design.

2. TRAFFIC PROJECTION

2.1. INITIAL DATA

Traffic data is available from the Traffic Counting Plan of the Government of Cantabria, provided by the University of Cantabria. These data were collected at the coverage station 811-01, located within the project area.

ROAD	LOCALITY	IMD (vh/day)	% HEAVY VH	YEAR
CA-811 Villanueva de la Peña – Herrera de Ibio	Villanueva de la Peña y Herrera de Ibio	512	**7**	2023

Table 2.5.1. CA-811 Traffic data.

2.2. TRAFFIC CALCULATION

The traffic growth for the year of commissioning is calculated using the following formula:

$$IMD_T = IMD_{2023}(1+r)^n$$

Where:

- IMD_T Average Daily Traffic (ADT) in the Year of Commissioning (2026)
- IMD_{2016} Initial Year Average Daily Traffic (2023)
- r Annual Growth Rate
- n number of years.

The numerical value of parameter *r* is defined in Nota de Servicio 5/2014, which sets out the technical specifications and recommendations for conducting traffic studies in Feasibility Studies, Preliminary Designs, and Roadway Projects, issued by the Spanish Ministry of Public Works (Ministerio de Fomento).

Traffic increment to use	
Period	**Annual Growth Rate**
2017 on	1,44 %

Table 2.5.2. Annual Growth Rate stablished in FOM/3317/2010.

As there is no available data on the distribution of heavy vehicles by lane, the provisions of Instruction 6.1-IC on Pavement Sections must be followed:

"In two-lane roadways with bidirectional traffic, each lane is assumed to carry half of the heavy vehicles circulating on the roadway."

In this way, the values of AADT and AADT for heavy vehicles per lane are obtained for the year of commissioning:

- AADT in the Year of Commissioning

$$\boldsymbol{AADT_{2026}} = \boldsymbol{IMD_{2026}} = 512 \cdot \left(1 + \frac{1{,}44}{100}\right)^3 = \mathbf{534}\ \boldsymbol{\frac{veh}{day}}$$

- AADT of Heavy Vehicles in the Year of Commissioning:

$$\boldsymbol{AADT_{heavy\ vehicles_2026}} = \boldsymbol{IMD_{veh\ pesados_2026}} = \frac{7}{100} \cdot 534 = \mathbf{37}\ \boldsymbol{\frac{heavy\ veh}{day}}$$

- AADT of Heavy Vehicles in the Year of Commissioning per lane:

$$\boldsymbol{AADT_{heavy\ vehicles_2026_lane}} = \boldsymbol{IMD_{veh\ pesados_2026_carril}} = \frac{1}{2} \cdot 37 = \mathbf{18}\boldsymbol{\frac{heavy\ veh}{day * lane}}$$

3. LEVEL OF SERVICE

The road designed in this project corresponds to a two-way rural interurban road, with one lane in each direction and no dedicated passing lanes. The main objective is to determine the number of vehicles experiencing delays during travel in order to define the corresponding Level of Service (LOS). To this end, the LOS will be calculated following the procedure described below.

The total length of the road is 1,640 meters and, for the purpose of this study, it is divided into the following segments:

- Segment with **no-passing zone** (Station PK 0+000 – PK 0+460).
- Segment with **passing allowed** (Station PK 0+460 – PK 1+240).
- Segment with the **most adverse gradient** (Station PK 0+640 – PK 0+720).
- Segment with the **most restrictive curve radius** (Station PK 0+440 – PK 0+480)

The classification of passing and no-passing zones has been carried out in accordance with Order FOM/273/2016 of February 19, which approves Norma 3.1-IC de Trazado This regulation establishes criteria for passing zones based on distance and visibility, assessed from a height of 1.1 meters above the road centerline. In this case, passing is considered allowed when the required passing sight distance for a design speed of 60 km/h is available, and adequate visibility is ensured through proper horizontal and vertical alignment coordination.

The Level of Service (LOS) for the road will be determined based on the methodology outlined in the Highway Capacity Manual (HCM), 7th Edition, 2022.

Based on each segment's length and corresponding gradient, the vertical class is determined. Due to the variation in slope, each segment presents a different vertical classification. Final results are presented at the end of this section.

First we have to determine the classification for vertical alignment:

Segment Length (mi)	Segment Percent Grade (%)									
	≤1	>1 ≤2	>2 ≤3	>3 ≤4	>4 ≤5	>5 ≤6	>6 ≤7	>7 ≤8	>8 ≤9	>9
≤0.1	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	2 (1)	2 (2)	2 (2)
>0.1 ≤0.2	1 (1)	1 (1)	1 (1)	1 (1)	2 (1)	2 (2)	2 (2)	3 (2)	3 (3)	3 (3)
>0.2 ≤0.3	1 (1)	1 (1)	1 (1)	2 (1)	2 (2)	3 (2)	3 (3)	4 (3)	4 (4)	5 (5)
>0.3 ≤0.4	1 (1)	1 (1)	2 (1)	2 (2)	3 (2)	3 (3)	4 (4)	5 (4)	5 (5)	5 (5)
>0.4 ≤0.5	1 (1)	1 (1)	2 (1)	2 (2)	3 (3)	4 (3)	5 (4)	5 (5)	5 (5)	5 (5)
>0.5 ≤0.6	1 (1)	1 (1)	2 (1)	3 (2)	3 (3)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)
>0.6 ≤0.7	1 (1)	1 (1)	2 (1)	3 (2)	4 (3)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)
>0.7 ≤0.8	1 (1)	1 (1)	2 (1)	3 (3)	4 (4)	5 (4)	5 (5)	5 (5)	5 (5)	5 (5)
>0.8 ≤0.9	1 (1)	1 (1)	2 (1)	3 (3)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
>0.9 ≤1.0	1 (1)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
>1.0 ≤1.1	1 (1)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)
>1.1	1 (1)	1 (1)	2 (2)	4 (4)	4 (4)	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)

Table 2.5.3. Classification for vertical class.

$$v_d = \frac{V_d}{FHP} \quad (Eq\ 1)$$

Where:

- v_d demand flow rate in direction consdiered.
- V_d demand volume for direction (AATD*K_{30}).
- FHP Peak Hour Factor.

$$BFFS = 1{,}14 * S_{pl} \quad (Eq\ 2)$$

Where:

- $BFFS$ base free-flow speed.
- S_{pl} speed limit.

$$FFS = BFFS - a \cdot (HV\%) - f_{LS} - f_A \quad \text{(Ecuación 3)}$$

Where:

- FFS free-flow speed in the analysis direction.

- f_{LS} adjustment for lane and shoulder width.
- f_A adjustment for access-point density.
- HV percentage of heavy vehicles in the analysis direction.
- a value obtained in equation 4.

$$a = máx\left[\{0.0333\}, \left\{a_0 + a_1 \cdot BFFS + a_2 \cdot L + máx(\{0\}, \{a_3 + a_4 \cdot BFFS \cdot L\}) \cdot \frac{v_0}{1000}\right\}\right] \quad \text{(Ecuación 4)}$$

Vertical Class	a_0	a_1	a_2	a_3	a_4	a_5
1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	−0.45036	0.00814	0.01543	0.01358	0.00000	0.00000
3	−0.29591	0.00743	0.00000	0.01246	0.00000	0.00000
4	−0.40902	0.00975	0.00767	−0.18363	0.00423	0.00000
5	−0.38360	0.01074	0.01945	−0.69848	0.01069	0.12700

Table 2.5.3. Coefficient for Equation 4.

$$f_{LS} = 0.6 \cdot (12 - LW) + 0.7 \cdot (6 - SW) \quad (Ecuación\ 5)$$

Where:

- LW Lane width .
- SW shoulder width.

$$S = \begin{cases} FFS & Si\ v_d \leq 100 \\ FFS - m\left(\frac{v_d}{1000} - 0.1\right)^p & Si\ v_d > 100 \end{cases} \quad (Ecuación\ 7)$$

In our case, since the traffic volume is below 100 vehicles in all scenarios, we proceed directly to calculating the Percent Followers (PF), assuming that the overall average speed is equal to the Free-Flow Speed (FFS).

Once the speed has been determined, the percentage of delayed vehicles is obtained based on the capacities at 25% and 100% of the total traffic volume.

$$PF = 100 \cdot \left[1 - e^{\left(m \cdot \left\{\frac{v_d}{1000}\right\}^p\right)}\right] \quad (Ecuación\ 17)$$

Where:

- PF percent followers
- v_d directional flow.
- m equation coefficient.
- p exponent coefficient.

$$PF_{cap} = b_0 + b_1(L) + b_2 \cdot \left(\sqrt{L}\right) + b_3 \cdot (FFS) + b_4 \cdot \left(\sqrt{FFS}\right) + b_5 \cdot (HV\%) + b_6 \cdot \left(FFS \cdot \frac{v_0}{1000}\right) + b_7 \cdot \left(\sqrt{\frac{v_0}{1000}}\right)$$
(Ecuación 18)

Vertical Class	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7
1	37.68080	3.05089	−7.90866	−0.94321	13.64266	−0.00050	−0.05500	7.13758
2	58.21104	5.73387	−13.66293	−0.66126	9.08575	−0.00950	−0.03602	7.14619
3	113.20439	10.01778	−18.90000	0.46542	−6.75338	−0.03000	−0.05800	10.03239
4	58.29978	−0.53611	7.35076	−0.27046	4.49850	−0.01100	−0.02968	8.89680
5	3.32968	−0.84377	7.08952	−1.32089	19.98477	−0.01250	−0.02960	9.99453

Table 2.5.5. Coefficients for equation 18.

$$PF_{25cap} = c_0 + c_1(L) + c_2 \cdot \left(\sqrt{L}\right) + c_3 \cdot (FFS) + c_4 \cdot \left(\sqrt{FFS}\right) + c_5 \cdot (HV\%) + c_6\left(FFS \cdot \frac{v_0}{1000}\right) + c_7 \cdot \sqrt{\frac{v_0}{1000}}$$
(Ecuación 20)

Vertical Class	c_0	c_1	c_2	c_3	c_4	c_5	c_6	c_7
1	18.01780	10.00000	−21.60000	−0.97853	12.05214	−0.00750	−0.06700	11.60405
2	47.83887	12.80000	−28.20000	−0.61758	5.80000	−0.04550	−0.03344	11.35573
3	125.40000	19.50000	−34.90000	0.90672	−16.10000	−0.11000	−0.06200	14.71136
4	103.13534	14.68459	−23.72704	0.66444	−11.95763	−0.10000	0.00172	14.70067
5	89.00000	19.02642	−34.54240	0.29792	−6.62528	−0.16000	0.00480	17.56611

Table 2.5.6 Coefficients for equation 20.

$$m = d_1\left(\frac{0 - \ln\left[1 - \frac{PF_{25cap}}{100}\right]}{0.25\left[\frac{cap}{1{,}000}\right]}\right) + d_2\left(\frac{0 - \ln\left[1 - \frac{PF_{cap}}{100}\right]}{\left[\frac{cap}{1{,}000}\right]}\right)$$

Segment Type	d_1	d_2
Passing Constrained and Passing Zone	−0.29764	−0.71917
Passing Lane	−0.15808	−0.83732

Table 2.54.7 Coefficients for equation 22.

$$p = e_0 + e_1\left(\frac{0 - \ln\left[1 - \frac{PF_{25cap}}{100}\right]}{0.25\left[\frac{cap}{1{,}000}\right]}\right) + e_2\left(\frac{0 - \ln\left[1 - \frac{PF_{cap}}{100}\right]}{\left[\frac{cap}{1{,}000}\right]}\right) + e_3\sqrt{\frac{0 - \ln\left(1 - \frac{PF_{25cap}}{100}\right)}{0.25\left[\frac{cap}{1{,}000}\right]}} + e_4\sqrt{\frac{0 - \ln\left(1 - \frac{PF_{cap}}{100}\right)}{\left[\frac{cap}{1{,}000}\right]}}$$

Segment Type	e_0	e_1	e_2	e_3	e_4
Passing Constrained and Passing Zone	0.81165	0.37920	−0.49524	−2.11289	2.41146
Passing Lane	−1.63246	1.64960	−4.45823	−4.89119	10.33057

Table 2.5.8. Coefficients for equation 23.

Lastly we obtain the level of service based on PF:

$$FD = \frac{PF}{100} \cdot \frac{v_d}{S} \qquad (Ecuación\ 35)$$

LOS	Follower Density (followers/mi/ln) Higher-Speed Highways Posted Speed Limit ≥ 50 mi/h	Lower-Speed Highways Posted Speed Limit < 50 mi/h
A	≤ 2.0	≤ 2.5
B	> 2.0 – 4.0	> 2.5 – 5.0
C	> 4.0 – 8.0	> 5.0 – 10.0
D	> 8.0 – 12.0	> 10.0 – 15.0
E	> 12.0	> 15.0
F	Demand exceeds capacity	

Table 2.5.9. Two-lane road service levels.

According to the results obtained, all analyzed subsections achieve a **Level of Service A**. The table below presents the development of the calculations and the intermediate values used to determine the Level of Service for each of the selected road segments.

• Segment with overtaking prohibited (Station 0+000 – Station 0+460).

DATA					LEVEL OF SERVICE CALCULATION				
Parameter		Units		Value	Parameter		Units	Results	Equation
Curved Lenght	PK			0+000 - 0+460	Traffic volume in analysed direction	vd	veh/h/lane	30	1
Vertical Class	CVert			2	Total intensity	v0	veh/h	59	
Length	Lt	mi	460	0,286	Basic free flow speed	BFFS	mi/h	42,502	2
Passing			Prohibited	Prohibited	Free flow speed	FFS	mi/h	40,286	3
Density in one lane	Vd	veh/h/carril		28	Equation 4 coefficient	a		0,0333	4
Density in both lanes	V0	veh/h/carril		55,536	Lane width adjustment factor	fls	mi/h	2,214	5
Peak Hour Factor	FHP		0,94	0,94	Access-point adjustment factor	fa	mi/h	0	6
Speed limit	Spl	mi/h	60	37,28	Speed in analysed direction	S	mi/h	40,286	7
Heavy vehicle %	HV	%		7	Slope coefficient	m			8
Slope	i	%	3,3	0,97	Exponent coefficient	p		0,24763	11
Lane width (ft)	LW	ft	3,5	11,5	Average speed on curved subsegment	SHC	mi/h		12
Shoulder width (ft)	SW	ft	1	3,3	Free-flow speed on curved subsegment	FFSHC	mi/h	53,118	13
Acceses (acc/mi)	APD	acc/mi	0,00	0,00	Basic free-flow speed on curved subsection	BFFSHC	mi/h	53,297	14
Radius C2	R2	ft	500	1640,42	Eq 12 Coefficient	m			15
Horizontal Class C1	CHoriz			1	25% Capacity	Smed	mi/h	**40,286**	16
Radius C2 (ft)	LC1	mi	176	0,10936	100% Capacity	FFSmed	mi/h	29,957	
Length of Segment 2 (straight)	LR2	mi	110	0,06835	Slope coefficient	PFcap100	%	84,072	18
					Exponent Coefficient	PFcap25	%	52,048	20
					Percentage of delayed vehicles	m		-1,46412	22
					Density of delayed vehicles	p		0,94370	23
					Level Of Service	PF	%	**5,14**	17
					Traffic volume in analysed direction	FD	veh/mi	0,038	35
					Total intensity	NS		**A**	

- Segment where overtaking is permitted (Station 0+460 – Station 1+240).

DATA					LEVEL OF SERVICE CALCULATION				
Parameter		Units		Value	Parameter		Units	Results	Equation
Curved Lenght	PK			0+460 - 1+240	Traffic volume in analysed direction	vd	veh/h/carril	59	1
Vertical Class	CVert			4	Total intensity	v0	veh/h	118	
Length	Lt	mi	780	0,485	Basic free flow speed	BFFS	mi/h	42,502	2
Passing			Permited	Permited	Free flow speed	FFS	mi/h	40,286	3
Density in one lane	Vd	veh/h/lane		56	Equation 4 coefficient	a		0,0333	4
Density in both lanes	V0	veh/h/lane		111,072	Lane width adjustment factor	fls	mi/h	2,214	5
Peak Hour Factor	FHP		0,94	0,94	Access-point adjustment factor	fa	mi/h	0,000	6
Speed limit	Spl	mi/h	60	37,28	Speed in analysed direction	S	mi/h	40,2858	7
Heavy vehicle %	HV	%		7	Slope coefficient	m			8
Slope	i	%	3,61	1,07	Exponent coefficient	p		0,56654	11
Lane width (ft)	LW	ft	3,5	11,5	Average speed on curved subsegment	SHC	mi/h		12
Shoulder width (ft)	SW	ft	1	3,3	Free-flow speed on curved subsegment	FFSHC	mi/h	53,1182	13
Acceses (acc/mi)	APD	acc/mi	0,00	0,00	Basic free-flow speed on curved subsection	BFFSHC	mi/h	53,2967	14
Radius C1	R1	ft	400	1312,34	Eq 12 Coefficient	m			15
Horizontal Class C1	CHoriz			1	25% Capacity	Smed	mi/h	**40,2858**	16
Radius C2 (ft)	R2	ft	500	1640,42	100% Capacity	FFSmed	mi/h	50,8612	
Horizontal Class C2	CHoriz			1	Slope coefficient	PFcap100	%	84,356	18
Length of Segment 1 (curve)	LC1	mi	302	0,18765	Exponent Coefficient	PFcap25	%	46,614	20
Length of Segment 2 (straight)	LR2	mi	191	0,11868	Percentage of delayed vehicles	m		-1,38755	22
Length of Segment 3 (curve)	LC2	mi	300	0,18641	Density of delayed vehicles	p		1,08266	23
					Level Of Service	PF	%	**6,28**	17
					Traffic volume in analysed direction	FD	veh/mi	0,092	35
					Total intensity	NS		**A**	

- Segment with the most unfavorable grade (Station 0+640 – Station 0+720).

DATA					LEVEL OF SERVICE CALCULATION				
Parameter		Units		Value	Parameter		Units	Results	Equation
Curved Lenght	PK			0+640 - 0+720	Traffic volume in analysed direction	vd	veh/h/lane	59	1
Vertical Class	CVert			1	Total intensity	v0	veh/h	118	
Length	Lt	mi	80	0,050	Basic free flow speed	BFFS	mi/h	42,502	2
Passing			Prohibited	Prohited	Free flow speed	FFS	mi/h	39,826	3
Density in one lane	Vd	veh/h/lane		56	Equation 4 coefficient	a		0,0333	4
Density in both lanes	V0	veh/h/carril		111,072	Lane width adjustment factor	fls	mi/h	2,673	5
Peak Hour Factor	FHP		0,94	0,94	Access-point adjustment factor	fa	mi/h	0,000	6
Speed limit	Spl	mi/h	60	37,28	Speed in analysed direction	S	mi/h	39,8265	7
Heavy vehicle %	HV	%		7	Slope coefficient	m			8
Slope	i	%	2,85	2,85	Exponent coefficient	p		0,56654	11
Lane width (ft)	LW	ft	3,5	11,5	Average speed on curved subsegment	SHC	mi/h	**39,8265**	12
Shoulder width (ft)	SW	ft	0,8	2,6	Free-flow speed on curved subsegment	FFSHC	mi/h	53,1182	13
Acceses (acc/mi)	APD	acc/mi	0,00	0,00	Basic free-flow speed on curved subsection	BFFSHC	mi/h	53,2967	14
Horizontal Class	CHoriz			1	Eq 12 Coefficient	m			15
Radius C2 (ft)	R2	ft	500	1640,42	25% Capacity	PFcap100	%	86,792	18
					100% Capacity	PFcap25	%	54,408	20
					Slope coefficient	m		-1,59397	22
					Exponent Coefficient	p		1,13410	23
					Percentage of delayed vehicles	PF	%	**6,24**	17
					Density of delayed vehicles	FD	veh/mi	0,093	35
					Level Of Service	NS		**A**	

- Curved segment with the most restrictive radius (Station 0+440 – Station 0+480).

DATA					LEVEL OF SERVICE CALCULATIONS				
Parameter		Units		Value	Parameter		Units	Result	Equation
Curved Lenght	PK			0+440 -0+480	Traffic volume in analysed direction	vd	veh/h/lane	59	1
Vertical Class	CVert			1	Total intensity	v0	veh/h	118	
Length	Lt	mi	40	0,025	Basic free flow speed	BFFS	mi/h	42,502	2
Passing			Permited	Permited	Free flow speed	FFS	mi/h	39,826	3
Density in one lane	Vd	veh/h/lane		56	Equation 4 coefficient	a		0,0333	4
Density in both lanes	V0	veh/h/lane		111,072	Lane width adjustment factor	fls	mi/h	2,673	5
Peak Hour Factor	FHP		0,94	0,94	Access-point adjustment factor	fa	mi/h	0,000	6
Speed limit	Spl	mi/h	60	37,28	Speed in analysed direction	S	mi/h	39,8265	7
Heavy vehicle %	HV	%		7	Slope coefficient	m		2,60232	8
Slope	i	%	0,67	0,67	Exponent coefficient	p		0,56654	11
Lane width (ft)	LW	ft	3,5	11,5	Average speed on curved subsegment	SHC	mi/h	**39,8265**	12
Shoulder width (ft)	SW	ft	0,8	2,6	Free-flow speed on curved subsegment	FFSHC	mi/h	53,1182	13
Acceses (acc/mi)	APD	acc/mi	0,00	0,00	Basic free-flow speed on curved subsection	BFFSHC	mi/h	53,2967	14
Horizontal Class	CHoriz			1	Eq 12 Coefficient	m		3,0216	15
Radius C1 (ft)	R1	ft	400	1312,34	25% Capacity	PFcap100	%	87,233	18
					100% Capacity	PFcap25	%	55,570	20
					Slope coefficient	m		-1,63073	22
					Exponent Coefficient	p		1,15370	23
					Percentage of delayed vehicles	PF	%	**6,05**	17
					Density of delayed vehicles	FD	veh/mi	0,090	35
					Level Of Service	NS		**A**	

PRELIMINARY STUDIES 6 – SOLUTIONS TO TRAFFIC

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1. INTRODUCTION

This annex presents the various proposals for diverting and regulating vehicle traffic during the execution of the different phases of the construction works. The work will be carried out following the guidelines established in:

- Norma 8.3-IC. "*Señalización de obras"*, publicada por la Dirección General de Carreteras en 1989,
- "*Manual de ejemplos de señalización de obras fijas"*, publicado por la Dirección General de Carreteras en 1997.

Additionally, road markings, delineation devices, and a list of signs that may be used during the works are included.

2. GENERAL PRINCIPLES OF WORK ZONE SIGNAGE

2.1. OBJECTIVES

Work zone signage is fundamentally intended to achieve the following objectives:

- Inform road users of the presence of construction works.
- Regulate traffic flow within the area affected by the works.
- Modify user behavior by adapting it to the unexpected situation and complying with the specific requirements of the work zone.
- Protect workers from accidents caused by intrusion through proper signage and delineation of the work zone.

To prioritize the safety of drivers and workers, it is essential that the previously mentioned objectives are met at all times. In this way, safe traffic flow can be ensured along with the uninterrupted continuation of the works within the project area.

2.2. SIGNALING

Road users must not encounter unexpected or difficult-to-interpret situations that have not been previously warned, as their reaction could lead to an accident. For this reason, signage and delineation must be properly justified, consistent, and not excessive; they must adapt to the progression of the works both spatially and temporally, eliminate any permanent signage that could cause confusion, and be removed as soon as they are no longer necessary.

3. SOLUTIONS TO TRAFFIC

The following guidelines will be ensured at all times:

• Whenever possible, adequate and sufficiently wide passages will be maintained for two-way traffic. Alternating one-lane traffic may be implemented using traffic signals that properly regulate traffic in both directions.
• In the exceptional case that a complete traffic closure is necessary, it will be as brief as possible, ensuring circulation through a properly signed detour route.

4. DRAWINGS

In our case, the work in question involves a two-way road with a single carriageway for two lanes, designated as type A according to Standard 8.3-IC. The various figures, extracted from the "Manual of Examples for Fixed Work Zone Signage," show the solutions adopted in different cases:

- **A1:** Work zone presenting an obstacle to traffic located outside the roadway platform.
- **A2:** Obstacle on the outer shoulder.
- **A5:** Obstacle on the carriageway such that it is not necessary to reduce the number of lanes open to traffic.
- **A6:** Obstacle on the carriageway requiring a reduction of one lane open to traffic.
- **A7:** Obstacle on the carriageway requiring a reduction of more than one lane open to traffic.
- **A8:** Obstacle on the carriageway requiring a full closure of the roadway.

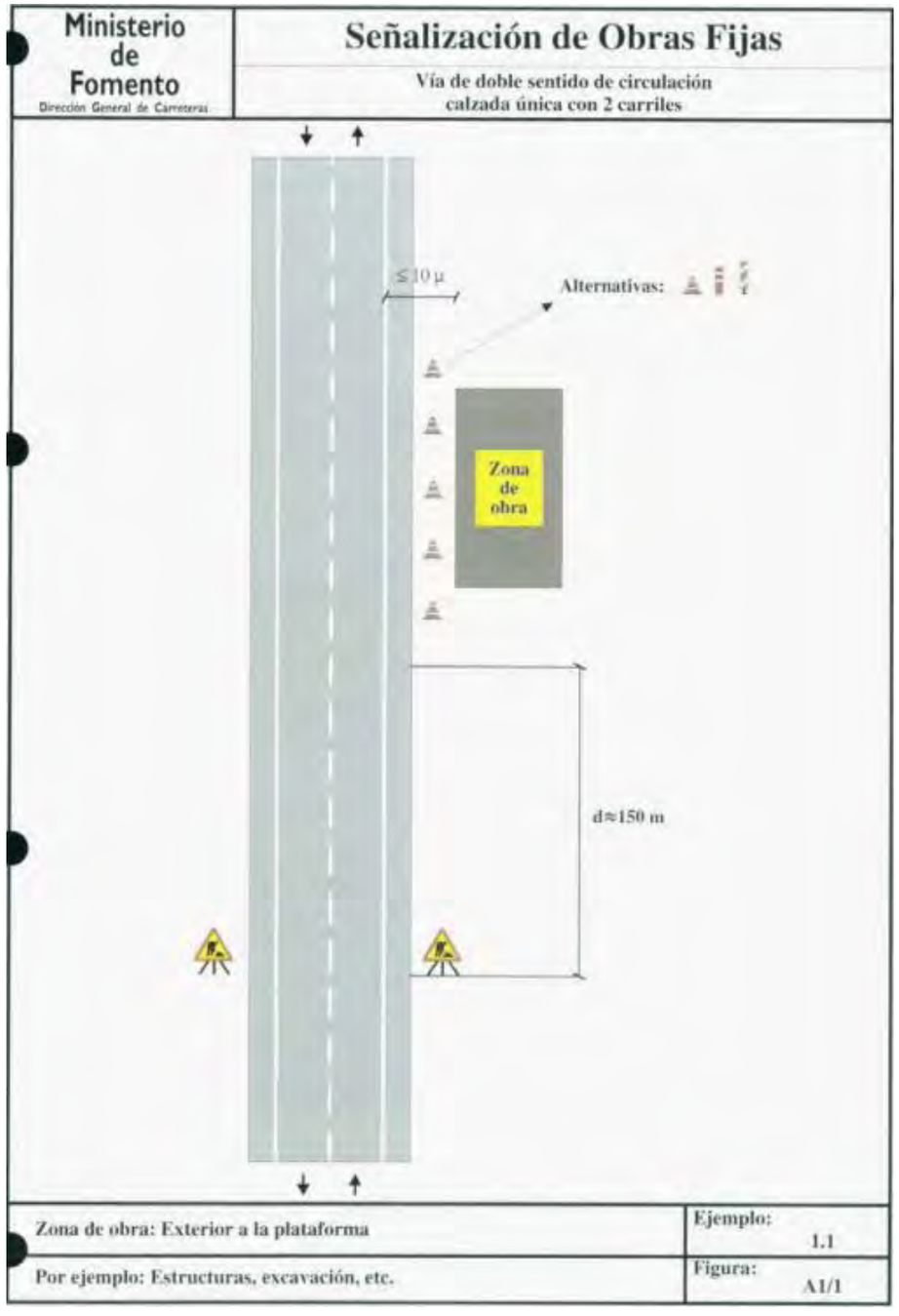

Figure 2.6.1. Sections affected by upcoming construction works

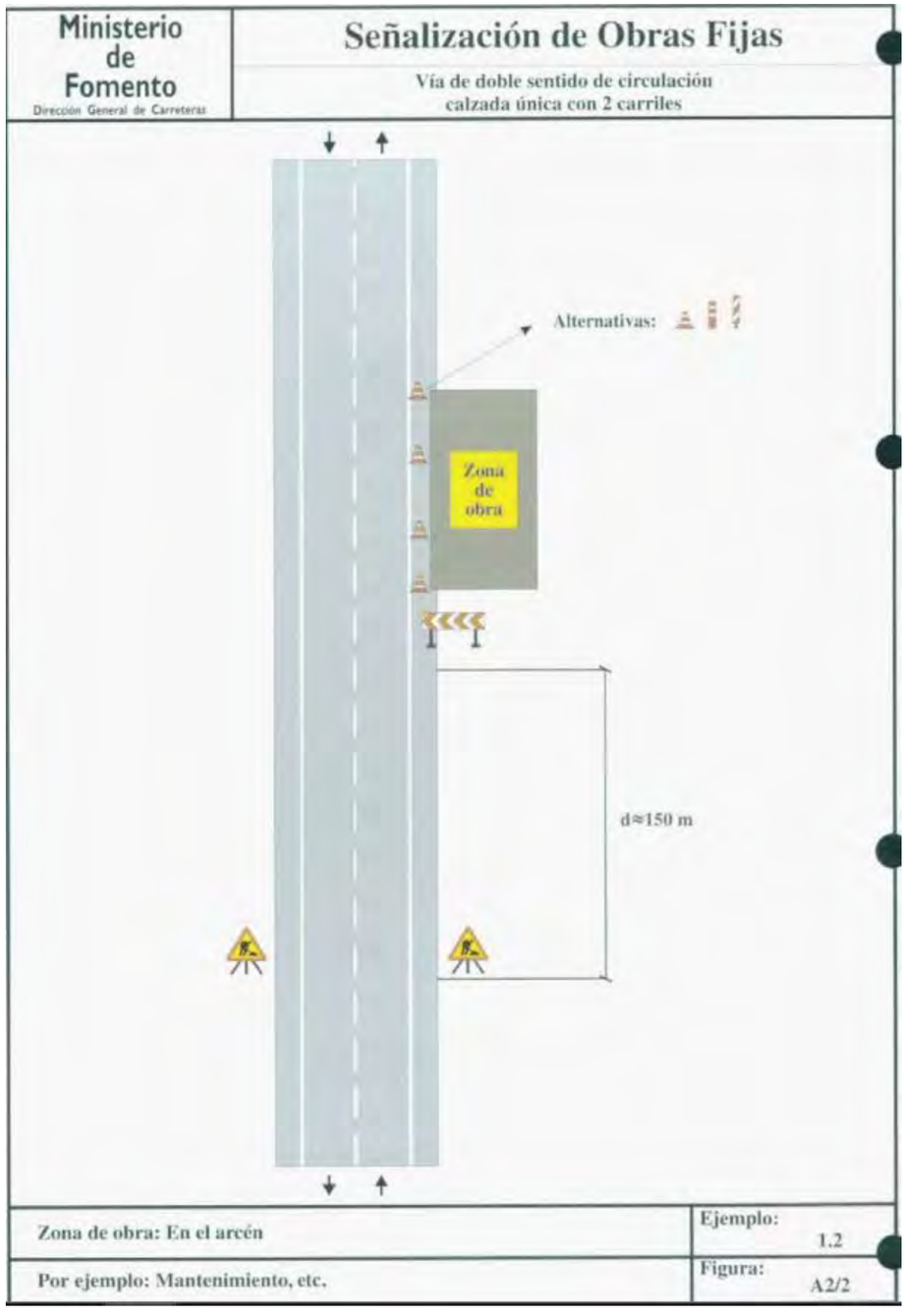

Figure 2.6.2. Section affected by construction with partial shoulder encrouchment

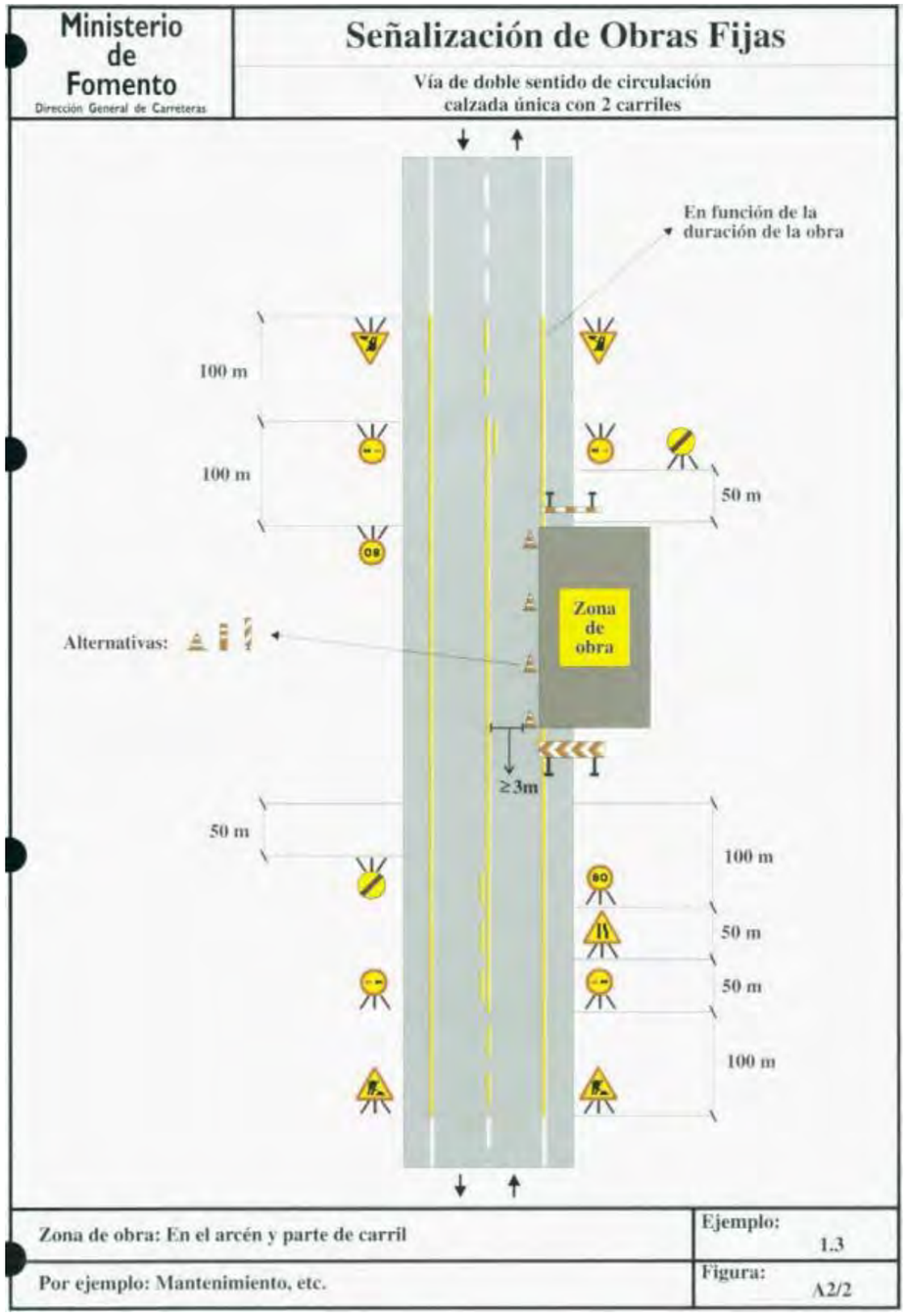

Figure 2.6.1. Section affected by construction with partial roadway encroachment.

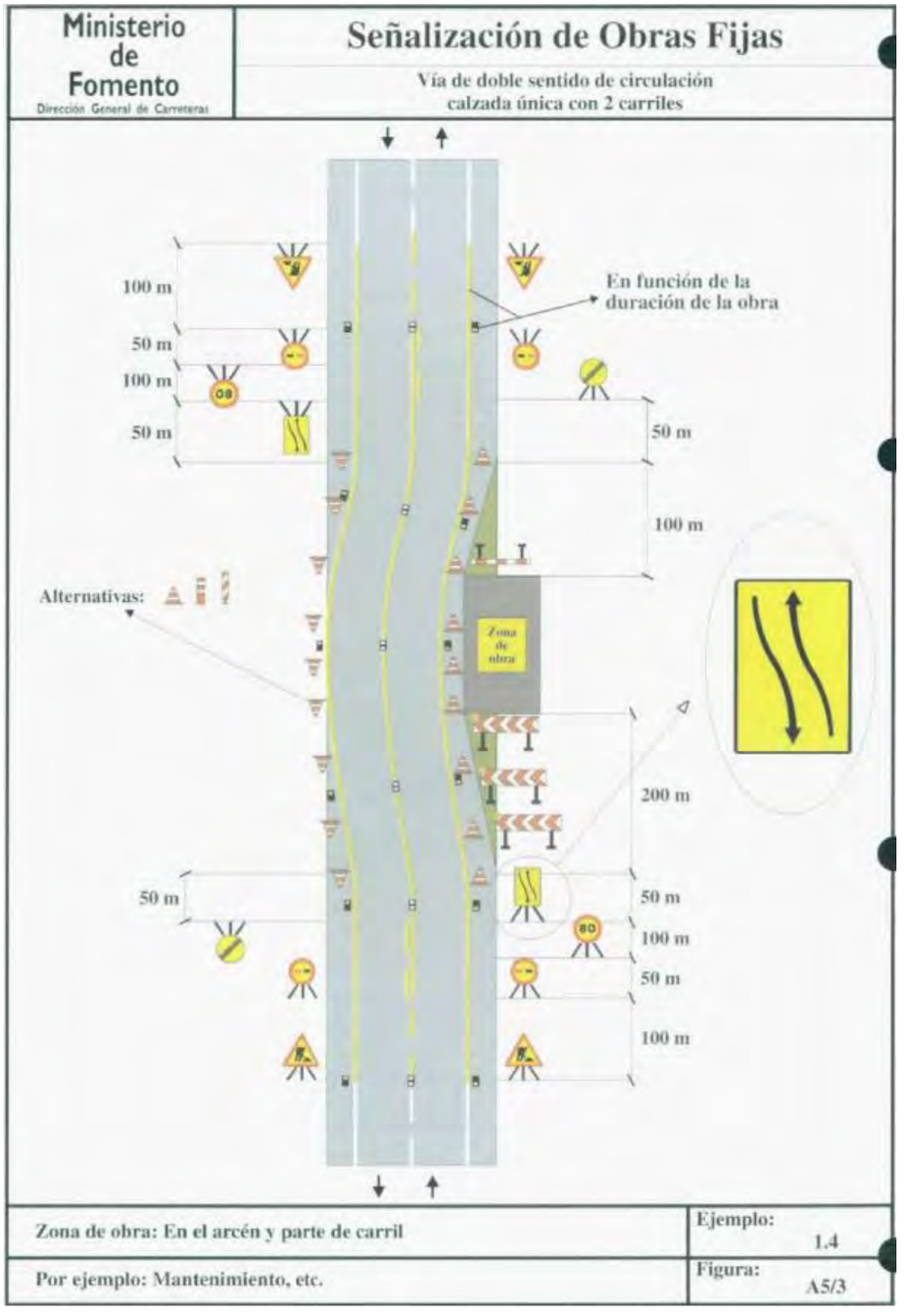

Figure 2.6.2. Segment affected by construction with temporary lane shift.

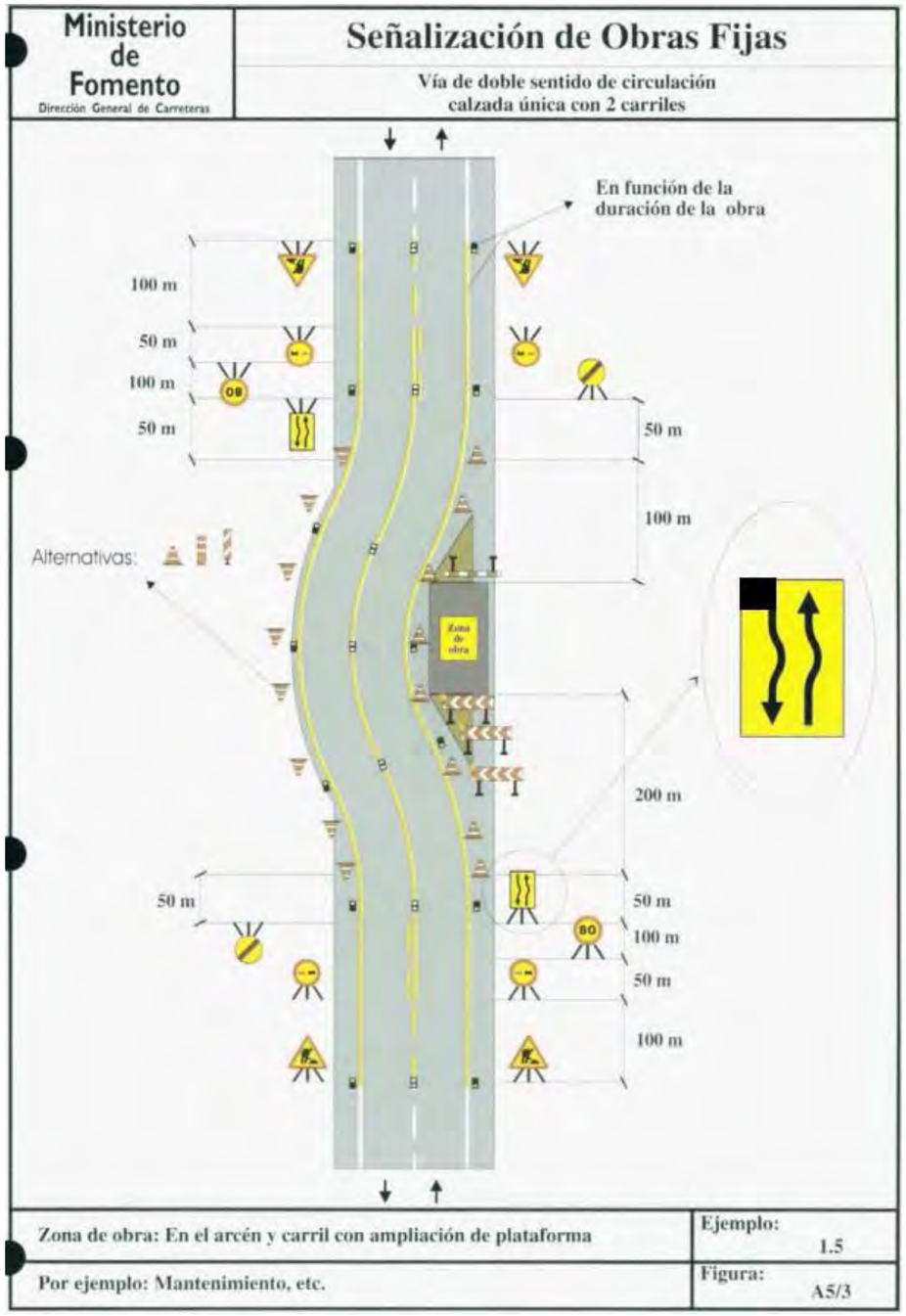

Figure 2.6.3.Segment affected by construction with roadway widening.

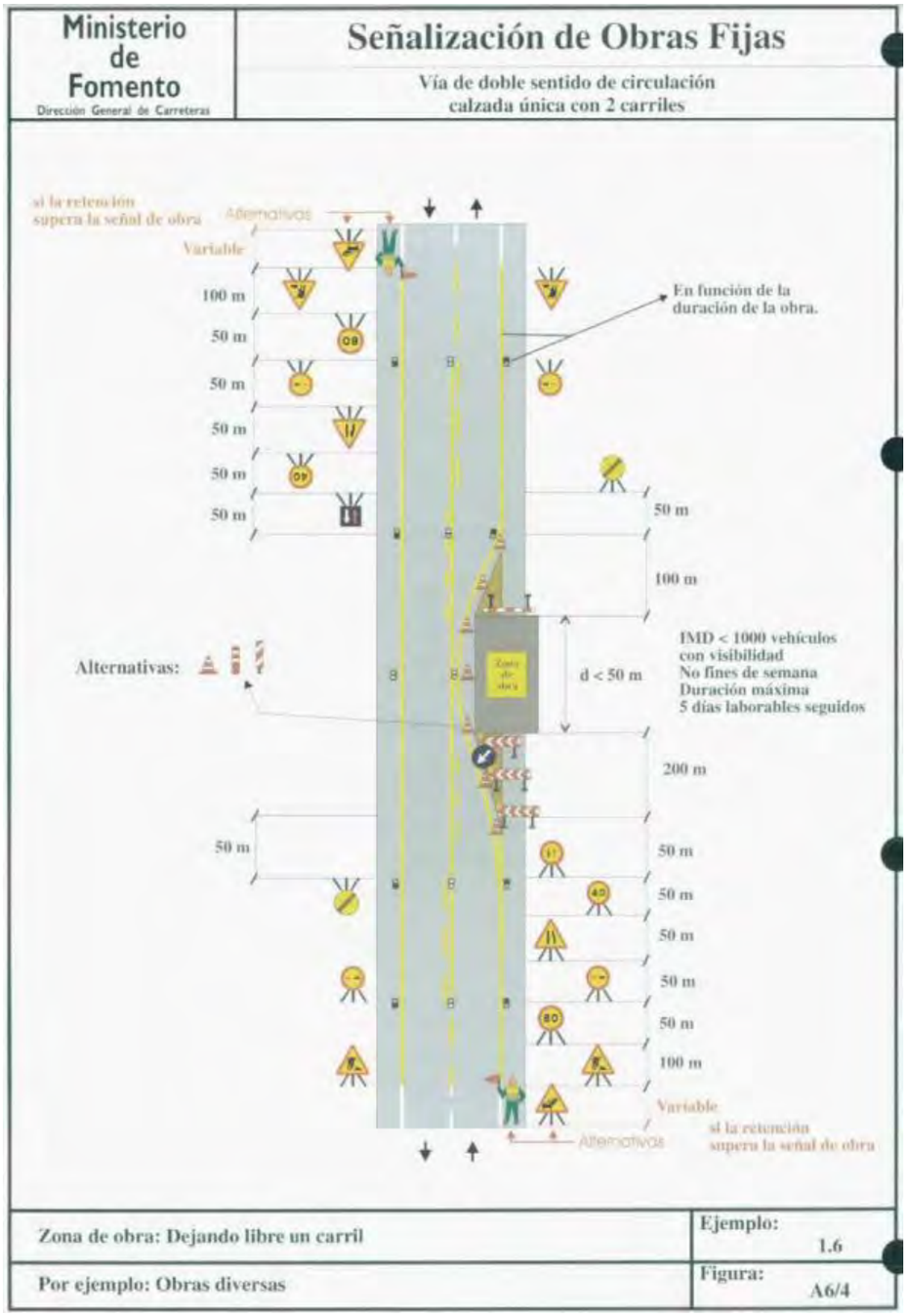

Figure 2.6.4. Segment affected by construction with total lane closure without traffic signals.

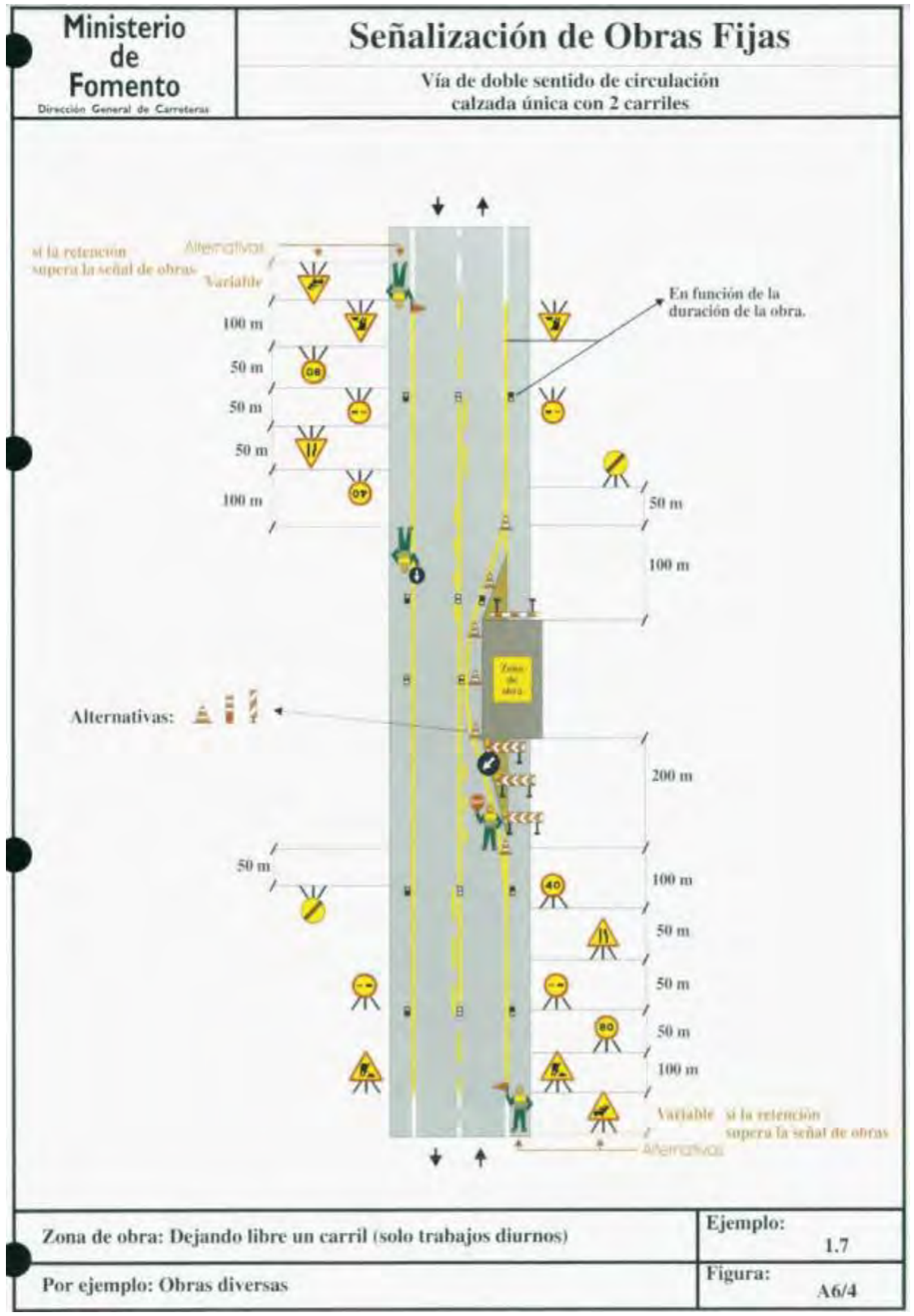

Figure 2.6.5. Segment affected by construction with full lane occupation and manual traffic control. (daytime work only).

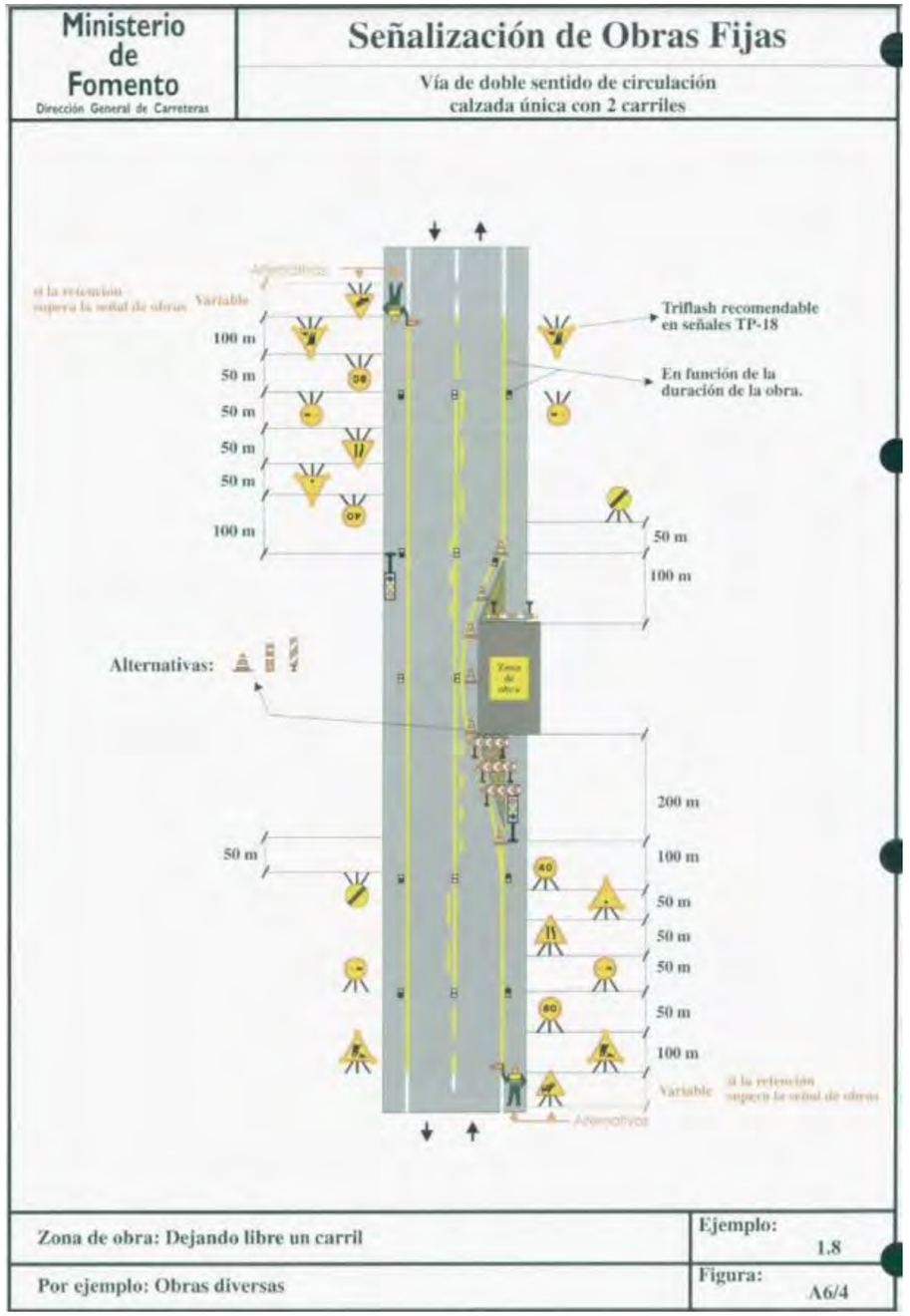

Figure 2.6.6. Segment affected by construction with full lane occupation and traffic signals.

5. CONSTRUCTION SITE SIGNALING

The following are the various signs used during the works, including vertical signs, road markings, delineation devices, and lighting.

5.1. VERTICAL SIGN

5.1.1. DANGER SIGNS

- Danger due to traffic lights (TP-3).

Figure 2.6.9. Signal TP-3

- Danger due to road narrowing (TP-17a/TP-17b).

Figure 2.6.10. Signals TP-17a and TP-17b.

- Danger due to sharp curve to the right/left. (TP-13a/TP-13b).

Figure 2.6.11. Signals TP-13a and TP-13b.

- Danger due to construction works (TP-18).

Figure 2.6.12. Signal TP-18.

- Danger due to two-way traffic (TP-25).

Figure 2.6.13. Signal TP-25.

- Danger due to flying gravel (TP-28).

Figure 2.6.14. Signal TP-28.

- Danger due to lateral step (TP-30).

Figure 2.6.15. Signal TP-30.

- Danger due to congestion (TP-31).

Figure 2.6.16. Signall TP-31.

- General danger (TP-50).

Figure 2.6.17. Signal TP-50.

5.1.2. REGULATORY AND PRIORITY SIGNS

- Maximum speed (TR-301).

Figure 2.6.18. Signal TR-301.

- Obligatory direction (TR-401a/TR-401b).

Figure 2.6.19. Signals TR-401a and TR-401b.

- Passing prohibiton (TR-305).

Figure 2.6.20. Signal TR-305.

- Endo f prohibitions (TR-500).

Figure.2.6.21 Signal TR-500.

5.1.3. INFORMATION SIGNS

- Access prohibited to all persons not involved in this work.

Figure 2.6.22. Access prohibited sign.

- Sign: “TRUCKS EXIT” (T-431).

Figure 2.6.23. Pannel T-431.

5.1.4. MANUAL SIGNS

- Manual signal: stop/go (TM-2/TM-3)

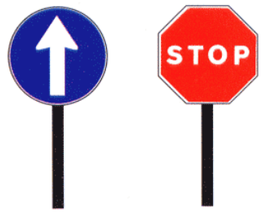

Figure 2.6.24. Signals TM-2 and TM-3

5.2. REFLECTIVE DELINEATION DEVICES

- Narrow directional panel (TB-2).

Figure 2.6.25. Delineation TB-2.

- Delineation cone (TB-6).

Figure 2.6.26. Delineation TB-6.

- Left/right edge delineators (TB-8/TB-9).

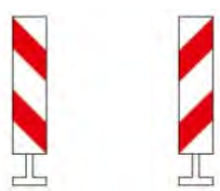

Figure 2.6.27. Delineation TB-9 and TB-8.

5.3. HORIZONTAL SIGNALING

The section affected by the works will be equipped with temporary horizontal road markings, which will warn of the presence of construction and ensure visibility both during the day and at night.

- Yellow road marking (TB-12).

Figure 2.6.28. Horizontal signalingl TB-12.

- Raised pavement markers (TB-10).

Figure 2.6.29. Horizontal signaling TB-10.

5.4. LUMINOUS ELEMENTS

If necessary, illuminated devices will be used for roadway delineation or for regulating the traffic flowing through it.

- Tricolor Traffic Light (TL-1).

Figure 2.6.30. Luminous Element TL-1.

PRELIMINARY STUDIES 7 – ENVIRONMENTAL STUDIES

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1. INTRODUCTION

This annex will present the environmental impact assessment of the project. It will begin with a reference to the applicable regulations and the required content of the study. Subsequently, the environmental assessment will be carried out through a description of the project, an analysis of the surrounding environment, the identification of potential impacts, their assessment, and, finally, the proposal of preventive and corrective measures for each phase of the project. An Environmental Monitoring Program will also be included to ensure follow-up and control during the execution phase.

2. LEGISLATION

For the drafting of this study, the current national legislation in the field will be taken into account:

- Ley 9/2018, de 5 de diciembre, por la que se modifica la Ley 21/2013, de 9 de diciembre, de evaluación ambiental (BOE, 11 de diciembre de 2013).

Regarding the Autonomous Community of Cantabria, the following regulations must be considered:

- Ley 17/2006, de 11 de diciembre, de control ambiental integrado.
- Decreto 19/2010, de 18 de marzo, por el que se aprueba el reglamento de la Ley 17/2006, de Control Ambiental Integrado.

According to Anexo I de la Ley 21/2013, the following road projects are subject to **Ordinary Environmental Assessment**:

- Construction of motorways and expressways.
- Construction of a new road with four or more lanes, or the realignment and/or widening of an existing two-lane or narrower road to reach four or more lanes, when the new or modified section is equal to or greater than 10 km in continuous length.

According to Anexo II de la Ley 21/2013 the following road projects are subject to **Simplified Environmental Assessment**:

- Construction of bypasses and conventional roads not included in Annex I.

Therefore, the works described in this Project are subject to a **Simplified Environmental Assessment**.

3. ENVIRONMENTAL ASSESMENT

3.1. PROJECT LOCATION

The planned road runs through the municipality of Mazcuerras. It is bordered to the north by the municipalities of Cabezón de la Sal and Reocín, to the west by Ruente and Cabezón de la Sal, to the south by Cieza and Ruente, and to the east by Cartes and Los Corrales de Buelna.

Figure 2.7.1 Mazcuerras Location.

3.2. PROJECT DESCRIPTION

The purpose of this project is to improve the existing conditions of road CA-811 by implementing a new alignment and widening the platform to include a bicycle lane. It is considered as a new construction.
The realignment and widening of the CA-811 platform represents a substantial improvement to the quality of the existing road, which is currently in an unacceptable condition.

The addition of a bicycle lane on road CA-811, between Villanueva de la Peña and Herrera de Ibio, will not only increase safety and improve the quality of the road for all users but also promote a healthier and more sustainable lifestyle, significantly enhancing the quality of life for the local community.

The main technical characteristics are as follows:

- Type of project: Construction Project
- Typical cross-section: Single carriageway road with one lane in each direction and a dedicated bicycle lane
- Design speed: 60 km/h
- Length: 1.275 km
- Carriageway width: 7 meters (two 3.5-meter-wide lanes)
- Bicycle lane: 2 meters wide
- Shoulders: 1 meter on the right side (ascending chainage) and 0.3 meters on the left side

3.2.1. LIST OF IMPACT-GENERATING ACTIONS

Taking as a reference the *Guide for the Preparation of Environmental Studies for Projects with Impact on the Natural Environment*, specifically "Guide 1: Land-based Communication and Transport Infrastructures", and in particular the section concerning the description of project actions that may generate environmental impact, a list has been compiled of the actions present in each phase of the project life cycle that could potentially cause both positive and negative effects on the environment..

Construction Phase:

- Land clearing and earthworks
- Land use and occupation requirements
- Creation of detours and watercourse channeling
- Installation and operation of material processing plants
- Construction of auxiliary roads and access points
- Transportation of materials
- Movement of heavy machinery
- Paving of surfaces
- Deposition of materials
- Installation of fencing and vehicle circulation
- Construction of structures related to the works

Operation Phase:

- Increase in road traffic
- Use of machinery for maintenance operations
- Application of salts, herbicides, and other additives for infrastructure conservation
- Routine road maintenance (cleaning, line painting, partial resurfacing, etc.)
- Potential glare caused by vehicle headlights
- Formation of waste dumps in nearby areas due to increased accessibility
- Increase in atmospheric emissions (CO_2, CO, VOCs, NO_x, SO_x, heavy metals, free radicals) potentially affecting natural elements in the receiving environment

Decommissioning Phase:

- This phase is **not considered** for the infrastructure included in this study

.

3.3. MEDIA DESCRIPTION

3.3.1. PHYSICAL MEDIA

The main features of the physical environment in the vicinity of the project site are detailed below, including aspects such as climate, hydrology, air quality, noise pollution, and light pollution.

3.3.1.1. CLIMATE

The project area is classified within the Temperate Climate (type C) according to the Köppen-Geiger climate classification system, characterized by an average temperature in the coldest month ranging between 0°C and 18°C. Specifically, the zone corresponds to subtype Cfb, which denotes a temperate climate without a dry season and with mild summers, where the average temperature of the warmest month is equal to or below 22°C, and there are at least four months with an average temperature exceeding 10°C.

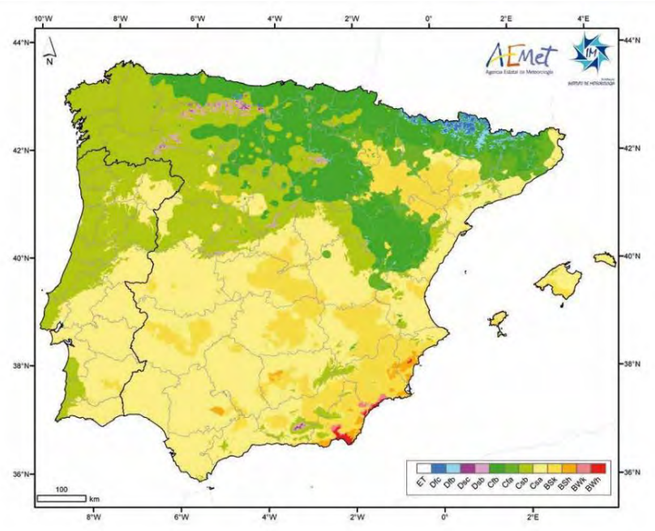

Figure 2.7.2. Climate Map of Spain.

Cantabria is part of the Atlantic regions of Europe, where an oceanic climate predominates, characterized by mild winters, cool summers, high humidity, abundant cloud cover, and rainfall distributed throughout the year. However, due to the diversity of its terrain and its geographic location at the southern edge of the Atlantic climatic zone, various climatic variants are present within the region.

Figure 2.7.3. Climate regions in Cantabria

3.3.1.2. HIDROLOGY

Regarding hydrology, the project segment terminates at the intersection immediately preceding a small bridge spanning the Ceceja stream. Although this bridge is not included within the project scope, the stream's watershed will be considered in the design and implementation of drainage systems during construction to ensure proper water management and minimize environmental impact.

3.3.1.3. AIR POLLUTION

The project area corresponds to a predominantly rural zone primarily dedicated to the primary sector, so air quality is generally considered good. The Solvay and Sniace factories are located at a sufficient distance to avoid impacting air quality.

3.3.1.4. NOISE PULLUTION

Noise pollution in the project area is low due to minimal traffic flow and the absence of factories or industrial activity.

3.3.1.5. LIGHT POLUTION

the project area is unlit, resulting in virtually no light pollution in the zone.

3.3.2. BIOLOGICAL MEDIA

Below are the main characteristics of the flora and fauna present in the project's area of influence.

3.3.2.1. FLORA

The following figures depict the main tree, herbaceous, and shrub formations within the Autonomous Community of Cantabria..

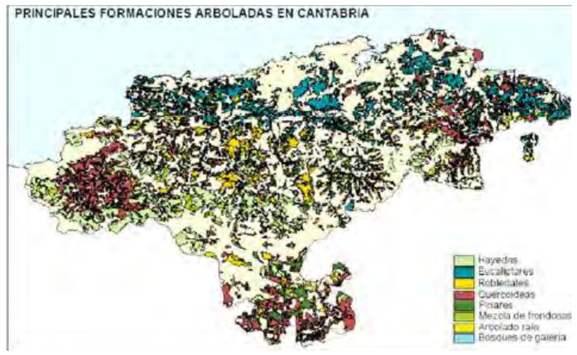

Figure 1.7.5. Main Tree Formations in Cantabria.

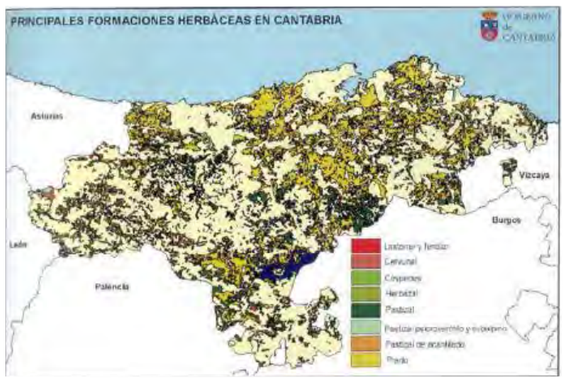

Figure2.7.6. Main Herbaceous Formations in Cantabria.

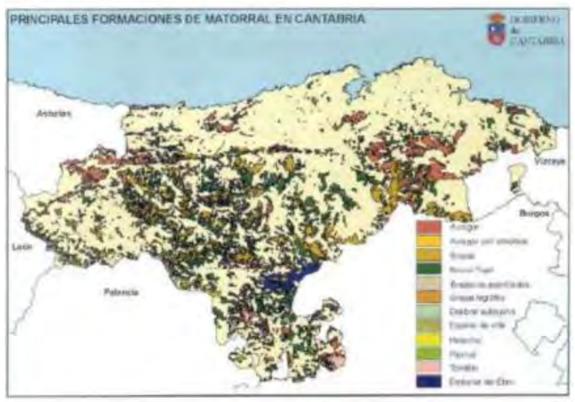

Figure 2.7.7. Main Shrubland Formations in Cantabria

3.3.2.2. FAUNA

Below is a list of animal species that may be found in the project area, depending on the specific environmental unit in which it is located.

- Meadows

	Nombre común	Nombre científico
Mamíferos	Zorro	*Vulpes vulpes*
	Comadreja	*Mustela nivalis*
	Garduña	*Martes foina*
	Rata de agua norteña	*Arvicola terrestris*
	Ratón espiguero	*Micromys minutus*
	Ratón común	*Mus domesticus*
	Topillo oscuro	*Pitymis duodecimcostatus*
	Topo común	*Talpa europaea*
	Erizo	*Erinaceus europaeus*
	Musaraña común	*Crocidura russula*
Aves	Codorniz	*Coturnis coturnix*
	Bisbita común	*Anthus pratensis*
	Golondrina común	*Hirundo rustica*
	Urraca	*Pica pica*
Reptiles	Lución	*Anguis fragilis*
	Eslizón tridáctilo	*Chalcides chalcides*
	Culebra de collar	*Natrix natrix*
	Víbora europea	*Vipera berus*
Anfibios	Sapo partero	*Alytes obstericans*
	Rana bermeja	*Rana temporaria*

- Deciduous Forest

	Nombre común	Nombre científico
Mamíferos	Armiño	*Mustela erminea*
	Marta	*Martes martes*
	Garduña	*Martes foina*
	Corzo	*Capreolus capreolus*
	Jabalí	*Sus scrofa*
	Ciervo	*Cervus elaphus*
	Erizo común	*Erinaceus europaeus*
	Musaraña colicuadrada.	*Sorex araneus*
	Ardilla	*Sciurus vulgaris*
	Lirón gris	*Glis glis*
Aves	Pito negro	*Dryocopus martius*
	Pico mediano	*Dendrocopos medius*
	Buho chico	*Asio otus*
	Azor	*Accipiter gentilis*
	Gavilán	*Accipiter nisus*
	Halcón abejero	*Pernix apivorus*
	Arrendajo	*Garrulus glandarius*
	Agateador común	*Certhia brachidactyla*
	Trepador azul	*Sitta europaea*
	Perdiz pardilla	*Perdix perdix*
Reptiles	Culebra de esculapio	*Elephane longissima*
	Lagarto verde	*Lacerta viridis*

- Evergreen Forest

	Nombre común	Nombre científico
Mamíferos	Tejón	*Meles meles*
	Lirón careto	*Eliomys quercinus*
	Jabalí	*Sus scrofa*
Aves	Gavilán	*Accipiter nisus*
	Alimoche común	*Neophron percnopterus*
	Halcón peregrino	*Falco peregrinus*
	Paloma torcaz	*Columba palumbus*
	Tórtola común	*Streptopelia turtur*
	Cuco	*Cuculus canorus*
	Escribano montesino	*Emberiza cia*
	Pardillo	*Acanthis cannabina*
Reptiles	Víbora europea	*Vipera berus*
	Culebrilla ciega	*Blanus cinereus*
	Lagartija colilarga	*Psammodromus algirus*
Anfibios	Sapo corredor	*Bufo calamita*

- Broadleaf Forest

	Nombre común	Nombre científico
Mamíferos	Gineta	*Genetta genetta*
	Tejón	*Meles meles*
	Lirón careto	*Eliomys quercinus*
	Lirón gris	*Glis glis*
Aves	Azor	*Accipiter gentilis*
	Gavilán	*Accipite nisus*
	Ratonero común	*Buteo buteo*
	Águila calzada	*Hieraetus fasciatus*
	Carbonero común	*Parus major*
	Carbonero palustre	*Parus palustris*
	Herrerillo	*Parus caeruleus*
	Cárabo	*Strix aluco*
Reptiles	Culebra de esculapio	*Elaphe longissima*
	Víbora europea	*Vipera berus*
	Lagarto verde	*Lacerta viridis*
	Lagarto verdinegro	*Lacerta schreiberi*
	Lagartija de turbera	*Lacerta vivípara*

3.3.3. SOCIAL MEDIA

The municipality has a population of 2,093 inhabitants (INE, 2024), distributed across the localities of Cos, Herrera de Ibio, Ibio, Mazcuerras, Riaño de Ibio, Sierra de Ibio, and Villanueva de la Peña.

Traditionally, the municipality's economy has been primarily based on cattle farming and flower cultivation. However, these activities are currently in decline, with the majority of the population now engaged in tertiary sector activities, notably rural tourism and hospitality.

3.3.4. PERCEPTUAL ENVIRONMENT

The perceptual environment refers to the landscape of the area; it is essential to assess how the intervention may impact the existing landscape and to establish measures aimed at minimizing possible alterations as much as possible.

The road section is characterized by flat topography, with relatively level areas to the north and east of the road, which are used as small agricultural plots. However, to the southwest, there is an area of higher elevation with a greater abundance of trees and shrubland.

The nearby population centers, Villanueva de la Peña and Herrera de Ibio, are small localities, especially the latter. In Villanueva de la Peña, detached single-family houses of one or two stories predominate, along with fairly modern residential developments due to a growing population. Herrera de Ibio is characterized by narrower streets and more traditional single-family homes. The population is predominantly military due to the proximity to the Ibio Military Center.

3.3.5. AREAS OF SPECIAL PROTECTION

The alignment of the bypass does not affect any area designated as a special environmental protection zone.

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3.4. IMPACT IDENTIFICATION

Below are the different factors along with the potential impacts they may generate.

Factors	Potential Environmental Impacts
ATMOSPHERE	Noise pollution.
	Light pollution.
	Emissions of dust, particulate matter, and gaseous contaminants.
HIDROLOGY	Runoff of materials from stockpiles or earthworks.
	Accidental spills of lubricants, fuels, paints, concrete, bitumen, and other hazardous or polluting substances/products.
FLORA	Removal of native vegetation for construction execution.
	Risk of spread of invasive plant species along the corridor created by the new road.
	Lack of restoration of herbaceous and/or arboreal vegetation cover.
	Risk of accidental fires.
FAUNA	Increase in nuisance due to noise and vibrations from vehicles.
	Alteration and destruction of existing vegetation cover and other wildlife habitats, nests, or shelters.
	Impacts on wildlife permeability and mobility.
	Increase in wildlife mortality due to vehicle collisions.
SOIL	Loss of soil fertility and nutrient properties of the topsoil.
	Soil loss due to erosion.
	Soil washing on slopes.
	Temporary and permanent land occupation.
	Soil compaction in occupied areas.
LANDSCAPE	Alteration of landscape features and local morphology.
	Lack of restoration of natural landscape in slopes and other intervened areas.
ARCHITECTRUAL	Risk of affecting possible archaeological or heritage sites.
SOCIOECONOMICS	Disturbance to local residents caused by construction works.
	Failure to restore affected services and land uses.
	Generation of employment opportunities.
WASTE	Inadequate management of Construction and Demolition Waste (CDW), especially those posing environmental and public health risks.

Table 2.7.1. Potential Environmental Impacts.

3.5. CHARACTERIZATION AND ASSESSMENT OF IMPACT

The characterization and evaluation of impacts are carried out using a semi-quantitative numerical method, in accordance with the criteria established in **Royal Decree 1131/1988** for impact characterization. The following concepts are defined to identify and assess each impact. These effects can be classified as **negative**, if they cause harm, or **positive**, if they generate benefits.

- **(I) Intensity:** Indicates the level of modification or alteration caused by the impact on the affected environment.
- **(E) Extent:** Refers to the area affected, which may range from a localized point to a zone exceeding the project's boundaries.
- **(M) Timing:** Refers to the time elapsed from the initiation of the action until the impact manifests in the environment.
- **(P) Persistence:** Evaluates the duration of the impact once the causing action has ceased, i.e., how long the alteration lasts.
- **(R) Reversibility:** Measures the environment's capacity to recover its original state after the impact has occurred.

The assessment of each of these factors is performed using a matrix that assigns specific values to the different levels of each component, allowing for a more objective and structured evaluation.

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Signo **- Impacto beneficioso +** **- Impacto perjudicial -**	**I, Intensidad (grado de destrucción):** **- Baja.....2^0** **- Media.....2^1** **- Alta.....2^2** **- Muy alta.....2^3** **- Total.....2^4**
E, Extensión (Área de influencia): **- Puntual.....2^0** **- Parcial.....2^1** **- Extenso.....2^2** **- Total.....2^3** **- Crítico.....+4**	**M, Momento:** **- Largo plazo.....2^0** **- Medio plazo.....2^1** **- Inmediato.....2^2** **- Crítico.....+4**
P, Persistencia: **- Fugaz.....2^0** **- Temporal..... 2^1** **- Pertinaz.....2^2** **- Permanente..... 2^3**	**R, Reversibilidad:** **- Corto plazo.....2^0** **- Medio plazo.....2^1** **- Largo plazo .....2^2** **- Irreversible .....2^3** **- Irrecuperable .....2^4**

Table 2.7.2. Impact Valorization.

Once all impacts have been characterized and evaluated, their significance is calculated using the following formula:

$$Importance\ (I) = 3I + 2E + M + P + R$$

Once the significance is obtained, the results will be normalized by calculating the relative importance (I_r) using the following expression:

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$$I_r = \left(\frac{I - 8}{104 - 8}\right) \cdot 10$$

Based on the normalized value (Ir) of each impact, one of the following ratings will be assigned.

Impact	Description	Ir
COMPATIBLE	Immediate recovery **after cessation of the activity causing the impact.**	**0,0-2,5**
	No corrective measures required.	
MODERATED	Recovery does **not require intensive corrective measures.**	**2,5-5,0**
	Perceptible change **in the environment.**	
SEVERE	Recovery **requires corrective measures and a period of time.**	**5,0-7,5**
	Notable environmental loss.	
CRITICAL	Magnitude **exceeds the acceptable threshold.**	**7,5-10,0**
	Permanent loss **of environmental quality conditions.**	
	No possible recovery, even with corrective measures.	

Table 2.7.3. Impacts.

Having defined the aspects for impact characterization and evaluation, the assessment of impacts is then carried out considering the construction and operation phases.

DESCRIPTION		ENVIROMENTAL ASSESMENT						IMPORTANCIE		IMPACT
Factors	Potential Environmental Impacts	Sign	I	E	M	P	R	I	Ir	
ATMOSPHERE	Noise pollution	-	2	1	4	2	4	18	1,042	COMPATIBLE
	Light pollution	-	1	2	5	4	4	20	1,250	COMPATIBLE
	Emissions of dust, particles, and gases	-	2	2	2	4	4	20	1,250	COMPATIBLE
HIDROLOGY	Material runoff	-	2	2	4	4	4	22	1,458	COMPATIBLE
	Accidental spills	-	8	4	4	4	4	44	3,750	MODERATED
FLORA	Removal of native vegetation	-	2	3	4	4	4	24	1,667	COMPATIBLE
	Risk of invasive species spread	-	4	4	2	4	4	30	2,292	COMPATIBLE
	Restoration of vegetation cover	-	1	2	4	4	2	17	0,938	COMPATIBLE
	Risk of accidental fires	-	2	2	2	8	4	24	1,667	COMPATIBLE
FAUNA	Noise emissions and vibrations	-	1	2	4	4	2	17	0,938	COMPATIBLE
	Alteration of vegetation cover	-	2	2	2	8	4	24	1,667	COMPATIBLE
	Impact on wildlife mobility	-	2	4	4	8	4	30	2,292	COMPATIBLE
	Increased mortality due to accidents	-	6	2	4	2	10	38	3,125	MODERADO
SOIL	Loss of land properties	-	4	2	2	4	4	26	1,875	COMPATIBLE
	Soil loss due to erosion	-	2	4	2	4	8	28	2,083	COMPATIBLE
	Soil washing on slopes	-	4	2	4	4	4	28	2,083	COMPATIBLE
	Temporary and permanent land occupation	-	6	2	2	6	4	34	2,708	MODERADED
	Soil compaction	-	4	1	4	8	4	30	2,292	COMPATIBLE
LANDSCAPE	Alteration of landscape forms	-	4	4	2	4	8	34	2,708	MODERADED
	Lack of restoration of natural landscape	-	4	2	6	2	4	28	2,083	COMPATIBLE
ARCHITECTRUAL	Impact on potential archaeological sites	-	4	2	8	8	14	46	3,958	MODERADED
SOCIOECONOMICS	Disturbance to residents due to construction	-	4	1	4	4	4	26	1,875	COMPATIBLE
	Restoration of affected utilities	-	4	2	4	2	2	24	1,667	COMPATIBLE
	Job creation	+	4	2	4	2	1	23	1,563	COMPATIBLE
WASTE	Improper management of Construction and Demolition Waste (CDW)	-		4	6	2	4	20	1,250	MODERATED

Table 2.7.4. Impact Valorization

3.6. PREVENTIVE AND CORRECTIVE MEASURES

Impacts assessed as compatible do not require the implementation of preventive measures. However, those considered potentially moderate do require the adoption of specific actions to prevent or mitigate their effects.

Below, various preventive measures are detailed, aimed at preserving the environment and minimizing, as much as possible, the impacts resulting from the project.

3.6.1. ATMOSPHERE

The following measures must be adopted to minimize the impact on air quality during construction works:

- Ensure compliance with current emissions regulations.
- Guarantee proper maintenance of all machinery used.
- Control activities likely to generate dust, especially during earth-moving operations.
- Limit vehicle speeds near sensitive areas.
- Reduce the height of material drops and, when necessary, apply water sprays to prevent particle dispersion,

3.6.2. HIDROLOGY

To prevent soil and water contamination during construction, the following environmental protection measures will be implemented:

- Install sediment retention barriers near watercourses to prevent runoff.
- Handle hazardous substances under appropriate safety conditions.
- Provide impermeable containment basins for washing the gutters of concrete mixers.
- Ensure proper location and management of stockpiles and machinery.
- Implement an Environmental Emergency Plan establishing protocols for incident response, with immediate reporting of any accidental spills to the Northern Hydrographic Confederation.

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3.6.3. GROUND

To protect the soil during construction works, the following measures will be adopted:

- Precisely define the work area to avoid unnecessary impacts.
- Extract and preserve the topsoil layer for subsequent use in landscape restoration.
- Store topsoil in stockpiles no higher than 1.5 meters, keeping it moist and fertilized if necessary to maintain its properties.
- Designate machinery parking areas on impermeable surfaces.
- In case of contamination spills, remove the affected soil and manage it as hazardous waste.
- Use absorbent materials to clean machinery leaks, managing the resulting waste as hazardous.
- Upon completion of the works, dismantle all temporary facilities and carry out a thorough cleaning of the affected area.

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3.6.4. FLORA

To adequately protect vegetation during construction works, the following measures will be adopted:

- It is prohibited to fix nails, stakes, ropes, or cables to trees or shrubs.
- Stacking or leaning materials against tree trunks is not allowed.
- Areas where clearing work is carried out must be clearly delineated.
- Activities with fire risk will be conducted away from highly flammable zones.
- Extreme precautions will be taken during the cleaning of drains and watercourses to avoid unnecessary removal of natural vegetation.
- Areas significantly altered must be subject to restoration.
- Vegetation will be protected from impacts and soil compaction in root zones, as well as from potential damage caused by fauna.
- Invasive plant species will be properly managed.

- The “Program for the Control of Invasive Plants in Cantabria” promoted by the Directorate General of Forests and Nature Conservation will be applied.
- The project schedule must include partial restorations carried out in an orderly manner.
- Clearing, seeding, and planting activities will be carried out during the most suitable times of the year.
- If nearby trees are damaged during the work, clean and smooth cuts will be made on the affected branches, followed by the application of a healing product.

3.6.5. FAUNA

To minimize the impact on wildlife during construction, the following measures will be implemented:

- Reduce noise and vibrations to the lowest possible level.
- Avoid creating environments or conditions that may attract animals toward the roadway.
- Perform clearing work from the center of the road outward, facilitating the escape of any nearby wildlife.
- Install reflective devices to discourage animals from crossing when vehicles are present.

3.6.6. LANDSCAPE

To reduce the impact on the landscape during the execution of the works, the following measures will be applied:

- Complete restoration of the affected area.
- Transport unused surplus material from the embankments to an authorized landfill.
- Ensure orderliness and cleanliness in all work areas.
- If the planned revegetation actions prove insufficient, implement additional, more intensive corrective measures.

3.6.7. SOCIOECONOMIC

The following measures will be applied with the aim of minimizing socioeconomic impacts:

- Ensure the uninterrupted operation and continuity of affected services during the construction phase.
- Coordinate the work schedule with the activities taking place in the surrounding area, ensuring compatibility.

3.6.8. WASTE MANAGEMENT

The following measures will be implemented to reduce the impact of waste:

- Strictly comply with the applicable current regulations.
- Properly segregate the waste, store it on-site, and subsequently deliver it to an authorized waste manager.

3.7. ENVIRONMENTAL MONITORING PROGRAM

The Environmental Monitoring Program aims to establish a tracking system that ensures the effective compliance with the preventive, protective, and corrective measures designed to minimize potential environmental impacts arising from the execution of the works. This program will remain in effect throughout the entire duration of the construction and must apply a clear and systematic method for environmental control.

The EMP will cover the following main aspects:

- Identification of impacts that must be monitored, along with their associated environmental measures.
- Verification of the effectiveness of corrective measures and the definition of alternative solutions if these prove insufficient.
- Early detection systems for environmental impacts.
- Control of dust emissions resulting from vehicle and machinery traffic.
- Monitoring of noise levels generated during the works.
- Supervision of waste management.
- Verification of the correct execution of drainage works, in accordance with approvals from competent authorities.

- Monitoring the condition of watercourses to prevent alterations to the natural water flow.

This program is an essential tool to ensure the environmental integration of the project during its construction phase.

PROJECT DESIGN

PROJECT DESIGN 1 - EARTHWORKS

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1. INTRODUCTION

In this appendix, the earthworks associated with the execution of the project are described. The corresponding report is included, based on data collected at 20-meter intervals, as well as the mass haul diagram..

2. EARTHWORKS

In the project area, embankment and excavation volumes are fairly balanced, allowing for the use of this type of soil for compensation purposes, following the geotechnical study and the classification of the soil type. Any surplus excavation material will be transported to a disposal site.

2.1. SLOPES

In accordance with the Geotechnical Study, and based on the soil type and the heights of cuts and fills, the following slopes have been established for the entire section:

- Fill slopes: 3H:2V
- Cut slopes: 3H:2V

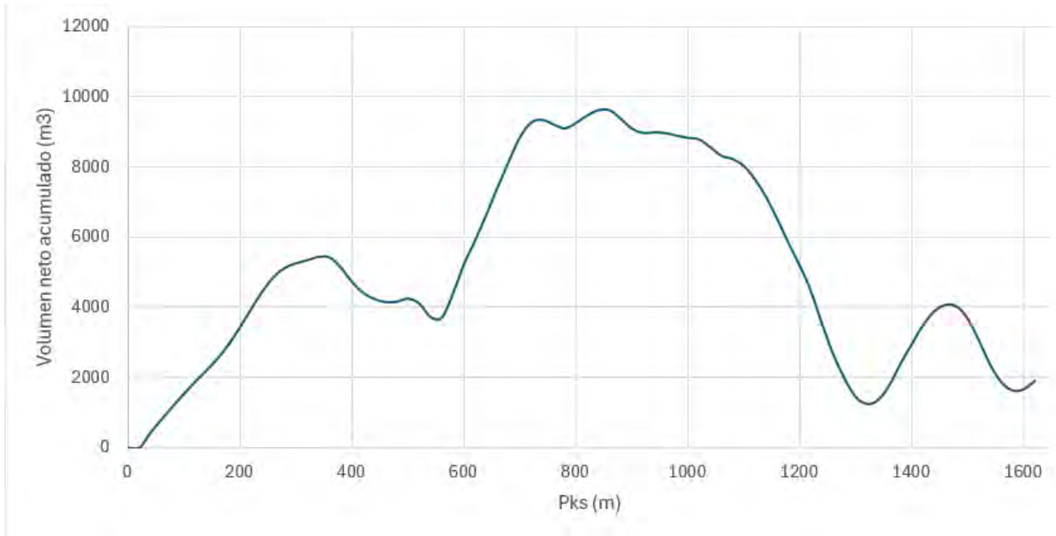
2.2. EARTHWORKS REPORT

This report presents the volumes of earth that must be excavated and placed to form the platform on which the pavement structures will be built. Specifically, it includes the cut (excavation) volumes and the fill (embankment) volumes required for the project.

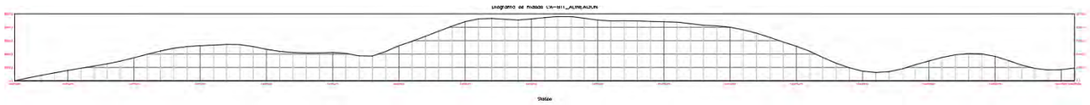
P,K,	Cut área (m2)	Cut volume (m^3)	Reusable volume (m^3)	Fill volume (m^3)	Fill Volume (m3)	Cumulative cut volume (m^3)	Cumulative reusable volume (m^3)	Cumulative fill volume (m^3)	Cumulative net volume (m^3)
0+000,000	0	0	0	0	0	0	0	0	0
0+020,000	26,02	0	0	2,54	0	0	0	0	0
0+040,000	22,77	487,97	487,97	2,83	53,68	487,97	487,97	53,68	434,29
0+060,000	19,78	425,57	425,57	1,34	41,65	913,54	913,54	95,33	818,21
0+080,000	18,29	380,78	380,78	0	13,4	1294,31	1294,31	108,72	1185,59
0+100,000	17,93	362,2	362,2	0	0	1656,51	1656,51	108,72	1547,79
0+120,000	16,03	337,74	337,74	0,23	2,16	1994,26	1994,26	110,89	1883,37
0+140,000	16,85	326,44	326,44	0,67	8,03	2320,69	2320,69	118,92	2201,77
0+160,000	19,34	358,17	358,17	0,97	13,81	2678,86	2678,86	132,72	2546,14
0+180,000	23,47	424,54	424,54	0,81	14,7	3103,4	3103,4	147,42	2955,98
0+200,000	26,42	496,32	496,32	0,65	11,95	3599,72	3599,72	159,37	3440,35
0+220,000	26,81	529,87	529,87	0,57	10,12	4129,6	4129,6	169,49	3960,11
0+240,000	24,69	513,25	513,25	1,11	16,02	4642,85	4642,85	185,51	4457,34
0+260,000	21,4	460,16	460,16	4,08	53,02	5103,01	5103,01	238,53	4864,48
0+280,000	18,01	394,09	394,09	9,78	138,6	5497,1	5497,1	377,13	5119,97
0+300,000	15,13	331,38	331,38	10,55	203,31	5828,47	5828,47	580,44	5248,03
0+320,000	15,03	301,53	301,53	10,8	213,52	6130	6130	793,96	5336,04
0+340,000	17,57	325,96	325,96	12,4	232	6455,96	6455,96	1025,96	5430
0+360,000	6,69	242,63	242,63	14,05	264,46	6698,59	6698,59	1290,42	5408,17
0+380,000	1,25	79,46	79,46	22,71	367,54	6778,06	6778,06	1657,96	5120,1
0+400,000	0,43	16,96	16,96	20,88	429,76	6795,02	6795,02	2087,72	4707,3
0+420,000	2,03	23,02	23,02	12,76	329,8	6818,04	6818,04	2417,52	4400,52
0+440,000	1,91	34,65	34,65	8,19	208,73	6852,69	6852,69	2626,25	4226,44
0+460,000	2,25	34,75	34,75	3,49	116,64	6887,44	6887,44	2742,88	4144,56
0+480,000	3,45	48,64	48,64	0,27	37,3	6936,08	6936,08	2780,18	4155,9
0+500,000	7,58	102,29	102,29	1,68	16,35	7038,37	7038,37	2796,53	4241,84
0+520,000	0,05	73,69	73,69	21,98	218,24	7112,05	7112,05	3014,77	4097,28
0+540,000	2,87	29,14	29,14	20	407,88	7141,2	7141,2	3422,66	3718,54
0+560,000	25,03	279,05	279,05	9,46	294,65	7420,25	7420,25	3717,3	3702,95
0+580,000	52,71	777,39	777,39	0	94,66	8197,63	8197,63	3811,96	4385,67
0+600,000	38,37	910,79	910,79	6,03	60,29	9108,43	9108,43	3872,25	5236,18
0+620,000	37,86	762,3	762,3	2,66	86,87	9870,72	9870,72	3959,12	5911,6
0+640,000	38,84	766,93	766,93	0,06	27,22	10637,7	10637,7	3986,34	6651,31
0+660,000	37,86	766,94	766,94	0,01	0,76	11404,6	11404,6	3987,09	7417,5
0+680,000	37,13	741,38	741,38	0,09	1,01	12146	12146	3988,1	8157,87
0+700,000	32,83	683,11	683,11	0	0,9	12829,1	12829,1	3989	8840,08
0+720,000	9,85	416,86	416,86	0,49	4,47	13246	13246	3993,47	9252,48
0+740,000	2,1	117,79	117,79	4,32	45,72	13363,7	13363,7	4039,18	9324,56
0+760,000	0,62	25,75	25,75	11,81	156,48	13389,5	13389,5	4195,66	9193,82
0+780,000	4,71	49,11	49,11	4,32	157,23	13438,6	13438,6	4352,89	9085,71
0+800,000	15,72	198,73	198,73	0,05	42,79	13637,3	13637,3	4395,68	9241,64
0+820,000	8,07	235,88	235,88	2,31	23,41	13873,2	13873,2	4419,09	9454,11
0+840,000	10,29	183,58	183,58	1,35	36,6	14056,8	14056,8	4455,69	9601,09
0+860,000	1,63	119,12	119,12	10,7	120,57	14175,9	14175,9	4576,25	9599,65
0+880,000	0,04	16,65	16,65	15,68	263,8	14192,6	14192,6	4840,05	9352,5
0+900,000	0	0,4	0,4	12,19	278,68	14192,9	14192,9	5118,73	9074,21
0+920,000	1,43	14,34	14,34	1,04	132,36	14207,3	14207,3	5251,09	8956,19
0+940,000	2,13	35,59	35,59	1,04	20,8	14242,9	14242,9	5271,89	8970,99
0+960,000	0,6	27,02	27,02	3,65	46,72	14269,9	14269,9	5318,61	8951,28
0+980,000	0,43	10,06	10,06	5,18	86,44	14280	14280	5405,05	8874,9
1+000,000	2,09	23,42	23,42	3,29	82,69	14303,4	14303,4	5487,74	8815,64
1+020,000	5,17	68,48	68,48	8,23	116,28	14371,9	14371,9	5604,02	8767,84
1+040,000	0	50,17	50,17	19,06	273,88	14422	14422	5877,89	8544,14

1+060,000	2,22	22,25	22,25	7,37	264,27	14444,3	14444,3	6142,16	8302,12
1+080,000	3,44	56,69	56,69	7,44	148,09	14501	14501	6290,26	8210,7
1+100,000	0,07	35,09	35,09	16,58	240,17	14536,1	14536,1	6530,42	8005,63
1+120,000	0,12	1,87	1,87	22,05	386,32	14537,9	14537,9	6916,74	7621,19
1+140,000	0	1,24	1,24	28,64	506,9	14539,2	14539,2	7423,64	7115,52
1+160,000	0	0,01	0,01	35,02	636,55	14539,2	14539,2	8060,19	6478,99
1+180,000	0,49	4,8	4,8	33,73	680,41	14544	14544	8740,6	5803,38
1+200,000	1,17	15,76	15,76	32,8	651,99	14559,7	14559,7	9392,59	5167,15
1+220,000	0,18	12,55	12,55	45,55	757,23	14572,3	14572,3	10149,8	4422,47
1+240,000	0	1,66	1,66	51,09	932,33	14574	14574	11082,2	3491,8
1+260,000	0,09	0,89	0,89	37,76	864,89	14574,8	14574,8	11947	2627,8
1+280,000	0	0,9	0,9	30,99	677,76	14575,7	14575,7	12624,8	1950,94
1+300,000	0,14	1,41	1,41	20,52	515,09	14577,2	14577,2	13139,9	1437,27
1+320,000	8,65	87,91	87,91	7,5	280,19	14665,1	14665,1	13420,1	1244,98
1+340,000	20,24	288,88	288,88	9,13	166,28	14954	14954	13586,4	1367,58
1+360,000	41,06	613,02	613,02	9,73	188,6	15567	15567	13775	1791,99
1+380,000	49,08	901,46	901,46	18,76	284,93	16468,4	16468,4	14059,9	2408,53
1+400,000	41,83	909,18	909,18	17,05	358,1	17377,6	17377,6	14418	2959,59
1+420,000	42,25	845,46	845,46	15,99	313,09	18223,1	18223,1	14731,1	3491,96
1+440,000	34,56	775,92	775,92	26,34	384,25	18999	18999	15115,4	3883,63
1+460,000	30,06	655,67	655,67	27,56	475,2	19654,7	19654,7	15590,6	4064,1
1+480,000	12,98	437,63	437,63	27,67	487,65	20092,3	20092,3	16078,2	4014,08
1+500,000	3,6	169,11	169,11	30,45	526,42	20261,4	20261,4	16604,6	3656,77
1+520,000	0	36,55	36,55	38,78	660,97	20297,9	20297,9	17265,6	3032,36
1+540,000	0	0	0	30,64	681,84	20297,9	20297,9	17947,4	2350,52
1+560,000	0	0	0	18,68	493,23	20297,9	20297,9	18440,7	1857,29
1+580,000	1,94	19,44	19,44	6,36	250,39	20317,4	20317,4	18691	1626,34
1+600,000	10,47	124,18	124,18	1,83	81,94	20441,6	20441,6	18773	1668,58
1+620,000	15,94	264,12	264,12	0,07	19,07	20705,7	20705,7	18792,1	1913,62

2.3. EARTHWORKS DIAGRAM



Graph 3.1.1. Earthworks Diagram



Graph 3.1. 2. Earthworks diagram from Civil3D

3. CONCLUSION

The earthworks summary for the project road is as follows:

VOLUME (m3)	
Cut	20705,68
Fill	18792,06
Excess material to landfill	1950,94

Table 3.1.1. Earthworks summary

PROJECT DESIGN 2 - DRAINAGE

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INTRODUCTION

This annex defines the flow rates and sizes the drainage elements, both transverse and longitudinal, of the roadway platform, in accordance with the provisions of Nota de Servicio 8/2014.

For the flow calculations, reference is made to Norma 5.2-IC "*Drenaje superficial*", approbed byOrden FOM/298/2016, de 15 de febrero, as Norma 5.1-IC "*Drenaje*" del M.O.P.U., currently substituted by Orden Circular 17/2003, de 23 de diciembre, concerning recommendations for the design and construction of underground drainage in road works.

1. FLOW RATE CALCULATION

Standard 5.2-IC proposes, for catchment areas smaller than 50 km², the rational method for calculating the annual maximum flow, Q_T, corresponding to a given return period, T. The mentioned method uses the following general calculation formula:

$$Q_T = \frac{I(T, tc) * C * A * Kt}{3.6}$$

Where:

- Q_T ($m3/s$): Annual maximum flow corresponding to the return period T, at the basin's discharge point
- I(T,tc) (mm/h): Rainfall intensity corresponding to the considered return period T, for a storm duration equal to the basin's concentration time tc
- C (dimensionless): Average runoff coefficient.
- A ($km2$): Basin area or considered surface.
- Kt (dimensionless): Uniformity coefficient in the temporal distribution of rainfall.

2.1 RAINFALL INTENSITY

The rainfall intensity (I), as a function of the return period and concentration time, is calculated using the following formula:

$$I(T, t_c)(mm/h) = I_d \cdot F_{int}$$

Where:

- I_d Corrected average daily intensity corresponding to the return period T.
- F_{int} Intensity factor.

2.1.1 RETURN PERIOD

The return period to be used in the flow calculations is 100 years for transverse drainage works and 25 years for platform and shoulder drainage (longitudinal drainage), as stipulated by the regulations.

2.1.2 CORRECTED AVERAGE DAILY INTENSITY

The corrected average daily intensity corresponding to the return period TTT, Idl_dId, is obtained using the following formula::

$$I_d(mm/h) = \frac{P_d \cdot K_A}{24}$$

Where :

- P_d Maximum daily precipitation corresponding to the return period T.
- K_A Reduction factor for precipitation due to the basin area..

2.1.3 MAXIMUM DAILY PRECIPITATION

The maximum daily precipitation is obtained from the document "Máximas lluvias diarias en la España peninsular", that defines:

$$Pd = \bar{P} * \mathrm{K}_T$$

Where:

- $\bar{P}$ Average value of the annual maximum precipitation..
- K_T Amplification factor.

The average value of the annual maximum precipitation is obtained from "Sheet 3-1. Bilbao" of the isohyetal map in the maximum rainfall document.

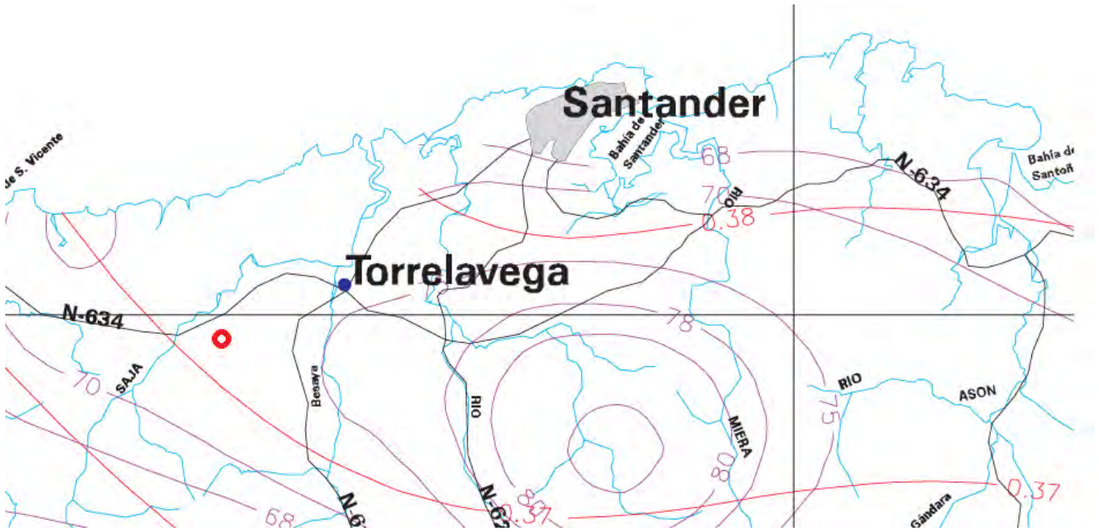


Figure 3.2.1. Mapa Máximas lluvias diarias. Sheet 3-1. Bilbao.

$$\bar{P} = 70\frac{mm}{h} \qquad C_V = 0.37$$

The amplification factor K_T depends on the return period and the coefficient of variation C_v (which is obtained from the isoline map). The amplification factor can be found in the following table.

	PERIODO DE RETORNO EN AÑOS (T)							
C_v	2	5	10	25	50	100	200	500
0.30	0.935	1.194	1.377	1.625	1.823	2.022	2.251	2.541
0.31	0.932	1.198	1.385	1.640	1.854	2.068	2.296	2.602
0.32	0.929	1.202	1.400	1.671	1.884	2.098	2.342	2.663
0.33	0.927	1.209	1.415	1.686	1.915	2.144	2.388	2.724
0.34	0.924	1.213	1.423	1.717	1.930	2.174	2.434	2.785
0.35	0.921	1.217	1.438	1.732	1.961	2.220	2.480	2.831
0.36	0.919	1.225	1.446	1.747	1.991	2.251	2.525	2.892
0.37	0.917	1.232	1.461	1.778	2.022	2.281	2.571	2.953
0.38	0.914	1.240	1.469	1.793	2.052	2.327	2.617	3.014
0.39	0.912	1.243	1.484	1.808	2.083	2.357	2.663	3.067
0.40	0.909	1.247	1.492	1.839	2.113	2.403	2.708	3.128
0.41	0.906	1.255	1.507	1.854	2.144	2.434	2.754	3.189
0.42	0.904	1.259	1.514	1.884	2.174	2.480	2.800	3.250
0.43	0.901	1.263	1.534	1.900	2.205	2.510	2.846	3.311
0.44	0.898	1.270	1.541	1.915	2.220	2.556	2.892	3.372

Table 3.2.1. Cv values depending on the return period.

2.1.4 PRECIPITATION REDUCTION FACTOR DUE TO BASIN AREA

The precipitation reduction factor due to basin area is calculated using:

$$If\ A < 1\ km^2\ \rightarrow K_A = 1$$

$$If \geq 1\ km^2 \rightarrow K_A = 1 - \frac{\log_{10} A}{15}$$

2.1.5 INTENSITY FACTOR

Intensity Factor is obtained using the following formula:

$$F_{int} = \max\left(F_a, F_b\right)$$

Where:

- F_a Factor obtained from the torrentiality index (I_1/I_d).
- F_b Factor obtained from the IDF curves of a nearby rain gauge.

As data from a nearby pluviograph is not available, the following value will be taken directly:

$$F_{int} = F_a = \left(\frac{I_1}{I_d}\right)^{3.5287-2.5287*t^{0.1}}$$

Where:

- $\frac{I_1}{I_d}$ Torrentiality index expressing the ratio between hourly precipitation intensity and corrected average daily intensity.
- t duration of the rainfall event.

Torreciality index is obtained with the following map:

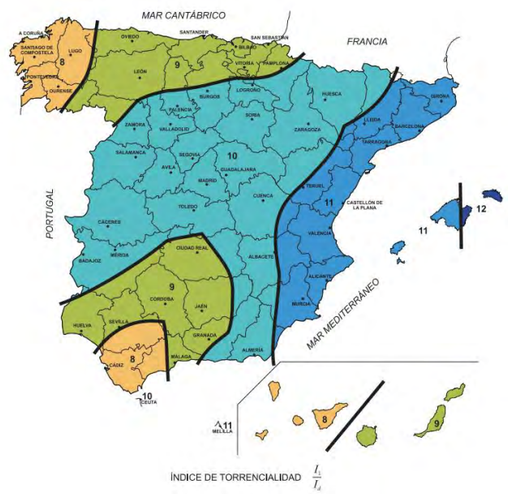


Figure 3.2.2. Torrenciality Index Map.

In this case $\frac{I_1}{I_d}$ for every basin is 9.

2.1.6 TIME OF CONCENTRATION

To obtain the factor F_a, the expression must be specified for a rainfall duration equal to the time of concentration ($t = t_c$).

The time of concentration (t_C) is the elapsed time between the start of the rainfall event and the moment when the entire basin surface contributes runoff at the outlet point. Its calculation differs between primary and secondary basins. In the case of primary basins, it is obtained as follows:

$$t_C(h) = 0{,}3 \cdot L_C^{0,76} \cdot J_C^{-0,19}$$

Where:

- L_C length of the main channel..
- J_C average slope of the channel.

In small primary basins where the travel time of diffuse flow over the terrain is significant compared to the total travel time, the previous formula will not apply. Instead, the guidelines provided below for secondary basins must be followed. This situation is considered to occur when the time of concentration calculated by the previous formula is less than 0.25 hours. ($t_C < 0.25$).

$$t_{dif}(min) = 2 \cdot L_{dif}^{0,408} \cdot n_{dif}^{0.312} \cdot J_{dif}^{-0,209}$$

Where:

- L_{dif} Length of the channel in diffuse flow..
- J_{dif} average slope of the channel..
- n_{dif} diffuse flow coefficient, which is determined according to the following table:

Cobertura del terreno		n_{dif}
Pavimentado o revestido		0,015
No pavimentado ni revestido	Sin vegetación	0,050
	Con vegetación escasa	0,120
	Con vegetación media	0,320
	Con vegetación densa	1,000

Table 3.2.2. Diffuse Flow coefficient

The time of concentration assuming diffuse flow will be:

t_{dif} (minutos)	t_c (minutos)
≤ 5	5
$5 \leq t_{dif} \leq 40$	t_{dif}
≥ 40	40

Table 3.2.3. Determination of tc in diffuse flow.

2.2 RUNOFF COEFFICIENT

Runoff coefficient is obtained as:

$$If\ P_d * K_A > P_0 \ \rightarrow \ C = \frac{\left(\frac{P_d * K_A}{P_0} - 1\right) * \left(\frac{P_d * K_A}{P_0} + 23\right)}{\left(\frac{P_d * K_A}{P_0} + 11\right)^2}$$

$$If\ P_d * K_A < P_0 \ \rightarrow \ C = 0$$

2.2.1 RUNOFF THRESHOLD

The intensity factor is obtained using the following formula:

$$P_0 = P_0^i * \beta$$

Where:

- P_0^i Initial value of the runoff threshold.
- B Corrector coefficient

Initial value of the runoff threshold is obtained by "Tabla 2.3" de la 5.2 IC.

This value depends on the soil hydrological group, which ranges from A to D, representing drainage conditions from more to less favorable. In the project area, according to the following map, the soil is classified as group C.

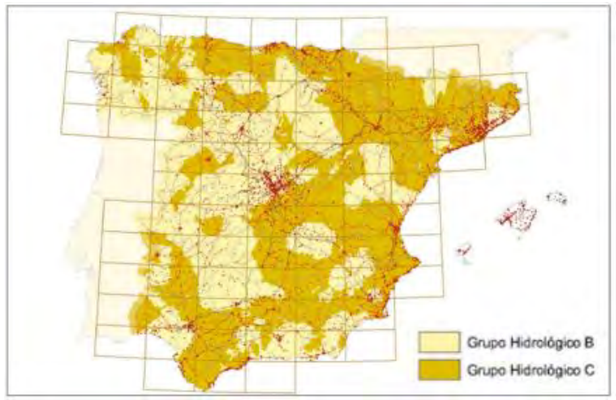


Figure 3.3.3. Mapo of Hidrological groups of the ground. Norma 5.2 IC "Drenaje superficial".

Values for P_0^i depending on the use of the ground are given:

CODE	USE OF GROUND	SLOPE	P_0^i
11100	Continuous urban fabric		1
11200	Disontinuous urban fabric		8
23100	Meadows and Grasslands	>=3	18
23100	Meadows and Grasslands	<3	22
23100	Wooden Meadows	>=3	18
23100	Wooden Meadows	<3	22

Table 3.2.4. Runoff Threshold value.

2.2.2 CORRECTOR COEFFICIENT OF THE RUNOFF THRESHOLD

The correction coefficient of the runoff threshold, β, is given by the following expression for the drainage of road platforms and shoulders (longitudinal drainage):

$$\beta^{PM} = \beta_m \cdot F_T$$

For cross drainge the formula is:

$$\beta^{DT} = (\beta_m - \Delta_{50}) \cdot F_T$$

Where:

- β^{PM} Correction coefficient of the runoff threshold for drainage of the roadway platform and shoulders.

- β^{DT} Correction coefficient of the runoff threshold for transverse drainage of the roadway..
- β_m Mean value of the correction coefficient of the runoff threshold in the region.
- F_T Factor depending on the return period.
- Δ_{50} Deviation from the mean value with a 50% confidence interval.

The values of these elements are obtained from the Standard and depend on each region into which the Spanish territory is divided for the calculation of the coefficient β.

Figure 3.2.4. Regions considered for the characterization of the correction coefficient of the runoff threshold.

As can be observed, the road is located in Region 13. Based on this region, the coefficients described in the following table from the standard are established:

Región	Valor medio, β_m	Desviación respecto al valor medio para el intervalo de confianza del			Período de retorno T (años), F_T				
		50% Δ_{50}	67% Δ_{67}	90% Δ_{90}	2	5	25	100	500
11	0,90	0,20	0,30	0,50	0,80	0,90	1,13	1,34	1,59
12	0,95	0,20	0,25	0,45	0,75	0,90	1,14	1,33	1,56
13	0,60	0,15	0,25	0,40	0,74	0,90	1,15	1,34	1,55
21	1,20	0,20	0,35	0,55	0,74	0,88	1,18	1,47	1,90

Table 3.2.5. Corrector Coefficient of the Runoff Threshold value.

2.3 UNIFORMITY COEFFICIENT

Is calculated as:

$$K_t = 1 + \frac{t_c^{1,25}}{t_c^{1,25} + 14}$$

Where:

- K_t Coefficient of uniformity in the temporal distribution of precipitation.
- t_c time of concentration.

2. CROSS DRAINAGE

2.1. WATERSHED CALCULATIONS

The following shows the calculation of the flows for the main catchments, carried out as detailed in this annex following the rational method:

Datos de partida					Intensidad de precipitación														Coeficiente de escorrentía							C. uniformidad	Caudal
					Máximas lluvias					A<1 km2			Reg. Difuso si tc<0,25 h														
Cuenca	Área	Longitud cauce principal	Diferencia de cota del cauce principal	Pendiente media	Coeficiente de variación	Valor medio de la máxima	Cuantil Regional	Factor de amplificación	Precipitación diaria para T	Factor reductor de la precipitación por área	Intensidad media diaria de precipitación	Tiempo de concentración	Coeficiente de flujo (con vegetación media)	Tiempo de recorrido en flujo difuso sobre el terreno	Tiempo de concentración en flujo difuso	Duración del aguacero	Índice de torrencialidad	Factor obtenido a partir del índice de torrencialidad	Factor de intensidad	Intensidad de precipitación para T y tc	Valor inicial del umbral de escorrentía	Coeficiente corrector del umbral de escorrentía para	Valor medio en la región del	Desviación respecto al valor medio	Factor función del periodo de retorno	Umbral de escorrentia	Coeficiente de escorrentia	Coeficiente de uniformidad (Kt)	Caudal máximo anual para T en el punto de desagüe de la cuenca
C	A	L cauce	Dif. Cota	Pend. Media	Cv	P	Yt	KT	Pd	KA	Id	tc	ndif	tdif	tc	t	I1/Id	Fa	Fint	I(T,tc)	P0i	βDT	βm	Δ50	FT	P0	C	Kt	Q
Ud	km2	km	m			mm			mm/día		mm/h	horas		min	min	horas	horas			mm/h	mm					mm			m3/s
1	0,095	0,773	85	0,1099	0,37	70	2,3		161	1	6,708	0,37	0,32	2,0017	5	0,375	9	15,11	15,11	101,42	18	0,603	0,6	0,15	1,34	10,854	0,784	1,02	2,157
2	0,096	0,486	65	0,1337	0,37	70	2,3		161	1	6,708	0,25	0,32	1,5899	5	0,254	9	18,33	18,33	122,97	18	0,603	0,6	0,15	1,34	10,854	0,784	1,01	2,628
3	0,091	0,413	54	0,1307	0,37	70	2,3		161	1	6,708	0,22	0,32	1,4948	5	0,225	9	19,41	19,41	130,25	18	0,603	0,6	0,15	1,34	10,854	0,784	1,01	2,623

3.2 CROSS DRAINAGE SYSTEMS

A transverse drainage system is designed with a projected service life of 100 years, aimed at preserving the natural water flow and ensuring the passage of runoff from both the watershed areas and the road platform including its margins. The solution for evacuating water from the three culverts involves the use of precast concrete pipes.

The culvert to be used will be designed with a minimum diameter of 1.8 meters, complying with the recommendation of 5.1-IC "Drenaje superficial" egarding the minimum diameter of a drainage pipe (CDS) based on its length. Likewise, the roadway has been aligned to ensure adequate cover, leaving sufficient space for the pipeline beneath the pavement.

L (m)	D_L (m)
L (m) < 3	D_L (m) ≥ 0,6
3 ≤ L (m) < 4	D_L (m) ≥ 0,8
4 ≤ L (m) < 5	D_L (m) ≥ 1,0
5 ≤ L (m) < 10	D_L (m) ≥ 1,2
10 ≤ L (m) < 15	D_L (m) ≥ 1,5
L (m) ≥ 15	D_L (m) ≥ 1,8

Table 3.2.6. Minimmum recommended dimensions for a CDS. Norma 5.2 IC "Drenaje superficial".

The calculation of the flow rate and allowable velocity for each culvert is performed using Manning's method, applying the following equations:

$$Flow\ Rate \rightarrow \quad Q_{CH} = \frac{R_H^{\frac{2}{3}} * J^{\frac{1}{2}} * S_H}{n} \geq Qp$$

$$Speed \rightarrow V_P = \frac{Q_P}{S_P} \leq V_{MAX}$$

Where:

- Q_{CH} CDS available Flow rate.
- Q_P Design flow rate.
- R_H Hydraulic Radius
- J Slope of the culvert (CDS).
- Q_{CH} Allowable flow rate for the culvert (CDS).
- S_H Wetted cross-sectional area of the culvert (CDS).
- n Manning's roughness coefficient.
- V_P Flow velocity through the culvert (CDS).
- V_{MAX} Maximum allowable velocity for the culvert (CDS).

Both the Manning's roughness coefficient and the maximum allowable velocity are determined based on the drainage element material, according to the following tables:

MATERIAL		n ($sm^{-1/3}$)
Cuneta	Sin vegetación. Superficie uniforme	0,020-0,025
	Sin vegetación. Superficie irregular	0,020-0,033
	Con vegetación herbácea segada	0,033-0,040
	Con vegetación herbácea espesa	0,040-0,050
	En roca. Superficie uniforme	0,029-0,033
	En roca. Superficie irregular	0,033-0,050
	Fondo de grava. Cajeros de hormigón	0,017-0,020
	Fondo de grava. Cajeros encachados	0,022-0,033
	Encachado	0,020-0,029
	Hormigón proyectado	0,017-0,022
	Revestida con hormigón in situ	0,013-0,017
Pavimento con mezclas bituminosas		0,013-0,018
Hormigón en marcos y otras estructuras in situ		0,014-0,017
Gaviones		0,020-0,040
Tubo de hormigón		0,012-0,017
Tubo de fundición		0,010-0,015
Tubo de acero		0,010-0,014
Tubo de materiales poliméricos		0,008-0,013

Table 3.2.6. Roughness coefficient

Naturaleza de la superficie	Máxima velocidad admisible (m/s)
Terreno sin vegetación arenoso o limoso	0,20-0,60
Terreno sin vegetación arcilloso	0,60-0,90
Terreno sin vegetación en arcillas duras y margas blandas	0,90-1,40
Terreno sin vegetación en gravas y cantos	1,20-2,30
Terreno parcialmente cubierto de vegetación	0,60-1,20
Terreno con vegetación herbácea permanente	1,20-1,80
Rocas blandas	1,40-3,00
Mampostería, rocas duras	3,00-5,00
Hormigón	4,50-6,00

Table 3.2.7. Maximum water velocity

For concrete pipes, the roughness coefficient used will be 0.015. Additionally, the velocity must meet criteria of being greater than 0.5 m/s and less than 6 m/s to ensure sediment transport without causing excessive erosion. The flow capacity of the culvert must exceed the combined inflow from the various defined catchment areas.

The table displays the capacity of the three culverts, verifying that their flow capacity exceeds the demand, along with all the necessary parameters for their calculation:

Comprobación												
C	Qp	D	J	RH	S	n	perímetro	v	QCH	Qp/QCH	r	CUMPLE?
Ud	m3/s	m		m	m2		m	m/s	m3/s		m	
Pk0+380	2,157931518	1,8	0,0013	0,45	2,54469005	0,015	5,65486678	1,411525602	3,59189515	0,600777981	0,9	SI
PK0+880	2,628412643	1,8	0,02	0,45	2,54469005	0,015	5,65486678	5,536458913	14,0885719	0,186563454	0,9	SI
PK1+100	2,623088491	1,8	0,02	0,45	2,54469005	0,015	5,65486678	5,536458913	14,0885719	0,186185549	0,9	SI

All water from catchment areas draining the surface starting at the highest point of the alignment (PK 1+260) will be discharged through the Ceceja stream, located at a lower elevation than this point and with sufficient capacity to evacuate both the catchment flows and precipitation runoff from the roadway itself.
No transverse drainage structure has been designed at PK 1+520 due to its proximity to the Ceceja stream's depression.

In the transverse drainage works, inspection chambers will be installed to direct flow into the culverts when their slope is insufficient to allow direct drainage over the embankment surface. Slope has been a critical factor in sizing the culverts, as steeper slopes produced flow velocities exceeding the permissible range.

Drainage solution schematics are attached in the drawing documents

:

3. LONGITUDINAL DRAINAGE

The longitudinal drainage of the roadway platform and its respective shoulders is managed through the use of cut-off ditches and inspection chambers.

3.1. FLOW CALCULATION

Below is the calculation of the hydraulic capacity of the selected ditch, considering together the contributing catchment area from the largest cut, which creates the most restrictive condition, along with the adjacent pavement area.

		DESIGN FLOW RATE				DITCH's HYDRAULIC CAPACITY							RESULT
Ditch	Inlet Watersheds			Total Flow Rate in place	Design Flow Rate	Area	Hidraulic radius	Wetted perimeter	Ditch Slope	Mannings Coefficient	Capacity	Velocity	Check to fit the design parameters
				Qt	Qd	A	Rh	p	J	n	Q	Vp	
				m3/s	m3/s	m2	m	m	%	s/m3^-1	m3/s	m/s	
1	Pavimento+ Desmonte			0,143	0,143	0,05625	0,068	0,83059788	5,80	0,015	0,150	2,668	OK!

3.2. FOOT OF CUT DITCHES

The ditch to be used is the VA-75 type, commonly employed in the Cantabria region, featuring an inner slope of 1:1 and an outer slope of 4:1, resulting in a total depth of 15 cm. The remaining dimensions are shown in the figure below:

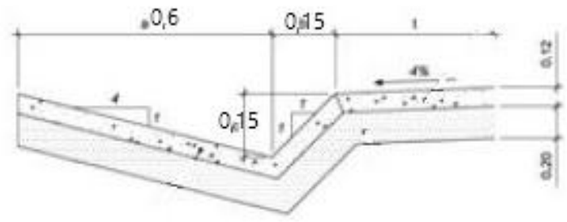
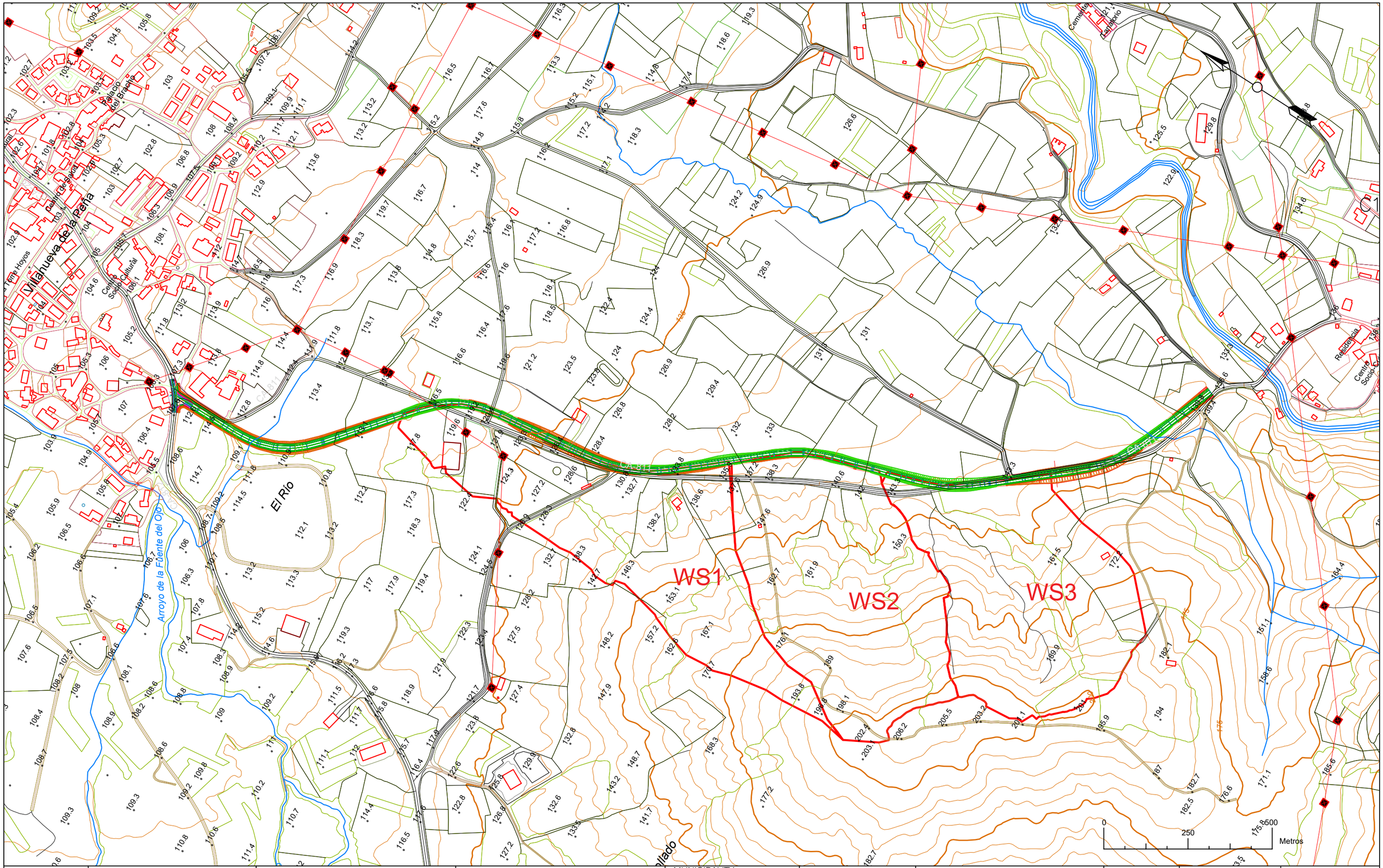


Figure 3.2.5. Section of VA-75.Measures in meters.

Ditches of this type will be constructed at the foot of the various cut slopes generated along the route. The ditch has been designed to avoid the need for auxiliary drainage elements such as culverts, inspection chambers, or downspouts, ensuring better hydraulic performance of the system and facilitating water evacuation through the transversal drainage components.

4. WATERSHED PLANS

Attached below is a 1:2500 scale map of the main catchment areas within the Project's study zone.



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE: Construction Project	TITLE: Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY: Mazcuerras REGION: Cantabria	DRAWING: Watershed Plan	AUTHOR: Jorge Sáenz Ferández	SCALE: 1:2500	DATE: July 2025	SHEET: SHEET 1 OF 1

PROJECT DESIGN 3 – GEOMETRIC DESIGN

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2.2.1. Subgrade Category 2

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1. INTRODUCTION

This appendix sizes the road subgrade and pavement, using as design parameters the Average Daily Heavy Vehicle Traffic per lane and the subgrade category, defined by the geological and geotechnical characteristics of the materials on which it rests. These dimensions are determined in accordance with the following regulations:

- Norma 6.1-IC "Secciones de firme" (Orden FOM/3460/2003, de 28 de noviembre, por la que se aprueba la Norma 6.1-IC Secciones de firme, de la Instrucción de Carreteras).
- Pliego de Prescripciones Técnicas Generales para Obras de Carreteras y Puentes (PG-3).

2. DESIGN PARAMETERS

2.1. HEAVY TRAFFIC CATEGORY

The Average Daily Heavy Vehicle Traffic in the year of commissioning (IMPp), calculated in the Traffic Study, is 37 heavy vehicles per day. As shown in the following table, the heavy traffic category is T41.

CATEGORÍA DE TRÁFICO PESADO	T31	T32	T41	T42
IMDp (vehículos pesados/día)	< 200 ≥ 100	< 100 ≥ 50	< 50 ≥ 25	< 25

Table 3.3.1. Heavy traffic categories T31 to T42. Standard 6.1-IC "Pavement Sections."

2.2. SUBGRADE TYPE

2.2.1. SUBGRADE CATEGORY

This parameter is defined based on the compressibility modulus in the second cycle of the plate load test, E_v2, which will be obtained following NLT-357 "Plate Load Test." Since the goal is to achieve the highest possible subgrade category and, according to the geotechnical appendix, a type E3 subgrade (Compressibility modulus in the second cycle of the plate load test > 300 MPa) will be adopted when designing the section to be constructed.

It is important to ensure proper compaction to achieve this type of subgrade with the soil from the project area.

CATEGORÍA DE EXPLANADA	E1	E2	E3
E_{V2} (MPa)	≥ 60	≥ 120	≥ 300

Table 3.3.2. Subgrade Categories. Standard 6.1-IC "Pavement Sections."

2.2.2. SOIL TYPE

The materials used for the formation of the subgrade are defined according to the same assumptions in Appendix No. 9 – Geotechnical Study of the corridor, which states that the soil used for the subgrade surface will be a tolerable soil (0).

SÍMBOLO	DEFINICIÓN DEL MATERIAL	ARTÍCULO DEL PG-3	PRESCRIPCIONES COMPLEMENTARIAS
IN	Suelo inadecuado o Marginal	330	– Su empleo sólo será posible si se estabiliza con cal o con cemento para conseguir S-EST1 o S-EST2.
0	Suelo tolerable	330	– CBR ≥ 3 (*). – Contenido en materia orgánica < 1%. – Contenido en sulfatos solubles (SO_3) < 1%. – Hinchamiento libre < 1%.
1	Suelo adecuado	330	– CBR ≥ 5 (*)(**).
2	Suelo seleccionado	330	– CBR ≥ 10 (*) (**).
3	Suelo seleccionado	330	– CBR ≥ 20 (*)
S-EST1 S-EST2 S-EST3	Suelo estabilizado *in situ* con cemento o con cal	512	– Espesor mínimo: 25 cm. – Espesor máximo: 30 cm.

Table 3.3.3. Soil Types. Standard 6.1-IC "Pavement Sections."

3. SUBGRADE DESIGN

According to the soil type (0) and the desired subgrade category (E3), Standard 6.1-IC establishes the subgrade design as shown in the following table:

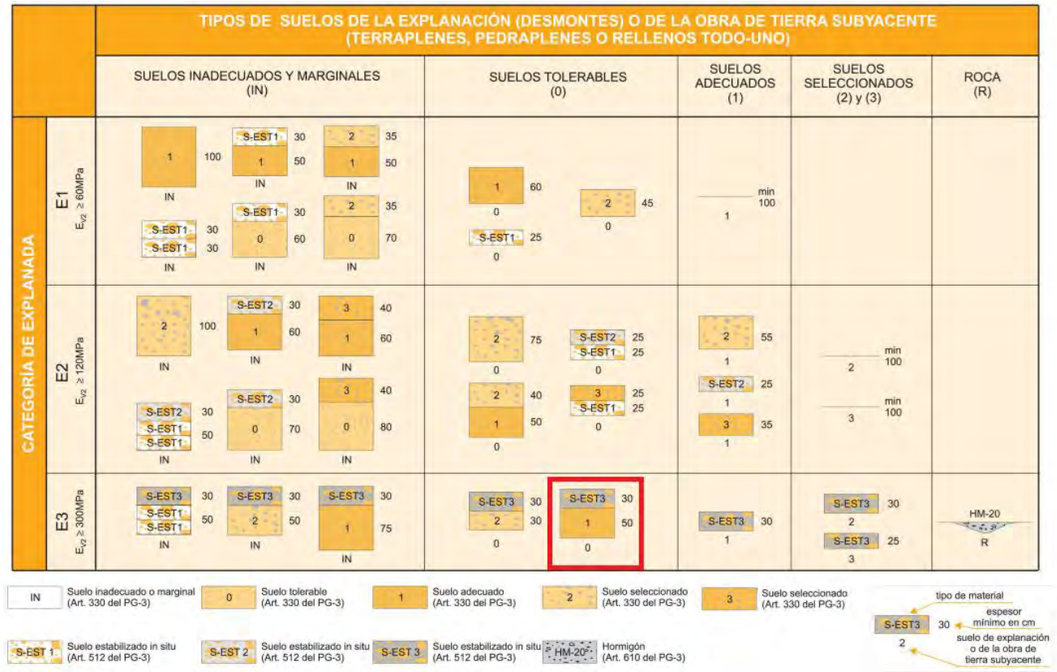

Table 3.3.4. Subgrade formation. Standard 6.1-IC "Pavement Sections."

Of the two possible options to achieve an E3 subgrade with a tolerable base soil, the solution with 50 cm of suitable soil is chosen due to the absence of selected soil types in the project area and the availability of suitable soils. This is complemented by 30 cm of stabilized soil type 3 (cement only). To protect the subgrade, a curing spray of type C60B3 CUR will be applied over the stabilized soil.

4. PAVEMENT DESIGN

Given the subgrade category (E3) and the heavy traffic category (T41), the pavement sections are determined in accordance with the current regulations.

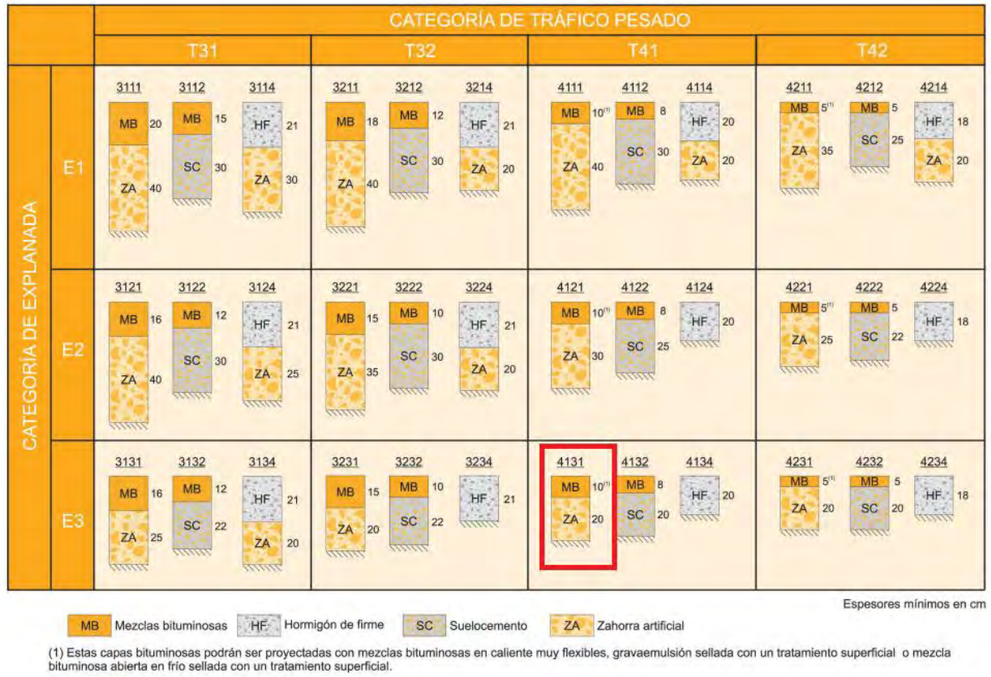

Table 3.3.5. Pavement Sections Catalog. Standard 6.1-IC "Pavement Sections."

Solution 4131 is adopted, consisting of 10 cm of bituminous mixture (BM) over a 20 cm layer of artificial base course (ABC). Additionally, as noted in footnote (1), it will be considered that the bituminous layers may be applied with highly flexible hot bituminous mixtures, gravel emulsion sealed with a surface treatment, or cold open-graded bituminous mixture sealed with a surface treatment..

The determination of the type of granular base has been based on Article 510 of the PG-3 specifications.

4.1. BITUMINOUS LAYER

The bituminous mixture is laid in two layers: intermediate and wearing course.

- The wearing course layer will consist of a dense hot bituminous mixture (D) with a thickness of 5 cm.
- The intermediate layer will consist of a dense hot bituminous mixture (S) with a thickness of 10 cm.

Both layers will be dimensioned as shown in the table from Standard 6.1-IC.

TIPO DE CAPA	TIPO DE MEZCLA (*)	CATEGORÍA DE TRÁFICO PESADO		
		T00 a T1	T2 y T31	T32 y T4 (T41 y T42)
Rodadura	PA	4		
	M	3	2-3	
	F			
	D y S		6-5	5
Intermedia	D y S		5-10(**)	
Base	S y G		7-15	
	MAM	7-13		

(*) Ver definiciones en tabla 5 o artículos 542 y 543 del PG-3.
(**) Salvo en arcenes, para los que se seguirá lo indicado en el apartado 7.

Table 3.3.6. Thickness of Hot Bituminous Mixture Layers. Standard 6.1-IC "Pavement Sections."

The selection of the types of bituminous mixtures to be used in each layer has been based on the provisions of Norma 6.1-IC "Secciones de Firme," as well as Artículos 542 and 543 de Orden Circular 24/2008 concerning the General Technical Specifications for Road and Bridge Works (PG-3).

Artículo: 542- Mezclas Bituminosas en Caliente Tipo Hormigón Bituminosos

Artículo 543- Mezclas Bituminosas para Capas de Rodadura. Mezclas Drenantes y Discontinuas.

For the wearing course, an AC 16 Surf D mixture (previously designated D-12) with a thickness of 5 cm will be adopted, and for the intermediate course, an AC 22 Binder S mixture (previously designated S-20) will be used.

The determination of the different types of sprays has been based on the following articles from the PG-3 specifications:

- Artículo 530 – Riegos de Imprimación
- Artículo 531 – Riegos de Adherencia
- Artículo 532 – Riegos de curado

5. CONCLUSION

Below is a summary table of the thicknesses of the pavement and subgrade layers, along with the corresponding coatings (sprays).

Layer		Thickness (cm)
Pavement	Bituminous Mixture AC16 SURF 50/70 D	5
	Adhesion tack coat C60B3	-
	Bituminous Mixture AC22 BIN 50/70 S CALIZA	10
	Priming bituminous spray C60BF4 IMP	-
	Granular Base(ZA 20)	20
Subgrade	Adhesion tack coat C60B3 CUR	-
	Cement-Stabilized Soil (S-EST-3)	30
	Acceptable Soil (1)	50
	Tolerable Soil (0)	-

Table 3.3.7. Subgrade and Pavement Layers.

Finally, it should be noted that this pavement package will be constructed along the entire section of the road and bike lane.

PROJECT DESIGN 4 – ROAD ALIGNMENT

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4. CROSS SECTION 9

1. INTRODUCTION

This appendix outlines the geometric alignment characteristics of the adopted solution. The alignment has been designed in accordance with Norma 3.1-IC “Trazado,” edicion de 2020, publicado por el Ministerio de Transporte, based on a design speed of 60 km/h. The horizontal and vertical alignment reports are included.

2. HORIZONTAL ALIGNMENT

A design speed of 60 km/h has been considered for the existing road whose alignment has been modified. The road in question is a single carriageway with two-way traffic, classified as Group 3 (C-60). The horizontal alignment of the bypass includes seven straight sections connected by circular curves, each with its corresponding transition curves in the form of clothoids. This solution was adopted to better adapt to the local topography while avoiding existing properties.

The alignment ends just before the existing bridge over the Ceceja stream; therefore, it is not considered part of this project, as it involves structural works.

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2.1. STRAIGHT ALIGNMENTS

To ensure proper comfort and driving adaptation, as well as to avoid problems related to fatigue, glare, or excessive speed, straight alignments must comply with a series of minimum and maximum length values based on the road's design speed, in accordance with the applicable standard. For this project, the following value applies:

$$L_{min,s} = 1{,}39 \cdot V_p$$

$$L_{min,o} = 2{,}78 \cdot V_p$$

$$L_{max} = 16{,}7 \cdot V_p$$

Where:

- $L_{min,s}$ Minimum length (m) for “S”-shaped alignments.
- $L_{min,o}$ Minimum length (m) for all other cases..
- L_{max} Maximum length (m).
- V_p Design speed of the section (km/h)

All the straight sections of the project's horizontal alignment comply with the minimum and maximum length requirements. Furthermore, these exceed the maximum length of 85 m to be considered a limited-length straight; therefore, it was not necessary to verify the radius ratios of the curves affecting the straights, nor is it necessary to establish superelevation using two different cross slopes.

V_p (km/h)	$L_{min,s}$ (m)	$L_{min,o}$ (m)	L_{max} (m)
140	195	389	2 338
130	181	361	2 171
120	167	333	2 004
110	153	306	1 837
100	139	278	1 670
90	125	250	1 503
80	111	222	1 336
70	97	194	1 169
60	83	167	1 002
50	69	139	835
40	56	111	668

Table 3.4.1. Maximum and Minimum Lengths of Straight Alignments (Table 4.1, Norma 3.1-IC)

VELOCIDAD DE PROYECTO (V_p) DEL TRAMO (km/h)	MÁXIMA LONGITUD DE UNA ALINEACIÓN RECTA PARA SER CONSIDERADA DE LONGITUD LIMITADA (m)
140, 130, 120, 110 y 100	400
90	300
80	230
70	175
60	85
50	50 (*)
40	30 (*)
(*) Este valor es inferior a ($L_{mín.s}$) recomendado en la Tabla 4.1.	

Table 3.4.2. Maximum Length for a Straight to Be Considered of Limited Length (Tabla 4.2, Norma 3.1-IC)

2.2. CURVED ALIGNMENTS

Circular curves must comply with a series of minimum radius and maximum superelevation values based on the design speed, stopping sight distance throughout their length, and the coordination of the horizontal and vertical alignment. For this project, with a design speed of 60 km/h, these values are as follows:

- The minimum radius of the road will be 130 meters, a value met by all curves.
- For this road, the curve radii are 130, 150, and 200 meters. Therefore, the superelevation of the circular alignments will be 7%, which is the maximum superelevation allowed for a C-60 road.
- The coefficient of friction value will be 0.151

VELOCIDAD DE PROYECTO (V_p) (km/h)	GRUPO 1 A-140 Y A-130		GRUPO 2 A-120, A-110, A-100, A-90, A-80 Y C-100		GRUPO 3 C-90, C-80, C-70, C-60, C-50 Y C-40	
	RADIO MÍNIMO (m)	PERALTE MÁXIMO (%)	RADIO MÍNIMO (m)	PERALTE MÁXIMO (%)	RADIO MÍNIMO (m)	PERALTE MÁXIMO (%)
140	1 050	8,00	--	--	--	--
130	850	8,00	--	--	--	--
120	--	--	700	8,00	--	--
110	--	--	550	8,00	--	--
100	--	--	450	8,00	--	--
90	--	--	350	8,00	350	7,00
80	--	--	250	8,00	265	7,00
70	--	--	--	--	190	7,00
60	--	--	--	--	130	7,00
50	--	--	--	--	85	7,00
40	--	--	--	--	50	7,00

Table 3.4.3. Design Speed – Minimum Radius – Maximum Superelevation Relationship (Tabla 4.4, Norma 3.1-IC)

GRUPO	DENOMINACIÓN	RADIO (m)	PERALTE (%)
1	Autopistas y autovías A-140 y A-130	$850 \leq R \leq 1\,050$	8
		$1\,050 \leq R \leq 5\,000$	$8 - 7{,}96\cdot(1 - 1\,050/R)^{1{,}2}$
		$5\,000 \leq R < 7\,500$	2
		$7\,500 \leq R$	Bombeo
2	Autopistas y autovías A-120, A-110, A-100, A-90 y A-80, carreteras multicarril C-100 y carreteras convencionales C-100	$250 \leq R \leq 700$	8
		$700 \leq R \leq 5\,000$	$8 - 7{,}3\cdot(1 - 700/R)^{1{,}3}$
		$5\,000 \leq R < 7\,500$	2
		$7\,500 \leq R$	Bombeo
3	Carreteras multicarril C-90, C-80, C-70, C-60, C-50 y C-40 y carreteras convencionales C-90, C-80, C-70, C-60, C-50 y C-40	$50 \leq R \leq 350$	7
		$350 \leq R \leq 2\,500$	$7 - 6{,}65\cdot(1 - 350/R)^{1{,}8}$
		$2\,500 \leq R < 3\,500$	2
		$3\,500 \leq R$	Bombeo

Table 3.4.4. Superelevation According to Curve Radius (Tabla 4.5, Norma 3.1-IC).

V_e (km/h)	40	50	60	70	80	90	100	110	120	130	140
$f_{t\,MAX.}$	0,180	0,166	0,151	0,137	0,122	0,113	0,104	0,096	0,087	0,078	0,069

Table 3.4.5. Maximum Mobilized Cross Friction Coefficient (Tabla 4.3, Norma 3.1-IC)

Once these values have been determined, the maximum speed on these curves can be defined using the following expression.

$$V^2 = 127 \cdot R\left(f_t + \frac{p}{100}\right)$$

Where:

- V velocidad de la curva (km/h).
- R Curve radius (m).
- f_t Mobilized cross friction coefficient.
- p Superelevation of the curve (%).

Thus, the following values are obtained:

CURVE	INITIAL P.K.	FINAL P.K.	RADIUS	SUPERELEVATION	Ft	Va	Vlim
			m	%		km/h	km/h
1	0+155,51	0+207,00	130	7	0,151	60	60,40
2	0+436,60	0+473,02	130	7	0,151	60	60,40
3	0+700,20	0+757,26	200	7	0,151	60	74,92
4	0+986,86	0+988,81	150	7	0,151	60	64,88
5	1+197,68	1+219,67	200	7	0,151	60	74,92
6	1+438,30	1+480,55	200	7	0,151	60	74,92

Table 3.4.6. Maximum Speed in Road curves

Transition curves are used to avoid abrupt changes in the curvature of the alignment; therefore, their design must provide the same levels of comfort and safety. The fundamental equation of such a curve is as follows:

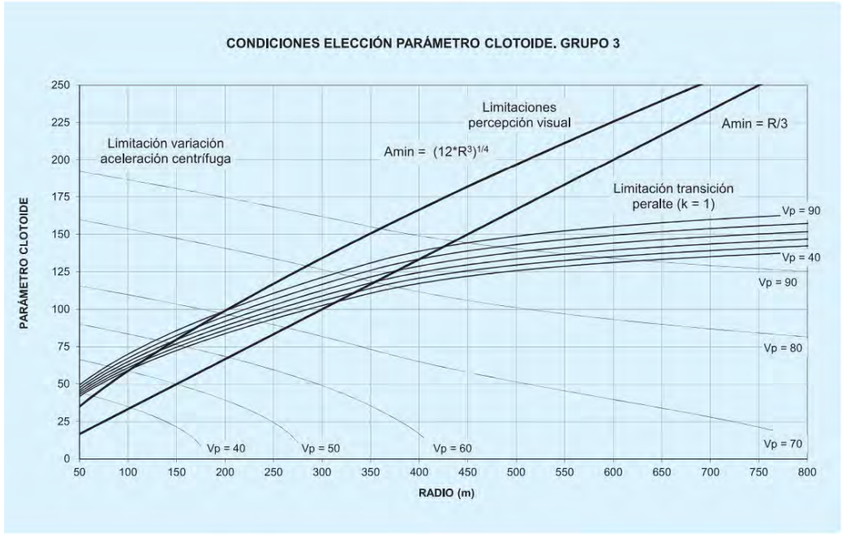
$$A^2 = R \cdot L$$

Where:

- A Clothoid parameter.
- R Clothoid radius (m)
- L Clothoid length (m)

Curves must comply, using the following chart, with a series of minimum values of their parameters based on:

- The limitation of the variation of centrifugal acceleration in the horizontal plane.
- The limitation due to superelevation transition.
- The limitation due to visual perception conditions.



Graph 3.4.1. Criteria for Selecting the Clothoid Parameter for a Group 3 Road (Figure 4.4, Norma 3.1-IC)

2.3. HORIZONTAL ALIGNMENT REPORT

Below are the values for each horizontal alignment obtained from Civil 3D.

Alignment: CA-811_ALINEACION

Description:

Tangent Data

Length:	92.618	Course:	S 00° 51' 30.3791" E

Spiral Curve Data: clothoid

Length:	62.308	L Tan:	41.664
Radius:	130.000	S Tan:	20.884
Theta:	13° 43' 50.3234"	P:	1.242
X:	61.951	K:	31.094
Y:	4.957	A:	90.000
Chord:	62.149	Course:	S 05° 25' 59.1318" E

Circular Curve Data

Delta:	23° 06' 42.9143"	Type:	LEFT
Radius:	130.000		
Length:	52.439	Tangent:	26.581
Mid-Ord:	2.635	External:	2.690
Chord:	52.084	Course:	S 26° 08' 42.1596" E

Spiral Curve Data: clothoid

Length:	62.308	L Tan:	41.664
Radius:	130.000	S Tan:	20.884
Theta:	13° 43' 50.3234"	P:	1.242
X:	61.951	K:	31.094
Y:	4.957	A:	90.000
Chord:	62.149	Course:	S 46° 51' 25.1875" E

Tangent Data

Length:	109.710	Course:	S 51° 25' 53.9402" E

Spiral Curve Data: clothoid

Length:	62.308	L Tan:	41.664
Radius:	130.000	S Tan:	20.884
Theta:	13° 43' 50.3234"	P:	1.242
X:	61.951	K:	31.094
Y:	4.957	A:	90.000
Chord:	62.149	Course:	S 46° 51' 25.1875" E

Circular Curve Data

Delta:	16° 28' 01.6281"	Type:	RIGHT
Radius:	130.000		
Length:	37.363	Tangent:	18.811
Mid-Ord:	1.340	External:	1.354
Chord:	37.234	Course:	S 29° 28' 02.8027" E

Spiral Curve Data: clothoid

Length:	62.308	L Tan:	41.664
Radius:	130.000	S Tan:	20.884
Theta:	13° 43' 50.3234"	P:	1.242
X:	61.951	K:	31.094
Y:	4.957	A:	90.000
Chord:	62.149	Course:	S 12° 04' 40.4180" E

Tangent Data			
Length:	103.813	Course:	S 07° 30' 11.6653" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 10° 23' 28.8342" E

Circular Curve Data			
Delta:	16° 20' 56.4410"	Type:	LEFT
Radius:	200.000		
Length:	57.069	Tangent:	28.730
Mid-Ord:	2.032	External:	2.053
Chord:	56.875	Course:	S 24° 20' 37.4377" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 38° 17' 46.0413" E

Tangent Data			
Length:	108.927	Course:	S 41° 11' 03.2102" E

Spiral Curve Data: clothoid			
Length:	60.167	L Tan:	40.196
Radius:	150.000	S Tan:	20.133
Theta:	11° 29' 27.5528"	P:	1.004
X:	59.925	K:	30.043
Y:	4.011	A:	95.000
Chord:	60.059	Course:	S 37° 21' 18.7258" E

Circular Curve Data			
Delta:	00° 44' 44.1410"	Type:	RIGHT
Radius:	150.000		
Length:	1.952	Tangent:	0.976
Mid-Ord:	0.003	External:	0.003
Chord:	1.952	Course:	S 29° 19' 13.5868" E

Spiral Curve Data: clothoid			
Length:	60.167	L Tan:	40.196
Radius:	150.000	S Tan:	20.133
Theta:	11° 29' 27.5528"	P:	1.004
X:	59.925	K:	30.043
Y:	4.011	A:	95.000
Chord:	60.059	Course:	S 21° 17' 08.4479" E

Tangent Data			
Length:	88.201	Course:	S 17° 27' 23.9635" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 20° 20' 41.1324" E

Circular Curve Data			
Delta:	06° 17' 57.5089"	Type:	LEFT
Radius:	200.000		
Length:	21.989	Tangent:	11.005
Mid-Ord:	0.302	External:	0.303
Chord:	21.978	Course:	S 29° 16' 20.2699" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 38° 11' 59.4074" E

Tangent Data			
Length:	97.561	Course:	S 41° 05' 16.5763" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 43° 58' 33.7453" E

Circular Curve Data			
Delta:	12° 08' 38.1446"	Type:	LEFT
Radius:	200.000		
Length:	42.390	Tangent:	21.275
Mid-Ord:	1.122	External:	1.128
Chord:	42.311	Course:	S 55° 49' 33.2006" E

Spiral Curve Data: clothoid			
Length:	60.500	L Tan:	40.382
Radius:	200.000	S Tan:	20.211
Theta:	08° 39' 57.5519"	P:	0.762
X:	60.362	K:	30.227
Y:	3.045	A:	110.000
Chord:	60.439	Course:	S 67° 40' 32.6559" E

Tangent Data			
Length:	93.404	Course:	S 70° 33' 49.8248" E

3. VERTICAL ALIGNMENT

The vertical alignment of a road is determined by the proper combination of constant gradient sections (tangents) and vertical curves (parabolas).

3.1. GRADIENT OF THE VERTICAL ALIGNMENT

The maximum gradient of the vertical alignment will be defined by the standard based on the design speed.

VELOCIDAD DE PROYECTO (V_p) (km/h)	INCLINACIÓN MÁXIMA (%)	INCLINACIÓN EXCEPCIONAL (%)
100	4	5
90 y 80	5	7
70 y 60	6	8
50 y 40	7	10

Table 3.4.7. Maximum Gradient of the Vertical Alignment for Conventional Roads.

The minimum grade value of the vertical alignment shall not be less than 0.5%. Exceptionally, the grade may reach a lower value, not less than 0.2%. The slope of the maximum cross slope at any point on the roadway surface shall not be less than 0.5% to ensure proper drainage of precipitation, and it should be kept below 10%.

The vertical alignment is characterized by gentle grades. The road slope will not exceed the established maximum grade at any point.

3.2. VERTICAL CURVES

The chosen shape for the vertical curve is a symmetric parabola with a vertical axis, described by the equation:

$$y = \frac{X^2}{2 \cdot K_v}$$

Where K_v is the radius of the osculating circle at the vertex of the parabola, known as the "parameter," which can be expressed as a function of the length of the parabola L and the absolute value of the algebraic difference between the grades at each end of the vertical curve, that is:

$$\theta = |i_2 - i_1|$$

Thus, the formula becomes:

$$K_v = \frac{L}{\theta}$$

Below are the diagrams of vertical curves, both convex (crest) and concave (sag).

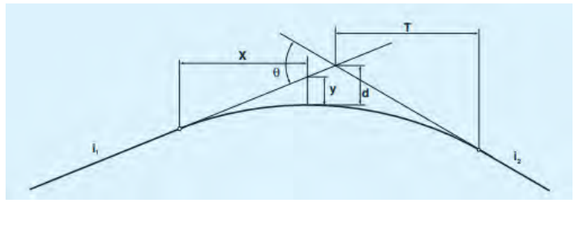


Figure 3.4.1. Convex Vertical Curve (Figure 5.1, Norma 3.1-IC)

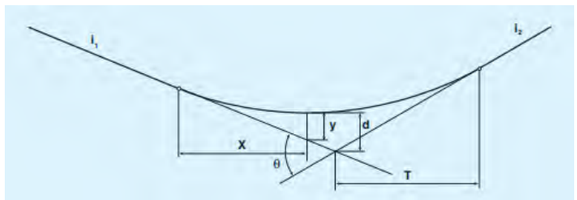


Figure 3.4.2. Concave Vertical Curve (Norma 5.1, Standard 3.1-IC)

3.3. VERTICAL ALIGNMENT REPORT

Below are the values of each vertical alignment obtained in Civil 3D. Throughout the alignment, efforts have been made to ensure good horizontal-vertical coordination by defining parabolic curves coinciding with circular sections, ending the parabolic alignment as close as possible to the tangency point between the circular alignment and the transition curve.

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	109.774	2.656 %	0.000
2	0+01.356	109.810	-1.442 %	0.000
3	0+05.339	109.752	0.560 %	0.000
4	2+00.128	110.843	3.301 %	95.949
5	6+13.348	124.483	5.823 %	53.172
6	7+54.082	132.677	1.330 %	75.897
7	9+89.600	135.809	3.967 %	92.322
8	12+19.665	144.937	-0.595 %	114.057
9	14+72.812	143.431	-2.155 %	70.213
10	16+40.000	139.828		

4. CROSS SECTION

The cross-section of the road is determined in accordance with the widths defined by the standard for a design speed of 60 km/h. The following table summarizes the different typical cross-section types based on the road classification and the design speed:

CLASE DE CARRETERA	VELOCIDAD DE PROYECTO (V_p) (km/h)	ANCHO (m)				NIVEL DE SERVICIO MÍNIMO EN LA HORA DE PROYECTO DEL AÑO HORIZONTE
		CARRILES	ARCENES		BERMAS (MÍNIMO)	
			INTERIOR / IZQUIERDO	EXTERIOR / DERECHO		
Autopista y autovía	140, 130 y 120	3,50	1,00 / 1,50	2,50	1,00	C
	110 y 100	3,50	1,00 / 1,50	2,50	1,00	D
	90 y 80	3,50	1,00	2,50	1,00	D
Carretera multicarril	100	3,50	1,00 / 1,50	2,50	1,00	D
	90 y 80	3,50	1,00	2,50	1,00	D
	70 y 60	3,50	0,50 / 1,00	1,50 / 2,50	1,00	E
	50 y 40	3,25 a 3,50	0,50 / 1,00	1,00 / 1,50	0,50	E
Carretera convencional	100	3,50	2,50		1,00	D
	90 y 80	3,50	1,50		1,00	D
	70 y 60	3,50	1,00 / 1,50		0,75	E
	50 y 40	3,00 a 3,50	0,50 / 1,00		0,50	E

Table 3.4.8. Cross-Section Dimensions (Tabla 7.1, Norma 3.1-IC)

The cross-section consists of 3.50 m wide lanes, plus a 2-meter-wide bike lane, with one lane in each direction (1 meter each) on the ascending side of the kilometer posts (left side in the direction towards Herrera de Ibio). The section is finished with 1-meter-wide shoulder on the right side and a 0.3-meter-wide shoulder next to the bike lane on the left side , both with a 1:1 slope.

The roadway and shoulders on straight sections will have the same minimum transverse slope of 2% towards each side from the centerline of the roadway.

In circular curves and other curves, the transverse slope of the roadway and shoulders will coincide with the superelevation.

PROJECT DESIGN 5- SIGNAGE, DELINEATION, AND CONTAINMENT SYSTEMS

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1. VERTICAL SIGNALING

The purpose of this annex is to define the implementation and types of horizontal and vertical signage, delineation devices, and containment systems required for the Project. The signage aims to warn drivers of potential hazards and regulate traffic flow, avoiding excessive use of signs so as not to overload driver attention, thus enabling safe and comfortable driving.

The vertical signage has been designed in accordance with the provisions of Norma 8.1-IC “Señalización Vertical” issued by the Ministerio de Desarrollo (Orden FOM/534/2014, March 20) and the document “Señales Verticales de Tráfico” published by the Directorate General of Highways in 1992.

1.1. VERTICAL SIGNALING TYPOLOGY

According to the Official Catalogue of Traffic Signs and based on their function, vertical signs and panels are classified as follows:

- Warning signs: Designated by the letter "P," generally triangular in shape, followed by a number.
- Regulatory signs: Designated by the letter "R," generally circular, followed by a number, and further classified into:
- Priority signs (numbers below 100).
- No entry signs (numbers between 100 and 199).
- Passage restriction signs (numbers between 200 and 299).
- Other prohibition or restriction signs (numbers between 300 and 399).
- Mandatory signs (numbers between 400 and 499).
- End of prohibition or restriction signs (numbers above 500).

Information signs: Generally rectangular, designated by the letter “S” followed by a number, and subdivided into:

- General indication signs (below 50).
- Lane-related signs (between 50 and 99).
- Service signs (between 100 and 199).
- Other signs (above 900).

Orientation signs, further subdivided into:

- Advance warning signs (between 200 and 299).
- Direction signs (between 300 and 399).
- Road identification signs (between 400 and 499).
- Location signs (between 500 and 599).
- Confirmation signs (between 600 and 699).
- Signs for specific use in urban areas (between 700 and 799).

Supplementary panels (800 to 899).

1.2. RETROREFLECTIVITY

All elements of vertical signs (background, characters, borders, arrows, symbols, and colored pictograms) must be retroreflective to ensure proper visibility at all times. Furthermore, the retroreflectivity must be uniform across all elements of the same sign or panel.

According to Standard 8.1-IC, and depending on the type of project roadway, different levels of retroreflectivity will be required for fixed-content signs and panels;

TIPO DE SEÑAL O CARTEL	ENTORNO DE UBICACIÓN DE LA SEÑAL O CARTEL		
	ZONA PERIURBANA (Travesías, circunvalaciones…)	AUTOPISTA AUTOVÍA Y ANTIGUAS VÍAS RÁPIDAS	CARRETERA CONVENCIONAL
SEÑALES DE CONTENIDO FIJO	Clase RA2	Clase RA2	Clase RA2
CARTELES	Clase RA3	Clase RA3	Clase RA2

Table 3.5.1. Minimum retroreflectivity.

Since the project road is classified as a "Conventional Road," fixed-content signs and panels shall have a minimum retroreflectivity of class RA-2.

1.3. ROAD TYPE SIGNAGE

At the beginning of the road, in the downhill direction of the P.K., the road type signage will be installed. Additionally, at 100 meters, an R-301 sign indicating the general speed limit will also be placed.

Figure 3.5.1. Road beginning sign.

1.4. DESTINATION SIGNAGE

At the intersection of CA-812 with CA-811, the project road, signage indicating the direction to Herrera de Ibio will be installed:

Figure 3.5.2. Signage used in the CA-812 and CA-811 intersection

Likewise, the following sign must be installed at the exit of Herrera de Ibio:

Figure 3.5.3. Signage used to indicate Villanueva de la Peña direction

1.5. ELEMENTS CARACTERISTICS

1.5.1. DIMENSIONS

The fixed-content signs for the project road, in accordance with Standard 8.1-IC, shall have the following standardized dimensions appropriate for a conventional road with a shoulder:

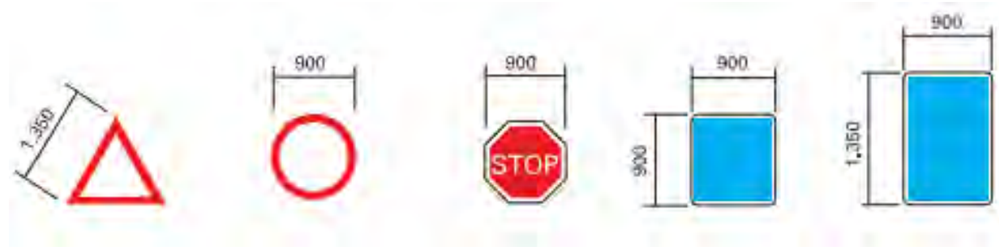

Figure 3.5.4 Signage Size Norma 8.1-IC "Señalización Vertical".

The supplementary panels accompanying these signs will be placed below them and will have the same width.

All signs shall be made of galvanized steel sheet, except for directional signs, which will be made of aluminum profiles. The supporting elements will be galvanized steel posts.

The panels will have variable dimensions depending on their content.

1.5.2. COLORS

Directional signs for conventional roads will generally have black letters on a white background.

CLASE DE CARRETERA	FONDO	CARACTERES, ORLAS Y FLECHAS
Autopista	Azul	Blanco
Autovía		
Vía Rápida	Blanco	Negro
C. Convencional		

Table 3.5.2. Colors in signage.

The location signs for towns will have uppercase black letters on a white background.

The town entrance sign will have a red border, while the town exit sign will have a black border with a red diagonal stripe.

.

1.5.3. ARROWS

The arrows on advance warning and immediate exit signs placed at the roadside will be arranged as follows.

.

Figure 3.5.5. Arrow types

1.5.4. SIGN PANNEL COMPOSITION

The typeface will be based on the alphabet known as "Conventional Road" (CCRIGE). The basic letter height (Hb), which corresponds to the height of the uppercase letter or the largest number on the sign panel, will be as follows:

Type	H_b (mm)
Arrow panel at intersections	150
Advance warning side panel	200
Town Sign	150
Complementary Pannel	100

Table 3.5.3.Basic panel Height Types.

1.6. SPEED IN CURVES

The recommended speed on a curve depends on the superelevation and the radius of the curve.

.

The minimum curve radius in the alignment is 130 meters, for which a recommended speed of 60 km/h applies, matching the design speed for which the road has been laid out.

Radio	Recomendación de velocidad
Menor de 65 m	40
Entre 65 m y 105 m	50
Entre 105 m y 155 m	60
Entre 155 m y 220 m	70

Table 3.5.4. Recommended speed in curves.

1.7. PASSING PROHIBITION

The overtaking maneuver will be permitted in the section between P.K. 0+460 and P.K. 1+240. In all other sections, overtaking will be prohibited.

2. HORIZONTAL SIGNAGE

For the design of the road's horizontal signage, Norma 8.2-IC "Marcas Viales," approved by the Ministerial Order of July 16, 1987, will be used.

Conventional thermoplastic clay-type paint with glass beads will be used to mark the different types of horizontal signage, including edge lines, lane separation lines, and symbols.

2.1. CONTINOUS LONGITUDINAL MARKING

2.1.1. SEPARATION OF DIRECTIONS

For the separation of directions in sections where crossing into the opposite lane is prohibited, road marking M-2.2 will be used.

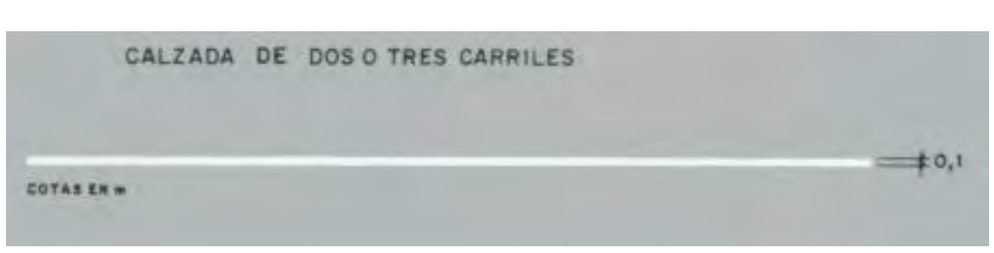

Figure 3.5.6. Marking M-2.2.

2.1.2. ROAD EDGE

For delimiting the road edge in impassable sections, the M-2.6 road marking will be used with a width of *a*, where *a* = 0.1 m.

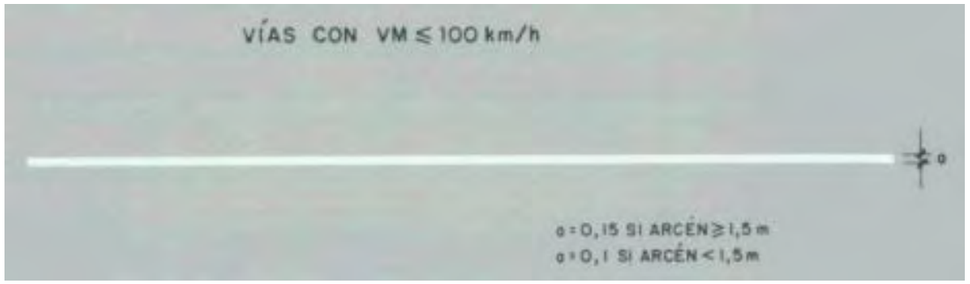

Figure 3.5.7. Marking M-2.6.

2.2. DISCONTINOUS LONGITUDINAL MARKING

2.2.1. SEPARATION OF DIRECTIONS

For the separation of traffic directions where overtaking is allowed, the road marking M-1.3 will be used.

Figure 3.5.8. Marking M-1.3.

2.2.2. ROAD EDGE

To delineate the edge of the carriageway in sections where crossing the line is allowed to change direction or use an access, the M-1.12 marking will be applied.

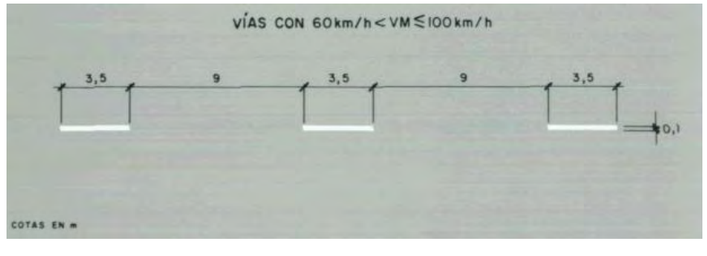

Figure 3.5.9. Marking M-1.12.

2.3. CROSS MARKING

2.3.1. STOP LINE

A transverse marking M-4.1 will be placed before a vertical stop sign R-2.

Figure 3.5.10. Marking M-4.1.

2.3.2. YIELD LINE

A road marking M-4.2 will be placed before a vertical yield sign R-1, which must not be crossed according to the meaning of this sign.

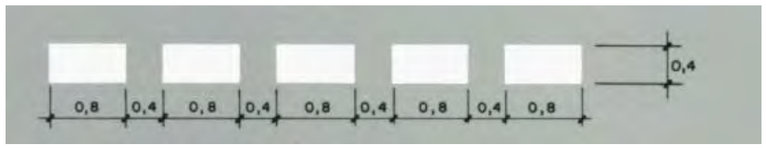

Figure 3.5.11. Marking M-4.2.

2.4. ARROWS

At intersections, directional or lane selection arrows will be placed to indicate to drivers which lane they should use. The road marking used is M-5.2.

.

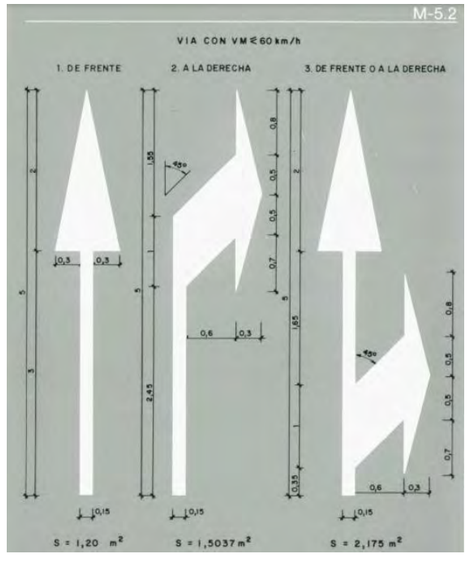

Figure 3.5.12. Marking M-5.2.

2.5. INSCRIPTIONS

M-6.4 markings will be placed before the M-4.1 stop line.

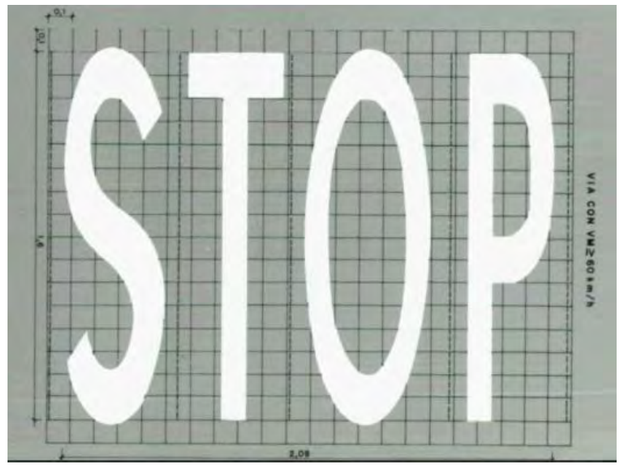

Figure 3.5.13 Marking M-6.4.

M-6.5 markings will be placed before the M-4.2 yield line.

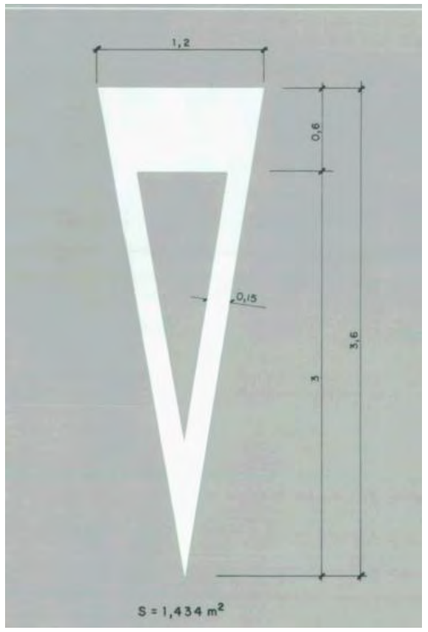

Figure 3.5.14. Marking M-6.5.

2.6. CHEVRON MARKINGS

The interior of the traffic islands will be filled with chevron markings (M-7.2). The chevrons consist of 40 cm wide stripes spaced 1 meter apart, arranged at a 30° angle relative to the direction of the roadway. Between the islands and the continuous edge line of the carriageway, there will be a 50 cm gap also filled with chevron markings.

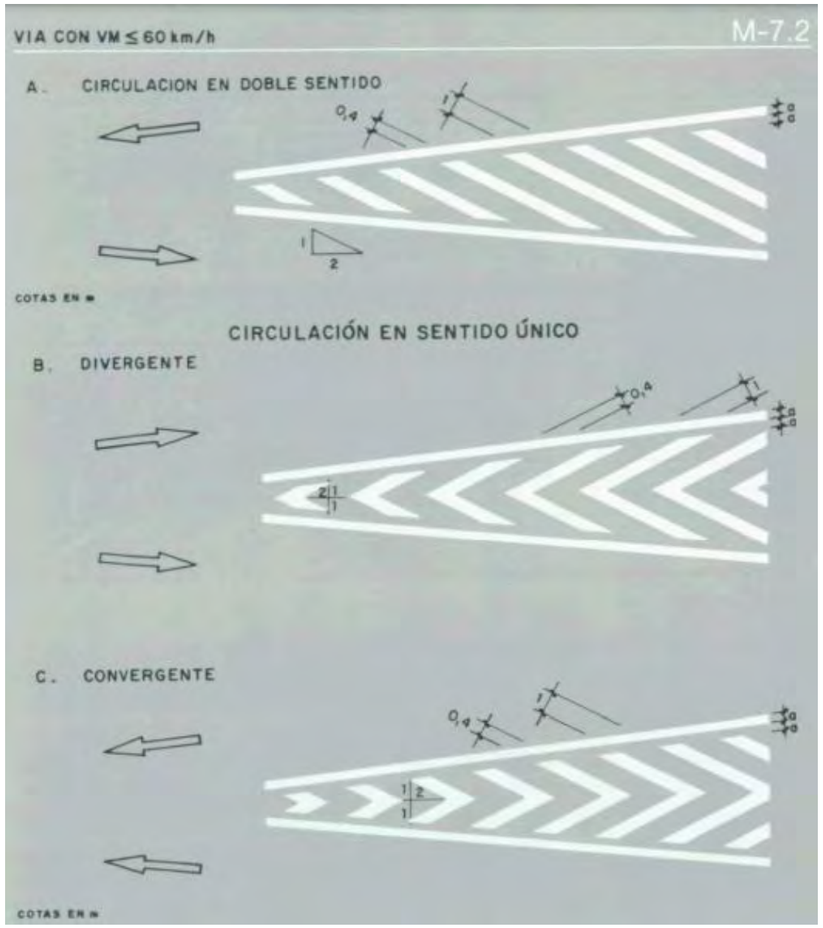

Figure 3.5.15. Marking M-7.2.

3. CURVE DELINEATION

For curve delineation, curve marking panels will be used, consisting of a panel with white retroreflective stripes of class RA2 on a blue background of class NR.

Figure 3.5.16 Directional Pannel.

In curves where a significant speed reduction is necessary, double or triple directional panels will be installed, spaced 15 cm apart, as shown in the figure below.

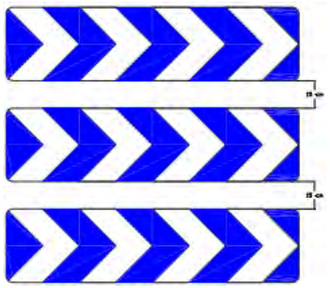

Figure 3.5.17. Separation between directional pannels.

These curve delineation panels are always placed perpendicular to the driver and along the curve, with their spacing approximately equal to R/10.

Depending on the difference between the approach speed (Va) and the curve speed (V2), a single, double, or triple panel is installed, according to the following table.

Va-V_2	Panel		Señales
Entre 15 km/h y 30 km/h	Simple		P-13 o P-14
Entre 30 km/h y 45 km/h	Doble		P-13 o P-14 + S-7
Más de 45 km/h	Triple		P-13 o P-14 + 2 S-7

Table 3.5.5. Curve delineation types

4. VEHICLE CONTAINING SYSTEMS

For the installation of vehicle containment systems, the recommendations of Circular Order 35/2014 on Criteria for the Application of Vehicle Containment Systems will be followed.

4.1. ARRANGEMENT OF SAFETY BARRIERS

Safety barriers will be installed in the following cases:

- Posts or similar elements at the edge of the roadway when their diameter exceeds 15 cm.
- Embankments higher than 3 meters and retaining walls.
- Presence of buildings or enclosures.
- Buildings close to the road.
- Presence of ditches.

4.2. INSTALATION CRITERIA

4.2.1. ACCIDENT RISK

Accident risks are classified according to regulations as very serious, serious, and normal. According to the criteria established in the Circular Order, the road is considered to have a normal accident risk.

4.2.2. CONTAINING LEVEL

For a normal accident risk and based on the design speed and the heavy vehicle ADT calculated in the Traffic Study, the containment level is established according to the following table.

RIESGO DE ACCIDENTE(*)	IMD e IMDp POR SENTIDO	NIVEL DE CONTENCIÓN RECOMENDADO	
		BARRERAS	PRETILES
MUY GRAVE	IMDp ≥ 5000	H3 – H4b	H4b
	5000 > IMDp ≥ 2000	H2 – H3	H4b
	IMDp < 2000	H2	H3
GRAVE	IMD ≥ 10000	H1 – H2	H3
	IMDp ≥ 2000	H2	H3
	400 ≤ IMDp < 2000	H1	H2
	IMDp < 400	N2 – H1	H1 – H2
NORMAL	IMDp ≥ 2000	H1	H1 – H2
	400 ≤ IMDp < 2000	N2 – H1	H1
	IMDp < 400	N2	N2 – H1
	IMDp < 50 y Vp ≤ 80 km/h	N1 – N2	N2

Table 3.5.6. Containing level depending on the risk of accident.

Containment barriers of level N1-N2 and parapets of level N2 are specified.

4.2.3. WORK WIDTH

The closest obstacle to the roadway is considered to be the users of the bike lane, who, in the worst-case scenario, could be traveling less than 0.6 m from the edge of the roadway. Therefore, a working width W1 will be considered, following the recommendations of the following table.

DISTANCIA AL OBSTÁCULO, d_o (m)	CLASE DE ANCHURA DE TRABAJO NECESARIA
$d_o \leq 0,6$	W1
$0,6 < d_o \leq 0,8$	W2 a W1
$0,8 < d_o \leq 1,0$	W3 a W1
$1,0 < d_o \leq 1,3$	W4 a W1
$1,3 < d_o \leq 1,7$	W5 a W1
$1,7 < d_o \leq 2,1$	W6 a W1
$2,1 < d_o \leq 2,5$	W7 a W1

Table 3.5.7. Work width according to distance to obstacle .

4.3. SAFETY BARRIERS ELECTION

Safety barriers with containment level N2 and working width W1 will be installed.

4.4. SAFETY BARRIERS LAYOUT

4.4.1. LONGITUDINAL LAYOUT

Safety barriers will be installed parallel to the road centerline. When a barrier is intended to protect an obstacle, the containment system must begin before the section where the isolated obstacle starts, at a minimum distance (Lm) defined in the following table according to the design speed.

.

VELOCIDAD DE PROYECTO (km/h)	LONGITUD MÍNIMA L_m (m)
≤ 70	28
70 a 100	48
> 100	60

Table 3.5.8. Minimum length (Lm).

Thus, it is determined that the minimum distance will be 28 meters, plus the ends. This minimum distance is used both as an anticipation of the beginning and as an extension of the end.

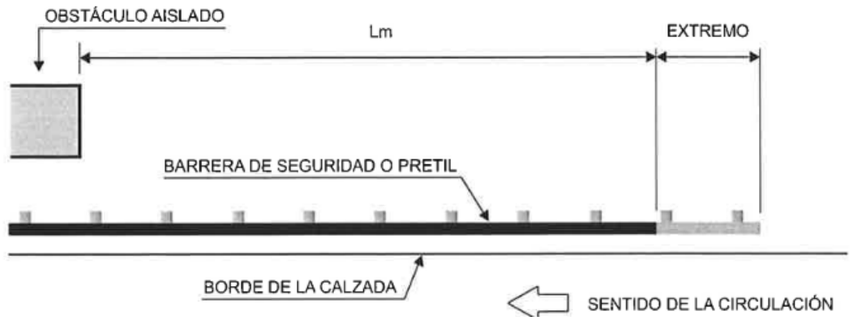

Figure 3.5.18 Arrangement of barriers as advance protection before the start of an obstacle.

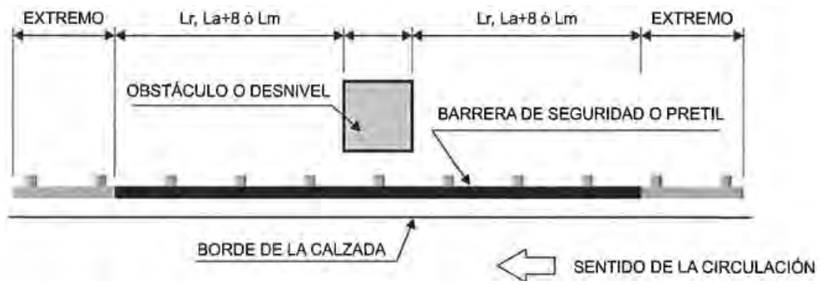

Figure 3.5.19. Arrangement of barriers as an extension of the end of an obstacle.

4.4.2. TRANSVERSAL LAYOUT

Containment systems will be installed at least 50 cm from the edge of the roadway. Since our shoulder section has a width of 1 m, this requirement can be met by installing them at the edge of the shoulder.

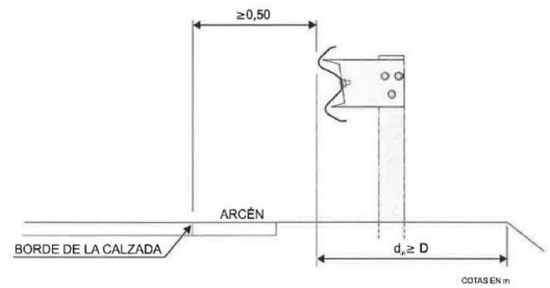

Figure 3.5.20. Barriers transversal Layout

PROJECT DESIGN 6 – ENVIRONMENTAL INTEGRATION

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1. INTRODUCTION

The objective of this appendix is to define the revegetation measures necessary for the proper environmental integration and landscape restoration of the alterations caused by the works. To this end, the techniques and actions aimed at achieving the appropriate environmental integration of the project and its surroundings are presented.

2. APLICABLE STANDARDS

The recommendations of the “Manual of Plantations in the Road Environment” published by the Directorate General of Highways in 1992 will be taken into account.

3. REMOVAL OF TOP SOIL

Before starting earthworks, the topsoil layer will be removed, stored for the shortest possible time, protected, and kept uncompacted to be reused later on slopes requiring revegetation by applying a layer between 15 and 30 cm thick. Priority will be given to the use of native vegetation to restore the affected areas, promoting landscape integration and minimizing the visual impact of the works.

Hydroseeding and broadleaf tree planting will be carried out on embankments, while hydroseeding with woody species will be applied on cut slopes, provided the slope allows it and after spreading topsoil.

The establishment of a vegetative cover will help reduce erosion, improve the quality of runoff water, and ensure the proper functioning of drainage systems.

4. PLANTATIONS

4.1. PLANTATION TYPES

There are two types: more or less developed plants and seeds. When planting trees or shrubs, typically already established plants are used, whereas herbaceous vegetation is usually planted in the form of seeds.Objetivos de las Plantaciones

There are two groups of plantings along the margins of the project road, classified according to their functions.

- Functional plantings, whose objective is to technically complement the quality of the works to be carried out or already executed. These can be:
    - Protection against erosion.
    - Protection against atmospheric agents: rain, snow, wind, etc.
    - Acoustic (noise) protection.
    - Protection against dust and exhaust gases.
    - Traffic safety.
    - Protection against glare.
    - Assistance in road delineation (marking)
- Aesthetic plantings, aimed at improving the landscape for the integration of the works into the surroundings. The aesthetic functions they may fulfill include:Reposición del paisaje del entorno.
    - Creation of new landscapes
    - Screening of man-made elements.

4.2. PLANTING AREA

Plantations Will be carried out on:

- Cut slopes
- Enbankment slopes.

5. HYDROSEEDING

The landscape restoration technique to be used will be hydroseeding. This technique involves spraying a mixture of seeds, mulch, soil stabilizers, fertilizers, and other components onto the soil surface from a mobile tank equipped with a pressure pump and distribution nozzles. The mixture will consist of the following components:

- Mixture of different types of revegetation seeds: 25
- Short-fiber wood mulch: 300 g
- Organic fertilizers: 40 g
- Stabilizing agent: 20g
- Biodegradable coconut fiber mat: 400 g/m²

5.1. TYPES OF SEEDS

More than one type of seed will be used in hydroseeding to ensure its success, diversifying risks and balancing the advantages and disadvantages of each species

The most suitable seeds for hydroseeding should have the following characteristics:

- Low acquisition cost.
- Low requirements regarding climate, soil conditions, and maintenance.
- Rapid initial growth.
- Dense and deep root system.
- Wide availability in the market.
- Long-lasting.

5.2. SEEDING SEASON

Hydroseeding will preferably be carried out during the vegetative dormancy period. In general, this can be defined as between the months of November and March.

The hydroseeding process will follow the steps below:

1. **Site preparation**: removal of rills and gullies to prevent seed washout caused by water flowing through these surface irregularities. Installation of mesh to retain seeds and reduce surface runoff on the slope.

2. **Seeding**: spraying of the hydroseeding mixture, including the appropriate amounts of mulch and stabilizer, using a hydroseeder. Fertilizers will also be added during this phase.

3. **Watering**: immediate irrigation with water following the hydroseeding application.

5.3. HYDROSEEDIG

The contractor will not be responsible for the maintenance of the hydroseeding required to keep the vegetation in good condition once the construction works are completed. Instead, the road owner will assume this responsibility.

Maintenance tasks will include mowing, watering, and fertilizing the vegetation..

5.3.1. MOWING

Both manual and mechanical mowing using a tractor with an articulated arm will be carried out along the project when approximately fifty percent (50%) of the plants reach a height between 20 and 25 cm. Additionally, mowing will be required if vegetation obstructs ditches or any type of drainage structure.

5.3.2. IRRIGATION

Irrigation will be carried out to promote the establishment and development of the installed vegetative cover. An initial irrigation will be performed immediately after hydroseeding, taking the necessary precautions to prevent seed washout down the slope. Subsequently, due to the region’s precipitation conditions, periodic irrigation will not be required.

5.3.3. FERTILIZATION

In addition to the initial fertilization at the time of planting, mineral fertilizers will be applied during maintenance irrigation in areas where the soil has low nutrient capacity.

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1. INTRODUCTION

This annex includes the staking-out report generated from the Civil 3D software, prepared based on two points within the project area at 20-meter intervals.

2. STACKING OUT REPORT

Nombre de alineación: CA-811_ALINEACION
Descripción:
Intervalo de P.K.: inicio: 0+000.00, fin: 164+104.00
Tipo de ángulo de jalonamiento: GiradoMenos
Punto ocupado: ordenada 4,795,779.0922, abscisa 403,493.9276
Punto de fijación de orientación hacia atrás: ordenada 4,795,811.0106, abscisa 403,556.1771
Incremento de P.K.: 20.00
Desfase: 0.00

P.K.	Girado.Derecha	Distancia	Coordenada.N	Coordenada.E
0+000.00	276.0128 (d)	736.058m	4,796,465.6444m	403,228.5453m
0+020.00	275.4593 (d)	717.331m	4,796,445.6466m	403,228.8449m
0+040.00	274.8761 (d)	698.674m	4,796,425.6489m	403,229.1446m
0+060.00	274.2609 (d)	680.094m	4,796,405.6511m	403,229.4442m
0+080.00	273.6113 (d)	661.596m	4,796,385.6534m	403,229.7439m
0+100.00	272.9251 (d)	643.185m	4,796,365.6557m	403,230.0518m
0+120.00	272.2328 (d)	624.712m	4,796,345.6700m	403,230.7654m
0+140.00	271.6173 (d)	605.843m	4,796,325.7837m	403,232.8270m
0+160.00	271.1809 (d)	586.382m	4,796,306.2827m	403,237.1910m
0+180.00	271.0142 (d)	566.472m	4,796,287.6587m	403,244.4270m
0+200.00	271.1572 (d)	546.540m	4,796,270.3636m	403,254.4316m
0+220.00	271.6367 (d)	527.069m	4,796,254.7782m	403,266.9372m
0+240.00	272.4162 (d)	508.358m	4,796,240.8273m	403,281.2568m
0+260.00	273.4117 (d)	490.340m	4,796,227.9582m	403,296.5638m
0+280.00	274.5365 (d)	472.714m	4,796,215.4747m	403,312.1895m
0+300.00	275.7499 (d)	455.293m	4,796,203.0057m	403,327.8268m
0+320.00	277.0593 (d)	438.093m	4,796,190.5367m	403,343.4641m
0+340.00	278.4748 (d)	421.141m	4,796,178.0678m	403,359.1014m
0+360.00	280.0081 (d)	404.467m	4,796,165.5988m	403,374.7387m

0+380.00	281.6719 (d)	388.107m	4,796,153.1299m	403,390.3760m
0+400.00	283.4583 (d)	371.994m	4,796,140.5208m	403,405.8998m
0+420.00	285.2743 (d)	355.657m	4,796,127.1410m	403,420.7587m
0+440.00	286.9852 (d)	338.565m	4,796,112.3467m	403,434.1978m
0+460.00	288.4316 (d)	320.397m	4,796,095.7898m	403,445.3817m
0+480.00	289.5114 (d)	301.294m	4,796,077.7146m	403,453.8964m
0+500.00	290.1697 (d)	281.589m	4,796,058.5964m	403,459.7235m
0+520.00	290.4845 (d)	261.650m	4,796,038.9754m	403,463.5728m
0+540.00	290.6016 (d)	241.657m	4,796,019.1745m	403,466.3829m
0+560.00	290.6881 (d)	221.660m	4,795,999.3458m	403,468.9946m
0+580.00	290.7917 (d)	201.664m	4,795,979.5170m	403,471.6063m
0+600.00	290.9181 (d)	181.668m	4,795,959.6883m	403,474.2179m
0+620.00	291.0758 (d)	161.674m	4,795,939.8595m	403,476.8296m
0+640.00	291.2780 (d)	141.681m	4,795,920.0308m	403,479.4412m
0+660.00	291.5677 (d)	121.692m	4,795,900.2080m	403,482.0973m
0+680.00	292.2480 (d)	101.737m	4,795,880.4579m	403,485.2401m
0+700.00	294.0587 (d)	81.951m	4,795,860.9244m	403,489.5132m
0+720.00	298.5789 (d)	62.777m	4,795,841.8491m	403,495.4968m
0+740.00	309.1379 (d)	45.363m	4,795,823.4656m	403,503.3526m
0+760.00	332.5239 (d)	32.950m	4,795,805.9582m	403,513.0043m
0+780.00	8.2977 (d)	32.092m	4,795,789.4601m	403,524.2984m
0+800.00	34.1826 (d)	43.141m	4,795,773.8076m	403,536.7441m
0+820.00	47.2547 (d)	59.481m	4,795,758.6429m	403,549.7832m
0+840.00	54.3646 (d)	77.620m	4,795,743.5907m	403,562.9525m
0+860.00	58.7399 (d)	96.497m	4,795,728.5388m	403,576.1222m
0+880.00	61.6724 (d)	115.751m	4,795,713.4869m	403,589.2918m
0+900.00	63.7645 (d)	135.223m	4,795,698.4349m	403,602.4615m

0+920.00	65.3285 (d)	154.829m	4,795,683.3830m	403,615.6311m
0+940.00	66.5431 (d)	174.523m	4,795,668.3253m	403,628.7941m
0+960.00	67.6217 (d)	194.219m	4,795,653.0209m	403,641.6675m
0+980.00	68.8265 (d)	213.749m	4,795,636.9559m	403,653.5704m
1+000.00	70.3320 (d)	232.857m	4,795,619.7339m	403,663.7133m
1+020.00	72.1111 (d)	251.383m	4,795,601.4471m	403,671.7923m
1+040.00	73.9464 (d)	269.560m	4,795,582.5921m	403,678.4547m
1+060.00	75.6664 (d)	287.729m	4,795,563.5301m	403,684.5075m
1+080.00	77.1906 (d)	306.104m	4,795,544.4512m	403,690.5072m
1+100.00	78.5414 (d)	324.672m	4,795,525.3723m	403,696.5069m
1+120.00	79.7454 (d)	343.401m	4,795,506.2934m	403,702.5066m
1+140.00	80.8245 (d)	362.266m	4,795,487.2146m	403,708.5063m
1+160.00	81.7861 (d)	381.268m	4,795,468.1575m	403,714.5744m
1+180.00	82.5773 (d)	400.525m	4,795,449.2838m	403,721.1861m
1+200.00	83.1315 (d)	420.122m	4,795,430.8570m	403,728.9481m
1+220.00	83.4005 (d)	440.011m	4,795,413.2192m	403,738.3597m
1+240.00	83.4032 (d)	460.004m	4,795,396.5828m	403,749.4479m
1+260.00	83.2260 (d)	479.949m	4,795,380.8251m	403,761.7596m
1+280.00	82.9661 (d)	499.824m	4,795,365.6014m	403,774.7295m
1+300.00	82.7012 (d)	519.685m	4,795,350.5258m	403,787.8719m
1+320.00	82.4555 (d)	539.556m	4,795,335.4517m	403,801.0163m
1+340.00	82.2273 (d)	559.436m	4,795,320.3777m	403,814.1606m
1+360.00	82.0147 (d)	579.324m	4,795,305.3037m	403,827.3049m
1+380.00	81.8163 (d)	599.219m	4,795,290.2296m	403,840.4493m
1+400.00	81.6247 (d)	619.115m	4,795,275.1981m	403,853.6420m
1+420.00	81.3957 (d)	638.955m	4,795,260.5383m	403,867.2444m
1+440.00	81.0762 (d)	658.620m	4,795,246.7330m	403,881.7086m

1+460.00	80.6255 (d)	677.909m	4,795,234.2984m	403,897.3627m
1+480.00	80.0431 (d)	696.640m	4,795,223.4881m	403,914.1795m
1+500.00	79.3459 (d)	714.695m	4,795,214.3768m	403,931.9754m
1+520.00	78.5757 (d)	732.168m	4,795,206.6554m	403,950.4215m
1+540.00	77.7828 (d)	749.342m	4,795,199.7494m	403,969.1907m
1+560.00	77.0095 (d)	766.528m	4,795,193.0779m	403,988.0452m
1+580.00	76.2700 (d)	783.845m	4,795,186.4101m	404,006.9009m
1+600.00	75.5625 (d)	801.288m	4,795,179.7422m	404,025.7567m
1+620.00	74.8853 (d)	818.848m	4,795,173.0744m	404,044.6125m
1+640.00	74.2366 (d)	836.517m	4,795,166.4066m	404,063.4682m
1+641.04	74.2036 (d)	837.439m	4,795,166.0597m	404,064.4492m

TECHNICAL SPECIFICATIONS

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1. INTRODUCTION AND GENERALITIES

1.1. TECHNICAL SPECIFICATIONS OBJECT

1.1.1. DEFINITION

This Technical Specifications constitutes the set of specifications, prescriptions, criteria and standards that, together with those established in the General Technical Specifications for Road and Bridge Works PG-3 de la Dirección General de Carreteras y Caminos Vecinales, approved by the O.M. de 6 de Febrero de 1976, and what is indicated in the Plans, define all the technical requirements of the works that are the object of the construction project: "Geometric Realignment and Platform Widening of CA-811".

It is legal for all purposes by O.M. de 2-VII-76, the publication of said General Technical Specifications, published by the Servicio de Publicaciones del Directorio General de Carreteras

The set of both Specifications also contains the general description of the works, the conditions that the materials must meet, the instructions for the execution, measurement and payment of the work units and are the guiding standard to be followed by the Contractor and Project Manager.

1.1.2. SCOPE OF APPLIACTION

These Specific Technical Specifications shall apply to the construction, control, management and inspection of the works corresponding to the construction project: “Geometric Realignment and Platform Widening of CA-811”.

1.1.3. CORRELATION WITH PG-3

The content of these Specifications is broadly based on the requirements of the PG-3. The corresponding articles of the PG-3 that are referenced are indicated in the sections.

1.2. GENERAL PROVISIONS

The specifications established in the Artículo 101.- “Disposiciones generales” del PG-3 supplemented or modified with those contained in this Article of these Specifications, as well as the rest of the provisions of PG-3.

1.2.1. CONSTRUCTION MANAGEMENT

The Construction Manager is the person with appropriate and sufficient qualifications, directly responsible for checking and monitoring the correct execution of the contracted works.

The powers assigned in these Specifications to the Project Manager and those assigned to him by current legislation, may be delegated to his collaborating personnel, in accordance with the established prescriptions, and the Contractor may require that such delegated powers be explicitly issued in order that appears in the corresponding "Order Book" of the work.

Any member of the Construction Manager's collaborating team, explicitly including the Construction Management body, may give in the event of an emergency, at the discretion of the same, the instructions that he or she deems pertinent within the legal attributions, which will be mandatory for the Contractor.

The inclusion in these Specifications of the expressions Construction Manager and Construction Management are practically ambivalent, taking into account the above, although it must be understood here that when indicating Construction Management, the functions or tasks to which this expression refers are presumably delegable.

The management, supervision and supervision of the works will be exercised by the Technical Services of the Government of Cantabria in the person designated by him.

The functions of the Director, in terms of the direction, control and supervision of the works, which fundamentally affect his relations with the Contractor, are those indicated in the apartado 101.3 del PG-3.

1.2.2. PERSONNEL, MEANS AND RESPONSABILITIES OF THE CONTRIBUTOR

The Contractor shall have at least the following technical staff:

- Delegate: Civil Engineer or Technical Public Works Engineer with more than 10 years of experience in construction works.
- Site Manager: Civil Engineer or Technical Public Works Engineer with full availability to the site, resident in Cantabria and a minimum of 5 years experience in similar works. Where appropriate, it may coincide with the previous one.
- Head of Topography: Technical Engineer in Topography with total availability to the site, resident in Cantabria and a minimum experience of 5 years in similar works.

- The one established in Artículo C107/11.- "Obligaciones Preventivas del Contratista" of these Specifications relating to the Preventive Organization of the Contractor on the Site for the fulfillment of its obligations in this area.
- Human and material resources necessary for the correct execution of the work.

The contractor is ultimately responsible for the quality of the materials used in the execution of the work, as well as for the result of the use of the means and methods of execution, even if the use of the materials and for the use of the means and methods of execution requires the approval of the D.O., and up to the limit established by the applicable rules and current legislation.

1.2.3. ORDER OF PROJECT DOCUMENTS

The documents that make up the project are the following:

- Document 1 - INTRODUCTION
- Document 2 – PRELIMINARY STUDIES
- Document 3 – PROJECT DESIGN
- Document 4 – TECHNICAL SPECIFICATIONS
- Document 5 – Budget
- Document 6 – Execution Plan
- Document 7 - Appendices

1.3. DESCRIPTION OF THE WORKS

The work is part of the improvement of the layout and extension of the platform of the CA-811 road that runs from Villanueva de la Peña to Herrera de Ibio

The subject of this Construction Project is the section of the road between kilometre points 0+000 (intersection with CA-811) and 1+640 (end point, metres before the bridge over the Ceceja stream).

The route is projected with a design speed of 60 km/h. The road has two lanes of 3.5 meters wide, each for one direction of traffic. A 1-metre hard shoulder is projected on the right side (uphill direction of PKs) and a small 0.3-metre hard shoulder on the left. In addition, a bike lane is included on the left of the road

The intersection of the CA-811 road (object of the project) with the CA-812 road that runs through Villanueva de la Peña will be adapted. The route extends 1640 meters and ends meters before an existing stone bridge that runs through the Ceceja Creek, which is outside the project area. In it, the route has been improved, the pavement defined, the drainage and the signage of the aforementioned section

The layout in plan and elevation has soft agreements to increase comfort and safety in circulation, complying in all cases with current regulations.

The volume of clearing and embankment is quite balanced in the work, being the volume of clearing slightly higher, it will be sent to landfill. On the slopes formed in embankment and clearing, vegetation will be restored by hydroseeding.

Se dispondrán elementos de drenaje tanto longitudinales (cunetas para el drenaje de calzada y márgenes) como transversales (obras de drenaje transversal para el drenaje de cuencas). También se dispondrá la señalización horizontal y vertical y elementos de contención de vehículos. No se instalará iluminación al encontrarse el trazado fuera del área urbana.

The following actions will be carried out:

- Execution of the earthworks. The standard section has two 3.5-metre-wide lanes, 1-metre and 0.3-metre hard shoulders and a 2-metre bike lane. Sections of clearing and embankment will be built.
- Execution of the drainage. Transverse drainage is contemplated, to drain the water that discharges from the basins to the roadway, and longitudinal, to evacuate runoff from the platform and margins.
    - Transversal: 3 transverse drainage works are proposed along the bypass.
    - Longitudinal: VA-75 type ditches will be executed
- Spreading of the pavement layers. Starting from a suitable soil and a T41 traffic category, 50 cm of suitable soil, 30 centimetres of cement-stabilised soil (S-EST-3), 20 centimetres of gravel and the following pavement layers will be available, to achieve an E3 esplanade:
    - Middle layer: AC22 BIN 50/70 SB LIMESTONE, 10 cm.
    - Tread: AC16 SURF 50/70 D, 5 cm.
- Placement of signage and containment systems. Both vertical signage (signs with RA-2 retroreflectance and RA-3 signs) and horizontal signage (road markings and islands) are contemplated, as well as N2-W2 vehicle containment barriers.

- Environmental integration. The revegetation of slopes will be carried out by hydroseeding.

1.3.1. DOCUMENTATION TO BE DELIVERED TO THE CONTRACTOR

Los documentos, tanto del proyecto como otros complementarios que la Dirección de Obra entregue al Contratista, pueden tener un valor contractual o meramente informativo, según se detalla en el presente Artículo.

Contract Documents

The provisions of artículos 82, 128 y 129 del Reglamento General de Contratación del Estado y en la cláusula 7 del pliego de Cláusulas Administrativas Generales para la contratación de obras (Contratos del Estado).

The work programme shall be a contractual document when it is mandatory, in accordance with the provisions of artículo 128 del Reglamento General de Contratación or, failing that, when expressly provided for in the Specific Administrative Clauses specifications.

The Environmental Impact Statement will be a contractual document, which will be the pronouncement of the competent environmental authority, in which, in accordance with the artículo 4 del R.D.L. 1302/1986, It determines, with respect to the foreseeable environmental effects, the convenience or not of carrying out the planned activity, and, if so, the conditions that must be established in order to adequately protect the environment and natural resources.

In this case, it is the responsibility of the Vice-Ministry of the Environment to formulate said Declaration. The specific studies carried out to obtain the identification and assessment of environmental impacts will be of a purely informative nature. This is not the case with the Corrective Measures and Surveillance Plan included in the Construction project.

In the event that it is deemed necessary to classify any other project document as contractual, this will be stated in the Specific Technical Specifications, establishing then the rules by which the contracting incidents will be governed by the other contractual documents.

Notwithstanding the foregoing, the contractual nature will only be considered applicable to said document if it is expressly mentioned in the Tender Documents in accordance with the artículo 81 del Reglamento de Contratación del Estudio.

Both the geotechnical information of the project and the data on the origin of materials, unless such origin is required in the corresponding article of the Specific Technical Specifications, tests, local conditions, diagrams of earthworks, studies of machinery, climatic conditions, price justification and, in general, all those that are usually included in the project report, they are informative and should therefore be accepted only as supplements to the information that the Contractor must acquire directly and with its own means.

Therefore, the Contractor will be responsible for any errors that may arise from its defect or negligence in obtaining all the data that affect the contract, the planning and the execution of the works.

Documents Defining Works and Order of Priority

The works are defined by the Plans, the Specifications and the regulations included in section 1.1.3 of these Specifications.

It is not the purpose, however, of Plans and Specifications to define each and every one of the details or construction particularities that may be required for the execution of the works, nor will it be the responsibility of the Administration, the Designer or the Construction Manager for the absence of such details, which must be executed, in any case, by the Contractor, in accordance with current regulations and following widely accepted criteria in the execution of similar works.

Compliance with Ordinances and Regulations in Force

The Contractor is obliged to comply with the legislation in force that, for any reason, during the development of the works, is applicable to it, even if it is not expressly indicated in these Specifications or in any other document of a contractual nature.

1.3.2. DRAWINGS

The works will be carried out in accordance with the Project Plans used for its award and with the instructions and complementary execution plans that, with sufficient detail for the description of the works, the Property will deliver to the Contractor.

Complementary and New Works Plans

The Contractor must request in writing addressed to the Construction Management, the complementary execution plans necessary to define the works to be carried out 30 days before the scheduled date in accordance

with the work program. The plans requested under these conditions will be delivered to the Contractor within a period not exceeding 15 days.

Interpretation of the Plans

Any doubt in the interpretation of the plans must be communicated in writing to the Construction Manager, who within 15 days will give the necessary explanations to clarify the details that are not perfectly defined in the Plans.

Confrontation of Plantations and Measures

The Contractor shall immediately after receipt of all the Drawings provided to it and shall promptly inform the Director of Works of any anomaly or contradiction.

The dimensions of the Plans will always prevail over the scale measurements.

The Contractor must compare the different Plans and check the dimensions before rigging the work and will be responsible for any error that could have been avoided if it had done so.

Complementary Detail Drawings

It will be the responsibility of the Contractor to prepare as many complementary detailed plans as necessary for the correct execution of the works. These plans will be submitted to the Construction Management 15 working days in advance for approval and/or comments.

Archive of Documents That Define Works

The Contractor shall have at its disposal on site a complete copy of the Specifications and the legal regulations reflected therein, a complete set of the Project Drawings, as well as copies of all the complementary drawings developed by the Contractor and accepted by the Construction Management and of the revised plans provided by the Construction Management. along with any accompanying instructions and supplemental specifications.

On a monthly basis and as a result of this updated file, the Contractor is obliged to submit a collection of the "*As Built*" plans or plans of the work actually executed, duly contrasted with the data obtained jointly with the Construction Management, being responsible for the expenses incurred for this reason.

The data reflected in the "*As Built*" drawings must be checked and approved by the Contractor's Quality Assurance Manager.

The Contractor will be obliged to submit a monthly technical report to the Technical Services of the Provincial Council's Construction Management, in relation to the actions and possible incidents with environmental repercussions that have occurred. The degree of execution of the corrective measures and the effectiveness of these measures will also be indicated. If the results are negative, they will be studied and a proposal for new corrective measures will be presented.

The Property will provide original plans for the execution of this work.

1.3.3. CONTRADICTIONS, OMISSIONS OR ERRORS IN DOCUMENTATION

What is mentioned in the General and Particular Technical Specifications and omitted from the plans or vice versa, must be executed as if it were contained in all these documents.

In the event of contradiction between the Project Plans and the Specifications of Prescriptions, the provisions of the latter shall prevail.

Omissions in Plans and Specifications or erroneous descriptions of details of the work, which are manifestly indispensable to carry out the spirit or intention set forth in the Plans and Specifications or that by use and custom must be made, not only do not exempt the Contractor from the obligation to execute these omitted or erroneously described details of work, but, on the contrary, they must be executed as if they had been fully and correctly specified.

For the execution of the aforementioned details, the Contractor will prepare sketches that will be available to the Director of the Works for approval and subsequent execution and payment.

In any case, the contradictions, omissions or errors that are noticed in these documents by the Director or by the Contractor, must be mandatorily reflected in the Order Book.

1.4. DEVELOPMENT AND CONTROL OF THE WORKS

1.4.1. EQUIPMENT AND MACHINERY

The equipment and machinery necessary for the execution of all the work units must be previously justified by the Contractor, in accordance with the volume of work to be carried out and the work program of the works, and submit them to the Construction Management for approval.

The verification of the Construction Management refers exclusively to the verification that the aforementioned equipment complies with the conditions offered by the Contractor. It will not hold the latter responsible for being solely responsible for the quality and the execution time of the works.

The equipment will always be kept in satisfactory working conditions and exclusively dedicated to the works of the contract, it may not be removed without written authorization from the Construction Management, after justification that the work units for whose execution it was planned have been completed.

1.4.2. INSTALLATIONS, WORKS AND AUXILIARY MEANS

Facilities and Auxiliary Works Project

The Contractor is obliged to design and build, at its own expense, all auxiliary buildings for offices, warehouses, sheds, sanitary facilities and other temporary facilities.

It is also responsible for the connection and supply of electricity and water for the execution of the works, which will be carried out in accordance with the regulations in force and the rules of the Supply Company.

The projects of the works and auxiliary facilities must be submitted to the approval of the Construction Management.

Location and Execution

The location of these works, dimensions and even their appearance when the main work so requires, will be subject to the approval of the Construction Management. The provisions of the section on temporary occupation of land shall also apply.

The Contractor is obliged to submit a plan of the exact location of the work facilities, such as machinery parks, warehouses of materials, oils and fuels, etc., taking into account the protection and not affecting the natural values of the area. This plan must be submitted to the Construction Management for approval.

Removal of Facilities and Auxiliary Works

The Contractor at the end of the works or in advance, as far as possible, shall remove all auxiliary and/or temporary buildings, works and installations at its own expense.

After removing them, they will proceed to clean the places occupied by them, leaving these, in any case, clean and free of debris.

The Contractor will proceed to the appropriate treatment of the surfaces compacted by the facilities and auxiliary works and their subsequent restoration in accordance with the technical and material conditions described in the Specifications of the Revegetation Project.

1.4.3. GUARANTEE AND QUALITY CONTROL OF THE WORKS

Definition

Quality assurance shall be understood as the set of planned and systematic actions necessary to provide adequate confidence that all structures, components and facilities are constructed in accordance with the contract, codes, standards and design specifications.

Quality assurance includes quality control, which includes those actions to verify that the quality is in accordance with the predetermined requirements. The quality control of a work includes the following aspects:

- Quality of raw materials.
- Quality of equipment or materials supplied to the site, including its manufacturing process.
- Quality of execution of the works (construction and assembly).
- Quality of the finished work (inspection and testing).

Contractor Quality Assurance Program

Once the bid has been awarded and one month before the date scheduled for the start of the work, the Contractor will send a Quality Assurance program to the Construction Management.

The Construction Management will evaluate the program and will communicate its approval or comments in writing to the Contractor.

The quality assurance programme shall include at least the description of the following concepts:

- Organization:

This section will include a specific functional and nominal organisational chart for the contract.

The organizational chart will include the specific organization of quality assurance in accordance with the needs and demands of the work. The means, whether own or third-party, will be properly approved.

The Contractor's quality assurance officer shall be exclusively dedicated to his or her function.

- Procedures, instructions and plans:

All activities related to construction, inspection and testing must be carried out in accordance with work instructions, procedures, plans or other similar documents that develop in detail what is specified in the Technical Specifications of the Project.

The program will contain a list of such procedures, instructions and plans that will subsequently be submitted to the Construction Management for approval, sufficiently in advance of the start of the work.

- Control of purchased materials and services

The Contractor will carry out a prior evaluation and selection of suppliers that must be documented and will be submitted to the approval of the Construction Management.

The documentation to be submitted for each proposed equipment or material will be at least the following:

- Equipment plan.
- Detail plan.
- Sufficient complementary documentation so that the Site Manager can have the precise information to determine the acceptance or rejection of the equipment.
- Materials that make up each element of the equipment.
- Standards according to which it has been designed.
- Construction procedure.
- Standards to be used for acceptance tests, specifying which of them must be carried out on the bench and which on site.

Likewise, it will carry out the reception inspection in which it is verified that the material is in accordance with the requirements of the Project, issuing the corresponding inspection report.

- Handling, storage and transport

The quality assurance program to be developed by the Contractor must take into account the procedures and instructions for compliance with the requirements related to the transport, handling and storage of the materials and components used in the work.

- Special processes

Special processes such as welding, testing, testing, etc., will be carried out and controlled by qualified personnel of the Contractor, using approved procedures in accordance with the applicable codes, standards and specifications. The programme shall define the means of ensuring and documenting such requirements.

- Inspection of the work by the Contractor

The Contractor is responsible for carrying out the controls, tests, inspections and tests required in these Specifications. The program must define the system to be developed by the Contractor to comply with this section.

- Documentation management

The proper management of the documentation relating to the quality of the work will be ensured, so that a final documented evidence of the quality of the elements and activities included in the quality assurance programme is achieved.

The Contractor shall define the means to ensure that all documentation relating to the quality of the construction is filed and controlled until it is delivered to the Construction Management.

Quality Control Plans and Inspection Point Programs

The Contractor shall submit to the Construction Management a quality control plan for each activity or phase of work one month prior to the scheduled start date of the activity or phase.

The Construction Management will evaluate the quality control plan and will communicate its approval or comments in writing to the Contractor.

The activities or phases of work for which a quality control plan will be presented will be, among others, the following:

- Reception and storage of materials.
- Reception and storage of equipment.
- Geometric control of earthworks.
- Fillings and compaction.
- Factory works.
- Concrete manufacturing and transportation. Installation on site and curing.
- Execution and rooting of plantations.
- Etc.

The quality control plan shall include, at least, a description of the following concepts where applicable:

- Description and purpose of the plan.
- Applicable codes and standards.
- Materials to be used.
- Construction plans.
- Construction procedures.
- Inspection, testing and testing procedures.
- Suppliers and subcontractors.
- Packing, transport and storage.
- Market and identification.
- Documentation to be generated regarding construction, inspection, testing and testing.

Attached to the quality control plan will be a program of inspection points, a document that will consist of a sequential list of all the construction, inspection, testing and testing operations to be carried out throughout the activity or phase of work.

For each operation, the reference of the Plans and procedures to be used will be indicated, whenever possible, as well as the participation of the Contractor's organizations in the controls to be carried out. A blank space will be left so that the Construction Management can mark its own inspection points.

Once the activity or work phase has been completed, there will be evidence (through protocols or signatures in the inspection point program) that all the inspections, tests and tests scheduled by the different organizations involved have been carried out.

Payment of Quality Assurance System Costs

The costs incurred by the Contractor as a result of the obligations incurred in compliance with the Specifications will be borne by the Contractor and are understood to be included in the prices of the Project.

In particular, all quality control tests and trials that need to be carried out in compliance with these Technical Specifications, or the general regulations applicable to this Project, will be at the expense of the Contractor, unless expressly specified otherwise.

Quality Control Level

The corresponding articles of these Specifications or the Plans specify the type and number of tests to be carried out systematically during the execution of the work to control the quality of the work. It is understood that the fixed number of tests is minimum and that, in the event that several criteria are indicated to determine their frequency, the one that requires a higher frequency will be taken.

The Site Manager may modify the frequency and type of such tests in order to achieve adequate quality control of the work, or request the Contractor to carry out quality controls not provided for in the Project. The additional tests caused will be at the expense of the Contractor provided that their amount does not exceed 2% of the total net budget for the execution of the work, including extensions, if any.

Inspection and Quality Control by the Construction Management

The Construction Management, on its own, may maintain a team for inspection and quality control of the works and carry out homologation and contradictory tests.

The Construction Management, in order to carry out these tasks with its own programs and procedures, will have access at any time to all the work pits, sources of supply, factories and production processes, laboratories and quality control files of the Contractor or its subcontractor.

The Contractor shall supply, at its own expense, all the materials to be tested, and shall provide the necessary facilities for this purpose.

The cost of carrying out these contradictory tests will be borne by the Administration if, as a result of them, the supply, material or unit of work meets the quality requirements.

The tests will be at the expense of the Contractor in the following cases:

a) If as a result of the tests the supply, material or unit of work is rejected.
b) If they are additional tests proposed by the Contractor on supplies, materials or work units that have been previously rejected in the tests carried out by the Construction Management.

1.4.4. MATERIALS

All materials must be suitable for the purpose for which they are intended and having been taken into account in the bases of prices and formation of budgets, it is understood that they will be of the best quality in their class among those existing in the market.

For this reason, and although due to their particular characteristics or lesser relative importance they have not deserved to be the subject of a more explicit definition, their use will be conditional on the approval of the Chief Engineer, who may determine the appropriate acceptance tests or tests for this purpose.

In any case, the materials will be of equal or better quality than that which could be deduced from their origin, valuation or characteristics, cited in any document of the Project, they will be subject to official standards or criteria of good manufacturing in the field, and the Chief Engineer may demand their supply by signature that offers the appropriate guarantees.

The figures for weights or volumes of materials that appear in the composite units of Price Table No. 2, will serve only to know the cost of these materials collected on site, but for no reason concepto tendrán valor a efectos de Define the proportions of the mixtures or the volume necessary in stockpiles to achieve the unity of this, compacted on site.

1.4.5. EARTH EXTRACTION

Before the excavation, all the topsoil necessary for revegetation will be removed, after separating trees, plants, stumps, weeds, fallen wood, debris, rubbish or any other existing material that may alter the quality and conservation of the land.

This land is located in the surface horizons of the soil. Only those horizons explored by the roots should be extracted, discarding the layers near the excessively clayey rocks.

Compaction by passing machinery of the surface to be stripped must be avoided.

The earth must also be removed prior to any excavation of trenches, wells, opening of runways, etc.

Topsoil should not be operated on in the event of rainy days or when the soil is excessively caked.

If deemed necessary, the different layers of the soil must be removed separately, easily differentiated by their different colour, abundance of roots, texture, etc. Lands of different quality should be managed separately to preserve the qualities of those better lands.

The stockpiling of topsoil is the stacking of this soil in the necessary quantity for its subsequent use in sowing and planting. The collection will be carried out in the chosen places and in agreement with the Construction Management, so that they do not interfere with the normal development of the works, respecting the environment and in accordance with the instructions described in the corresponding work unit. The provisions of the section on the temporary location of materials will be applied. In stockpiles, topsoil will be kept free of stones and other foreign objects.

1.4.6. STOCKPILES, LANDFILLS AND LOANS

The Administration will make land available and will indicate the minimum operations for the start and operation of the landfill. However, the Contractor may look for other landfills if it deems it appropriate, under its sole responsibility and will be responsible for the expenses of the discharge fee.

A Surplus Dumping Plan will be drawn up and must be complied with by the Contractor awarded the works. This plan will indicate the characteristics of the landfills, such as the shape of the deposits, their location, volume, etc.

No more area than that initially planned for landfills will be affected. The trees that are adjacent to the landfill and whose persistence is decided by the Revegetation Project and the Construction Management, must be protected by avoiding compaction on the area of their base corresponding to the overhang of the crown.

The surplus to be dumped will be made up exclusively of inert materials from the work. The development and execution of the Surplus Plan will be supervised by the Construction Management, which may establish modifications to it, provided that they are not of a substantial nature. If there are substantial variations in it, during the execution of the works, the Contractor is obliged to submit to the Construction Management an Environmental Impact Study whose methodology and content conforms to the provisions of the Ley 21/2013, de 9 de diciembre, de Evaluación Ambiental.

The search for loans and their payment to the owners will be the responsibility of the Contractor, as well as the operations necessary for their initiation and operation, which will be under the approval and supervision of the Construction Management. The latter may determine that the materials from the excavation are dumped and spread on land owned by it, within a maximum radius of ten (10) kilometers from the excavation site, without it being a reason to review the contracted price.

The Site Manager shall have one (1) month to capture or refuse the extraction and dumping sites proposed by the Contractor. The term will be counted from the moment the Contractor notifies the dumps, loans and/or quarries that it intends to use. The acceptance by the Site Manager of the extraction and dumping sites does not limit the Contractor's liability, both with respect to the quality of the materials and the exploitable volume of the deposit and the obtaining of the corresponding licences and permits.

The Contractor is obliged to dispose at its own expense of materials of lower quality than that required that appear during the exploitation of the previously authorised quarry, gravel pit or deposit.

And if during the course of the exploitation the materials cease to meet the quality conditions, or if the volume or production is insufficient, due to an increase in the proportion of non-usable material, the Contractor must find another place of extraction in accordance with the rules given in the previous paragraphs and without the change of natural deposit giving him the option of demanding any compensation.

The Contractor may use the materials obtained from the excavation in the works provided that they meet the conditions set forth in these Specifications.

The Construction Management may provide the bidders or Contractors with any data or prior study that it becomes aware of when drafting the Project, but always for information purposes and without this annulling or contradicting the provisions of the first paragraph of this section.

The locations of the areas for the installation of the stockpiles will be proposed by the Contractor for the approval of the Construction Management. The provisions of the section on temporary occupation of land shall also apply.

1.4.7. ACCESS TO WORKS

Construction of Access Roads

The ramps and provisional accesses to the different pits will be executed under the responsibility and on behalf of the Contractor. The Construction Management may request that all or part of them be built before the start of the works.

The Contractor must submit a plan with the access roads, taking into account the minimum impact on the natural environment and must be submitted to the approval of the Construction Management.

The Contractor will proceed with the appropriate treatment of the compacted surfaces and their subsequent restoration in accordance with the technical and material conditions described in the Revegetation Project.

The Contractor will be obliged to reconstruct at its own expense all those works, constructions and installations of public or private service, such as cables, sidewalks, ditches, sewerage, etc., that are affected by the construction of roads, accesses and provisional works. They must also place the necessary signage at junctions or detours with roads, streets, etc. It must also remove all surplus construction materials and means from the site, once the construction is finished, leaving the area perfectly clean.

The roads or accesses will be located, as far as possible, outside the place where the final works are located. In the exceptional case that interference must necessarily occur, the subsequent modifications necessary for the execution of the works will be borne by the Contractor.

Conservation and Use

The Contractor will maintain the temporary accesses and roads in suitable conditions for their use. If the roads are to be used by several Contractors, they shall agree among themselves on the distribution of the costs of their construction and maintenance, which shall be made in proportion to the traffic generated by each Contractor. In the event of a discrepancy, the Construction Management will arbitrate the distribution of the aforementioned expenses by paying or deducting the amounts resulting, if necessary, from the payments corresponding to each Contractor.

Temporary Land Occupation for Access Roads

In the event that the construction of the accesses affects third parties and involves any type of temporary occupation, the Contractor must have reached a prior agreement with those affected, with the amount of the expenses being borne by the Contractor.

1.4.8. OCCUPATIONAL HEALTH AND SAFETY

It covers the measures and precautions that the Contractor is obliged to carry out and adopt during the execution of the works for the prevention of risks, accidents and occupational diseases, as well as those derived from the hygiene and welfare work of the workers.

According to Real Decreto 84/1990, An Occupational Health and Safety study must be part of this Work Execution Project, consistent with the content of said work execution project, in which the specific safety and hygiene problems will be developed with a minimum content and characteristics. This plan shall not exceed the budget of the health and safety project corresponding to the Project, it being understood that any excess shall be included in the percentage of indirect costs that are part of the Project prices.

The payment of the budget corresponding to the health and safety project will be made in accordance with the corresponding price table that appears therein, or, where appropriate, in the occupational health and safety plan, approved by the Administration, and which is considered a contract document for this purpose.

1.4.9. NOISE AND VIBRATION CONTROL

The Contractor shall take appropriate measures to minimize noise and vibration.

Noise level measurements in urban areas shall remain below the limits indicated in this paragraph.

In general, the Contractor must comply with the provisions of the Regulations in Force, whether they are National ("Health and Safety Regulations") or for Municipal use. In the event of doubt, the most restrictive will be applied.

All machinery located outdoors shall be organised in such a way as to minimise noise generation. In compressors used outdoors, the noise level shall not exceed the specified values. If at 7 m they produce sound levels greater than 75d/B (A) they will not be located less than 8 m from homes or similar. If the levels are higher than 70 d/B (A) they shall not be located less than 4 m from dwellings or similar.

Mobile compressors shall operate and be maintained in accordance with the manufacturer's instructions to minimize noise, and unnecessary operation shall be avoided.

Pneumatic tools shall be equipped, as far as possible, with silencers.

1.4.10. EMERGENCIES

The Contractor shall have the necessary organization to carry out urgent work, outside working hours, necessary in the opinion of the Site Manager, to solve emergencies related to the works of the Contract.

The Site Manager shall at all times have an up-to-date list of addresses and telephone numbers of the Contractor's personnel responsible for the organisation of these emergency works.

1.4.11. WORK MODIFICATIONS

If during the execution of the works causes arise that motivate modifications in the execution of the same with reference to what was planned or under different conditions, the Contractor will inform the Construction Management of these facts so that it can authorize the corresponding modification.

Within twenty days of the delivery by the Construction Management to the Contractor of the documents containing the modifications to the Project prepared by said Management, or, where appropriate, simultaneously with the delivery to the Construction Management by the Contractor of the plans or documents in which the latter proposes the modification, the Contractor shall submit the list of prices covering the new concepts.

For the payment of these unforeseen or modified works, the provisions of the section on contradictory prices will apply.

1.4.12. CONSERVATION OF WORKS DURING THE WARRANTY PERIOD

The Contractor undertakes to conserve at its own expense, until they are provisionally received, all the works that make up the Project. In addition, it is obliged to keep it for the guarantee period of one year from the date of provisional receipt, for which it will be paid, with justification, the corresponding expenses, for which an item is reserved in budget document

Works that have suffered deterioration due to negligence or other reasons attributable to the Contractor, or for any cause that may be considered avoidable, will not be counted for these purposes. Likewise, it will be the Contractor's obligation to replace and collect from the third party responsible for accidents or deterioration caused by third parties, due to the exploitation of the work.

1.4.13. FINAL CLEANING OF WORKS

When the works are completed, all installations, warehouses and buildings temporarily constructed for the service of the work must be removed and the sites of their site restored to their original form.

Temporary roads, including access to loans and quarries, should be treated in the same way.

It will be executed in such a way that the affected areas are completely clean and in aesthetic conditions, in accordance with the surrounding landscape. These works will be paid in the form of a lump sum.

The technical indications of the Construction Management will not be subject to payment, as in the case of landfills whose disposal is provided by the Administration, and must also comply with the obligations indicated by the Management for the final conditioning of these.

1.5. CONTRACTOR LIABILITY

1.5.1. PERMIT AND LICENSES

The Contractor must obtain, at its own expense, the permits or licenses necessary for the execution of the works, with the exception of those corresponding to the expropriation of the areas defined in the project.

1.5.2. INSURANCE

The Contractor will take out "fully comprehensive" insurance to cover any damage or compensation that may occur as a result of carrying out the work.

1.5.3. THIRD-PARTY CLAIMS

All claims for damages received by the Contractor shall be notified in writing and without delay to the Site Manager. A similar exchange of information will be effected from complaints received in writing.

The Contractor shall notify the Site Manager, in writing and without delay, of any accident or damage that occurs during the execution of the works.

The Contractor will take the necessary precautions to avoid any kind of damage to third parties and will attend as soon as possible to the claims of affected owners that are accepted by the Construction Manager.

In the event of damage to third parties, the Contractor shall inform the Site Manager and those affected.

The Contractor shall restore the property to its original location as quickly as possible, especially if it is a critical public service or if there are significant risks.

1.6. MEASUREMENT AND PAYMENT

1.6.1. PAYMENT OF WORK

Unless otherwise indicated in the Bidding Documents and/or the Award Contract, the contracted works will be paid as "Works at unit prices" applying the unit prices to the resulting work units.

Likewise, they may be liquidated in whole or in part, by means of lump sum items.

In all cases of settlement by application of unit prices, the quantities to be taken into account will be established on the basis of the quantities deducted from the measurements.

Measurements are the data collected from the qualitative and quantitative elements that characterize the works executed, the stockpiles made, or the supplies made; they constitute verification of a certain state of fact and will be carried out by the Construction Management who will present it to the Contractor.

The Contractor is obliged to request (in due time) the presence of the Construction Management, for the contradictory taking of measurements in the works, services and supplies that are not susceptible to subsequent verifications or verifications, in the absence of which, unless contrary evidence must be provided at its own expense, the decisions of the Construction Management will prevail with all their consequences.

Certifications

Unless otherwise indicated in the Bidding Documents and/or the Award Contract, all payments will be made against monthly certifications of works executed.

At the end of each month, the Construction Management will draw up a provisional valued list of the works carried out in the previous month and at origin to be used to draw up the corresponding certification, proceeding as specified in the General Administrative Clauses for State contracts.

The contract prices or the contradictory prices that have been approved by the Construction Management will be applied.

The contract prices are fixed and without revision whatever the execution period of the works.

The payment of the amount of a certification will always be made on good account and pending the final certification, with a reduction of the amount established as a guarantee, and considering the complementary payments and deductions that may result from the clauses of the Award Contract.

Upon the total completion of the work, a general and definitive certification will be established.

The payment of the sum due to the Contractor, after the establishment and acceptance of the final certification and deducting the partial payments already made, will be made, deducting the retention of guarantee and those others that result from the application of the clauses of the Award Contract and/or Bidding Documents.

The monthly provisional certifications, and the final certifications, will be established in such a way that the amount of the works settled by the administration and the overall amount of the other works appear separately, accumulated from the origin.

In all cases, payments will be made in the manner specified in the Award Contract, Bidding Documents and/or formula agreed upon in the award with the Contractor.

Application Pricing

The unit, elementary and lump sum prices of material execution to be used, will be those resulting from the application of the reduction made by the Contractor in its bid, to all the corresponding prices of the project, except in those units explicitly specified in the corresponding articles of the chapter "work units" of these Specifications, in which a reduction is considered when a loan material is replaced, quarry or any other external source, for another obtained in the work carried out on the site itself.

All unit or lump sum prices for "material execution" include, without exception or reservation, all the expenses and charges incurred in the execution of the works corresponding to each of them, including those resulting from the obligations imposed on the Contractor by the different documents of the contract and especially by these Technical Specifications.

These prices will include all the expenses necessary for the execution of the corresponding works until their complete completion and fine-tuning, so that they serve the purpose for which they were projected, and especially the following:

- The costs of labour, consumables and miscellaneous supplies, including necessary finishes and finishes, even if they have not been expressly described in the justification of unit prices.
- Planning, coordination and quality control costs.
- The costs of carrying out calculations, plans or construction sketches.
- Storage, transport and tool costs.
- The costs of transport, operation, conservation and repair of auxiliary work equipment, as well as the costs of depreciation or depreciation of the same.
- The costs of maintaining the auxiliary access roads of other provisional works.
- Electricity costs for motive power and lighting, unless expressly stated otherwise.
- Insurance of all kinds.
- Financing costs.
- The "execution by contract" prices obtained according to the criteria of the Bidding Specifications or Award Contract also include:

- Overhead and industrial profit.
- Taxes and fees of all kinds.

The prices also cover:

- Non-recoverable expenses related to the study and establishment of all auxiliary facilities, unless expressly indicated that they will be paid separately.
- Non-recoverable expenses related to the dismantling and removal of all auxiliary installations, including the arrangement of the corresponding land, unless it is expressly indicated that they will be paid separately.

Those units that are not specifically listed in these Technical Specifications will be paid completely finished in accordance with the conditions at the prices set in Price Table No. 1 that include all the expenses necessary for their execution, understanding that when said completely finished, materials, auxiliary means, paintings, tests, commissioning and all the elements or operations required for the use of the units in the question.

Except in the cases provided for in these Specifications, the Contractor may not, under any pretext, request the modification of the award prices.

Departures Alzadas

These are items in the budget corresponding to the execution of a work, or one of its parts, in any of the following cases:

- For a fixed price defined prior to the execution of the work and without decomposition in the unit prices (lump sum of full payment).
- The invoicing at its expense is justified by the application of existing elementary or lump sum unit prices to real measurements whose definition is imprecise in the project phase (lump sum to be justified).

In the first case, the item will be paid in full after the completion of the work defined therein and under the conditions specified, while in the second case only the amount resulting from the actual measurement will be certified, with the availability of total or partial use of the same being discretionary for the Construction Management, without the Contractor having the right to claim for this concept.

The lump sum items will have the same treatment in terms of their classification (material and contractual execution) as that indicated for unit and elementary prices.

Unauthorized Work and Defective Work

As a general rule, work not contemplated in the Project and carried out without the authorization of the Construction Management will not be paid, as well as those defective that must be demolished and replaced at the quality levels required in the Project.

However, if any unit of work that has not been executed exactly in accordance with the conditions stipulated in the Specifications, and is nevertheless admissible in the opinion of the Construction Management, it may be provisionally and definitively received, as the case may be, but the Contractor will be obliged to conform without the right to claim of any kind, with the economic reduction that is determined, except in the case in which the Contractor prefers to demolish it at its own expense and rebuild it in accordance with the conditions within the established contractual period.

Incomplete Work Units

When, due to termination or other circumstance, it is necessary to value incomplete works, the prices of Price Table No. 2 will be applied, without the valuation of each unit of work other than the valuation of said table being claimed, nor that the Contractor is entitled to any claim for insufficiency or omission of the cost of any element that constitutes the price. The items that make up the breakdown of the price will be payable, when all the material, including the accessories, are stockpiled, or the work or operations that determine the definition of the item have been carried out in their entirety, since the criterion to be followed must be that only phases with completed execution are considered payable, the Contractor losing all rights in the event of leaving them incomplete.

Excesses of Work

Any excess work that has not been authorised in writing by the Construction Manager will not be paid.

The Construction Manager may decide in this case that the necessary restitution be made to adjust the work to the definition of the Project, in which case all the expenses that this causes will be borne by the Contractor.

Payment of Stockpiled Materials

The Construction Management reserves the right to make to the Contractor, at the request of the Contractor, payments on the price of certain materials collected in the work, acquired in full ownership and effectively paid by the Contractor.

The subscriptions will be calculated by applying the elementary prices that appear in the price tables.

If the price tables do not specify the basic prices required, credit memos may be calculated on the basis of the invoices submitted by the Contractor.

The materials collected on which the payments have been made may not be removed from the work without the authorization of the Construction Management and without the prior reimbursement of the fertilizers.

The payments on stockpiles will be deducted from the monthly provisional certifications, to the extent that the materials have been used in the execution of the corresponding work.

The payments for materials made may not be invoked by the Contractor to mitigate its responsibility, relating to the proper conservation until use, of all the stockpiles in storage. The Contractor is responsible in any situation for the stockpiles constituted on site for its works, whatever their origin.

The advance payments for stockpiles do not oblige the Construction Management in terms of accepting elementary prices for materials, being only representative of quantities on account.

Price Review

Depending on the items that make up the Budget of the work, the following is set as a price revision formula:

Kt = 0,01At /A0 + 0,05Bt /B0 + 0,09Ct /C0 + 0,11Et /E0 + 0,01Mt /M0 + 0,01Ot /O0 + 0,02Pt /P0 + 0,01Qt /Q0 + 0,12Rt /R0 + 0,17St /S0+ 0,01Ut /U0 + 0,39

Where the meaning of each of the terms is as follows:

Kt: theoretical revision coefficient for the moment of execution t.

At: cost index of aluminium at the time of execution t.

Year: Aluminium cost index on the date of tender.

Bt: cost index of bituminous materials at the time of execution t.

Bo: bituminous materials cost index on the date of tender.

Ct: cement cost index at the time of execution t.

Co: cement cost index on the date of tender.

Et: energy cost index at the time of execution t.

Eo: energy cost index on the date of tender.

Mt: timber cost index at the time of execution t.

Mo: Wood cost index on the date of tender.

Ot: cost index of the plants at the time of execution t.

Oo: plant cost index on the date of tender.

Pt: cost index of plastic products at the time of execution t.

Po: cost index of plastic products on the date of tender.

Qt: Cost index of chemical products at the time of execution t.

Qo: Chemical Cost Index on the Tender Date.

Rt: aggregates and rocks cost index at the time of execution t.

Ro: Aggregates and rocks cost index on the date of tender.

St: Cost Index of Steel Materials at the Time of Execution t.

So: Cost index of steel materials on the date of tender.

Ut: copper cost index at the time of execution t.

Uo: copper cost index on the date of tender.

1.6.2. CONTRADICTORY PRICES

If the development of the work makes it necessary to execute units, for which there are no prices in the price tables of this Project, the corresponding unit prices will be formulated jointly by the Construction Management and the Contractor.

The auxiliary prices (materials, machinery and labour) and the average yields to be used in the formation of the new prices will be those that appear in the table of elementary prices and in the price breakdown of this Project, as far as they may be applicable.

The price will be fixed in any case before the new unit is executed. The application price will be set by the Administration, in view of the proposal of the Construction Manager and the observations of the Contractor.

In the absence of mutual agreement and pending the resolution of the discrepancy, the Contractor will be provisionally liquidated based on prices estimated by the Construction Management.

1.6.3. EXPENSES ON BEHALF OF THE CONTRACTOR

In general, they are those specified as such in the chapters of these Technical Specifications and which are understood to be passed on by the Contractor in the different unitary, elementary and/or lump prices, as indicated in the second section of this Article.

1.7. CONSTRUCTION OFFICE

As a complement to the cláusula 7 del pliego de cláusulas Administrativas Generales, para la Contratación de Obras del Estado, Decreto 3954/1970 de 31 de diciembre, the obligation on the part of the Contractor to make available to the Chief Engineer sufficient dependencies (within the area of his work office) for the facilities that may be needed for the control and supervision of the works. At least it will provide an on-site office for the exclusive use of the technical services of the Construction Management. The useful area of the aforementioned offices will be at least 50 m2.

These facilities will be built and equipped with water, electricity and telephone services so that they are available for occupation and use thirty days after the date of commencement of the work.

The Contractor shall provide heating, light and cleaning until the completion of the work.

The telephone in these offices will be completely independent, so that it fully ensures your privacy.

The corresponding cost will be borne by the Contractor and will be understood to be reflected in the corresponding unit prices.

1.8. ZONE PROTECCTION

1.8.1. ZONE PREPARATION

The preparation of the land consists of removing from the areas foreseen for the location of the work, trees, plants, stumps, weeds, fallen wood, debris, garbage or any other existing material, which are in the way, that are not compatible with the Construction Project or are not trees to be protected.

These clearing operations will be carried out with the appropriate safety precautions, in order to avoid damage to existing constructions, adjacent properties, roads or public services and accidents of any kind. When the trees to be felled may cause damage to other trees that must be preserved or to adjacent buildings, they shall be chopped from the crown to the foot, or they shall be made to fall towards the centre of the cleaning area.

Before carrying out the filling, on a natural ground, it will be cleared, removing the stumps and roots, so that none remain inside the filling foundation or less than 15 cm deep below the natural surface of the land, also eliminating those that exist under the embankments. The gaps left by the extraction of stumps and roots will be filled with soil from the same soil, carrying out the compaction equivalent to the existing soil.

When there are wells or holes in the ground, their treatment will be set by the Construction Management as the case may be.

All materials that may be destroyed by fire shall be burned or removed to landfill in accordance with the indications of the Director of the Work and the regulations that exist in each locality.

1.8.2. DITCH CLEANING

When the accumulation of stones and other materials hinders the function of the gutters, they must be cleaned mechanically or manually.

Care will also be taken not to modify the size or shape of the initial ditch, in all the actions that may be carried out in them.

1.8.3. USED OIL TREATMENT

The treatment of used oils shall comply with the provisions of Ley 7/2022, de 8 de abril, of waste and contaminated soil for a circular economy.

Used oil means all industrial or lubrication oils, of mineral, natural or synthetic origin, which are no longer fit for their original use, such as used combustion engine oils and gearbox oils, lubricating oils, turbine oils and hydraulic oils, excluding used cooking oils.

Management is the set of activities aimed at giving used oils the final destination that guarantees the protection of human health, the conservation of the environment and the preservation of natural resources. It includes the operations of collection, storage, treatment, recovery, regeneration and combustion.

The producer is the natural or legal person who, as the owner of the activity, generates used oil. A producer is also considered to be a natural person who, by himself or by order of another natural or legal person, generates used oil. The Contractor will be responsible for all used oil generated.

The manager is the natural or legal person authorised to carry out any of the management activities of used oils, whether or not they are a producer of the same.

The Contractor is obliged to allocate the used oil to correct management, avoiding transferring the contamination to the different receiving media.

It is prohibited:

- Any discharge of used oil in surface waters, inland waters, groundwater, in any territorial sea area and in sewerage or wastewater disposal systems.
- Any deposit or discharge of used oil with harmful effects on the soil, as well as any uncontrolled dumping of waste derived from the treatment of used oil.
- Any treatment of used oil that causes air pollution above the level established in the legislation on the protection of the atmospheric environment.

The Contractor must comply with the prohibitions set out in the previous section, by delivering the aforementioned oil to an authorised manager. In order to comply with the provisions of the previous section, the producer must:

- Store used oils in satisfactory conditions, avoiding mixtures with water or other non-oily residues.
- Have facilities that allow the conservation of used oils until they are collected and managed, and that are accessible to the vehicles responsible for carrying out the aforementioned collection.
- Deliver the used oils to persons authorised for collection, or carry out, with due authorisation, the transport to the authorised place of management.

The Contractor shall submit to the Construction Management the control and monitoring document, which shall be signed by the producer and receiver. The Contractor shall keep a copy of the document corresponding to each assignment for one year. The manager will be obliged to send the competent body a copy of the documents relating to each assignment, as established in the Order.

1.8.4. LANDSCAPE INTEGRATION

The Construction Management may require a rounded finish on the contact edges between the earthwork and the natural terrain or on the edges between levelling planes, both horizontal and inclined, and the Contractor must in any case avoid the appearance of geometric shapes with sharp angles, except where the plans and the Project indicate it.

The slopes of the earthwork must be, in their entirety, shaped in accordance with what the Director indicates in this regard, and must be kept in perfect condition, until the final reception of the works, both in terms of functional and aesthetic aspects.

The contouring of slopes that are carried out to harmonize with the surrounding landscape must be done with a gradual transition, paying special attention to the transitions between slopes of different inclinations. At the intersections of clearing and filling, the slopes will be warped to join each other and with the natural surface of the land, without causing a visible discontinuity.

The finish of the slopes will be smooth, uniform and totally in accordance with the surface of the land and the work, without great contrasts, and adjusting to the Plans, trying to avoid damage to existing trees or rocks that have patina, for which the necessary adjustments must be made.

On slopes that are to be provided with vegetation cover, the surface must not be smoothed or compacted, without prejudice to safety, it will not undergo any final treatment, and it is even desirable to preserve the traces of the passage of machinery. The result of a sowing is directly linked to the state of the slope surface: being in stable equilibrium, it will be rough and uneven in such a way that the seeds and products of the hydroseeding or the topsoil to be spread find holes where they can resist washing or slipping.

The expenses derived from the refurbishment will be borne by the Contractor.

1.9. ENVIRONMENTAL IMACT STUDY

An Environmental Impact Study will be carried out, in the event of substantial variations in the Project, during the execution of the works, (access and work tracks, surplus plan and other unforeseen modifications).

According to the provisions of the Ley 21/2013, de 9 de diciembre, de Evaluación Ambiental, Any plan, programme or project likely to have significant effects on the environment must be submitted to an appropriate

environmental assessment before its adoption, approval or authorisation. Its methodology and content must be in accordance with the provisions of said Ley and in the Ley 9/2018, de 5 de diciembre, amending the Ley 21/2013, de 9 de diciembre, de evaluación ambiental, la Ley 21/2015, de 20 de julio, amending the Ley 43/2003, de 21 de noviembre, de Montes y la Ley 1/2005, de 9 de marzo, regulating the greenhouse gas emission allowance trading system.

1.10. RECEPTION AND LIQUIDATION

1.10.1. LIQUIDATION PROJECT

The Contractor will deliver to the Construction Management for approval all the sketches and plans of the work actually built and that involve modifications with respect to the Project or allow and have served to establish the editions of the certifications.

With all this duly approved documentation, or the contradictory plans and measurements of the Construction Management, where appropriate, the Liquidation Project will be constituted. Based on this, the final settlement of the works will be carried out in a single final certification, as indicated in the section on certifications.

1.10.2. PROVISIONAL ACCEPTANCE OF THE WORKS

At the end of the execution of the works subject to these Specifications, it will be verified that the works are completed in accordance with the prescribed conditions, in which case provisional acceptance will take place, in accordance with the provisions of the General Administrative Clauses Specifications (Chapter VI. section 1) and the General Regulations on State Procurement (Chapter VI Section 2).

The provisional acceptance record shall state the deficiencies that, in the opinion of the Construction Management, must be corrected by the Contractor, also stipulating the maximum period of two (2) months in which they must be executed, as well as the manner in which such work must be carried out.

1.10.3. WARRANTY PERIOD. CONTRACTOR LIABILITY

The guarantee period, counting from the provisional acceptance of the works, will be one (1) year. During this period, the Contractor will be in charge of the ordinary conservation of the same, regardless of the nature of the work to be carried out, provided that it was not motivated by force majeure. It must also correct those points that were reflected in the provisional acceptance record of the works. The Contractor will be responsible for the expenses corresponding to the general tests that would have to be carried out during the guarantee period, provided that this has been indicated in the provisional acceptance certificate of the works.

The guarantee period for the actions related to sowing and planting, described in the Revegetation Project and, as established in the Specifications of Prescriptions, will be two (2) years. During this guarantee period, maintenance and conservation of the plants, plantations, and related works will be established, for a period of two (2) years, as specified in the Specific Specifications of the Revegetation Project.

Maintenance includes all those works that need to be carried out periodically, daily or seasonally, on the planted areas to allow their evolution and development, as they had been designed in the project and thus achieve the functional and botanical characteristics that define and differentiate them, as well as to obtain increases in the ornamental value for which they have often been planted. For maintenance and conservation, the Revegetation Project establishes an item for the maintenance and conservation of plantations throughout the guarantee period. The Construction Management will carry out as many inspections as it deems appropriate to order the proper maintenance of the plants, sowing and constructions. With regard to the responsibility of the Contractor, it is up to the Construction Management to judge the true cause of the deterioration or deficiencies, deciding who is responsible for bearing the costs of the repairs.

1.10.4. FINAL ACCEPTANCE OF THE WORKS

At the end of the guarantee period, the final receipt of the refund of the amounts withheld as a guarantee will be made, if applicable. The final acceptance of the works does not exempt the Contractor from the responsibilities that may correspond to it, in accordance with current legislation, referring to possible defects due to hidden defects that arise in the useful life of the work. When the final acceptance is made, it will be necessary to verify those works or deficiencies that for different reasons appear in the provisional acceptance certificate, as pending execution or repair during the guarantee period.

2. BASIC MATERIALS

2.1. CONCRETE

2.1.1. DEFINITION

Concrete is defined as the mixture in appropriate proportions of cement, coarse aggregate, fine aggregate and water, with or without the incorporation of additives or additions, which develops its properties by hardening the cement paste (cement and water).

2.1.2. GENERAL CONDITIONS

Materials of this type must meet the characteristics specified by the Structural Code.

2.1.3. MATERIALS

The materials used in the manufacture of concrete, the characteristics of which are determined in the corresponding articles of PG-3, shall be the following:

- Artículo 202, "Cementos"
- Artículo 280, "Agua a emplear en morteros y hormigones"
- Artículo 281, "Aditivos a emplear en morteros y hormigones"
- Artículo 283, "Adiciones a emplear en hormigones"

2.1.4. CONCRETE TYPES

The following types of concrete will be used:

- HM-12,5
- HM-15
- HM-20

2.1.5. SUPPLY CONDITIONS

The delivery of concrete must be regulated in such a way that its installation is carried out continuously. The time elapsed between deliveries may not exceed, in any case, thirty minutes (30 min), when the concrete belongs to the same structural element or phase of a structural element.

2.1.6. EXECUTION

Poured

The free pouring of concrete from heights greater than two meters (2 m) will not be allowed, and it is forbidden to pour it with shovels over a long distance, distribute it with rakes, or make it advance more than one meter (1 m) inside the formwork. Efforts should always be made to distribute the concrete vertically, avoiding projecting the pouring jet onto reinforcement or formwork. When pouring the concrete, it will vibrate so that the reinforcements are perfectly enveloped, taking special care of the areas where there is a large number of them,

Compaction

The vibrators shall always be applied in such a way that their effect extends to the entire mass, without local segregation or significant leakage of slurry through the formwork joints. Compaction will be more careful and intense next to the walls and corners of the formwork and in areas of high density of reinforcement, until the paste refluxes to the surface.

If surface vibrators are used, they will be applied by moving them slowly, so that the surface of the concrete is completely moistened.

If vibrators attached to the formwork are used, special care must be taken to ensure the rigidity of the formwork and the devices anchoring the vibrators to them.

If internal vibrators are used, they should be immersed vertically in the pouring, so that their tip penetrates the adjacent vibrated pouring, and they should be removed at an incline. The needle should be inserted and removed slowly and at a constant speed, and it is recommended that no more than ten centimetres per second (10 cm/s) should be exceeded. The distance between immersion points shall be adequate to give the entire surface of the vibrated mass a shiny appearance; As a general rule, it will be preferable to vibrate at many points for a short time than to vibrate at few points for a long time.

Cured

During the setting and first hardening period, it must be ensured that the humidity of the concrete is maintained, for which it must be cured by means of procedures that do not cause any type of damage to the surface, when it has to be visible, nor involve the contribution of substances harmful to the concrete.

Direct irrigation with water (avoiding the washing of the concrete), the arrangement of burlap, straw mats or other similar fabrics with high moisture retention power, plastic sheets and film-forming curing products may be used as curing procedures, so that the evaporation rate does not exceed in any case half a litre per square metre per hour (0.50 l/m2 /h).

When concreting is carried out at a temperature above forty degrees Celsius (40ºC), the concrete must be cured by wet method. The curing process should continue without interruption for at least ten days (10 days).

2.1.7. MEASUREMENT AND PAYMENT

The concrete will be paid per cubic meters (m3) measured on the Project Plans, of the work units actually executed. Cement, aggregates, water, additives and additions, as well as the manufacture and transport and pouring of concrete, are included in the unit price of concrete, as well as its compaction, execution of joints, curing and finishing.

Operations that must be carried out to repair defects will not be paid.

2.2. MORTAR

2.2.1. DEFINITION

Cement mortars are defined as the mass made up of fine aggregate, cement and water. Eventually, it may contain an additive product to improve some of its properties, the use of which must have been previously approved by the Director of the works.

2.2.2. MATERIALS

The materials used in the manufacture of mortar, the characteristics of which are determined in their corresponding articles of PG-3, shall be as follows:

- Artículo 202, "Cementos"
- Artículo 280, "Agua a emplear en morteros y hormigones"
- Artículos 281 a 284, Productos de adición
- Artículo 610.2.3, Árido fino

2.2.3. MORTAR TYPES

M-250 type mortar will be used.

2.2.4. MANUFACTURING

The mortar may be mixed by hand or mechanically: in the first case it will be done on an impermeable floor. The cement and sand will be mixed dry until a homogeneous product of uniform colour is obtained. Next, the amount of water strictly necessary will be added so that, once the dough has been beaten, it has the right consistency for its application on site.

Only the mortar required for immediate use shall be manufactured, and all mortars that have begun to set and those that have not been used within forty-five minutes (45 minutes) following their kneading shall be rejected.

2.2.5. MEASUREMENT AND PAYMENT

The mortar will not be paid directly, as it is considered included in the price of the corresponding unit, unless it is defined as an independent unit, in which case it will be measured and paid for by cubic metres (m3) actually used.

2.3. STEEL REBAR

2.3.1. DEFINITION

Corrugated bars for structural concrete are steel products with a sensibly cylindrical shape that have protrusions or grooves on their surface in order to improve their adhesion to the concrete.

2.3.2. GENERAL CONDITIONS

Materials of this type must meet the characteristics specified by the Structural Code.

2.3.3. TYPE OF STEEL

Type B 400 S steel is used.

2.3.4. SUPPLY CONDITIONS

The material must be transported using appropriate procedures to ensure that the batches arrive at the place of delivery under the stipulated conditions.

2.3.5. RECEPTION AND CONTROL

Prior to ordering the batch, the scheduled tasks must be planned, in order to facilitate unloading and storage operations.

Inspections

Each delivery of the assembly batch will be accompanied by a supply sheet that will be available at all times to the construction manager/person responsible for the contract, and which must include, at least, the following information:

- Name of the company supplying the batch.
- Serial number of the supply sheet.
- Delivery date.
- Name of the petitioner and the person responsible for the reception.
- Technical specifications of the material delivered.
- Quantity and arrangement of the material that makes up the load, expressed in kg of material.
- Identification of the delivery truck (or transport equipment) and the person unloading.

2.3.6. QUALITY CONTROL

SMechanical test results may be requested at random.

Penalty

In the event of non-compliance with the specifications that affect the strength characteristics of the steel supplied and provided that, at the discretion of the construction manager/person responsible for the contract, these defects do not imply a significant loss of the functionality and safety of the work or part of it and it is not possible to correct them a posteriori, the batch may be accepted and penalties will be applied in the form of a deduction in the valued relationship, according to the following formula:

$$P1 = 0{,}1 \cdot P$$

Being:

- P1: unit deduction for penalty, €/Kg.
- Q: price of steel, €/Kg.

2.3.7. MEASUREMENT

The measurement and payment of the steel will be carried out in accordance with the provisions of the Specific Technical Specifications for the work unit of which it is part.

2.4. ASPHALT BITUMEN

2.4.1. DEFINITION

Asphalt bitumen, in accordance with the UNE-EN 12597 standard, are defined as hydrocarbon binders, practically non-volatile, obtained from crude oil or present in natural asphalts, which are totally or almost totally soluble in toluene, and with high viscosity at room temperature.

Three types of asphalt bitumens are specified:

- Conventional (UNE-EN 12591 standard).
- Hard (UNE-EN 13924-1 standard), for asphalt bitumens intended for the production of high-modulus bituminous mixtures.
- Multigrade (UNE-EN 13924-2 standard), with applications similar to those specified for conventional binders.

2.4.2. GENERAL CONDITIONS

The provisions of this article shall be without prejudice to the provisions of Reglamento 305/2011 de 9 de marzo, of the European Parliament and of the Council, laying down harmonised conditions for the placing of construction

products on the market. For CE marked products, the manufacturer shall be responsible for their conformity with the declared performance, in accordance with artículo 11 del Reglamento.

Asphalt bitumens must bear the CE marking, in accordance with the provisions of the previous UNE-EN standards.

In addition, the provisions of current legislation on environmental, health and safety, production, storage, management and transport of construction products, construction and demolition waste, and contaminated soil will be followed in all cases. The use of asphalt bitumens containing tars or other substances derived from the distillation of carbonaceous products - coal or others, or oxidized bitumens - is explicitly prohibited.

Asphalt bitumens must have a homogeneous appearance and be practically free of water, so that they do not foam when heated to the temperature of use.

The name of conventional and hard asphalt bitumens will be composed of two numbers, representing their minimum and maximum penetration, determined according to the UNE-EN 1426 standard, separated by a slash slanted to the right (/).

For both the tread layer and the intermediate and base layers, the bituminous binder to be used will be conventional bitumen type 50/70.

2.4.3. TRANSPORTATION AND STORAGE

The asphalt bitumen will be transported in heat-insulated tanks. The tanks must have a suitable element for taking samples, they must be equipped with thermometers located at clearly visible points, and they must be prepared to be able to heat the asphalt bitumen when, due to any anomaly, the temperature decreases and may prevent its transfer.

The Contractor shall notify the Construction Management in due time of the transport system to be used in order to obtain the corresponding approval, if applicable.

The tanks will be dedicated exclusively to the transport of asphalt bitumen, and adequate cleaning must be carried out beforehand if it has previously contained any other product.

The Director of Works may authorize, only for very short transports and in exceptional cases, the use of ordinary tanks without insulation or heating system, including those normally used for the transport of other liquids, provided that it can be verified that the tank has been completely cleaned.

The asphalt bitumen shall be stored in one or more tanks, suitably insulated from each other, provided with ventilation outlets to prevent them from working under pressure and shall have the necessary measuring and safety devices, in places of easy access.

The tanks must be heat-insulated and provided with thermometers located in clearly visible points and equipped with their own heating system, capable of preventing the temperature from deviating from that set for storage by more than ten degrees Celsius (10º C) in the event of any anomaly. They will also have a suitable valve for taking samples.

When the storage tanks do not have their own means of loading, the tanks used for the transport of bitumen asphalt shall be equipped with pneumatic or mechanical means for the rapid transfer of its contents to them. When transfer pumps are used, rotary pumps will be preferable to centrifugal pumps.

All pipes and pumps used for the transfer of bitumen, from the transport tank to the storage tank and from the storage tank to the equipment for use, must be heated, thermally insulated and arranged in such a way that they can be easily and perfectly cleaned after each application and/or working day. The transfer from the transport tanks to the storage tanks will always be carried out by direct pipe.

The Director of Works shall check, as often as he deems necessary, the transport and transfer systems and the storage conditions in all matters that may affect the quality of the material; and if it does not agree, it will suspend the operation until the necessary measures are taken so that it is carried out in accordance with its requirements.

2.4.4. RECPETION AND IDENTIFICATION

Each tank will be accompanied by a delivery note and information relating to the labelling and CE marking of the corresponding standard UNE-EN 12591, UNE-EN 13924-1 or UNE-EN 13924-2.

The delivery note shall contain, at least: the supplying company, the date of manufacture and supply, the vehicle transporting it, the quantity and type of asphalt bitumen supplied, the buyer and destination, and the order reference.

The CE labelling and marking must include: the CE symbol, the identification of the certification body, the distinctive identification mark and registered address of the manufacturer, the last two digits of the year of its first affixation, the reference number of the Declaration of Performance, the reference to the relevant European

standard, the description of the product, and information on the essential characteristics included in the corresponding standard.

The data sheet shall contain at least the reference of the tanker delivery note, the trade name, if any, and the type of bitumen supplied, and the penetration values according to the NLT-124 of the penetration index, according to the NLT-181 of the Fraass brittleness point and according to the NLT-182.

The supplier shall provide information on the maximum heating temperature, the mixing and compaction temperature range, the maximum storage time, or any other condition that may be necessary to ensure uniformity and maintenance of the product properties during the manufacturing and commissioning process.

The supplier shall provide a certificate, provided by the manufacturer, that the binder does not contain tars or other substances derived from the distillation of carbonaceous products, or oxidized bitumens.

2.4.5. QUALITY CONTROL

Reception Control

For the control of reception, documentary verification will be carried out to ensure that the values declared in the information accompanying the CE marking comply with the specifications established in these Specifications.

Regardless of the acceptance of the veracity of the properties referred to in the EC, if any anomaly is detected in transport, storage or handling, the Director of the Works may request at any time to carry out checks and tests on the materials supplied to the work.

Two (2) samples of at least one kilogram (1 kg) (UNE-EN 58 standard) will be taken from each asphalt bitumen tank that arrives at the site, at the time of transfer of the material from the tank to the storage tank.

Penetration will be determined on one of the samples (UNE-EN 1426 standard), and the other will be used for contrast tests if necessary.

Control at Mixer Inlet

The quantity of three hundred tonnes (300 t) of asphalt bitumen shall be considered as a batch, which shall be accepted or rejected en bloc, in accordance with the provisions of section 211.7 of this article. In any case, the Specific Technical Specifications or the Director of Works may set another lot size.

Two (2) samples of at least one kilogram (1 kg) (UNE-EN 58 standard) will be taken from each batch, at a point between the outlet of the storage tank and the inlet of the mixer.

On one of the samples, the penetration will be determined (UNE-EN 1426 standard), the softening point (UNE-EN 1427 standard) and the penetration index will be calculated (Annex A of UNE-EN 12591, UNE-EN 13924-1 or UNE EN 13924-2, as appropriate). The other sample will be used for contrast testing if necessary.

Additional Control

The Director of the Works, in the use of his powers, may require the performance of the necessary tests to verify the characteristics specified in the following table, with a recommended frequency of one (1) time every month and at least three (3) times during the execution of the work, for each type and composition of asphalt bitumen.

CARACTERÍSTICA		UNE-EN	UNIDAD	35/50	50/70	70/100	160/220
Penetración a 25 °C		1426	0,1 mm	35-50	50-70	70-100	160-220
Punto de reblandecimiento		1427	°C	50-58	46-54	43-51	35-43
Resistencia al envejecimiento UNE-EN 12607-1	Cambio de masa	12607-1	%	≤ 0,5	≤ 0,5	≤ 0,8	≤ 1,0
	Penetración retenida	1426	%	≥ 53	≥ 53	≥ 46	≥ 37
	Incremento punto reblandecimiento	1427	°C	≤ 11	≤ 10	≤ 11	≤ 12
Índice de penetración		12591 13924 Anexo A		De −1,5 a +0,7	De −1,5 a +0,7	De −1,5 a +0,7	De −1,5 a +0,7
Punto de fragilidad Fraass		12593	°C	≤ −5	≤ −8	≤ −10	≤ −15
Punto de inflamación en vaso abierto		ISO 2592	°C	≥ 240	≥ 230	≥ 230	≥ 220
Solubilidad		12592	%	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0

2.4.6. ACCEPTANCE OR REJECTION CRITERIA

The Specific Technical Specifications, or in its absence the Director of the Works, will indicate the measures to be adopted in the event that the asphalt bitumen does not meet any of the characteristics established in the previous table.

2.4.7. MEASUREMENT

The measurement and fertilization of the asphalt bitumen will be carried out as indicated in the Specific Technical Specifications for the work unit of which it is part, in tons (t).

2.5. BITUMINOUS EMULSIONS

2.5.1. DEFINITION

Bituminous emulsions are defined as the dispersions of small particles of a hydrocarbon binder and, eventually, a polymer in a water solution and an emulsifying agent.

For the purposes of applying the Specifications, cationic bituminous emulsions, in which the particles of the hydrocarbon binder have a positive polarity, are considered for use in the State road network.

2.5.2. GENERAL CONDITIONS

The provisions of this article shall be without prejudice to the provisions of Reglamento 305/2011 of the European Parliament and of the Council, on harmonised conditions for the placing on the market of construction products. For CE marked products, the manufacturer will be responsible for their conformity with the declared performance. These must be accompanied by the Declaration of Performance, and the instructions and safety information of the product.

The Contractor must verify that the values declared in the documents accompanying the CE marking allow compliance with the specifications contemplated in the Project or, failing that, in these Specifications, to be deduced, and must adopt, in the event that there are indications of non-compliance with the declared specifications, all those measures it deems appropriate to guarantee the suitability of the product supplied to the work.

Cationic bituminous emulsions must bear the CE marking, in accordance with the provisions of the UNE-EN 13808 standard.

In addition, in any case, the provisions of current legislation on environmental, health and safety, production, storage, management and transport of construction products, construction and demolition waste, and contaminated soil will be followed. The use of asphalt bitumens containing tars or other substances derived from the distillation of carbonaceous products (coal or others), or oxidized bitumen, is prohibited.

2.5.3. SPECIFICATIONS

The designation of cationic bituminous emulsions, modified or not, will follow the following scheme, in accordance with the UNE-EN 13808 standard:

C	% ligante	B	P	F	C. rotura	aplicación

Being:

- C: cationic emulsion.
- % binder: nominal binder content (UNE-EN 1428 standard).
- B: Indication that the hydrocarbon binder is an asphalt bitumen.
- P: it will be added in the event that the emulsion incorporates polymers.
- F: it will be included in the event that a fluidizer content greater than 3% is incorporated. It may be optional to indicate the type (Fm: mineral fluidifier, Fv: vegetable fluidifier).
- C. breakage: indicates the breakage class (UNE-EN 13075-1 standard), from 2 to 10.
- Application: type of emulsion application (ADH: adhesion irrigation, TER: heat-adherent adhesion irrigation, CUR: curing irrigation, IMP: primer irrigation, MIC: cold micro-agglomerate, REC: cold recycling).

The material used will comply with all the specifications set out in general terms in the corresponding chapter of the PG-3.

- Curing irrigation: C60B4 CUR bituminous emulsion, the binder of which must not be less than 300 g/m2 of residual binder.
- Primer irrigation: C60BF4 IMP bituminous emulsion, the binder of which shall not be less than 500 g/m2 of residual binder.

2.5.4. TRANSPORTATION AND STORAGE

The bituminous emulsion shall be transported in tanks and stored in one or more tanks, suitably insulated from each other, which shall be provided with ventilation outlets to prevent them from working under pressure, and which shall have the necessary measuring and safety apparatus, located at easily accessible points. In addition, they will have a suitable valve for taking samples.

Where storage tanks do not have their own means of loading, the tanks used for the transport of bituminous emulsion shall be equipped with pneumatic or mechanical means for rapid transfer.

All direct pipes and pumps, preferably rotary, used for the transfer of bituminous emulsion, from the transport tank to the storage tank and from the storage tank to the on-site application equipment or mixer, must be arranged in such a way that they can be easily and perfectly cleaned after each application or working day.

The Director of Works shall check, as often as he deems necessary, the transport and transfer systems and the storage conditions in all matters that may affect the quality of the material; and if it is not in its agreement, it will suspend the use of the contents of the corresponding tank or cistern until the characteristics it deems appropriate have been verified.

2.5.5. RECEPTION AND IDENTIFICATION

Each cationic bituminous emulsion tank that arrives at the site will be accompanied by a delivery note and the information relating to the labelling and CE marking of the UNE-EN 13808 standard.

The delivery note will contain the identification data of the supplying company; vehicle transporting it; quantity, trade name and order reference; name and address of the buyer and the destination.

The labelling and CE marking must include their identification and characteristics.

The supplier must provide a certificate, if any, provided by the manufacturer, that the emulsion does not contain tars or other substances derived from the distillation of carbonaceous products, or oxidised bitumen.

2.5.6. QUALITY CONTROL

Reception Control

For the control of reception, documentary verification will be carried out to ensure that the values declared in the information accompanying the CE marking comply with the specifications established in these Specifications.

Regardless of the acceptance of the veracity of the properties referred to in the CE marking, if any anomaly is detected during the transport, storage or handling of the products, the Director of the Works may at any time order the performance of checks and tests on the materials supplied to the work.

Two (2) samples of at least two kilograms (2 kg) will be taken from each bituminous emulsion tank that arrives at the site, in accordance with the UNE-EN 58 standard, at the time of transfer of the material from the tank to the storage tank. The appropriate tests will be carried out on one of the samples, and the other will be kept for at least fifteen days (15 days) to carry out contrast tests if necessary. In any case, the Director of Works may establish some other additional criteria for the control of the reception of the tanks.

Control at the Time of Use

The quantity of thirty tonnes (30 t) or daily fraction of bituminous emulsion shall be considered as a lot, which shall be accepted or rejected en bloc, except in the case of emulsions used in adhesion, priming and curing irrigation, in which case the weekly fraction shall be considered as a batch. In any case, the Specific Technical Specifications or the Director of Works may set another lot size.

Two (2) samples will be taken from each batch and the same tests will be carried out as those carried out for the reception control.

Additional Control

The Director of the Works, in order to avoid possible anomalies that may have occurred during the transport and/or storage of the materials, may require the necessary tests to be carried out to verify their characteristics, with a recommended frequency of one (1) time every month and at least three (3) times during the execution of the work. for each type and composition of bituminous emulsion.

If the bituminous emulsion has been stored for a period of more than fifteen days (>15 d), before use, at least two (2) samples shall be taken, one from the upper and one from the lower part of the storage tank, for the sieving test (UNE-EN 1429) and the binder content test (UNE-EN 1428). If it does not comply with the provisions for this characteristic, it will be homogenized and new tests will be carried out, or it will be removed.

In unfavourable weather conditions or in anomalous work situations, the Director of Works, in order to check the storage conditions, may reduce the period.

2.5.7. ACCEPTANCE OR REJECTION CRITERIA

The Specific Technical Specifications, or in its absence the Director of the Works, will indicate the measures to be adopted in the event that the bituminous emulsion does not comply with any of the established specifications.

2.5.8. MEASUREMENT

The measurement and payment of the bituminous emulsion will be carried out as indicated in the Specific Technical Specifications for the work unit of which it is part.

In stockpiles, the bituminous emulsion will be paid for tons (t) actually collected.

2.6. TERMOPLASTIC MATERIAL FOR ROAD MARKINGS

2.6.1. DEFINITION AND CLASSIFICATION

This section defines the thermoplastic materials for signalling that, once melted, are applied hot in the marking of road markings of bituminous pavements, with instant drying.

It is a mixture composed of mineral substances with a coarse grain size (up to 700 microns), a resin and a plasticizer, both in solid, granular or flake form; They also contain pre-mixed glass microspheres, a special mineral oil that helps control the application viscosity and plasticize the whole and a pigment that gives it its color.

Thermoplastic materials are solvent-free and it is heat that fluidifies the product to allow its application. They become solid immediately after application.

These materials will be applied indistinctly by extrusion or by spray with a gun, allowing the addition of glass microspheres immediately after application.

2.6.2. AGGREGATES

They are essentially composed of natural mineral substances of white color and suitable granulometry to achieve maximum compaction, such as siliceous sand, quartz, calcite, etc.

2.6.3. PIGMENT

It is made of titanium dioxide that gives the product its white color, and may eventually have a suitable extender incorporated that has a hardness and particle size that make it, at the same time, resistant to wear and slip.

2.6.4. BINDER OR PLASTICIZING VEHICLE

Made up of one or more thermoplastic resins of a different nature, natural or synthetic, whose purpose is to bind the aggregates and pigments together and give them adhesion to the pavement.

This vehicle will be suitably plasticized, generally with special oils, and stabilized to the action of ultraviolet rays.

The proportion of the constituents in the mixture may be freely decided by the manufacturer, provided that it complies with the conditions imposed as characteristics of the material before and after application.

2.6.5. TECHNICAL SPECIFICATIONS

2.6.5.1. GENERAL SPECIFICATIONS

Their colour will be white, understood as the one corresponding to reference B-118 of the UNE 48.103 Standard, and they will always be reflective.

The material shall be solid at room temperature and of a pasty consistency at forty degrees Celsius (40 °C).

Their specific gravity shall be between one and nine tenths and two and one tenth kilograms per cubic decimetre (1.9-2.1 kg/dm3).

The material applied shall not deteriorate due to contact with calcium sodium chloride and other chemical agents normally used against the formation of ice on the road, or due to fuels or lubricants that may be deposited by traffic.

In the plastic state, materials will not give off fumes that are toxic or otherwise dangerous to people or property.

The viscosity/temperature ratio of the plastic material will remain constant over at least four (4) reheats.

To ensure the best adhesion, the specified compound shall be melted and maintained at a minimum temperature of one hundred and ninety degrees (190 °C) without discoloration after four (4) hours at this temperature.

Al calentarse a doscientos grados centígrados (200 ºC) y dispersarse con paletas no presentará coágulos, depósitos duros ni separación de color y estará libre de piel, suciedad, partículas extrañas u otros ingredientes que pudieran ser causa de sangrado, manchado o decoloraciones.

The temperature of ignition shall not be less than two hundred and thirty-five degrees Celsius (235 °C) when performed with the Cleveland Open Glass.

The material shall include a percentage by weight of glass microspheres of around twenty per cent (20%) and, likewise, forty per cent (40%) of the total by weight must be supplied separately (combinex method), and the machinery must therefore be adapted to this type of use. This process ensures that they remain in the road marking throughout their useful life, which makes thermoplastics one of the best alternatives for long-lasting retroreflection, since the natural wear and tear of the road marking will gradually make them appear. The initial behavior depends on the application of post-mixing beads, but these have a very short shelf life (from 1 to 6 months), at which point the pre-mixing beads appear.

The pigmented organic binder vehicle shall consist of a mixture of thermoplastic synthetic resins and plasticizers, at least one of which shall be solid at room temperature. The total binder content of a thermoplastic compound shall not be less than fifteen percent (15%) nor more than thirty percent (30%) by weight.

The drying of the material will be instantaneous, giving a reasonable time margin of thirty (30) seconds, not suffering adhesion, discoloration or displacement under the action of traffic.

They are the materials with which the highest levels of night visibility are achieved in their useful life, reaching more than 400 mcd.m2.lx-1 after withstanding four million wheel arches in the durability test.

2.6.5.2. CHARACTERISTICS OF DRY FILM

Directional Light Reflectance

The directional light reflectance (MELC-12.97) for the color white, daytime visibility of the applied line, shall not be less than seventy-five (75) when the measurement is made with standardized light under an angle of forty-five degrees (45 ºC).

Retroreflection

The retroreflection or night-time visibility shall be greater than one hundred and fifty millicandela per lux and square metre (150 mcd/lux/m2) measured with a retroreflectometer operating with an angle of incidence of eighty-six degrees thirty minutes (86º 30´) and an angle of divergence of one degree thirty minutes (1º 30´).

Softening Point

The softening point shall not be less than ninety-five degrees Celsius (95 °C), measured according to the ball and ring method (ASTM B-28-58-T), using truncated conical rings.

Heat Stability

The manufacturer shall indicate the safety temperature, i.e. the temperature at which the material can be kept for a minimum of six (6) hours in a closed boiler or in the application machine without degradation. This temperature shall not be less than the softening temperature, measured according to the test indicated in the previous point, minus fifty degrees Celsius (50 ºC).

The decrease in luminance, using an EEL reflectance spectrophotometer with 601, 605 and 609 filters, shall not be greater than five (5) units.

Light stability

The decrease in light reflectance when a specimen of the material is subjected to the action of ultraviolet rays for sixteen hours (16 h) shall not exceed five (5) units.

Flow resistance

The decrease in height of a cone of thermoplastic material twelve centimeters (12 cm) in diameter and one hundred plus/minus five millimeters (100 ± 5 mm) in height for forty-eight (48) hours, at forty degrees Celsius (40 ºC), shall not be greater than twenty percent (20%).

Impact resistance

The impact of a steel ball falling from a height of two meters (2 m) at the temperature determined by local climatic conditions on ten (10) samples of fifty millimeters (50 mm) in diameter and twenty-five millimeters (25 mm) in thickness must not cause deterioration in at least six of the samples.

Abrasion resistance

The abrasion resistance will be measured by means of a Taber Abraser, using H-22 calibrated wheels, for which the material will be applied on a one-eighth of an inch thick Monel plate and the specimen will be subjected to an abrasion lubricated with water. The weight loss after one hundred (100) revolutions shall not exceed half a gram (0.5 g).

Slip resistance

All the materials used in road markings will offer a coefficient of friction to slip similar to that of the pavement on which they are placed. In any case, this coefficient must exceed the value forty-five (45) measured with the Road Research Laboratory's Skide device.

2.6.6. RECEPTION CONTROL

The Construction Manager will require the presentation of the corresponding official certificates prior to the start of the stockpiles.

An initial random sampling will be carried out, extracting one bottle out of every forty (40). A canister, chosen at random, will be sent to an Official Approved Laboratory in order to verify that all the specifications indicated in these Specifications are met. The rest of the bottles are reserved until the arrival of the results, in order to be able to carry out contrast tests in case of doubt.

At any time, the Site Manager may require the performance of any of the aforementioned tests, as well as choose the sample on which these tests will be carried out, which may be extracted from the reserved canisters or stockpiles.

2.6.7. MEASUREMENT AND PAYMENT

The measurement and payment of these materials will be carried out in accordance with the indications in the work unit of which they are part.

3. EARTHWORKS

3.1. LAND CLEARING AND CLEANING

3.1.1. DEFINITION AND SCOPE

The specifications of this work unit are based on those defined in Artículo 300 - "Desbroce del terreno" del PG-3.

It consists of removing and removing from the designated areas all trees, stumps, plants, weeds, brush, fallen wood, debris, garbage or any other undesirable material according to the judgment of the Director of the Works. It includes the removal of stakes, foundations and other elements of enclosures of rural plots, as well as the removal of trees not included in the work unit and the elimination of unpaved roads. The execution of this operation includes the following operations:

- Removal of materials subject to clearing.
- Removed and extended from them in their final location.

Topsoil must always be removed, except when it is to be maintained as indicated by the Director of the Works.

3.1.2. EXECUTION OF WORKS

Removal of materials to be cleared:

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

Topsoil must be removed from the land surfaces affected by excavations or embankments, to a depth of 30 cm or such depth as is verified or defined during the work.

Removal operations shall be carried out with the necessary precautions to achieve sufficient safety conditions and to avoid damage to existing nearby buildings.

The Contractor shall provide the appropriate protection measures to prevent vegetation, objects and services considered as permanent from being damaged. When such elements are damaged by the Contractor, the Contractor shall replace them, with the approval of the Director of Works, at no cost to the Property.

All stumps or roots greater than ten centimeters (10 cm) in diameter shall be removed to a depth of not less than fifty centimeters (50 cm), below the grade of the earthworks. Outside the earthworks, stumps of vegetation that in the opinion of the Director of Works need to be removed may be left cut at ground level.

All cavities caused by the extraction of stumps and roots shall be filled with material similar to the soil that has been exposed when clearing the land, and shall be compacted in accordance with the provisions of these Specifications until the surface is adjusted to that of the existing land. All wells and holes within the earthwork shall be filled in accordance with the instructions of the Director of Works.

Removal and disposal of the materials to be cleared:

All forest products or by-products, not susceptible to harvesting, shall be eliminated in accordance with the provisions of the Project or ordered by the Director of Works. In principle, these elements will be burned, when this operation is permitted and accepted by the Director of the Works. The Contractor must have specialized personnel to avoid damage to both vegetation and nearby property. At the end of each phase, the fire must be completely extinguished.

The topsoil from the clearing must be disposed of in its final location in the shortest possible time. If used directly, it should be stored in piles no higher than two meters (2 m), avoid being subjected to vehicle passage or overloading, and minimize transfers.

If the discharge is carried out outside the area, the Contractor must obtain suitable locations not visible from the road, which must be approved by the Director of Works, to whom it will provide copies of the contracts with the owners of the affected land.

3.1.3. MEASUREMENT AND PAYMENT

This work unit includes obtaining permits for the dumping of material from clearing.

Measures for the protection of vegetation and goods and services considered permanent will not be subject to independent payment. Nor will the clearing of the loan areas be paid.

The unit will be measured and paid according to the price tables of the Project for the square meters (m^2) measured on Plan, that is, that area to which the unit is applied excluding land that does not need clearing and clearing, such as paved roads.

3.2. TREE CUTTING

3.2.1. DEFINITION

The specifications of this work unit are based on those defined in Artículo 306 - "Tala de árbol con extracción de tocón" del PG-3.

It is defined as the set of operations necessary to cut, stump remove and remove from the area affected by the works, the trees defined in the Project individually or indicated by the D.O.

The execution of this unit includes the following operations:

- Felling of the tree.
- Removal of the stump.
- Loading and transport of the extracted materials to landfill or place of use.
- Filling and compaction of the cavities caused by the extraction of stumps and roots with artificial gravel.

For the purposes of this unit, trees between 5.00 and 7.00 metres in height are considered.

3.2.2. EXECUTION OF THE WORKS

The execution of this work unit must have the prior approval of the Construction Manager. In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

The trees shall be cut by means of a mechanical saw, and the necessary precautions must be taken to achieve sufficient safety conditions and avoid damage to third parties, personnel and means of work.

The trees susceptible to harvesting will be pruned and chopped in lengths of no less than three (3) meters, and must be deposited in the place designated by the Construction Manager.

All ground cavities caused by the removal of stumps and roots shall be filled with tolerable soil, and compacted to 98% of the Modified Proctor until the surface conforms to that of the existing soil.

Stumps, roots and other non-usable material will be disposed of by transport to landfill or place of use.

The buildings and facilities in the environment will be protected.

The services affected by the execution of this unit will be maintained or provisionally replaced, subsequently restoring them to their previous state.

3.2.3. MEASUREMENT AND PAYMENT

This unit will be measured and paid, in accordance with the price tables of the Project, for the units (ud) of tree actually felled and stumped.

The price includes the felling of the tree, the extraction of the stump, the loading and transport of the extracted materials to a landfill or place of use as ordered by the Site Manager, the filling and compaction of the cavity caused by the extraction of the stump and roots with artificial gravel, and the set of operations and costs necessary for the complete execution of the unit.

The removal of trees less than 5.00 m in height, as well as shrubs, plants, undergrowth and other elements of a similar nature shall be measured and fertilised in accordance with the provisions of Artículo "Despeje y desbroce del terreno" of these Specific Technical Specifications.

3.3. CONSTRUCTION PLATFORM EXCAVATION

The specifications of this work unit are based on those defined in Artículo 320 - "Excavación de la explanación y préstamos" del PG-3.

3.3.1. DEFINITION

It consists of the set of operations to excavate and level the areas where the road is to be located, including the platform, slopes and ditches, as well as the areas of loans, planned or authorized, and the consequent transport of the removed products to the deposit or place of use.

This unit includes the widening of the trenches, the improvement of slopes in the clearings, and the additional excavation in unsuitable soils, ordered by the Director of the Works.

3.3.2. CLASSIFICATION OF EXCAVATION

Excavation in soft ground along the entire clearing area, carried out by mechanical means, is considered.

3.3.3. SLOPES

The clearing slope will be **3H/2V**.

3.3.4. EXECUTION OF THE WORKS

General

Once the clearing operations of the land have been completed, the excavation works will begin, adjusting to the alignments, slopes, dimensions and other information contained in the Project, and to what the Director of the Works orders in this regard. The Contractor shall notify the Director of Works of the commencement of any excavation, and the planned execution system, sufficiently in advance in order to obtain approval thereof.

To this end, the use of excavation systems that do not correspond to those included in the Specific Technical Specifications must not be used, especially if the intended variation could excessively damage the ground.

During the execution of the work, appropriate precautions shall be taken, in any case, so as not to reduce the resistance or stability of the unexcavated ground. In particular, attention will be paid to the tectonic-structural characteristics of the environment and the alterations in its drainage and the necessary measures will be adopted to avoid the following phenomena: instability of slopes in rock or blocks of the same, due to inadequate blasting, landslides caused by the mismatch of the foot of the excavation, waterlogging due to faulty drainage of the works, excessive provisional slopes, etc.

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

Geometric Tolerance of Completion of Works

The following tolerances are set:

- Slopes up to 3 m: + 15 cm
- Slopes over 3 m: + 25 cm

The defined tolerances may be modified by the Director of the Works.

The maximum admissible tolerance in slopes, ditch bottoms and drains will be a function of the slope defined in the Project for each work unit.

- Ditches and drains with slopes between 3 ‰ and 5 ‰ = ± 1 ‰.
- Ditches and drains with slopes between 5 ‰ and 10 ‰ = ± 2 ‰.
- Ditches and drains with a slope greater than 10 ‰ = ± 4 ‰.

The maximum deviation in the gutter and drainage plan with respect to what is defined in the Project will be 10 cm.

3.3.5. MEASUREMENT AND PAYMENT

The excavation of the earthwork will be paid by cubic meters (m^3), in all types of terrain, measured on planes of transverse profiles.

The price includes transportation to landfill or place of use of the removed materials, but not refining, which is defined in a separate unit. Also included are the processes of training prospective knights, the payment of occupancy fees, and all the necessary operations and associated costs for the complete execution of the unit.

3.4. FILLS

3.4.1. DEFINITION AND MEASUREMENT

The specifications of this work unit are based on those defined in Artículo 330 - “Terraplenes” del PG-3.

This unit consists of the extension and compaction, by layers, of the materials in areas of such dimensions that they systematically allow the use of heavy machinery in order to create a platform on which the road surface sits. It includes completion and refining of the esplanade.

Its execution includes the following operations:

- Preparation of the support surface of the fill type fill.
- Extension of a layer.
- Wetting or drying out of a layer.
- Compaction of one layer.

The last three operations will be repeated as many times as necessary.

3.4.2. MATERIAL CLASSIFICATION

The materials used for the formation of embankments shall be classified into the following types:

- Acceptable Soil
- Tolerable Soil

3.4.3. SLOPES

The fills will be arranged with a **slope of 3H/2V**.

3.4.4. EXECUTION OF THE WORKS

Control de Compactación

The purpose of the compaction control will be to verify, on the one hand, that each layer meets the conditions of dry density and humidity, as established by the Director of the Works, and on the other hand, that the deformability characteristics are adequate to ensure an acceptable behavior of the fill.

To this end, the control will be carried out by the "Finished product control" method, through "in situ" determinations in the compacted backfill, comparing the results obtained with the corresponding reference values. In special circumstances, the Director of Works may also prescribe the performance of complementary tests to characterize the geotechnical properties of the backfill (shear strength, expansiveness, collapse, etc.).

Compaction control will be carried out by means of a plate load test according to NLT-357, at the crest (esplanade). The vertical strain modulus in the second load cycle of the plate load test (Ev2) shall be that corresponding to the esplanade category E31

Completion and Refining of the Concourse

The completion and refining of the esplanade shall be carried out in accordance with Articulo 340, “Terminación y refino de la explanada” del PG-3.

3.4.5. MEASUREMENT AND PAYMENT

The embankment-type fills will be fertilized by cubic meters (m3), measured on the transverse profile planes.

Fillings that were necessary to restore the earthwork to the projected levels due to excessive excavation or any other case of incorrect execution attributable to the Contractor or growth not provided for in these Specifications, in the Project or previously authorized by the Director of the Works will not be paid, and the Contractor will be obliged to correct such defects at its own expense without the right to any additional payment.

Two categories are distinguished in relation to their unit price:

- **Acceptable soil embankment.**
- **Embankment of soil from excavation.**

3.5. SLOPES FINISHING

3.5.1. DEFINITION

The specifications of this work unit are based on those defined in Artículo 341 - “Refino de taludes” del PG-3.

This unit consists of the operations necessary to achieve the geometric finish of the embankment slopes and the pedraplene crowning layer.

3.5.2. EXECUTION OF THE WORKS

The slope refining works will be carried out after the construction of drains and masonry works that prevent or hinder their execution. They will also be executed after the grading.

In the event of a landslide or instability process in the slope of a landfill, the material affected by it must be removed and replaced, and the damage caused in the work must be repaired. The contact surface between the replaced material and the remaining material on the slope must be profiled in such a way as to prevent the development of instabilities in favour of it. Subsequently, the surface of the slope must be profiled in accordance with the criteria defined in this article.

At the intersections between clearing and filling, the slopes will be warped to join each other and with the natural surface of the land, without causing a visible discontinuity.

The finish of the slopes will be smooth, uniform and totally in accordance with the surface of the land and the road, without great contrasts, and in accordance with the Project, trying to avoid damage to existing trees or rocks that have patina, for which the necessary adjustments must be made.

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

3.5.3. MEASUREMENT AND PAYMENT

The refining of slopes will be paid per square meter (m2) measured on the floor plans.

4. DRAINAGE

4.1. CONCRETE DITCH EXECUTED ON SITE

4.1.1. DEFINITION

The specifications of this work unit are based on those defined in Artículo 400 - “Cuneta de hormigón ejecutada en obra” del PG-3.

The concrete ditch executed on site is a longitudinal trench opened in the ground next to the platform, in order to receive and channel rainwater, which is covered "in situ" with concrete, placed on a suitably prepared seating bed.

The shape, dimensions and other characteristics correspond to those of a VA-75 type ditch.

4.1.2. MATERIALS

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

The provisions of this article shall be without prejudice to the provisions of Real Decreto 1630/1992 (modified by the R.D. 1328/1995), laying down provisions for the free movement of construction products, in application of the Directiva 89/106 CEE. In particular, with regard to special recognition procedures, the provisions of Article 9 of the aforementioned Royal Decree will be followed.

Concrete

The concrete used in the cladding, and its components, will generally comply with the requirements of the current regulations:

- Código Estructural.
- Instrucción para la Recepción de Cementos.
- Artículos 610 “Hormigones” y 630 “Obras de hormigón en masa o armado” del PG-3.

The characteristic compressive strength of concrete shall not be less than twenty megapascals (20 MPa), at twenty-eight days (28 d).

Other

The other materials to be used in this work unit, such as fillings, joints, etc., will comply with the specifications of the Project.

The sealing materials to be used in the joints, subject to prior acceptance by the Director of the Works, may be bituminous products, synthetic elastomeric products or elastic profiles, with filling and protection materials when necessary, depending on the type of joint in question.

4.1.3. EXECUTION

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

Preparation of the Seat Bed

From the natural surface of the ground or the earthworks, the excavation of the box required by the ditch and the levelling, refining and preparation of the settling bed will be carried out.

The excavation will be carried out, as far as possible, from downstream to upstream and, in any case, it will be maintained with a level and slope such that it does not produce water retention or waterlogging.

During the construction of the ditches, the appropriate measures will be adopted to avoid erosion and change of characteristics in the seating bed. For these purposes, the time that the bed may remain uncoated will be limited to what is essential for the installation of the concrete, and in no case will it exceed eight days (8d).

Concrete

The installation of the concrete will be carried out in accordance with the Structural Code, article 630 "Mass or reinforced concrete works" of the PG-3 and with the conditions required by the Project.

The finish of the surfaces will be taken care of, not allowing irregularities greater than fifteen millimeters (15 mm) measured with a static rule of three meters (3 m) according to NLT-334.

The defects in thickness of the concrete coating provided for in the Project Plans shall not exceed ten millimetres (10 mm), nor a quarter (1/4) of the nominal thickness.

The sections that do not meet these conditions will be raised and executed again, and filling with cement mortar will not be allowed.

Joints

The joints will be arranged as they appear in the plans or in the Project.

Shrink joints shall be executed, in general, at a distance of two metres (2 m), their thickness shall be three millimetres (3 mm) in the case of unsealed joints and at least five millimetres (5 mm) in the case of sealed joints.

The expansion joints will be executed at the joints with the masonry works. Its thickness shall be between fifteen and twenty millimetres (15 and 20 mm).

After the concrete has cured, the joints must be cleaned, and the filling, sealing and protection materials that appear in the Project must be placed.

4.1.4. MEASUREMENT AND PAYMENT

The gutter is measured in linear meters (ml) executed measured on floor plans. The fertilizer includes the concrete used and its placement until the execution of the work unit is completely completed.

4.2. REGISTER WELLS

4.2.1. DEFINITIOM

The specifications of this work unit are based on those defined in Artículo 410 - “Arquetas y pozos de registro” del PG-3.

The constituent material may be concrete, ceramic materials, prefabricated pieces or any other provided for in the Project or approved by the Director of the Works. It will usually be covered by a lid or rack.

4.2.2. SHAPE AND DIMENSIONS

The shape and dimensions of the manholes, as well as the materials to be used, will be those defined in the Project plans.

The minimum interior dimensions will be eighty centimeters by forty centimeters (80 cm x 40 cm) for depths less than one and a half meters (1.5 m). For greater depths, these elements will be visitable, with a minimum interior dimension of one meter (1 m) and a minimum dimension of the lid or grid of sixty centimeters (60 cm).

The lids or grilles will fit the body of the work, and will be placed so that their outer face is at the same level as the adjacent surfaces. They will be designed so that they can withstand the passage of traffic and precautions will be taken to prevent their theft or displacement.

The fund must be adapted to the hydraulic needs and, where appropriate, visitability. The continuity of the water flow must be ensured. Sandboxes will be available where necessary, and if they do not exist, it must be ensured that the waters carry the sediments.

4.2.3. MATERIALS

In general, all materials used in the construction of manholes and manholes shall comply with the provisions of the instructions and regulations in force that affect them, as well as in the corresponding articles of these Specifications. In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

The provisions of this article shall be without prejudice to the provisions of Real Decreto 1630/1992 (modified by the R.D. 1328/1995), laying down provisions for the free movement of construction products, in application of the Directiva 89/106 CEE. In particular, with regard to special recognition procedures, the provisions of Article 9 of the aforementioned Royal Decree shall apply.

The following specific requirements must also be complied with:

Concrete

- Código Estructural.
- Instrucción para la Recepción de Cementos (RC-16).
- Artículos 610 “Hormigones” y 630 "Obras de hormigón en masa o armado” del PG-3.
- Cleaning and filling concretes must have a minimum compressive strength of twelve and a half megapascals (12.5 MPa) at twenty-eight days (28 d).

Casting for Covers and Frames

- ONE IN 1561 and ONE IN 1563.

4.2.4. EXECUTION

The tolerances in the dimensions of the body of the manholes and manholes shall not exceed ten millimetres (10 mm) with respect to what is specified in the Project plans.

The connections of pipes and ditches will be made at the levels indicated in the Project plans, so that the ends of the conduits are flush with the interior faces of the walls.

The upper part of the work shall be arranged in such a way as to prevent spillage from the surrounding ground on it or within it.

The lids or grilles will fit the body of the work, and will be placed so that their outer face is at the same level as the adjacent surfaces. They will be designed so that they can withstand the passage of traffic and precautions will be taken to prevent their theft or displacement.

In the event that the Project considers it necessary, a watertightness test will be carried out.

The filling of the masonry backsplash will be carried out, in general, with material from the excavation, in accordance with the artículo 332, “Rellenos localizados” del PG-3.

In any case, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products will be followed.

4.2.5. MEASUREMENT AND PAYMENT

The price will include the complete and finished work unit including excavation, backfilling, complementary elements (cover, fence, feet, etc.).

4.3. PIPES

4.3.1. DEFINITION

This group of units includes circular pipes used as conduits in transverse and longitudinal drainage works.

It includes the following activities:

- Supply of prefabricated pipes.
- Preparation and placement of the tube seat concrete.
- Placement of the pipes and connecting elements.
- Any auxiliary work or operation necessary for the correct and rapid execution of this work unit.

4.3.2. MATERIALS

For the purposes of this project, reinforced concrete pipes with diameters of 400, 600, 800, 1000 and 1800 mm will be placed.

They will be class 135 according to the classification of the UNE-127-010-EX standard in accordance with what is defined in the Project.

The tubes will be prefabricated in reinforced concrete. They will be supplied in modules with a maximum length of 1.7 m.

The pipe settling concrete will have a compressive strength of 20 N/mm2 in the case of CDSs, and 15 N/mm2 in the case of collectors.

The concretes and reinforcements to be used must comply with the requirements defined in their corresponding articles.

The minimum reinforcement of the pipes will be those specified in the UNE-127-010-EX standard.

The joints will be tongue and groove with a joint, by means of a compression rubber joint. They must comply with the requirements of the UNE-53-571 standard.

4.3.3. EXECUTION

The installation of the pipes will be carried out in a trench, in an embankment or in an embanked trench with the minimum dimensions indicated in the plans, on a concrete slab with characteristic strength fck = 20 N/mm2.

Subsequently, the filling will be carried out to the necessary level in accordance with the provisions of artículo 332 “Rellenos localizados” del PG-3. Care must be taken to ensure that the joints are properly sealed to ensure their watertightness.

4.3.4. MEASUREMENT AND PAYMENT

The execution of the CDS embankment pipes is divided into the following activities:

- **Excavation in a compact trench**. By mechanical means, including loading, unloading and transporting products to landfill. Measured in cubic meters (m3) according to CDS Plans.
- **Reinforced concrete tube.** Diameter 1,800 mm. Even concrete foundation, filled with granular material, proportional part of joints, fully laid. Measured in linear meters (ml) on Floor Plan.
- **Mouthpiece with fins.** For pipe diameter 1,800 mm, completely finished. Measured by units (Ud) placed.
- **Filling of unselected material**. Fill to the level of the embankment core. Even extension and compaction. Measured in cubic meters (m3) according to CDS Plans.

In the case of the ODTs in causeways, the filling of the causeway will be carried out in accordance with the provisions of its corresponding article.

As for the collectors, these will be paid per linear meter (ml) measured on floor plans. The fertilizer includes trench excavation as well as joints and concrete coating.

5. FIRMS AND PAVEMENTS

5.1. GRANULAR MATERIAL

5.1.1. DEFINITION

Gravel is defined as granular material, with a continuous grain size, made up of totally or partially crushed particles, in the minimum proportion specified in each case and which is used as a pavement layer. The execution of the pavement layers with gravel includes the following operations:

- Study of the material and obtaining the working formula.
- Preparation of the existing surface.
- Preparation of material, if applicable, and transport to the place of employment.
- Spreading, wetting, if applicable, and compaction.

This unit includes the levelling of the resulting grading by at least three (3) points per cross-section, leaving cuttings in them. The points will be on the axis and both ends of the earthwork. Profiles will be leveled every twenty (20) meters.

5.1.2. MATERIALS

General Conditions

The materials shall come from the crushing and crushing of quarried stone or natural gravel, in which case the fraction retained by the 5 UNE sieve shall retain a minimum of seventy-five percent (75%) by weight of crushed elements that have two (2) or more fracture faces. The aggregate shall be composed of clean, solid and resistant elements, of reasonable uniformity, free of dust, dirt, clay or other foreign matter.

The gravel to be used with aggregates from crushing will be adjusted to the uses provided for in the PG-3 and specifically to the ZA (40).

The Director of Works may adopt, at the proposal of the Contractor, any of the other zone of the aforementioned PG-3.

Particle size composition

The fraction sifted by the 0.080 UNE sieve shall be less than two thirds (2/3) of the sifted by the 0.40 UNE sieve, by weight.

The maximum size shall not exceed half (1/2) of the thickness of the compacted layer.

The granulometric curve of the materials will be included within one of the spindles outlined in the PG-3 and the Project Manager will be the one who indicates at the time the use to be adopted.

Quality

The wear coefficient measured by the Los Angeles test, according to the Norma NLT-149/72, shall be less than thirty-five (35). The test will be carried out with the type B granulometry indicated in the aforementioned Standard.

Plasticity

The material will be "non-plastic", according to the NLT-105/72 and 106/72 Standards.

The sand equivalent shall be greater than thirty (30), according to Standard NLT-113/72.

5.1.3. EXECUTION

Seating Surface Preparation

The artificial gravel shall not be extended until it has been verified that the surface on which it is to be placed has the conditions of quality and shape provided, with the established tolerances. To this end, in addition to the possible repetition of the acceptance tests of said surface, the Director of the works may order the passage of a loaded truck, in order to observe its effect.

If there are defects or irregularities on the aforementioned surface that exceed those tolerable, they will be corrected before the start of the installation of the artificial gravel, according to the prescriptions of the corresponding Article of the Specific Technical Specifications.

The preparation of the artificial gravel will be done in the plant and not "in situ". The addition of compaction water will also be made in the plant, unless the Director of the works authorizes the wetting "in situ". The addition of compaction water will also be made in the plant, unless the Director of the works authorizes the wetting "in situ".

The optimal compaction moisture, deduced from the "Modified Proctor" test according to the Norma NLT-109/72, It may be adjusted to the composition and manner of action of the compaction equipment, according to the tests carried out in the test section.

The materials will be spread once the seating surface has been accepted, taking the necessary precautions to avoid segregation and contamination, in layers with thicknesses between ten and thirty (10 to 30 cm).

Any water supplies will take place before compaction. Thereafter, the only admissible wetting will be that intended to achieve the necessary humidity on the surface for the execution of the next layer. The water must be dosed properly, ensuring that in no case does an excess of it wash the material.

Layer Compaction

Once the most suitable humidity has been obtained, which must not exceed the optimum by more than one (1) percentage point, the layer will be compacted, which will continue until a density equal to at least that defined in the Quality Control section of this work unit is reached.

Areas which, due to their small size, slope, or proximity to passage or drainage works, walls or structures, do not allow the use of the equipment that is normally being used, shall be compacted with the appropriate means in each case, so that the densities achieved meet the specifications required for artificial gravel in the rest of the layer.

When the artificial gravel is composed of materials of different characteristics or origins and the mixing "in situ" has been authorised, each of them shall be spread in a layer of uniform thickness, so that the coarser material occupies the lower layer and the finer the upper layer. The thickness of each of these layers will be such that, when all of them are mixed, a granulometry that meets the required conditions is obtained. These layers shall be mixed with levellers, harrows, disc harrows, rotary mixers or other machinery approved by the Site Manager, so that the underlying material is not disturbed. The mixture shall be continued until a uniform material is obtained, which shall be compacted in accordance with the above.

Limitations of Execution

The layers of artificial gravel will be executed when the ambient temperature in the shade is greater than two degrees Celsius (2º C), and the work must be suspended when the temperature drops below this limit.

On the layers in execution, the action of all types of traffic will be prohibited, until their compaction has been completed. If this is not feasible, the traffic that necessarily has to pass over them will be distributed in such a way that no tracks are concentrated on the surface.

The Contractor will be responsible for the damage caused by this cause, and must proceed to repair them in accordance with the instructions of the Director of the Works.

When, due to the needs of the execution of the work, the road platform cannot be executed in its entire width, one meter (1 m) of the lateral strip of this layer, first extended as a semi-road, must be overexcavated at once, in order to guarantee a correct interlocking between both extensions.

5.1.4. QUALITY CONTROL

Each working day a control (1) of the reception of the material to be used will be carried out beforehand, obtaining at least the dry density corresponding to one hundred percent (100%) of the maximum obtained in the Modified Proctor test according to the Standard NLT-108/72.

A "lot", which will be accepted or rejected en bloc, will be considered to be the uniform material that enters two hundred and fifty meters (250 m) of roadway or shoulder, or alternatively in three thousand square meters (3,000 m2) of layer, or in the fraction built daily if this is less.

The number of controls per batch by means of the Natural Humidity tests, according to the NLT-102/72 Standard and "in situ" Density according to the NLT-109/72 Standard, will be six (6) for each of them.

Rapid non-destructive methods, such as radioactive isotopes, calcium carbide, air pycnometer, etc., may be used to carry out Moisture and Density tests, provided that a reasonable correspondence between these methods and the NLT-102/72 and 109/72 Standards has been determined through previous tests.

Moisture determination tests shall be indicative in nature and shall not in themselves constitute a basis for acceptance or rejection.

The dry densities obtained in the compacted layer that constitutes the batch must not be less than that obtained in the Modified Proctor test carried out according to the NLT-108/72 Standard. No more than two (2) results may yield results up to two (2) percentage points below the required density.

For each batch, a load test with plate (1) will be carried out according to the NLT-357/86 Standard, which will be two load-discharge cycles, obtaining the deformation modulus "E" for each cycle, and the second of them "E2" must exceed one thousand six hundred kilograms per square centimeter (E2 > 1,600 kg/cm2). The ratio between E2 and E1 must be less than 2.2.

If the required results are not achieved, the batch will be recompacted until the specified densities and modules are reached.

Finished Surface Tolerances

Refining stakes, leveled to millimetres (mm) in accordance with the Plans, on the axis and edges of transverse profiles, the distance not exceeding twenty metres (20 m) shall be arranged, the finished surface shall be compared with the theoretical surface passing through the heads of these cuttings.

The finished surface must not exceed the theoretical surface at any point, nor differ from it by more than one fifth (1/5) of the thickness provided for in the Plans for the artificial gravel layer.

The finished surface shall not vary by more than ten millimetres (10 mm) when checked with a three-metre (3 m) ruler, applied both parallel and normally to the axis of the road. Irregularities exceeding the above tolerances shall be corrected by the Contractor, in accordance with the instructions of the Director of Works.

5.1.5. MEASUREMENT AND PAYMENT

The preparation of the seating surface is considered to be included in the price of the layer immediately below.

The artificial gravel will be measured in cubic metres (m3), obtained from the standard sections indicated in the Plans.

The payment will be obtained by applying the resulting measurement to the corresponding price of Price Table No. 1.

The price of this work unit includes and, therefore, will not be considered fertiliser, the over-excavation of one metre (1 m) to be carried out on the side strip of this layer, first extended as a semi-roadway, when the total width of the platform is extended in two stages.

The overfills that are generated in the upper layers as they have not reached the project level, despite being included within the tolerances, will not give rise to the measurement and payment of said excess.

5.2. IMP COAT

The specifications of this work unit are based on those defined in Artículo 530 - “Riegos de imprimación” del PG-3.

5.2.1. DEFINITION

Primer irrigation is defined as the application of a hydrocarbon binder on a non-stabilised granular layer, prior to the placement of a layer or bituminous treatment on it, in order to have an impermeable surface without loose mineral particles.

Its execution includes the following operations:

- Preparation of the existing surface.
- Application of the bituminous binder.
- Possible extension of a cover aggregate.

5.2.2. MATERIALS

A B60BF4 IMP **emulsion will be used**.

The endowment will be 1 kg/m2.

5.2.3. EXECUTION

Preparation of the Existing Surface

It will be checked that the surface on which the primer irrigation is to be carried out meets the conditions specified for the corresponding work unit, and is not softened by excess moisture. Otherwise, it must be corrected in accordance with these Specifications referring to the work unit in question or the instructions of the Director of the Works.

Immediately before proceeding with the application of the hydrocarbon binder, the surface to be primed shall be cleaned of dust, dirt, mud and loose or harmful materials. To this end, mechanical sweepers or pressurized air machines will be used; In places inaccessible to this equipment, hand brooms may be used. Special care should be taken to clean the edges of the area to be primed. Once the surface is clean, it will be lightly watered with water, without saturating it.

Application of Bituminous Emulsion

When the surface to be primed still maintains a certain humidity, the hydrocarbon binder will be applied with the equipment and at the temperature approved by the Director of the Works. The latter may divide the total allocation into two (2) applications, if required by the correct execution of irrigation.

The extension of the hydrocarbon binder shall be carried out uniformly, avoiding duplication in the transverse working joints. To this end, strips of paper or other material should be placed under the diffusers in the areas where irrigation begins or is interrupted. Where it is necessary to irrigate by strips, a slight overlap of irrigation should be sought at the junction of two adjoining areas.

The application temperature of the binder shall be such that its viscosity shall be between twenty and one hundred seconds Saybolt Furol (20 to 100 sSF), according to NLT-138, in the case of the use of a fluidized bitumen for primer irrigation, or between five and twenty seconds Saybolt Furol (5 to 20 sSF), according to NLT-138, in the case that a bituminous emulsion is used.

To avoid staining them with binder, all elements such as curbs, fences, signs, beacons, trees, etc. that are exposed to it will be protected.

Extent of Cover Aggregate

The possible extension of the covering aggregate will be carried out, by order of the Director of the Works, when it is necessary to circulate vehicles on the primer or where it is observed that part of it is not absorbed twenty-four hours (24 hours) after the binder has been spread.

The extension of the covering aggregate will be carried out by mechanical means in a uniform manner and with the equipment approved by the Director of the Works. At the time of its extension, the aggregate must not contain more than two percent (2%) of free water, this limit may be raised to four percent (4%), if bituminous emulsion is used.

Contact of the paver wheels with uncovered binder shall be avoided. If aggregate has to be spread over a primed strip, but the adjacent one has not been primed, an area of the strip about twenty centimetres (20 cm) wide shall be left uncovered, next to the surface that has not yet been treated.

5.2.4. EXECUTION LIMITATIONS

Primer irrigation may be applied only when the ambient temperature is above ten degrees Celsius (10ºC), and there is no well-founded fear of atmospheric precipitation. This limit may be lowered by the Director of Works to five degrees Celsius (5ºC), if the ambient temperature tends to increase.

The application of the primer irrigation will be coordinated with the installation of the bituminous layer to the superimposed one, so that the hydrocarbon binder has not lost its effectiveness as a bonding element. When the Director of Works deems it necessary, another primer irrigation will be carried out, which will not be fertilized if the loss of effectiveness of the previous irrigation is attributable to the Contractor.

All types of circulation on the primer irrigation shall be prohibited, as long as all the binder has not been absorbed or, if cover aggregate has been extended, for four hours (4 hours) following the extension of said aggregate.

5.2.5. QUALITY CONTROL

The hydrocarbon binder must comply with the specifications established in the Materials section of these Specifications, depending on the type of hydrocarbon binder to be used.

The quality control of the cover aggregate will be set by the Director of the Works.

Execution Control

The smallest batch will be considered as a batch, which will be accepted or rejected en bloc, among those resulting from applying the following three (3) criteria:

- Five hundred meters (500 m) of roadway.
- Three thousand five hundred square meters (3,500 m2) of roadway.
- The surface primed daily.

In any case, the Director of Works may set another lot size.

The provisions of hydrocarbon binder and, where appropriate, aggregate, shall be checked by weighing metal trays or sheets of paper, or other similar material, placed on the surface during the application of the binder or the extension of the aggregate, at no less than five (5) points. In each of these trays, plates or sheets, the residual binder will be determined, according to UNE-EN 12697-3. The Director of Works may authorise the verification of the average endowments of hydrocarbon binder and aggregates, by other means.

The ambient temperature, the temperature of the surface to be primed and the temperature of the hydrocarbon binder shall be checked by means of thermometers placed away from any heating element.

5.2.6. ACCEPTANCE OR REJECTION CRITERIA

The average endowment, both of the residual binder and, where appropriate, of the aggregates, must not differ from that foreseen by more than fifteen percent (15%). No more than one (1) individual of the tested sample may present results that exceed the established limits.

The Director of Works will determine the measures to be adopted with the lots that do not meet the above criteria.

5.2.7. MEASUREMENT AND PAYMENT

The preparation of the existing surface will be considered included in the unit of work corresponding to the construction of the underlying layer, and therefore there will be no need for its separate payment.

The bituminous emulsion used in primer irrigation shall be fertilized per tonne (t) calculated as irrigated area multiplied by the endowment. The fertilizer will include the application of the emulsion.

This payment is considered to include any aggregate of coverage necessary to give way to traffic and its extension.

This unit of work will be paid according to the corresponding prices of Price Table No. 1.

5.3. ADHESION COAT

The specifications of this work unit are based on those defined in Artículo 531 - “Riegos de adherencia” del PG-3.

5.3.1. DEFINITION

Adhesion irrigation is defined as the application of a bituminous emulsion on a layer treated with hydrocarbon binders or hydraulic binders, prior to the placement of a bituminous layer on it.

Its execution includes the following operations:

- Preparation of the existing surface.
- Application of the bituminous binder.

5.3.2. MATERIALS

A C60B3 ADH **emulsion will be used**.

The endowment will be 0.5 kg/m2.

5.3.3. EXECUTION

Preparation of the Existing Surface

It will be verified that the area on which the adhesion irrigation is to be carried out complies with the conditions specified for the corresponding work unit. Otherwise, it must be corrected in accordance with the provisions of these Specifications, or failing that, with the instructions of the Director of the Works.

Immediately before proceeding with the application of the bituminous emulsion, the surface to be treated shall be cleaned of loose or harmful materials. To this end, mechanical sweepers or pressurised air machines, or another method approved by the Director of the Works, will be used to remove the covering aggregate (curing or primer irrigation), where appropriate, and possible dirt or loose or weakly adhered materials.

Application of bituminous emulsion

The bituminous emulsion will be applied with the equipment and temperature approved by the Director of the Works. Its extension will be carried out in a uniform manner, avoiding duplication in the transverse work joints.

The application temperature of the emulsion shall be such that its viscosity shall be between ten and 40.52-4 forty seconds Saybolt Furol (10 to 40 sSF), according to NLT-138:1999.

To avoid staining them with binder, any elements, such as curbs, fences, signs, beacons, etc., that are exposed to them will be protected.

5.3.4. EXECUTION LIMITATIONS

Adhesion irrigation may be applied only when the ambient temperature is above ten degrees Celsius (10ºC), and there is no well-founded fear of atmospheric precipitation. This limit may be lowered at the discretion of the Director of Works to five degrees Celsius (5ºC), if the ambient temperature tends to increase.

The application of adhesion irrigation shall be coordinated with the installation of the bituminous layer on the superimposed one, so that the bituminous emulsion has cured or broken, but without losing its effectiveness as a binding element. When the Director of Works deems it necessary, another adhesion irrigation will be carried out. All circulation on the adhesion irrigation shall be prohibited until the emulsion has broken down.

5.3.5. QUALITY CONTROL

The hydrocarbon binder must comply with the specifications established in the Materials section of these Specifications, depending on the type of hydrocarbon binder to be used.

The quality control of the cover aggregate will be set by the Director of the Works.

Execution Control

The smallest batch will be considered as a batch, which will be accepted or rejected en bloc, among those resulting from applying the following three (3) criteria:

- Five hundred meters (500 m) of roadway.
- Three thousand five hundred square meters (3,500 m2) of roadway.
- The area irrigated daily.

In each batch, the average supply of residual binder shall be checked, with metal, silicone or other appropriate material trays available at no less than three (3) points of the surface to be treated during the application of irrigation. In each of these collection elements, the equipment will be determined, by drying in the oven and weighing.

The ambient temperature, the temperature of the surface to be primed and the temperature of the hydrocarbon binder shall be checked by means of thermometers placed away from any heating element.

5.3.6. ACCEPTANCE OR REJECTION CRITERIA

The average residual binder endowment in each batch shall not differ from that foreseen with a tolerance of fifteen percent (15%) in excess and ten percent (10%) in default. In addition, it will not be admitted that more than one (1) individual of the tested sample presents results that exceed the established limits.

The Director of Works will determine the measures to be adopted with the lots that do not meet the above criteria.

5.3.7. MEASUREMENT AND PAYMENT

The bituminous emulsion used in adhesion irrigation shall be fertilized per tonne (t) calculated as irrigated area multiplied by the endowment. The fertilizer will include the preparation of the existing surface and the application of the emulsion.

5.4. HOT BITUMINOUS MIXTURES TYPE AC

5.4.1. DEFINITION

A hot bituminous mixture of bituminous concrete is defined as the combination of a hydrocarbon binder, aggregates (including mineral dust) with continuous granulometry and, eventually, additives, so that all the particles of the aggregate are covered by a homogeneous film of binder. Its manufacturing process involves heating the binder and the aggregates (except, if necessary, the mineral filler powder) and its installation must be carried out at a temperature much higher than the ambient temperature.

The execution of any type of hot bituminous mixture defined above includes the following operations:

- Study of the mixture and obtaining the working formula.
- Manufacture of the mixture according to the working formula.
- Transport of the mixture to the place of use.
- Preparation of the surface that is going to receive the mixture.
- Spreading and compacting the mixture.

5.4.2. FIRM LAYERS

The bituminous mixture will be applied to the following pavement layers:

Layer	Bituminous mixture	Thickness (cm)
Rolling	AC16 SURF 50/70 D	5
Intermediate	AC22 BIN 50/70 S	10

5.4.3. MATERIALS

Hydrocarbon Binder

The binder to be used will be 50/70 penetration bitumen in all layers (running, intermediate and base).

In the winter season, the asphalt bitumen of the wearing course will be improved by adding, in the proportion of 0.2%, a polyamine-based activator (Haffmitel or similar), in order to improve the adhesiveness of the fine aggregate. Its cost is considered included in the price of the binder.

The dosage and homogeneous dispersion of the additive must be approved by the Director of the Works.

Aggregates

The aggregates will be produced or supplied in differentiated particle size fractions, which will be collected and handled separately until they are introduced into the cold hoppers.

Before passing through the dryer of the manufacturing plant, the sand equivalent (SE4) (Annex A of the UNE-EN 933-8 standard), for the fraction 0/4mm of the combined aggregate (including mineral dust), in accordance with the proportions set in the working formula, must be greater than fifty-five (SE4 > 55) or, if this condition is not met, its methylene blue value (Annex A of the UNE-EN 933-9 standard) for the fraction 0/0.125mm of the combined aggregate, must be less than seven grams per kilogram (MBF < 7 g/kg) and, simultaneously, the sand equivalent (Annex A of the UNE-EN 933-8 standard) must be greater than forty-five (SE4 > 45).

Coarse Aggregate

Definition

Coarse aggregate is defined as the part of the total aggregate retained in the 2 mm sieve (UNE-EN 933-2 standard).

General conditions

Coarse aggregate will be obtained by crushing quarried stone or natural gravel. The rejection of the UNE 5 mm sieve must contain a minimum proportion of particles that present two (2) or more fracture faces, according to the NLT-358/87 Standard, not less than 100 in the wearing and intermediate layer.

Cleaning

The coarse aggregate must be free of all types of foreign matter that may affect the durability of the layer. The content of fines (UNE-EN 933-1 standard) determined as the percentage that passes through the sieve 0.063 mm, will be less than five per thousand (< 5‰) by mass.

In the event that the established requirements regarding the cleaning of coarse aggregate are not met, the Director of Works may require its washing, vacuuming or other previously approved methods, and a new check.

Quality

The maximum value of the Los Angeles wear coefficient of coarse aggregate must not exceed 25 in the wearing and intermediate layers.

The minimum value of the accelerated polishing coefficient of the coarse aggregate to be used in wearing courses shall be at least 50.

Form

The maximum index of slabs of the different fractions of the coarse aggregate will be less than or equal to 25.

Fine Aggregate

Definition

Fine aggregate is defined as the part of the total aggregate sifted by the 2 mm sieve and retained by the 0.063 mm sieve (UNE-EN 933-2 standard).

General conditions

The fine aggregate will proceed to 50% of the crushing and crushing of quarried stone of an ophytic nature for the wearing layer and of quarried stone of a limestone nature for the intermediate layer.

Cleaning

The fine aggregate must be free of lumps of clay, vegetable matter, lean or other foreign matter.

Quality

The material that is crushed to obtain fine aggregate must meet the conditions required for coarse aggregate over the Los Angeles wear coefficient, and the fine aggregate obtained must have a sand equivalent greater than 50.

Adhesiveness

Adhesiveness shall be considered to be sufficient if, in open mixtures, the adhesiveness index, according to Standard NLT-355/74, is greater than four (4); or if, in the other types of mixture, the loss of strength in the immersion-compression test, according to the NLT-162/84 Standard, does not exceed twenty-five percent (25%).

The adhesiveness between the aggregate and the hydrocarbon binder may be improved by means of activators or any other product sanctioned by experience. The Director of Works shall establish the specifications to be met by such additives and the resulting mixtures.

Polvo Mineral (filler)

Definition

Mineral dust is defined as aggregate whose majority passes through the 0.063 mm sieve (UNE-EN 933-2 standard).

General conditions

The mineral powder will be of 50% contribution for the wearing and intermediate layers, and of the cement type III-1/35/MRSR. These will be the minimum contributions, unless it is verified that the mineral dust from the aggregates meets the conditions required for the mineral contribution dust and the Director of the Works reduces or even cancels these minimum proportions.

The mineral dust that is inevitably attached to the aggregates after passing through the dryer may in no case exceed two percent (2%) of the mass of the mixture.

Finesse and Activity

The bulk density of the mineral dust (Annex A of the UNE-EN 1097-3 standard) must be between five and eight tenths of a gram per cubic centimetre (0.5 to 0.8 g/cm3).

The emulsibility coefficient, according to the NLT-180/74 Standard, must be less than six tenths (0.6).

5.4.4. NECESSARY EQUIPMENT

Manufacturing Center

The hot bituminous mixture will be manufactured in an area outside the work, subcontracting its supply.

The minimum hourly production of the plant will be indicated, depending on the characteristics and minimum consumption needs of the work.

Transport

They will consist of trucks with a smooth and watertight body, perfectly clean and which will be treated, to prevent the bituminous mixture from adhering to it, with a product whose composition and equipment must be approved by the Director of the Works.

The shape and height of the box must be such that, during pouring into the paver, the truck only touches it through the rollers provided for this purpose.

Trucks must always be provided with a suitable tarpaulin or cover to protect the hot bituminous mixture during transport.

Spreading Equipment

The pavers shall be self-propelled and shall be equipped with the necessary devices to spread the hot bituminous mixture with the desired geometry and production and a minimum of pre-compaction, which shall be set by the Director of the Works. The capacity of the hopper, as well as the power, will be adequate for the type of work they have to carry out.

The paver must be equipped with an automatic levelling device and a heating element for the execution of the longitudinal joint.

It shall be checked, where appropriate, that the adjustments of the screed and master conform to the mechanical tolerances specified by the manufacturer, and that these adjustments have not been affected by wear or other causes.

Compaction Equipment

Metal roller compactors, static or vibrant, pneumatic or mixed, may be used. The minimum equipment composition shall be one (1) metal roller vibratory or mixed compactor, and one (1) tire compactor.

All types of compactors must be self-propelled, have smooth-acting direction-of-travel reversers, and be equipped with devices for cleaning their rims or tyres during compaction and for keeping them moist if necessary.

Metal tire compactors shall not have grooves or irregularities in them. Vibratory compactors will have automatic devices to eliminate vibration by reversing the direction of travel. Tyre tyres shall have smooth wheels, in number, size and configuration such as to allow the overlap of the front and rear tyre tracks, and canvas skirts to protect against tyre cooling.

The contact pressures, static or dynamic, of the various types of compactors will be approved by the Director of the Works, and will be those necessary to achieve an adequate and homogeneous compactness of the mixture throughout its thickness, without producing breakage of the aggregate, or winding of the mixture at the compaction temperature.

In places inaccessible to normal compaction equipment, others of appropriate size and design for the work to be carried out shall be used and must always be authorized by the Director of the Works.

5.4.5. EXECUTION

The manufacture and commissioning of the mixture shall not begin until the corresponding working formula, studied in the laboratory and verified at the manufacturing plant, has been approved by the Director of the Works.

Surface Preparation

The layers of bituminous mixture will be applied on adhesion or primer irrigation, which are not included in this work unit as they constitute independent units.

It will be checked that, after the period of rupture of the binder of the adhesion irrigation, there are no traces of water on the surface; likewise, if a long time has elapsed since its application, it will be verified that its binding capacity with the bituminous mixture has not decreased in an injurious way; otherwise, the Director of Works may order the execution of an additional adhesion irrigation.

Transport and Reception of the Mixture

The hot bituminous mixture will be transported by truck from the manufacturing plant to the paver.

To prevent surface cooling, it must be protected during transport by tarpaulins or other suitable covers. When it is discharged into the paver or transfer equipment, its temperature may not be lower than that specified in the working formula.

Spread of Mixing

Unless otherwise justified by the Director of Works, the extension shall begin at the lower edge and shall be carried out in longitudinal strips. The width of these strips shall be fixed in such a way as to make as few joints as possible and to achieve the greatest continuity of the extension, taking into account the width of the section, the possible maintenance of circulation, the characteristics of the paver and the production of the plant.

After one strip has been extended and compacted, the next strip shall be extended while the edge of the first strip is still hot and in a condition to be compacted; otherwise, a longitudinal joint will be executed.

The paver shall be adjusted in such a way that the surface of the extended layer is smooth and uniform, without segregation or dragging, and with a thickness such that, once compacted, it conforms to the grade and cross-section indicated in the Project Drawings, with the established tolerances.

The extension will be carried out as continuously as possible, adjusting the speed of the paver to the production of the manufacturing plant so that it does not stop. In the event of stoppage, it shall be checked that the temperature of the mixture remaining unspread, in and under the hopper of the paver, does not fall below that prescribed in the working formula for the start of compaction; otherwise, a transverse joint will be executed.

Where it is impossible, in the opinion of the Director of Works, to use paving machines, hot bituminous mixing may be put on site by other procedures approved by the Director. To this end, it will be discharged outside the area where it is to be extended and distributed in a uniform layer of such thickness that, once compacted, it will conform to the grade and cross-section indicated in the Project Plans, with the established tolerances.

Transverse and Longitudinal Joints

Whenever they are unavoidable, care must be taken to ensure that the joints of overlapping layers are at least five metres (5 m) apart from the transverse joints and fifteen centimetres (15 cm) from the longitudinal ones.

When extending contiguous longitudinal strips, if the temperature of the first spreading is not higher than the minimum fixed in the working formula for completing compaction, the edge of this strip shall be cut vertically, revealing a flat and vertical surface throughout its thickness. A uniform and light layer of adhesion irrigation will be applied, allowing the emulsion to break down sufficiently. The joint will then be heated and the next strip will be extended against it.

The transverse joints in wearing layers will be compacted transversely, providing the necessary supports for the compaction elements.

5.4.6. EXECUTION LIMITATIONS

Unless expressly authorised by the Director of Works, the installation of hot bituminous mixtures shall not be permitted:

- When the ambient temperature in the shade is less than five degrees Celsius (5 ºC), unless the thickness of the layer to be spread is less than five centimeters (5 cm), in which case the limit will be eight degrees Celsius (8 ºC). In heavy wind, after frost, or on structure decks, the Director of Works may increase these limits, in view of the compaction results obtained.
- When atmospheric precipitation occurs.

Once its compaction has been completed, the executed layer may be opened to circulation as soon as it reaches room temperature in its full thickness or, with the express authorization of the Director of the Works, when it reaches a temperature of sixty degrees Celsius (60 ºC), avoiding stops and changes of direction on the newly spread mixture until it reaches room temperature.

5.4.7. QUALITY CONTROL

Only the installation will be taken into account, since the mixture will be subcontracted.

Extension

Before the mixture from the conveying element is poured into the paver hopper or transfer equipment, its appearance shall be checked and its temperature and ambient temperature measured to account for limitations.

At least once (1) a day, and at least once (1) per batch, samples will be taken and specimens prepared according to UNE-EN 12697-30 by applying seventy-five (75) blows per face if the maximum size of the aggregate is less than or equal to twenty-two millimetres (22 mm), or by means of UNE-EN 12697-32 for a maximum size of the aggregate greater than this value. The void content of these specimens shall be determined, in accordance with UNE-EN 12697-8, and the bulk density, in accordance with UNE-EN 12697-6 with the test method indicated in Annex B of UNE-EN 13108-20.

For each of the batches, the reference density for compaction shall be determined, defined by the average value of the last four (4) bulk density values obtained in the specimens mentioned above.

In the opinion of the Director of the Works, tests may be carried out on some of these samples to verify the dosage of the binder, according to UNE-EN 12697-1, and the granulometry of the aggregates extracted, according to UNE-EN 12697-2.

The extended thickness shall be checked at the frequency established by the Director of the Works, by means of a graduated punch.

- **Compaction**
- The composition and manner of action of the compaction equipment will be checked, verifying:
- That the number and type of compactors are approved.
- The operation of wetting, cleaning and protection devices.
- The ballast, total weight and, if applicable, inflation pressure of the compactors.
- The frequency and amplitude in vibratory compactors.
- The number of passes of each compactor.
- When compaction is complete, the temperature on the surface of the layer will be measured.
- **Finished Unit Reception Control**
- The smallest batch that results from applying the following three (3) criteria to a single layer of hot bituminous mixture will be considered as a batch, which will be accepted or rejected en bloc:
- Five hundred meters (500 m) of roadway.
- Three thousand five hundred square meters (3,500 m2) of roadway.
- The fraction built daily.
- Cores shall be extracted at randomly located points, in a number of not less than five (5), and their density and thickness shall be determined, in accordance with UNE-EN 12697-6 considering the test conditions listed in Annex B of UNE-EN 13108-20.
- The surface regularity of the batch shall be checked from twenty-four hours (24 h) after its execution and always before the extension of the next layer by determining the International Regularity Index (IRI), according to NLT-330, calculating a single IRI value for each hectometer of the auscultated profile, which shall be assigned to said hectometer. and so on until the measured section is completed, which must comply with the specifications of section 542.7.3. The verification of the surface regularity of the entire length of the work, in wearing layers, will also take place before the final acceptance of the works.
- In the case of wearing courses, the following tests shall be carried out, which shall comply with the provisions of Table 542.17:
- Measurement of the surface macrotexture, according to UNE-EN 13036-1, before the commissioning of the layer, at five (5) points of the batch randomly chosen so that there is at least one per hectometer (1/hm).
- Determination of slip resistance, according to NLT-336, after two (2) months after the commissioning of the layer, over the entire length of the batch.

5.4.8. MEASUREMENT AND PAYMENT

The preparation of the existing surface is not subject to fertilisation, nor is it included in this work unit. Adhesion irrigation is also not included; shall be paid as prescribed in these Specifications for said work unit.

The manufacture and installation of hot bituminous mixtures such as bituminous concrete will be paid per tonne (t), according to their type, measured by multiplying the widths indicated for each layer in the Project Plans, by thickness and density. This fertiliser shall be considered to include that of aggregates and that from milling of bituminous mixtures. Lateral growths or increases in thickness due to correction of losses in underlying layers will not be fertilised.

The fertilizer includes the hydrocarbon binder used (bitumen) and the filler mineral powder.

6. SIGNAGE, BEACONING AND CONTAINMENT SYSTEMS

6.1. ROAD MARKINGS

The specifications of this work unit are based on those defined in Artículo 700 - "Marcas viales" del PG-3. Also taken into account are the Normas 8.2-IC. – "Marcas viales" y 8.3-IC. – "Señalización de Obras".

6.1.1. DEFINITION

A road marking, reflective or not, is defined as an optical guide located on the surface of the road, forming lines or signs, for information and traffic regulation purposes.

6.1.2. TYPES

Road markings will be classified according to:

Its use: permanent use (white) or temporary use (yellow).
Its most relevant characteristics: type 1 (conventional road markings) or type 2 (road markings, with or without protrusions, specifically designed to maintain their properties in rainy or humid conditions).

During the execution of the works, road markings for temporary use of paint or prefabricated, yellow or orange, will be used, at the discretion of the D.O. and depending on the circumstances that concur in the same.

Once the work has been executed, road markings for permanent use will be applied as established by the Norma 8.2-IC.- "Marcas viales".

Temporary and permanent road markings will be type 2.

6.1.3. MATERIALS

When road markings for permanent use are used, two applications shall be made:

First application with paint.
Second application based on hot thermoplastic products or cold application plastics.

The characteristics that the materials must meet will be those specified in UNE 135 200(2), for paints, hot-applied thermoplastics and cold-applied plastics, and in UNE-EN-1790 in the case of prefabricated road markings.

Likewise, the post-mixed glass microspheres to be used in reflective road markings will comply with the characteristics indicated in UNE-EN-1423.

The quality guarantee of the materials used in the application of the road marking will be required in all circumstances from the Contractor awarded the works.

6.1.4. EXECUTION

Before proceeding with the application of the road marking, an inspection of the pavement will be carried out in order to check its surface condition and possible existing defects. Where necessary, the surface shall be cleaned to remove dirt or other contaminants that could have a negative influence on the quality and durability of the road marking to be applied.

Prior to the application of the materials that make up the road marking, a careful redesign of the works will be carried out to guarantee the correct completion of the works. To this end, when there is no suitable type of reference, a reference line shall be created, either continuously or by as many points as deemed necessary, separated from each other by a distance not exceeding fifty centimetres (50 cm).

Once the road tread layer has been executed, the definitive horizontal signage will be executed, for which type 2 road markings of permanent use will be used, which will consist of two applications.

In a first application, paint will be used.

Between eight and ten months after receipt of the work, always within the warranty period, a second application will be made based on hot thermoplastic products or cold application plastics.

6.1.5. APPLICATION MACHINERY

The machinery and equipment used for the application of the materials used in the execution of road markings must be capable of automatically applying and controlling the required dosages and conferring homogeneity on the road marking such as to guarantee its properties throughout it.

The characteristics of the machinery to be used in the application of road markings shall comply with the specifications of UNE 135 277(1).

6.1.6. CONSTRUCTION SITE SAFETY AND SIGNAGE

Before the application of the road markings begins, the Contractor shall submit to the Director of Works for the approval of the signalling systems for the protection of traffic, personnel, materials and machinery during the period of execution, as well as of the markings, freshly painted, until they are completely dry.

The safety and signalling measures established in Norma 8.3-IC and other current legislation on the matter will be complied with.

6.1.7. MEASUREMENT AND PAYMENT

When the road markings are of constant width, they will be paid per meter (ml) applied, measured by the axis of the same on Floor Plans.

Otherwise, road markings will be paid per square metre (m2), measured on floor plans. The price includes the glass spheres.

The road markings arranged on work signage are not included in the payment of this work unit, but will be paid as a lump sum.

6.2. VERTICAL SIGNS AND POSTS

The specifications of this work unit are based on those defined in Artículo 701 - “Señales y carteles verticales de circulación retrorreflectantes” del PG-3. They also apply Normas 8.1-IC. – “Señalización vertical” y 8.3-IC. – “Señalización de Obras”, as well as the monographs “Señalización móvil de obras” y “Manual de ejemplos de señalización de obras fijas” de la Dirección General de Carreteras, adapted to the prescriptions of this Project.

6.2.1. DEFINITION

Retroreflective traffic signs and posters are defined as the set of elements intended to inform, order or regulate the circulation of road traffic and on which legends and/or pictograms are inscribed. Once installed, they must offer maximum visibility in both day and night conditions; To do this, they must be able to reflect most of the incident light (usually from vehicle headlights) in the same direction as this, but in the opposite direction.

- Signs: their dimensions are fixed and depend on the type of road.
- Posters: their dimensions are deduced from the size of the characters, pictograms and borders used, and from the separations between lines, borders and borders. In the case of posters made up of slats, their dimensions will be adjusted to a multiple of these.

6.2.2. MATERIALS

The material to be used as a substrate is that defined in the Project. When signs, signs or complementary aluminium panels are used, the support and anchoring elements will be made of the same material.

In general, all signs will have retroreflectance class RA-2, except for signs for temporary use, which may be class RA1; the posters will have RA-3 retroreflectance.

If it is considered necessary to signal a greater danger in specific areas, signs and posters for permanent use will be placed covered by a level 3 retroreflective lemon yellow fluorescent sheet made up of wide-angle prismatic lenses.

The retroreflective sheets attached to the different signs and posters will be inscribed with the following information:

- Cl X mark, where the X is the number that indicates the retroreflectance class, in accordance with the UNE 135 334 standard.
- N quality mark.
- Manufacturer's logo.
- Batch number of the sheet manufacture.

6.2.3. FINISHED UNIT SPECIFICATIONS

Photometric Features

The minimum values of the retroreflection coefficient of the retroreflective vertical traffic signs and posters subject to this Project, for the warranty period, are those indicated in PG3.

Supporting Elements

The shape and dimensions of the foundation and the posts of the signs, side signs and directional panels are those defined in the Project.

6.2.4. CONSTRUCTION SITE SAFETY AND SIGNAGE

The safety and signage measures established in the Norma 8.3-IC and other legislation in force on the subject.

6.2.5. MEASUREMENT AND PAYMENT

Retroreflective vertical traffic signs, including their support elements, anchors and foundations, will be paid exclusively for units actually placed on site.

Retroreflective vertical circulation signs will be paid per square metre (m2) according to the dimensions specified in the Detail Plans. Supporting elements, anchors and foundations are included.

The vertical signage of works will be paid separately in its lump sum.

6.3. SAFETY BARRIERS

The specifications of this work unit are based on those defined in Artículo 704 - "Barreras de seguridad" del PG-3. Also applicable Orden Circular 321/95 T y P "Recomendaciones sobre sistemas de contención de vehículos", amended by the O.C. 6/01, adapted to the prescriptions of this Project.

6.3.1. DEFINITION

Safety barriers are defined as vehicle restraint systems, installed on the sides of roads whose purpose is to provide a certain level of containment to an out-of-control vehicle.

The type, dimensions and level of containment of the safety barriers to be used are those defined in the Project.

6.3.2. MATERIALS

The metal safety barriers shall comply with the requirements set out in Norma UNE 135121.- "Barreras metálicas de seguridad para contención de vehículos. Valla de perfil doble onda. Materiales, geometría, dimensiones y ensayos", y en concreto, lo relativo a "Identificación":

The manufacturer must mark all fences made according to the specifications of the aforementioned Standard.

- This mark must include the identification of the manufacturer, as well as a code for the traceability of the product. In the event that the forming and/or galvanizing processes are subcontracted, the billboards must also include the identification of the companies that carry out these processes.
- The marking must be legible to the naked eye and indelible. All fences must be marked in the same place, taking care that the marks cannot be hidden once the barrier has been mounted.

To paint the metal safety barriers, if applicable, two coats of polyurethane paint will be used, of the type indicated for the weather conditions, resistant to moisture and rubbing. The colour used for the paint will be RAL 6014 or the colour established by the D.O., always with a matt finish.

In the case of galvanised and painted metal safety barrier, in addition to this, the shock absorbers, posts, screws and anchor plate, if any, will be painted, all these elements, including the barrier, supplied to the site already painted.

Both primers and paints and the substrate on which they are applied will comply with the conditions set out in the NTE-RPP Technological Standard and the UNE standards referred to in said standard. When the material arrives at the site with a Certificate of Industrial Origin that certifies compliance with these conditions, standards and provisions, its reception will be made by checking only its apparent characteristics.

6.3.3. EXECUTION

Approved reflectors will be placed on metal safety barriers every 4 m.

In the case of galvanised and painted metal safety barrier, prior to the application of the first coat of paint, a coat of polyurethane primer will have been applied to the galvanised barrier.

6.3.4. SIGNAGE AND CONSTRUCTION SAFETY

The safety and signage measures established in the Norma 8.3-IC and other legislation in force on the subject.

6.3.5. MEASUREMENT AND PAYMENT

This unit will be measured and paid according to the price tables of the Project, for the linear meters (ml) of barriers placed measured on floor plans. The price includes the concrete foundation in the case of a concrete barrier; the plate and anchoring elements in the case of a barrier installed by means of an anchor plate; paint, regardless of the colour used, in the case of a metal safety barrier painted on its back; and the reflectors.

7. ENVIRONMENTAL INTEGRATION

7.1. TOPSOIL

7.1.1. DEFINITION

This is defined as the soil from the surface part of a land with a high content of organic matter placed in the formation of parterres and slope restitution.

7.1.2. EXECUTION

If the supply is made in bulk, the topsoil will be transported by truck to the place where it is to be extended.

Once the earth has been taken to the place where it is to be used, it will be extended with the thickness defined in the Project, and the clods will be shredded and subsequently raked to comply with the specifications of these Specifications.

7.1.3. MEASUREMENT AND PAYMENT

This unit will be measured and paid, in accordance with the price tables of the Project, for the cubic meters (m3) of topsoil actually placed. The price includes topsoil, removal by raking and crumbling clods, as well as all operations and costs necessary for the proper execution of the unit.

7.2. HYDROSEEDING

7.2.1. DEFINITION

It consists of the projection of a mixture of seeds and water, and generally fertilizer and other elements under pressure on the surface to be spiped.

This work unit includes:

- The obtaining, loading, transport and unloading or stacking of the material at the place of temporary storage, and from it, if any, or directly if there is none, to the place of use of the materials that make up the unit.
- In his case, the extension of a cover.
- Any work, machinery, material or auxiliary element necessary for the correct and rapid execution of this work unit.

Neither the previous refining of the slopes nor the subsequent care such as irrigation or fertilization is included.

Neither are woody seeds, additives or improvers that are not expressly included in the price breakdown.

7.2.2. MATERIALS

The hydroseeding materials will be:

- Water.
- Meadow seeds: 20 g.
- Shrub seeds: 5 g.
- Mulch (short or long fibres, straw, cotton, chopped hay, peat): 40 g.
- Stabilizer.
- Fertilizers: 20 g.

7.2.3. EXECUTION

The execution process from the chronological point of view will be as follows:

Water shall be introduced into the tank of the hydroseeder until half of the agitator vanes are covered; Next, the mulch will be incorporated, avoiding the formation of blocks or lumps on the surface of the water. Water will be added until 3/4 of the total tank capacity is completed, keeping the agitator vanes moving. At the same time, seeds, fertilizers and possible additives will be incorporated.

The agitator should be kept running for at least 10 more minutes, before starting sowing, to promote the dissolution of the fertilizers and stimulate the germinative capacity of the seeds. In the meantime, the tank should continue to be filled with water until about 10 cm was missing, and then the soil stabilizer product should be added.

The sowing process will not begin until a homogeneous mixture of all its components has been achieved.

One or two minutes before the start, the movement of the agitator vanes will be accelerated to achieve a better homogenization of the mixture.

Sowing shall be carried out through the barrel of the hydroseeder, if possible access to the sowing point, or otherwise, by means of one or more hoses connected to the barrel. The expulsion of the mixture will be carried out in such a way that the jet does not directly impinge on the surface to be sown to avoid fine movements on the slope during the operation and describing circles, or zig-zag, to prevent the projected mixture from running down the slope. The distance between the muzzle of the barrel (or hose) and the surface to be treated is a function of the pump's ejection power, ranging from 20 to 70 metres.

When weather conditions, excessive humidity, strong winds and other factors make it difficult to carry out the works and obtain satisfactory results, the work will be suspended, which will only be resumed when it is estimated that the conditions are favourable again, or when approved alternative or corrective measures and procedures have been adopted.

The barrel of the hydroseeder must be inclined above the horizontal to achieve a good distribution, that is, the launch must be from bottom to top.

In the case of embankments whose base is not accessible, hoses must be installed so that another operator can direct the jet from below. This same precaution must be taken when there are strong winds or any other circumstance that makes an imperfect distribution foreseeable due to the jet being launched from the top of the hydroseeder.

If there is hydroseeding capping, it will be carried out after the previous operation without a solution of continuity. The mechanical process is identical to that described for planting.

The immediacy of the sowing and capping phases is of great importance, so when it is expected that the available time will not allow the two phases to be carried out on the same day, both operations will be left for the following day.

7.2.4. MEASUREMENT AND PAYMENT

If within a maximum period of two months from the completion of the hydroseeding there has been no germination of the seeds in a treated area, the requirement to repeat the hydroseeding operation will be at the discretion of the Director of the Work; such repetition, if carried out, would be borne by the Contractor.

The measurement will be made by square meters (m2) measured on floor plans.

The unit price will include the contribution of all the necessary materials described in these Specifications and the execution of the complete unit. The payment will be made by applying the measurement to the unit prices, for the units specified above, which are included in Price Table No. 1.

Santander, July of 2024

Fdo.: Jorge Sáenz Fernández

BUDGET

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1. MEASUREMENTS

1.1. AUXILIAR MEASUREMENTS

EARTHWORKS:

P,K,	Cut area (m2)	Cut volume (m³)	Reusable volume (m³)	Fill volume (m³)	Fill Volume (m3)	Cumulative cut volume (m³)	Cumulative reusable volume (m³)	Cumulative fill volume (m³)	Cumulative net volume (m³)
0+000,000	0	0	0	0	0	0	0	0	0
0+020,000	26,02	0	0	2,54	0	0	0	0	0
0+040,000	22,77	487,97	487,97	2,83	53,68	487,97	487,97	53,68	434,29
0+060,000	19,78	425,57	425,57	1,34	41,65	913,54	913,54	95,33	818,21
0+080,000	18,29	380,78	380,78	0	13,4	1294,31	1294,31	108,72	1185,59
0+100,000	17,93	362,2	362,2	0	0	1656,51	1656,51	108,72	1547,79
0+120,000	16,03	337,74	337,74	0,23	2,16	1994,26	1994,26	110,89	1883,37
0+140,000	16,85	326,44	326,44	0,67	8,03	2320,69	2320,69	118,92	2201,77
0+160,000	19,34	358,17	358,17	0,97	13,81	2678,86	2678,86	132,72	2546,14
0+180,000	23,47	424,54	424,54	0,81	14,7	3103,4	3103,4	147,42	2955,98
0+200,000	26,42	496,32	496,32	0,65	11,95	3599,72	3599,72	159,37	3440,35
0+220,000	26,81	529,87	529,87	0,57	10,12	4129,6	4129,6	169,49	3960,11
0+240,000	24,69	513,25	513,25	1,11	16,02	4642,85	4642,85	185,51	4457,34
0+260,000	21,4	460,16	460,16	4,08	53,02	5103,01	5103,01	238,53	4864,48
0+280,000	18,01	394,09	394,09	9,78	138,6	5497,1	5497,1	377,13	5119,97
0+300,000	15,13	331,38	331,38	10,55	203,31	5828,47	5828,47	580,44	5248,03
0+320,000	15,03	301,53	301,53	10,8	213,52	6130	6130	793,96	5336,04
0+340,000	17,57	325,96	325,96	12,4	232	6455,96	6455,96	1025,96	5430
0+360,000	6,69	242,63	242,63	14,05	264,46	6698,59	6698,59	1290,42	5408,17
0+380,000	1,25	79,46	79,46	22,71	367,54	6778,06	6778,06	1657,96	5120,1
0+400,000	0,43	16,96	16,96	20,88	429,76	6795,02	6795,02	2087,72	4707,3
0+420,000	2,03	23,02	23,02	12,76	329,8	6818,04	6818,04	2417,52	4400,52
0+440,000	1,91	34,65	34,65	8,19	208,73	6852,69	6852,69	2626,25	4226,44
0+460,000	2,25	34,75	34,75	3,49	116,64	6887,44	6887,44	2742,88	4144,56
0+480,000	3,45	48,64	48,64	0,27	37,3	6936,08	6936,08	2780,18	4155,9
0+500,000	7,58	102,29	102,29	1,68	16,35	7038,37	7038,37	2796,53	4241,84
0+520,000	0,05	73,69	73,69	21,98	218,24	7112,05	7112,05	3014,77	4097,28
0+540,000	2,87	29,14	29,14	20	407,88	7141,2	7141,2	3422,66	3718,54
0+560,000	25,03	279,05	279,05	9,46	294,65	7420,25	7420,25	3717,3	3702,95
0+580,000	52,71	777,39	777,39	0	94,66	8197,63	8197,63	3811,96	4385,67
0+600,000	38,37	910,79	910,79	6,03	60,29	9108,43	9108,43	3872,25	5236,18
0+620,000	37,86	762,3	762,3	2,66	86,87	9870,72	9870,72	3959,12	5911,6
0+640,000	38,84	766,93	766,93	0,06	27,22	10637,7	10637,7	3986,34	6651,31
0+660,000	37,86	766,94	766,94	0,01	0,76	11404,6	11404,6	3987,09	7417,5
0+680,000	37,13	741,38	741,38	0,09	1,01	12146	12146	3988,1	8157,87
0+700,000	32,83	683,11	683,11	0	0,9	12829,1	12829,1	3989	8840,08
0+720,000	9,85	416,86	416,86	0,49	4,47	13246	13246	3993,47	9252,48
0+740,000	2,1	117,79	117,79	4,32	45,72	13363,7	13363,7	4039,18	9324,56
0+760,000	0,62	25,75	25,75	11,81	156,48	13389,5	13389,5	4195,66	9193,82
0+780,000	4,71	49,11	49,11	4,32	157,23	13438,6	13438,6	4352,89	9085,71
0+800,000	15,72	198,73	198,73	0,05	42,79	13637,3	13637,3	4395,68	9241,64
0+820,000	8,07	235,88	235,88	2,31	23,41	13873,2	13873,2	4419,09	9454,11
0+840,000	10,29	183,58	183,58	1,35	36,6	14056,8	14056,8	4455,69	9601,09
0+860,000	1,63	119,12	119,12	10,7	120,57	14175,9	14175,9	4576,25	9599,65
0+880,000	0,04	16,65	16,65	15,68	263,8	14192,6	14192,6	4840,05	9352,5
0+900,000	0	0,4	0,4	12,19	278,68	14192,9	14192,9	5118,73	9074,21
0+920,000	1,43	14,34	14,34	1,04	132,36	14207,3	14207,3	5251,09	8956,19
0+940,000	2,13	35,59	35,59	1,04	20,8	14242,9	14242,9	5271,89	8970,99
0+960,000	0,6	27,02	27,02	3,65	46,72	14269,9	14269,9	5318,61	8951,28
0+980,000	0,43	10,06	10,06	5,18	86,44	14280	14280	5405,05	8874,9
1+000,000	2,09	23,42	23,42	3,29	82,69	14303,4	14303,4	5487,74	8815,64
1+020,000	5,17	68,48	68,48	8,23	116,28	14371,9	14371,9	5604,02	8767,84
1+040,000	0	50,17	50,17	19,06	273,88	14422	14422	5877,89	8544,14
1+060,000	2,22	22,25	22,25	7,37	264,27	14444,3	14444,3	6142,16	8302,12
1+080,000	3,44	56,69	56,69	7,44	148,09	14501	14501	6290,26	8210,7
1+100,000	0,07	35,09	35,09	16,58	240,17	14536,1	14536,1	6530,42	8005,63
1+120,000	0,12	1,87	1,87	22,05	386,32	14537,9	14537,9	6916,74	7621,19
1+140,000	0	1,24	1,24	28,64	506,9	14539,2	14539,2	7423,64	7115,52
1+160,000	0	0,01	0,01	35,02	636,55	14539,2	14539,2	8060,19	6478,99
1+180,000	0,49	4,8	4,8	33,73	680,41	14544	14544	8740,6	5803,38
1+200,000	1,17	15,76	15,76	32,8	651,99	14559,7	14559,7	9392,59	5167,15
1+220,000	0,18	12,55	12,55	45,55	757,23	14572,3	14572,3	10149,8	4422,47
1+240,000	0	1,66	1,66	51,09	932,33	14574	14574	11082,2	3491,8
1+260,000	0,09	0,89	0,89	37,76	864,89	14574,8	14574,8	11947	2627,8
1+280,000	0	0,9	0,9	30,99	677,76	14575,7	14575,7	12624,8	1950,94
1+300,000	0,14	1,41	1,41	20,52	515,09	14577,2	14577,2	13139,9	1437,27
1+320,000	8,65	87,91	87,91	7,5	280,19	14665,1	14665,1	13420,1	1244,98
1+340,000	20,24	288,88	288,88	9,13	166,28	14954	14954	13586,4	1367,58
1+360,000	41,06	613,02	613,02	9,73	188,6	15567	15567	13775	1791,99
1+380,000	49,08	901,46	901,46	18,76	284,93	16468,4	16468,4	14059,9	2408,53
1+400,000	41,83	909,18	909,18	17,05	358,1	17377,6	17377,6	14418	2959,59
1+420,000	42,25	845,46	845,46	15,99	313,09	18223,1	18223,1	14731,1	3491,96
1+440,000	34,56	775,92	775,92	26,34	384,25	18999	18999	15115,4	3883,63
1+460,000	30,06	655,67	655,67	27,56	475,2	19654,7	19654,7	15590,6	4064,1
1+480,000	12,98	437,63	437,63	27,67	487,65	20092,3	20092,3	16078,2	4014,08

1+500,000	3,6	169,11	169,11	30,45	526,42	20261,4	20261,4	16604,6	3656,77
1+520,000	0	36,55	36,55	38,78	660,97	20297,9	20297,9	17265,6	3032,36
1+540,000	0	0	0	30,64	681,84	20297,9	20297,9	17947,4	2350,52
1+560,000	0	0	0	18,68	493,23	20297,9	20297,9	18440,7	1857,29
1+580,000	1,94	19,44	19,44	6,36	250,39	20317,4	20317,4	18691	1626,34
1+600,000	10,47	124,18	124,18	1,83	81,94	20441,6	20441,6	18773	1668,58
1+620,000	15,94	264,12	264,12	0,07	19,07	20705,7	20705,7	18792,1	1913,62

1.2. MEASUREMENTS BY CHAPTER

01	**EARTHWORKS**			
0101	**PRELIMINARY WORK**			
D39QE020	UD MEDIUM TREE FELLING	45,00	103,32	4.649,40
	Felling of a medium-sized tree with stump extraction, including felling by levels, chopping and transport to landfill and filling and compacting of cavities.			
D38AN015	M2 LAND CLEARING AND CLEARING	27.176,70	0,86	23.371,96
	M2. Clearing and clearing of land by mechanical means, including loading and transporting products to landfill.			
	TOTAL 0101			**28.021,36**
0102	**EXCAVATIONS**			
D38AP010	M3 EXCAV/TTE, T. VEGET. M/MECHANICS	20.705,68	1,90	39.340,79
	M3. Excavation in topsoil by mechanical means, i/loading and transport of products to landfill or place of use.			
	TOTAL 0102			**39.340,79**
0103	**BACKFILLS AND EMBANKMENTS**			
D38AR015	M3 EMBANKMENT FROM EXCAVATION	18.792,06	3,25	61.074,20
	M3. Embankment from excavation including extension, wetting and compaction up to 95% P.M. using vibratory roller.			
	TOTAL 0103			**61.074,20**
0104	**TERMINATION**			
D38AR031	M2 SLOPE FINISHING AND REFINING	11.170,64	1,90	21.224,22
	M2. Finishing and refining of slopes by mechanical means.			
	TOTAL 0104			**21.224,22**
	TOTAL 01			**149.660,57**
02	**DRAINAGE**			
0201	**TRANSVERSE DRAINAGE**			
D38CM075	ML TUBE D=180CM H.V.REC. M/GRANULAR	51,00	230,71	11.766,21
	ML. Tube D = 180 cm of vibropressed concrete i/p.p. of joints and filled with fully placed granular material.			
D38CR075	UD NOZZLE FINS O.F. 180 CM	3,00	2.321,75	6.965,25
	UD. Nozzle with fins in O.F. for spout D=1.80 m completely finished.			
D38CG015	UD MANHOLE 2.50>H>4.00 M	4,00	598,16	2.392,64
	UD. Well with a depth of between 2.50 and 4.00 m. including curb and slab in reinforced concrete; D=1.20 m.			
D38CT015	UD A. GANTRY/BOW REBATE Lv=350 CM	2,00	3.787,13	7.574,26
	YOU. Front of fins for gantry or lowered arch, in O.F. or road crossing of Lv=3.50 m.			
	TOTAL 0201			**28.698,36**
0202	**LONGITUDINAL DRAINAGE**			
C400_10.01	m GUTTER VA-75.	1.610,00	303,05	487.910,50
	Concrete ditch executed on site type VA-75.			
C403_07	m2 Gutter lining.	805,00	311,67	250.894,35
	Gutter lining.			
	TOTAL 0202			**738.804,85**
	TOTAL 02			**767.503,21**

03	**FIRM**			
D38GJ015	TM ASPHALT BITUMEN 50/70	2.111,50	268,00	565.882,00
	TM. Asphalt bitumen B 50/70 to be used in asphalt mixtures.			
D38GJ0015	t C60B3 ADH EMULSION	8,45	327,83	2.770,16
	C60B3 ADH emulsion in primer irrigation i/ sweeping and surface preparation, fully finished.			
D38GJ2001	t MBC AC 22 BIN 50/70 S LIMESTONE	4.138,54	87,33	361.418,70
	TM. Hot bituminous mixture type AC 22 BIN 50/70 S LIMESTONE including bitumen and filler, fully spread and compacted.			
D38GJ0010	t C60BF4 IMP EMULSION	16,89	342,37	5.782,63
	C60BF4 IMP emulsion in priming irrigation, sweeping and surface preparation, fully finished.			
D38GA115	M3 ARTIFICIAL SAVE	3.378,40	12,58	42.500,27
	M3. Artificial gravel, including extension and compaction in base formation.			
D38GG130	M2 ECR-0 EMULSION CURED AND ADHERE.	16.892,00	0,24	4.054,08
	M2. ECR-0 type emulsion in curing and adhesion irrigation i/ sweeping and surface preparation.			
D38GC115	M3 CEMENT FLOOR	5.576,00	16,26	90.665,76
	M3. Soil-cement, including extension and compaction, without cement for stabilization.			
0_F_C	CEMENT FOR STABILIZATION	230,99	18,12	4.185,54
	Cement to stabilize the pavement soil. Content 1.5% of total volume			
D38AR012	M3 SUITABLE SOIL EMBANKMENT	9.938,40	5,58	55.456,27
	M3. Suitable soil in areas of embankment from loans including spreading, wetting and compaction, up to 95% P.M. using vibratory roller			

TOTAL 03 ..... 1.132.715,41

04	**SIGNS**			
0401	**VERTICAL SIGNAGE**			
D38ID160	UD CIRCULAR SIGN 90	8,00	207,90	1.663,20
	UD. Circular reflective sign D=90 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38IE050	M2 RA2 REFLECTIVE STEEL SLAT SIGN	4,97	240,98	1.197,67
	M2. Sign in RA-3 retroreflectance steel slats with proportional part of IPN, i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38IE010	M2 GALVANIZED STEEL SHEET SIGN	5,14	235,00	1.207,90
	M2. RA-2 retroreflectance sign in galvanized steel sheet, i/p.p. galvanized posts, screws, foundation and anchorage, fully placed.			
D38ID140	UD TRIANGULAR SIGN 135	1,00	214,90	214,90
	UD. Triangular reflective sign of 135 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38ID170	UD OCTOGONAL SIGN 90	1,00	221,55	221,55
	UD. Octagonal sign A-90, i/p.p. galvanized post, screws, foundation and anchor, fully placed.			

TOTAL 0401 ..... 4.505,22

0402	**HORIZONTAL SIGNAGE**			
D38IA030	ML ROAD MARK 10 CM	6.560,00	0,36	2.361,60
	ML. 10 cm reflective road marking, with reflective paint and glass microspheres, with self-propelled machine.			
D38IA020	M2 REALLY PAINTED SURFACE	21,34	16,85	359,58
	M2. Surface really painted, with reflective paint and glass microspheres, with a self-propelled machine.			

TOTAL 0402 ..... 2.721,18

0403	**VEHICLE CONTAINMENT SYSTEMS**			
D38IM030	ML DOUBLE WAVE SAFETY BARRIER	3.200,00	37,42	119.744,00
	ML. Double wave safety barrier, i/p.p. pole, reflectors, separator and placement.			

TOTAL 0403 ..... 119.744,00

TOTAL 04 ..... 126.970,40

05	**PLANTATIONS**			
D38PA030	**M3 SPREADING TOPSOIL**	**3.336,90**	**1,19**	**3.970,91**
	M3. Spreading topsoil.			
D39QC060	**M2 HYDROSEEDING ON SLOPES**	**11.123,01**	**2,77**	**30.810,74**
	M2. hydroseeding on slopes based on 20 gr. of Pratenses seed, 5 gr. of shrubs, 300 gr. of Mulch, 40 gr. of fertilizer, 20 gr. of stabilizer, including placement of a 400 gr/m2 biodescribable organic coconut blanket.			
	TOTAL 05			**34.781,65**
06	**WASTE MANAGEMENT**			
	TOTAL 06			**29.278,49**
07	**HEALTH AND SAFETY**			
	TOTAL 07			**44.666,03**
	TOTAL			**2.285.575,76**

2. PRICE TABLE N1

0_F_C Cement to stabilize the pavement soil. Withtent 1.5% of total volume

18,12
EIGHTEEN EUROS with TWELVE CENTS

C400_10.01 m Withcrete ditch executed on site type VA-75.

303,05
THREE HUNDRED THREE EUROS with FIVE CENTS

C403_07 m2 Gutter lining.

311,67
THREE HUNDRED ELEVEN EUROS with SIXTY SEVEN CENTS

D38AN015 M2 M2. Clearing and clearing of land by mechanical means, including loading and transporting products to landfill.

0,86
CERO EUROS with EIGHTY SIX CENTS

D38AP010 M3 M3. Excavation in topsoil by mechanical means, i/loading and transport of products to landfill or place of use.

1,90
ONE EUROS with NINETY CENTS

D38AR012 M3 M3. Suitable soil in areas of embankment from loans including spreading, wetting and compaction, up to 95% P.M. using vibratory roller

5,58
FIVE EUROS with FIFTY EIGHT CENTS

D38AR015 M3 M3. Embankment from excavation including extension, wetting and compaction up to 95% P.M. using vibratory roller.

3,25
THREE EUROS with TWENTY FIVE CENTS

D38AR031 M2 M2. Finishing and refining of slopes by mechanical means.

1,90
ONE EUROS with NINETY CENTS

D38CG015 UD UD. Well with a depth of between 2.50 and 4.00 m including curb and slab in reinforced withcrete; D=1.20 m.

598,16
FIVE HUNDRED NINETY EIGHT EUROS with SIXTEEN CENTS

D38CM075 ML ML. Tube D = 180 cm of vibropressed withcrete i/p.p. of joints and filled with fully placed granular material.

230,71
TWO HUNDRED THIRTY EUROS with SEVENTY ONE CENTS

D38CR075 UD UD. Nozzle with fins in O.F. for spout D=1.80 m completely finished.

2.321,75
TWO THOUSAND THREE HUNDRED TWENTY ONE EUROS with SEVENTY FIVE CENTS

D38CT015 UD YOU. Front of fins for gantry or lowered arch, in O.F. or road crossing of Lv=3.50 m.

3.787,13
THREE THOUSAND SEVEN HUNDRED EIGHTY SEVEN EUROS with THIRTEEN CENTS

D38GA115 M3 M3. Artificial gravel, including extension and compaction in base formation.

12,58
TWELVE EUROS with FIFTY EIGHT CENTS

D38GC115 M3 M3. Soil-cement, including extension and compaction, without cement for stabilization.

16,26
SIXTEEN EUROS with TWENTY SIX CENTS

D38GG130 M2 M2. ECR-0 type emulsion in curing and adhesion irrigation i/ sweeping and surface preparation

0,24.
CERO EUROS with TWENTY FOUR CENTS

D38GJ0010 t C60BF4 IMP emulsion in priming irrigation, sweeping and surface preparation, fully finished.

342,37
THREE HUNDRED FORTY TWO EUROS with THIRTY SEVEN CENTS

D38GJ0015 t C60B3 ADH emulsion in primer irrigation i/ sweeping and surface preparation, fully finished.

327,83
THREE HUNDRED TWENTY SEVEN EUROS with EIGHTY THREE CENTS

D38GJ015 TM TM. Asphalt bitumen B 50/70 to be used in asphalt mixtures.

268,00
TWO HUNDRED SIXTY EIGHT EUROS

D38GJ2001 t TM. Hot bituminous mixture type AC 22 BIN 50/70 S LIMESTONE including bitumen and filler, fully spread and compacted.

87,33
EIGHTY SEVEN EUROS with THIRTY THREE CENTS

D38IA020 M2 M2. Surface really painted, with reflective paint and glass microspheres, with a self-propelled machine.

16,85
SIXTEEN EUROS with EIGHTY FIVE CENTS

D38IA030 ML ML. 10 cm reflective road marking, with reflective paint and glass microspheres, with self-propelled machine.

0,36
CERO EUROS with THIRTY SIX CENTS

D38ID140	UD	UD. Triangular reflective sign of 135 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.	214,90 TWO HUNDRED FOURTEEN EUROS with NINETY CENTS
D38ID160	UD	UD. Circular reflective sign D=90 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.	207,90 TWO HUNDRED SEVEN EUROS with NINETY CENTS
D38ID170	UD	UD. Octagonal sign A-90, i/p.p. galvanized post, screws, foundation and anchor, fully placed.	221,55 TWO HUNDRED TWENTY ONE EUROS with FIFTY FIVE CENTS
D38IE010	M2	M2. RA-2 retroreflectance sign in galvanized steel sheet, i/p.p. galvanized posts, screws, foundation and anchorage, fully placed.	235,00 TWO HUNDRED THIRTY FIVE EUROS
D38IE050	M2	M2. Sign in RA-3 retroreflectance steel slats with proportional part of IPN, i/p.p. galvanized post, screws, foundation and anchor, fully placed.	240,98 TWO HUNDRED FORTY EUROS with NINETY EIGHT CENTS
D38IM030	ML	ML. Double wave safety barrier, i/p.p. pole, reflectors, separator and placement.	37,42 THIRTY SEVEN EUROS with FORTY TWO CENTS
D38PA030	M3	M3. Spreading topsoil.	1,19 ONE EUROS with NINETEEN CENTS
D39QC060	M2	M2. hydroseeding on slopes based on 20 gr. of Pratenses seed, 5 gr. of shrubs, 300 gr. of Mulch, 40 gr. of fertilizer, 20 gr. of stabilizer, including placement of a 400 gr/m2 biodescribable organic cowithut blanket.	2,77 TWO EUROS with SEVENTY SEVEN CENTS
D39QE020	UD	Felling of a medium-sized tree with stump extraction, including felling by levels, chopping and transport to landfill and filling and compacting of cavities.	103,32 ONE HUNDRED THREE EUROS with THIRTY TWO CENTS

Santander, July of 2025

Signed: Jorge Sáenz Fernández

3. PRICE TABLE N2

0_F_C Cement to stabilize the pavement soil. Content 1.5% of total volume

Rest of the construction and materials.. 18,12

TOTAL UNIT..... 18,12

C400_10.01 m Concrete ditch executed on site type VA-75.

Rest of the construction and materials.. 303,05

TOTAL UNIT..... 303,05

C403_07 m2 Gutter lining.

Rest of the construction and materials.. 311,67

TOTAL UNIT..... 311,67

D38AN015 M2 M2. Clearing and clearing of land by mechanical means, including loading and transporting products to landfill.

Rest of the construction and materials.. 0,86

TOTAL UNIT..... 0,86

D38AP010 M3 M3. Excavation in topsoil by mechanical means, i/loading and transport of products to landfill or place of use.

Rest of the construction and materials.. 1,90

TOTAL UNIT..... 1,90

D38AR012 M3 M3. Suitable soil in areas of embankment from loans including spreading, wetting and compaction, up to 95% P.M. using vibratory roller

Rest of the construction and materials.. 5,58

TOTAL UNIT..... 5,58

D38AR015 M3 M3. Embankment from excavation including extension, wetting and compaction up to 95% P.M. using vibratory roller.

Rest of the construction and materials.. 3,25

TOTAL UNIT..... 3,25

D38AR031 M2 M2. Finishing and refining of slopes by mechanical means.

Rest of the construction and materials.. 1,90

TOTAL UNIT..... 1,90

D38CG015 UD UD. Well with a depth of between 2.50 and 4.00 m. including curb and slab in reinforced concrete; D=1.20 m.

Rest of the construction and materials.. 598,16

TOTAL UNIT..... 598,16

D38CM075 ML ML. Tube D = 180 cm of vibropressed concrete i/p.p. of joints and filled with fully placed granular material.

Rest of the construction and materials... 230,71

TOTAL UNIT..... 230,71

D38CR075 UD UD. Nozzle with fins in O.F. for spout D=1.80 m completely finished.

Rest of the construction and materials... 2.321,75

TOTAL UNIT..... 2.321,75

D38CT015 UD YOU. Front of fins for gantry or lowered arch, in O.F. or road crossing of Lv=3.50 m.

Rest of the construction and materials... 3.787,13

TOTAL UNIT..... 3.787,13

D38GA115 M3 M3. Artificial gravel, including extension and compaction in base formation.

Rest of the construction and materials... 12,58

TOTAL UNIT..... 12,58

D38GC115 M3 M3. Soil-cement, including extension and compaction, without cement for stabilization.

Rest of the construction and materials... 16,26

TOTAL UNIT..... 16,26

D38GG130 M2 M2. ECR-0 type emulsion in curing and adhesion irrigation i/ sweeping and surface preparation.

Rest of the construction and materials... 0,24

TOTAL UNIT..... 0,24

D38GJ0010 t C60BF4 IMP emulsion in priming irrigation, sweeping and surface preparation, fully finished.

Rest of the construction and materials... 342,37

TOTAL UNIT..... 342,37

D38GJ0015 t C60B3 ADH emulsion in primer irrigation i/ sweeping and surface preparation, fully finished.

Rest of the construction and materials... 327,83

TOTAL UNIT..... 327,83

D38GJ015 TM TM. Asphalt bitumen B 50/70 to be used in asphalt mixtures.

Rest of the construction and materials... 268,00

TOTAL UNIT..... 268,00

D38GJ2001 t TM. Hot bituminous mixture type AC 22 BIN 50/70 S LIMESTONE including bitumen and filler, fully spread and compacted.

Rest of the construction and materials... 87,33

TOTAL UNIT..... 87,33

D38IA020	M2	M2. Surface really painted, with reflective paint and glass microspheres, with a self-propelled machine.	
		Rest of the construction and materials..	16,85
		TOTAL UNIT.....	**16,85**
D38IA030	ML	ML. 10 cm reflective road marking, with reflective paint and glass microspheres, with self-propelled machine.	
		Rest of the construction and materials..	0,36
		TOTAL UNIT.....	**0,36**
D38ID140	UD	UD. Triangular reflective sign of 135 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.	
		Rest of the construction and materials..	214,90
		TOTAL UNIT.....	**214,90**
D38ID160	UD	UD. Circular reflective sign D=90 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.	
		Rest of the construction and materials..	207,90
		TOTAL UNIT.....	**207,90**
		Rest of the construction and materials..	207,90
		TOTAL UNIT.....	**207,90**
D38ID170	UD	UD. Octagonal sign A-90, i/p.p. galvanized post, screws, foundation and anchor, fully placed.	
		Rest of the construction and materials..	221,55
		TOTAL UNIT.....	**221,55**
D38IE010	M2	M2. RA-2 retroreflectance sign in galvanized steel sheet, i/p.p. galvanized posts, screws, foundation and anchorage, fully placed.	
		Rest of the construction and materials..	235,00
		TOTAL UNIT.....	**235,00**
D38IE050	M2	M2. Sign in RA-3 retroreflectance steel slats with proportional part of IPN, i/p.p. galvanized post, screws, foundation and anchor, fully placed.	
		Rest of the construction and materials..	240,98
		TOTAL UNIT.....	**240,98**
D38IM030	ML	ML. Double wave safety barrier, i/p.p. pole, reflectors, separator and placement.	
		Rest of the construction and materials..	37,42
		TOTAL UNIT.....	**37,42**
D38PA030	M3	M3. Spreading topsoil.	
		Rest of the construction and materials..	1,19
		TOTAL UNIT.....	**1,19**
D39QC060	M2	M2. hydroseeding on slopes based on 20 gr. of Pratenses seed, 5 gr. of shrubs, 300 gr. of Mulch, 40 gr. of fertilizer, 20 gr. of stabilizer, including placement of a 400 gr/m2 biodescribable organic coconut blanket.	
		Rest of the construction and materials...	2,77
		TOTAL UNIT.....	**2,77**
D39QE020	UD	Felling of a medium-sized tree with stump extraction, including felling by levels, chopping and transport to landfill and filling and compacting of cavities.	
		Rest of the construction and materials...	103,32
		TOTAL UNIT.....	**103,32**

Santander, July of 2025

Signed: Jorge Sáenz Fernández

4. BUDGET BY CHAPTERS

01	**EARTHWORKS**			
0101	**PRELIMINARY WORK**			
D39QE020	UD MEDIUM TREE FELLING	45,00	103,32	4.649,40
	Felling of a medium-sized tree with stump extraction, including felling by levels, chopping and transport to landfill and filling and compacting of cavities.			
D38AN015	M2 LAND CLEARING AND CLEARING	27.176,70	0,86	23.371,96
	M2. Clearing and clearing of land by mechanical means, including loading and transporting products to landfill.			
	TOTAL 0101			**28.021,36**
0102	**EXCAVATIONS**			
D38AP010	M3 EXCAV/TTE, T. VEGET. M/MECHANICS	20.705,68	1,90	39.340,79
	M3. Excavation in topsoil by mechanical means, i/loading and transport of products to landfill or place of use.			
	TOTAL 0102			**39.340,79**
0103	**BACKFILLS AND EMBANKMENTS**			
D38AR015	M3 EMBANKMENT FROM EXCAVATION	18.792,06	3,25	61.074,20
	M3. Embankment from excavation including extension, wetting and compaction up to 95% P.M. using vibratory roller.			
	TOTAL 0103			**61.074,20**
0104	**TERMINATION**			
D38AR031	M2 SLOPE FINISHING AND REFINING	11.170,64	1,90	21.224,22
	M2. Finishing and refining of slopes by mechanical means.			
	TOTAL 0104			**21.224,22**
	TOTAL 01			**149.660,57**

02	**DRAINAGE**			
0201	**TRANSVERSE DRAINAGE**			
D38CM075	ML TUBE D=180CM H.V.REC. M/GRANULAR	51,00	230,71	11.766,21
	ML. Tube D = 180 cm of vibropressed concrete i/p.p. of joints and filled with fully placed granular material.			
D38CR075	UD NOZZLE FINS O.F. 180 CM	3,00	2.321,75	6.965,25
	UD. Nozzle with fins in O.F. for spout D=1.80 m completely finished.			
D38CG015	UD MANHOLE 2.50>H>4.00 M	4,00	598,16	2.392,64
	UD. Well with a depth of between 2.50 and 4.00 m. including curb and slab in reinforced concrete; D=1.20 m.			
D38CT015	UD A. GANTRY/BOW REBATE Lv=350 CM	2,00	3.787,13	7.574,26
	YOU. Front of fins for gantry or lowered arch, in O.F. or road crossing of Lv=3.50 m.			
	TOTAL 0201			**28.698,36**
0202	**LONGITUDINAL DRAINAGE**			
C400_10.01	m GUTTER VA-75.	1.610,00	303,05	487.910,50
	Concrete ditch executed on site type VA-75.			
C403_07	m2 Gutter lining.	805,00	311,67	250.894,35
	Gutter lining.			
	TOTAL 0202			**738.804,85**
	TOTAL 02			**767.503,21**

03	**FIRM**			
D38GJ015	TM ASPHALT BITUMEN 50/70	2.111,50	268,00	565.882,00
	TM. Asphalt bitumen B 50/70 to be used in asphalt mixtures.			
D38GJ0015	t C60B3 ADH EMULSION	8,45	327,83	2.770,16
	C60B3 ADH emulsion in primer irrigation i/ sweeping and surface preparation, fully finished.			
D38GJ2001	t MBC AC 22 BIN 50/70 S LIMESTONE	4.138,54	87,33	361.418,70
	TM. Hot bituminous mixture type AC 22 BIN 50/70 S LIMESTONE including bitumen and filler, fully spread and compacted.			
D38GJ0010	t C60BF4 IMP EMULSION	16,89	342,37	5.782,63
	C60BF4 IMP emulsion in priming irrigation, sweeping and surface preparation, fully finished.			
D38GA115	M3 ARTIFICIAL SAVE	3.378,40	12,58	42.500,27
	M3. Artificial gravel, including extension and compaction in base formation.			
D38GG130	M2 ECR-0 EMULSION CURED AND ADHERE.	16.892,00	0,24	4.054,08
	M2. ECR-0 type emulsion in curing and adhesion irrigation i/ sweeping and surface preparation.			
D38GC115	M3 CEMENT FLOOR	5.576,00	16,26	90.665,76
	M3. Soil-cement, including extension and compaction, without cement for stabilization.			
0_F_C	CEMENT FOR STABILIZATION	230,99	18,12	4.185,54
	Cement to stabilize the pavement soil. Content 1.5% of total volume			
D38AR012	M3 SUITABLE SOIL EMBANKMENT	9.938,40	5,58	55.456,27
	M3. Suitable soil in areas of embankment from loans including spreading, wetting and compaction, up to 95% P.M. using vibratory roller			

TOTAL 03 ..... 1.132.715,41

04	**SIGNS**			
0401	**VERTICAL SIGNAGE**			
D38ID160	UD CIRCULAR SIGN 90	8,00	207,90	1.663,20
	UD. Circular reflective sign D=90 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38IE050	M2 RA2 REFLECTIVE STEEL SLAT SIGN	4,97	240,98	1.197,67
	M2. Sign in RA-3 retroreflectance steel slats with proportional part of IPN, i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38IE010	M2 GALVANIZED STEEL SHEET SIGN	5,14	235,00	1.207,90
	M2. RA-2 retroreflectance sign in galvanized steel sheet, i/p.p. galvanized posts, screws, foundation and anchorage, fully placed.			
D38ID140	UD TRIANGULAR SIGN 135	1,00	214,90	214,90
	UD. Triangular reflective sign of 135 cm., i/p.p. galvanized post, screws, foundation and anchor, fully placed.			
D38ID170	UD OCTOGONAL SIGN 90	1,00	221,55	221,55
	UD. Octagonal sign A-90, i/p.p. galvanized post, screws, foundation and anchor, fully placed.			

TOTAL 0401 ..... 4.505,22

0402	**HORIZONTAL SIGNAGE**			
D38IA030	ML ROAD MARK 10 CM	6.560,00	0,36	2.361,60
	ML. 10 cm reflective road marking, with reflective paint and glass microspheres, with self-propelled machine.			
D38IA020	M2 REALLY PAINTED SURFACE	21,34	16,85	359,58
	M2. Surface really painted, with reflective paint and glass microspheres, with a self-propelled machine.			

TOTAL 0402 ..... 2.721,18

0403	**VEHICLE CONTAINMENT SYSTEMS**			
D38IM030	ML DOUBLE WAVE SAFETY BARRIER	3.200,00	37,42	119.744,00
	ML. Double wave safety barrier, i/p.p. pole, reflectors, separator and placement.			

TOTAL 0403 ..... 119.744,00

TOTAL 04 ..... 126.970,40

05	**PLANTATIONS**			
D38PA030	**M3 SPREADING TOPSOIL**	**3.336,90**	**1,19**	**3.970,91**
	M3. Spreading topsoil.			
D39QC060	**M2 HYDROSEEDING ON SLOPES**	**11.123,01**	**2,77**	**30.810,74**
	M2. hydroseeding on slopes based on 20 gr. of Pratenses seed, 5 gr. of shrubs, 300 gr. of Mulch, 40 gr. of fertilizer, 20 gr. of stabilizer, including placement of a 400 gr/m2 biodescribable organic coconut blanket.			
	TOTAL 05			**34.781,65**
06	**WASTE MANAGEMENT**			
	TOTAL 06			**29.278,49**
07	**HEALTH AND SAFETY**			
	TOTAL 07			**44.666,03**
	TOTAL			**2.285.575,76**

Santander, July of 2025

Signed : Jorge Sáenz Fernández

5. BUDGET SUMMARY

01	EARTHWORKS	149.660,57
02	DRAINAGE	767.503,21
03	FIRM	1.132.715,41
04	SIGNS	126.970,40
05	PLANTATIONS	34.781,65
06	WASTE MANAGEMENT	29.278,49
07	HEALTH AND SAFETY	44.666,03

CONSTRUCTION BUDGET	**2.285.575,76**
13,00 % General Spendings	297.124,85
6,00 % industrial Benefit .	137.134,55
Sumation	434.259,40
TENER BASE BUDGET WITHOUT VAT	**2.719.835,16**
21% VAT	571.165,38
TENDER BASE BUDGET	**3.291.000,54**

The budget rises to the quatinty of THREE MILLIONS TWO HUNDRED NINETY ONE THOUSAND EUROS with FIFTY FOUR CENTS

Santander, July of 2025

Signed: Jorge Sáenz Fernández

BUDGET 1 – PRICE JUSTIFICATION

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1. INTRODUCTION

This annex presents a detailed breakdown and justification of the unit prices included in Price Table No. 1, which serve as the basis for the project budget. The direct construction cost (Material Execution Budget) of each work unit is obtained by summing its direct and indirect costs, with the latter calculated as a percentage applied to the former.

$$P_n = C_D + C_I = C_D * \left(1 + \frac{K}{100}\right)$$

Where:

- P_n Unit Construction cost (€).
- C_D Unit Direct Cost (€).
- C_I Indirect Unit Cost (€)
- K Indirect Costs percentage (%).

2. DIRECT COSTS

The direct costs of each work unit depend on three components:

- Labor cost
- Machinery cost
- Material cost

2.1. LABOR COST

The calculation of labor cost is base don the Convenio Colectivo de Construcción y Obras Públicas de Cantabria 2024.

The formula used to determine the hourly labor cost is established by Orden Ministerial de 21 de mayo de 1979:

$$C = k \cdot A + B$$

Where:

- C Company hourly labor cost (€/h).
- k A contribution rate coefficient of 1.4 will be applied.
- A Total employee remuneration of a purely wage-based nature (€/h).
- B Total non-wage remuneration (€/h).

2.1.1. WORKING CALENDAR OF CANTABRIA

Consejería de Industria, Empleo, Innovación y Comercio published on the BOC 150 (Orden IND/39/2024, de 29 de julio, that stablishes the working calendar for 2025 in Cantabria). Vacation days are shown below:

fecha	día	Festividad
1 de enero	Miércoles	Año Nuevo
6 de enero	Lunes	Epifanía del Señor
17 de abril	Jueves	Jueves Santo
18 de abril	Viernes	Viernes Santo
1 de mayo	Jueves	Fiesta del Trabajo
28 de julio	Lunes	Día de las Instituciones de Cantabria
15 de agosto	Viernes	Asunción de la Virgen
15 de septiembre	Lunes	La Bien Aparecida
1 de noviembre	Sábado	Todos los Santos
6 de diciembre	Sábado	Día de la Constitución Española
8 de diciembre	Lunes	Inmaculada Concepción
25 de diciembre	Jueves	Natividad del Señor

Table 5.1.1. Vacation days in Cantabria 2025

2.1.2. TOTAL EMPLOYEE REMUNERATION OF A PURELY WAGE-BASED NATURE (A)

The wage-based remuneration (A) for each level is calculated as the sum of the base salary, collective agreement allowance, vacation pay, summer bonus, Christmas bonus, seniority pay, and hazard pay.

NIVELES	S. BASE 336 DÍAS	P. CONVENIO 217 DÍAS	VACACIONES 30 DÍAS	PAGA DE VERANO	PAGA DE NAVIDAD	COMPUTO ANUAL
VI-Encargado,J. Taller	39,16	23,15	1.843,97	1.849,87	1.849,87	23.725,02
VII – Capataz	38,02	23,15	1.744,22	1.784,60	1.784,60	23.111,69
VIII - Ofc. 1 de Oficio	37,39	23,15	1.724,65	1.771,37	1.771,37	22.853,98
IX - Ofc. 2 de Oficio	36,17	23,15	1.628,27	1.696,37	1.696,37	22.197,68
X - Ayte. de Oficio	35,09	23,15	1.586,30	1.654,88	1.654,88	21.709,85
XI - Peón Especialista	34,94	23,15	1.550,97	1.631,70	1.631,70	21.577,76
XII - Peón Ordinario	34,68	23,15	1.482,92	1.580,14	1.580,14	21.319,23

Table 5.1.2. Employee remuneration. Cantabria, 2024.

The base salary, collective agreement allowance, vacation pay, and summer and Christmas bonuses are determined by applying the amounts established in the previous salary table for each worker level. The 2024 table is shown; however, the remuneration considers an expected increase of 2.75% for 2025, as the resolution for 2025 had not been published at the time of drafting this project.

2.1.2.1. SENIORITY

A seniority bonus of 5% over the base salary is applied to the higher levels (foreman, supervisor, and first-class skilled worker), as they are usually permanent employees on the company's payroll. Lower levels are typically temporary workers whose employment depends on the project location; therefore, they do not receive a seniority bonus.

2.1.2.2. HAZARD EXTRA

A hazard pay bonus of 10% over the base salary is applied to general laborers to cover risk-related tasks on site, assuming that these hazardous operations are performed during 50% of the working day.

Considering a total of 1,736 productive hours per year, the following hourly values corresponding to the wage-based remuneration (A) are obtained:

	WAGE – BASED REMUNERATION (A)								
	BASE SALARY (335 days)	COLLECTIVE AGREEMENT BONUS(217 days)	VACATIONS	SUMMER PAYMENT	CHRISTMAS PAYMENT	SENIORITY	HAZARD EXTRA	TOTAL ANUAL	HOURLY COST
	€/día	€/día	€	€	€	€	€	€	€
FOREMAN	39,07	23,79	1792,17	1833,68	1833,68	654,4225	0	24364,83	14,04
FIRST OFFICER	38,42	20,81	1772,08	1820,08	1820,08	643,535	0	23442,25	13,50
ORDINARY LABORER	35,63	20,81	1523,7	1623,59	1623,59	0	596,8025	21819,50	12,57

Table 5.1.3. Calculation of wage-based remuneration.

2.1.2. NON – WAGE REMUNERATION (B)

The non-wage remuneration (B) is calculated based on per diems, travel distance, tool wear, work clothing, and severance compensation.

2.1.2.1. DIETS AND TRAVEL DISTANCE

Full per diem will be paid to workers at higher levels (foreman and first-class skilled worker), and half per diem to those at lower levels (general laborer) for effective working days.

Additionally, a mileage allowance is established to cover workers' travel expenses to the worksite. This allowance is calculated based on a total distance of 30 kilometers (15 kilometers each way) and will be paid in euros per kilometer traveled per day. Again, the 2024 values are shown, but an expected increase of 2.75% is considered for remuneration.

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Dieta completa 39,57
Media dieta..... 12,97
Kl. 0,3

Table 25.4. Diets and Travel Distance Cantabria 2024.

2.1.2.2. TOOL WEAR

A weekly average amount of €3.08 will be applied as tool wear allowance, applicable to first officers skilled workers.

2.1.2.3. SEVERANCE COMPENSATION

The collective agreement establishes daily compensations for severance in cases of termination of an indefinite contract. These compensations will be paid for each calendar day of employment with the company, excluding days of absence due to illness, accident, or medical leave.

RETRIBUCIÓN DIARIA		
NIVELES	INDEMNIZACIÓN 4,50%	INDEMNIZACIÓN 7%
VI Encargado		4,54
VII Capataz		4,42
VIII Oficial 1º		4,37
IX Oficial 2º		4,25
X Ayte. Oficial		4,15
XI Peón. Espec.		4,13
XII Peón Ordina.		4,08

Tabla 5.1.5. Indemnizaciones 2024

Severance compensation is considered equivalent to 365 days worked. From the sum of the above concepts, the following non-wage remuneration (B) values are obtained for each level:

	RETIBUCIÓN CON CARÁCTER NO SALARIAL (B)				
	DIETS (217 days)	TRAVEK DISTANCE (217 days, 30 km)	TOOL WAER (42 weeks)	COMPENSATION	TOTAL ANNUAL
	€/day	€/km*day	€/week	€/day	€
FOREMAN	40,66	0,308	0	4,66	12529,2
FIRST OFFICER	40,66	0,308	3,08	4,26	12512,56
ORDINARY LABORER	13,33	0,308	0	4,19	6427,04

Table 5.1.6. Non-wage remuneration.

2.1.3. TOTAL REMUNERATION

According to the formula $C = 1{,}40 \cdot A + B$ the following labor costs are obtained:

	LABOR COST (C)	
	ANNUAL COST	HOURLY COST
	€	€/h
FOREMAN	46639,97	26,87
FIRST OFFICER	45331,70	26,11
ORDINARY LABORER	36974,34	21,30

Table 5.1.7. Labor Force Cost.

2.2. MACHINERY COST

The machinery to be used in the execution of the work is described below, along with their unit costs and total cost:

MQ.111	Tracked backhoe loader 20/25 Tn Tracked backhoe loader weighing 20/25 Tn	7,648	h	49,24	376,56
MQ.152	Three-axle truck. Three-axle truck.	15,295	h	33,67	514,98
MQ.255	12/15 Tn Motor Grader Motor grader weight 12/15 Tn	8,050	h	60,93	490,49
MQ.300	Self-propelled concrete paver. Self-propelled concrete paver.	27,370	h	221,89	6.073,13
MQ.302	Vibrating roller 0.80 m wide. Vibrating roller 0.80 m wide.	16,100	h	11,25	181,13
MQ.545	5 HP bilge pump. 5 HP bilge pump.	7,648	h	5,74	43,90
MQ.550	25 KVA generator set. 25 KVA generator set.	7,648	h	9,90	75,71
U39AA002	Pneumatic Backhoe Loader	749,233	H.	45,40	34.015,17
U39AB003	Front loader 80 hp	111,520	H.	42,15	4.700,57
U39AB004	CAT.950 Tire Shovel	81,530	H.	42,00	3.424,26
U39AB008	Shovel excv.hydra.S/retr tracks	1,980	H.	31,86	63,08
U39AB010	Shovel w/Tires (CAT-920)	33,369	H.	42,26	1.410,17
U39AC001	Compact.vibra.autopr. 12/14 t	6,375	H.	58,60	373,58
U39AC002	Compact.vibra.manual tray	30,600	H.	3,08	94,25
U39AC006	Pneumatic compactor. 60hp	67,568	H.	58,96	3.983,81
U39AC007	Tire compactor.autp.100hp	680,860	H.	56,27	38.311,99
U39AC008	Self-propelling vibrat.compactor	334,560	H.	56,89	19.033,12
U39AD002	Motor grader 130 hp	287,305	H.	65,13	18.712,15
U39AE001	10 t self-propelled tandem compactor	106,251	h	65,00	6.906,29
U39AF002	Crane truck 5 Tm.	6,375	H.	37,40	238,43
U39AG001	Nemát autropopulsad sweeper	29,641	h	6,20	183,77
U39AH003	Truck 5 tm	7,742	H.	26,51	205,24
U39AH005	Dump truck 10 tm	329,619	H.	50,60	16.678,74

U39AH024	Dump truck 125hp	326,120	H.	35,20	11.479,44
U39AH025	Bathtub truck 200 hp	744,321	H.	40,20	29.921,70
U39AI008	Agglomerated paver	70,355	h	118,00	8.301,91
U39AI012	Equipment Extend.base,Sub-bases	89,544	H.	40,18	3.597,88
U39AK001	Concrete unit 20/30 M3	111,520	H.	29,05	3.239,66
U39AL005	Tanker/water truck 140 hp	394,798	H.	26,15	10.323,97
U39AM005	Bituminator truck 130 hp	16,892	H.	24,35	411,32
U39AP001	Self-propelled marker	10,726	H.	6,20	66,50
U39AQ001	Maqui.pile posts barre.segu	240,000	H.	29,30	7.032,00
U39AT002	Trac. s/orug. Bull. 140 hp	108,707	H.	65,68	7.139,86
U39AZ001	Needle vibrator	11,406	H.	3,50	39,92
U39BK205	Hot asphalt plant	70,355	h	516,00	36.303,27
U40SE150	Chainsaw.	45,000	h	24,00	1080,00
VAR.03	Plus tte concrete 30-60 km, round trip. Plus concrete transport over a distance between 30 km and 60 km, round trip.	273,700	m3	5,20	1.423,24
VAR.06	Plus tte pro.de can. 30-60 km, round trip. Plus for transporting quarry products over a distance of between 30 km and 60 km, round trip.	635,950	t	3,87	2.461,13

TOTAL..... 281.741,90

2.3. MATERIAL COST

The materials to be used in the execution of the work are described below, along with their unit costs and total cost:

MA.AR023	Artificial gravel from quarry. Artificial gravel from quarry.	635,950	t	4,81	3.058,92
MA.HM104	HNE-20/B/20 concrete. HNE-20/B/20 concrete.	273,700	m3	65,98	18.058,73
MA.VA372	Wood for formwork. Wood for formwork.	0,443	m3	188,49	83,45
MA.VA375	Release agent. Release agent.	3,623	l	2,11	7,64
U04CA001	CEM II/A-P 32.5 R Bulk Cement	56,593	Tm	73,94	4.184,45
U04MA210	Concrete HM-12.5/P/40 Central	21,496	M3	56,26	1.209,36
U04MA310	Concrete HM-15/P/40 Central	6,026	M3	57,12	344,21
U04MA510	Concrete HM-20/P/40/I center	75,916	M3	64,39	4.888,23
U04PY001	Water	1.668,452	M3	0,55	917,65
U39BF101	Fabr. and Lt. concrete	57,085	M3	5,99	341,94
U39BH110	Metal formwork 20 sets	8,800	M2	23,88	210,14
U39BH125	Encofr.descofr.cimient.sole	185,937	M2	3,49	648,92
U39CE002	Artificial zahorra	3.885,160	M3	5,81	22.572,78
U39CE0020	Bituminous emulsion C60BF5 IMP	16,890	t	290,00	4.898,10
U39CE0021	Bituminous emulsion C60B3 ADH	8,450	t	243,26	2.055,55
U39CK001	Drain filter material >76mm	5,656	M3	9,20	52,04
U39CK005	Granular material	244,800	M3	5,15	1.260,72
U39CK006	Loan material	6.412,400	M3	5,21	33.408,60
U39CK022	Suitable soil	11.429,160	M3	1,69	19.315,28
U39CQ002	Mineral filler powder	3.939,890	t	56,47	222.485,59
U39DA002	Asphalt bitumen B 50/70	2.297,734	Tm	250,30	575.122,90
U39DE003	ECR-0 emulsion binder	16,892	Tm	148,97	2.516,40
U39GD010	Tube H. Vibropressed d= 180 cm.	51,000	Ml	163,68	8.347,68
U39HA001	Steel B 400 S	600,000	Kg	0,55	330,00
U39HA010	Steel B 400 S	3.406,688	Kg	1,60	5.450,70
U39HP001	36x21 pâté with polyurethane	48,000	Ud	2,15	103,20
U39HR001	Cast iron cover frame	4,000	Ud	29,73	118,92
U39IA005	Square wood	2,700	M3	102,68	277,24
U39VA002	Road marking paint	487,685	Kg	2,33	1.136,31
U39VF001	Sñ. triangic danger. 135 cm	1,000	Ud	124,60	124,60
U39VF060	Reflective sign ø=90 cm	8,000	Ud	117,70	941,60
U39VF070	Octagonal sign A-90	1,000	Ud	130,58	130,58
U39VH0020	Reflective panel. in sheet steel	5,140	M2	97,42	500,74
U39VM003	Galvaniz tube post.80x40x2mm	65,840	Ml	7,66	504,33
U39VM007	Galvan post. CPN 120 of 1.5 m.	800,000	Ml	16,18	12.944,00
U39VM010	IPN-12	7,455	Ml	14,90	111,08
U39VQ002	Screw set	800,000	Ud	2,76	2.208,00
U39VS002	Lighthouse catchers	128,000	Ud	3,07	392,96
U39VW020	Reflective steel slat sign E.G	4,970	M2	137,93	685,51
U39VZ001	N.V. Glass Spheres	325,123	Kg	1,10	357,64
U39VÑ025	Double wave galva band. 4 m	3.200,000	Ml	11,04	35.328,00
U39ZH001	Separator	800,000	Ud	4,29	3.432,00
U40MA615	Biodegradable organic blanket	11.123,010	M2	1,38	15.349,75
U40MA650	Complete hydroseeding mix	2.780,753	Kg	0,79	2.196,79

TOTAL 1.008.613,23

3. INDIRECT COSTS

Indirect costs (not directly attributable to a specific work unit) are obtained by applying a percentage K to the direct costs. The value of this percentage is calculated using the following expression:

$$K = V + J$$

Where:

- K Indirect Cost Percentage
- V Percentage resulting from the ratio between the valuation of indirect costs and the amount of direct costs (a 5% rate is applied).
- J Contingency expense percentage (a 1% rate is applied for land-based works).

Therefore, an indirect cost coefficient (K) of **6%** is applied to the direct cost of each work unit.

4. UNITARY COSTS

AUX.41	m2	Straight wall formwork. The total unit price is THREE HUNDRED SEVENTEEN EUROS with FORTY ONE CENTS	317,41
C400_10.01	m	GUTTER VA-75. The total unit price is THREE HUNDRED THREE EUROS with FIVE CENTS	303,05
C403_07	m2	Gutter lining. The total unit price is THREE HUNDRED ELEVEN EUROS with SIXTY SEVEN CENTS	311,67
D38AN015	M2	LAND CLEARING AND CLEARING The total unit price is CERO EUROS with EIGHTY SIX CENTS	0,86
D38AP010	M3	EXCAV/TTE, T. VEGET. M/MECHANICS The total unit price is ONE EUROS with NINETY CENTS	1,90
D38AR012	M3	SUITABLE SOIL EMBANKMENT The total unit price is FIVE EUROS with FIFTY EIGHT CENTS	5,58
D38AR015	M3	EMBANKMENT FROM EXCAVATION The total unit price is THREE EUROS with TWENTY FIVE CENTS	3,25
D38AR031	M2	SLOPE FINISHING AND REFINING The total unit price is ONE EUROS with NINETY CENTS	1,90
D38CG015	UD	MANHOLE 2.50>H>4.00 M The total unit price is FIVE HUNDRED NINETY EIGHT EUROS with SIXTEEN CENTS	598,16
D38CM075	ML	TUBE D=180CM H.V.REC. M/GRANULAR The total unit price is TWO HUNDRED THIRTY EUROS with SEVENTY ONE CENTS	230,71
D38CR075	UD	NOZZLE FINS O.F. 180 CM The total unit price is TWO THOUSAND THREE HUNDRED TWENTY ONE EUROS with SEVENTY FIVE CENTS	2.321,75
D38CT015	UD	A. GANTRY/BOW REBATE Lv=350 CM The total unit price is THREE THOUSAND SEVEN HUNDRED EIGHTY SEVEN EUROS with THIRTEEN CENTS	3.787,13
D38GA115	M3	ARTIFICIAL SAVE The total unit price is TWELVE EUROS with FIFTY EIGHT CENTS	12,58
D38GC115	M3	CEMENT FLOOR The total unit price is SIXTEEN EUROS with TWENTY SIX CENTS	16,26
D38GG130	M2	ECR-0 EMULSION CURED AND ADHERE. The total unit price is CERO EUROS with TWENTY FOUR CENTS	0,24
D38GJ0010	t	C60BF4 IMP EMULSION The total unit price is THREE HUNDRED FORTY TWO EUROS with THIRTY SEVEN CENTS	342,37
D38GJ0015	t	C60B3 ADH EMULSION The total unit price is THREE HUNDRED TWENTY SEVEN EUROS with EIGHTY THREE CENTS	327,83
D38GJ015	TM	ASPHALT BITUMEN 50/70 The total unit price is TWO HUNDRED SIXTY EIGHT EUROS	268,00
D38GJ2001	t	MBC AC 22 BIN 50/70 S LIMESTONE The total unit price is EIGHTY SEVEN EUROS with THIRTY THREE CENTS	87,33
D38IA020	M2	REALLY PAINTED SURFACE The total unit price is SIXTEEN EUROS with EIGHTY FIVE CENTS	16,85
D38IA030	ML	ROAD MARK 10 CM The total unit price is CERO EUROS with THIRTY SIX CENTS	0,36
D38ID140	UD	TRIANGULAR SIGN 135 The total unit price is TWO HUNDRED FOURTEEN EUROS with NINETY CENTS	214,90
D38ID160	UD	CIRCULAR SIGN 90 The total unit price is TWO HUNDRED SEVEN EUROS with NINETY CENTS	207,90
D38ID170	UD	OCTOGONAL SIGN 90 The total unit price is TWO HUNDRED TWENTY ONE EUROS with FIFTY FIVE CENTS	221,55
D38IE010	M2	GALVANIZED STEEL SHEET SIGN The total unit price is TWO HUNDRED THIRTY FIVE EUROS	235,00
D38IE050	M2	RA2 REFLECTIVE STEEL SLAT SIGN The total unit price is TWO HUNDRED FORTY EUROS with NINETY EIGHT CENTS	240,98
D38IM030	ML	DOUBLE WAVE SAFETY BARRIER The total unit price is THIRTY SEVEN EUROS with FORTY TWO CENTS	37,42
D38PA030	M3	SPREADING TOPSOIL The total unit price is ONE EUROS with NINETEEN CENTS	1,19
D39QC060	M2	HYDROSEEDING ON SLOPES The total unit price is TWO EUROS with SEVENTY SEVEN CENTS	2,77
D39QE020	UD	MEDIUM TREE FELLING The total unit price is ONE HUNDRED THREE EUROS with THIRTY TWO CENTS	103,32

5. BREAKDOWN OF UNITARY COSTS

CODE	QUANTITY	UD.	SUMMARY	PRICE	SUBTOTAL	AMOUNT
AUX.41		m2	Straight wall formwork.			
MO.001	0,050	h	Foreman.	20,52	1,03	
MO.002	0,250	h	1st Officer.	20,44	5,11	
U01AA011	12,500	Hr	Ordinary Laborer	21,30	266,25	
%CP.006	2,724	%	P.P. PPE's (s/labor).	0,50	1,36	
MA.VA372	0,011	m3	Wood for formwork.	188,49	2,07	
MA.VA375	0,090	l	Release agent.	2,11	0,19	
%CP.037	2,760	%	P.P.maq.y med. formwork auxiliaries.	15,00	41,40	
			TOTAL UNITARY COST			317,41
			The total unitary cost is THREE HUNDRED SEVENTEEN EUROS with FORTY ONE CENTS			
C400_10.01		m	GUTTER VA-75.			
MO.001	0,004	h	Foreman.	20,52	0,08	
MO.002	0,040	h	1st Officer.	20,44	0,82	
U01AA011	12,500	Hr	Ordinary Laborer	21,30	266,25	
%CP.006	2,672	%	P.P. PPE's (s/labor).	0,50	1,34	
AUX.01	0,350	m3	Mechanical excavation in trenches and wells.	5,76	2,02	
MA.AR023	0,320	t	Artificial gravel from quarry.	4,81	1,54	
VAR.06	0,320	t	Plus tte pro.de can. 30-60 km, round trip.	3,87	1,24	
MQ.255	0,005	h	12/15 Tn Motor Grader	60,93	0,30	
MA.HM104	0,120	m3	HNE-20/B/20 withcrete.	65,98	7,92	
VAR.03	0,120	m3	Plus tte withcrete 30-60 km, round trip.	5,20	0,62	
MQ.300	0,017	h	Self-propelled withcrete paver.	221,89	3,77	
%CI.002	2,859	%	Indirect costs (y/total)	6,00	17,15	
			TOTAL UNITARY COST			303,05
			The total unitary cost is THREE HUNDRED THREE EUROS with FIVE CENTS			
C403_07		m2	Gutter lining.			
MO.001	0,004	h	Foreman.	20,52	0,08	
MO.002	0,020	h	1st Officer.	20,44	0,41	
U01AA011	12,500	Hr	Ordinary Laborer	21,30	266,25	
%CP.006	2,667	%	P.P. PPE's (s/labor).	0,50	1,33	
AUX.01	0,250	m3	Mechanical excavation in trenches and wells.	5,76	1,44	
AUX.41	0,050	m2	Straight wall formwork.	317,41	15,87	
MA.AR023	0,150	t	Artificial gravel from quarry.	4,81	0,72	
VAR.06	0,150	t	Plus tte pro.de can. 30-60 km, round trip.	3,87	0,58	
MQ.302	0,020	h	Vibrating roller 0.80 m wide.	11,25	0,23	
MA.HM104	0,100	m3	HNE-20/B/20 withcrete.	65,98	6,60	
VAR.03	0,100	m3	Plus tte withcrete 30-60 km, round trip.	5,20	0,52	
%CI.002	2,940	%	Indirect costs (y/total)	6,00	17,64	
			TOTAL UNITARY COST			311,67
			The total unitary cost is THREE HUNDRED ELEVEN EUROS with SIXTY SEVEN CENTS			
D38AN015		M2	LAND CLEARING AND CLEARING			
U39AT002	0,004	H.	Trac. s/orug. Bull. 140 hp	65,68	0,26	
U39AB004	0,003	H.	CAT.950 Tire Shovel	42,00	0,13	
U39AH024	0,012	H.	Dump truck 125hp	35,20	0,42	
%0100000	0,008	%	Indirect costs... (s/total)	6,00	0,05	
			TOTAL UNITARY COST			0,86
			The total unitary cost is CERO EUROS with EIGHTY SIX CENTS			
D38AP010		M3	EXCAV/TTE, T. VEGET. M/MECHANICS			
U01AA006	0,010	Hr	Foreman	26,87	0,27	
U01AA011	0,010	Hr	Ordinary Laborer	21,30	0,21	
U39AA002	0,020	H.	Pneumatic Backhoe Loader	45,40	0,91	
U39AH025	0,010	H.	Bathtub truck 200 hp	40,20	0,40	
%0100000	0,018	%	Indirect costs... (s/total)	6,00	0,11	
			TOTAL UNITARY COST			1,90
			The total unitary cost is ONE EUROS with NINETY CENTS			
D38AR012		M3	SUITABLE SOIL EMBANKMENT			
U01AA006	0,010	Hr	Foreman	26,87	0,27	
U01AA011	0,035	Hr	Ordinary Laborer	21,30	0,75	
U39AD002	0,010	H.	Motor grader 130 hp	65,13	0,65	
U39AC007	0,020	H.	Tire compactor.autp.100hp	56,27	1,13	
U39AL005	0,020	H.	Tanker/water truck 140 hp	26,15	0,52	
U39CK022	1,150	M3	Suitable soil	1,69	1,94	
%0100000	0,053	%	Indirect costs... (s/total)	6,00	0,32	
			TOTAL UNITARY COST			5,58
			The total unitary cost is FIVE EUROS with FIFTY EIGHT CENTS			
D38AR015		M3	EMBANKMENT FROM EXCAVATION			
U01AA006	0,010	Hr	Foreman	26,87	0,27	
U01AA011	0,035	Hr	Ordinary Laborer	21,30	0,75	
U39AD002	0,010	H.	Motor grader 130 hp	65,13	0,65	
U39AL005	0,010	H.	Tanker/water truck 140 hp	26,15	0,26	
U39AC007	0,020	H.	Tire compactor.autp.100hp	56,27	1,13	
%0100000	0,031	%	Indirect costs... (s/total)	6,00	0,19	
			TOTAL UNITARY COST			3,25
			The total unitary cost is THREE EUROS with TWENTY FIVE CENTS			
D38AR031		M2	SLOPE FINISHING AND REFINING			
U01AA011	0,020	Hr	Ordinary Laborer	21,30	0,43	
U39AA002	0,030	H.	Pneumatic Backhoe Loader	45,40	1,36	
%CI	0,018	%	Indirect costs... (s/total)	6,00	0,11	
			TOTAL UNITARY COST			1,90
			The total unitary cost is ONE EUROS with NINETY CENTS			
D38CG015		UD	MANHOLE 2.50>H>4.00 M			
U01AA006	1,020	Hr	Foreman	26,87	27,41	
U01AA007	2,975	Hr	First Officer	26,11	77,68	
U01AA011	2,975	Hr	Ordinary Laborer	21,30	63,37	
U04MA310	0,550	M3	Withcrete HM-15/P/40 Central	57,12	31,42	
U04MA510	2,700	M3	Withcrete HM-20/P/40/I center	64,39	173,85	
U39HR001	1,000	Ud	Cast iron cover frame	29,73	29,73	
U39HA001	150,000	Kg	Steel B 400 S	0,55	82,50	
U39BH110	2,200	M2	Metal formwork 20 sets	23,88	52,54	
U39HP001	12,000	Ud	36x21 pâté with polyurethane	2,15	25,80	
%0100000	5,643	%	Indirect costs... (s/total)	6,00	33,86	
			TOTAL UNITARY COST			598,16
			The total unitary cost is FIVE HUNDRED NINETY EIGHT EUROS with SIXTEEN CENTS			
D38CM075		ML	TUBE D=180CM H.V.REC. M/GRANULAR			
U01AA006	0,125	Hr	Foreman	26,87	3,36	
U01AA007	0,175	Hr	First Officer	26,11	4,57	
U01AA011	0,350	Hr	Ordinary Laborer	21,30	7,46	
U39AF002	0,125	H.	Crane truck 5 Tm.	37,40	4,68	
U39AC001	0,125	H.	Compact.vibra.autopr. 12/14 t	58,60	7,33	
U39AC002	0,600	H.	Compact.vibra.manual tray	3,08	1,85	
U39CK005	4,800	M3	Granular material	5,15	24,72	
U39GD010	1,000	Ml	Tube H. Vibropressed d= 180 cm.	163,68	163,68	
%0100000	2,177	%	Indirect costs... (s/total)	6,00	13,06	

TOTAL UNITARY COST 230,71

The total unitary cost is TWO HUNDRED THIRTY EUROS with SEVENTY ONE CENTS

D38CR075		UD	NOZZLE FINS O.F. 180 CM			
U04MA510	13,534	M3	Withcrete HM-20/P/40/I center	64,39	871,45	
U04MA210	5,280	M3	Withcrete HM-12.5/P/40 Central	56,26	297,05	
U39BF101	18,814	M3	Fabr. and Lt. withcrete	5,99	112,70	
U39BH125	61,979	M2	Encofr.descofr.cimient.sole	3,49	216,31	
U39HA010	425,496	Kg	Steel B 400 S	1,60	680,79	
U01AA007	0,175	Hr	First Officer	26,11	4,57	
U01AA011	0,350	Hr	Ordinary Laborer	21,30	7,46	
%0100000	21,903	%	Indirect costs... (s/total)	6,00	131,42	

TOTAL UNITARY COST 2.321,75

The total unitary cost is TWO THOUSAND THREE HUNDRED TWENTY ONE EUROS with SEVENTY FIVE CENTS

D38CT015		UD	A. GANTRY/BOW REBATE Lv=350 CM			
U01AA006	1,000	Hr	Foreman	26,87	26,87	
U01AA007	15,500	Hr	First Officer	26,11	404,71	
U01AA011	12,500	Hr	Ordinary Laborer	21,30	266,25	
U39AB008	0,990	H.	Shovel excv.hydra.S/retr tracks	31,86	31,54	
U39AZ001	5,703	H.	Needle vibrator	3,50	19,96	
U39AP001	1,016	H.	Self-propelled marker	6,20	6,30	
U04MA510	12,257	M3	Withcrete HM-20/P/40/I center	64,39	789,23	
U04MA210	2,828	M3	Withcrete HM-12.5/P/40 Central	56,26	159,10	
U39HA010	1.065,100	Kg	Steel B 400 S	1,60	1.704,16	
U39CK001	2,828	M3	Drain filter material >76mm	9,20	26,02	
U39IA005	1,350	M3	Square wood	102,68	138,62	
%0100000	35,728	%	Indirect costs... (s/total)	6,00	214,37	

TOTAL UNITARY COST 3.787,13

The total unitary cost is THREE THOUSAND SEVEN HUNDRED EIGHTY SEVEN EUROS with THIRTEEN CENTS

D38GA115		M3	ARTIFICIAL SAVE			
U01AA006	0,005	Hr	Foreman	26,87	0,13	
U01AA011	0,050	Hr	Ordinary Laborer	21,30	1,07	
U39CE002	1,150	M3	Artificial zahorra	5,81	6,68	
U39AI012	0,010	H.	Equipment Extend.base,Sub-bases	40,18	0,40	
U39AH025	0,060	H.	Bathtub truck 200 hp	40,20	2,41	
U39AC006	0,020	H.	Pneumatic compactor. 60hp	58,96	1,18	
%0100000	0,119	%	Indirect costs... (s/total)	6,00	0,71	

TOTAL UNITARY COST 12,58

The total unitary cost is TWELVE EUROS with FIFTY EIGHT CENTS

D38GC115		M3	CEMENT FLOOR			
U01AA006	0,005	Hr	Foreman	26,87	0,13	
U01AA011	0,074	Hr	Ordinary Laborer	21,30	1,58	
U39CK006	1,150	M3	Loan material	5,21	5,99	
U39AB003	0,020	H.	Front loader 80 hp	42,15	0,84	
U39AK001	0,020	H.	Withcrete unit 20/30 M3	29,05	0,58	
U39AH025	0,060	H.	Bathtub truck 200 hp	40,20	2,41	
U39AI012	0,010	H.	Equipment Extend.base,Sub-bases	40,18	0,40	
U39AC008	0,060	H.	Self-propelling vibrat.compactor	56,89	3,41	
%0100000	0,153	%	Indirect costs... (s/total)	6,00	0,92	

TOTAL UNITARY COST 16,26

The total unitary cost is SIXTEEN EUROS with TWENTY SIX CENTS

D38GG130		M2	ECR-0 EMULSION CURED AND ADHERE.			
U01AA006	0,001	Hr	Foreman	26,87	0,03	
U01AA011	0,001	Hr	Ordinary Laborer	21,30	0,02	
U39AM005	0,001	H.	Bituminator truck 130 hp	24,35	0,02	
U39AG001	0,001	h	Nemát autropopulsad sweeper	6,20	0,01	
U39DE003	0,001	Tm	ECR-0 emulsion binder	148,97	0,15	
%0200001	0,002	%	Indirect costs... (s/total)	6,00	0,01	

TOTAL UNITARY COST 0,24

The total unitary cost is CERO EUROS with TWENTY FOUR CENTS

D38GJ0010		t	C60BF4 IMP EMULSION			
U01AA006	0,120	Hr	Foreman	26,87	3,22	
U01AA007	0,480	Hr	First Officer	26,11	12,53	
U01AA011	0,480	Hr	Ordinary Laborer	21,30	10,22	
U39CE0020	1,000	t	Bituminous emulsion C60BF5 IMP	290,00	290,00	
U39AL005	0,240	H.	Tanker/water truck 140 hp	26,15	6,28	
U39AG001	0,120	h	Nemát autropopulsad sweeper	6,20	0,74	
%CI	3,230	%	Indirect costs... (s/total)	6,00	19,38	

TOTAL UNITARY COST 342,37

The total unitary cost is THREE HUNDRED FORTY TWO EUROS with THIRTY SEVEN CENTS

D38GJ0015		t	C60B3 ADH EMULSION			
U01AA011	0,960	Hr	Ordinary Laborer	21,30	20,45	
U01AA007	0,960	Hr	First Officer	26,11	25,07	
U01AA006	0,240	Hr	Foreman	26,87	6,45	
U39CE0021	1,000	t	Bituminous emulsion C60B3 ADH	243,26	243,26	
U39AG001	0,240	h	Nemát autropopulsad sweeper	6,20	1,49	
U39AL005	0,480	H.	Tanker/water truck 140 hp	26,15	12,55	
%CI	3,093	%	Indirect costs... (s/total)	6,00	18,56	

TOTAL UNITARY COST 327,83

The total unitary cost is THREE HUNDRED TWENTY SEVEN EUROS with EIGHTY THREE CENTS

D38GJ015		TM	ASPHALT BITUMEN 50/70			
U39DA002	1,000	Tm	Asphalt bitumen B 50/70	250,30	250,30	
U39AE001	0,017	h	10 t self-propelled tandem compactor	65,00	1,11	
U39AC007	0,017	H.	Tire compactor.autp.100hp	56,27	0,96	
U39AH005	0,009	H.	Dump truck 10 tm	50,60	0,46	
%0100000	2,528	%	Indirect costs... (s/total)	6,00	15,17	

TOTAL UNITARY COST 268,00

The total unitary cost is TWO HUNDRED SIXTY EIGHT EUROS

D38GJ2001		t	MBC AC 22 BIN 50/70 S LIMESTONE			
U01AA006	0,017	Hr	Foreman	26,87	0,46	
U01AA007	0,083	Hr	First Officer	26,11	2,17	
U01AA011	0,067	Hr	Ordinary Laborer	21,30	1,43	
U39BK205	0,017	h	Hot asphalt plant	516,00	8,77	
U39AI008	0,017	h	Agglomerated paver	118,00	2,01	
U39AE001	0,017	h	10 t self-propelled tandem compactor	65,00	1,11	
U39AC007	0,017	H.	Tire compactor.autp.100hp	56,27	0,96	
U39AH005	0,009	H.	Dump truck 10 tm	50,60	0,46	
U39DA002	0,045	Tm	Asphalt bitumen B 50/70	250,30	11,26	
U39CQ002	0,952	t	Mineral filler powder	56,47	53,76	
%CI	0,824	%	Indirect costs... (s/total)	6,00	4,94	

TOTAL UNITARY COST 87,33

The total unitary cost is EIGHTY SEVEN EUROS with THIRTY THREE CENTS

D38IA020		M2	REALLY PAINTED SURFACE			
U01AA006	0,049	Hr	Foreman	26,87	1,32	
U01AA007	0,100	Hr	First Officer	26,11	2,61	
U01AA011	0,400	Hr	Ordinary Laborer	21,30	8,52	
U39VA002	0,720	Kg	Road marking paint	2,33	1,68	
U39VZ001	0,480	Kg	N.V. Glass Spheres	1,10	0,53	
U39AG001	0,100	h	Nemát autropopulsad sweeper	6,20	0,62	
U39AP001	0,100	H.	Self-propelled marker	6,20	0,62	

%CI	0,159	%	Indirect costs... (s/total)	6,00	0,95	

TOTAL UNITARY COST 16,85

The total unitary cost is SIXTEEN EUROS with EIGHTY FIVE CENTS

D38IA030		ML	ROAD MARK 10 CM			
U01AA006	0,001	Hr	Foreman	26,87	0,03	
U01AA007	0,001	Hr	First Officer	26,11	0,03	
U01AA011	0,002	Hr	Ordinary Laborer	21,30	0,04	
U39VA002	0,072	Kg	Road marking paint	2,33	0,17	
U39VZ001	0,048	Kg	N.V. Glass Spheres	1,10	0,05	
U39AG001	0,001	h	Nemát autropopulsad sweeper	6,20	0,01	
U39AP001	0,001	H.	Self-propelled marker	6,20	0,01	
%0200001	0,003	%	Indirect costs... (s/total)	6,00	0,02	

TOTAL UNITARY COST 0,36

The total unitary cost is CERO EUROS with THIRTY SIX CENTS

D38ID140		UD	TRIANGULAR SIGN 135			
U01AA006	0,200	Hr	Foreman	26,87	5,37	
U01AA011	1,200	Hr	Ordinary Laborer	21,30	25,56	
U39AH003	0,500	H.	Truck 5 tm	26,51	13,26	
U39VF001	1,000	Ud	Sñ. triangic danger. 135 cm	124,60	124,60	
U39VM003	3,500	Ml	Galvaniz tube post.80x40x2mm	7,66	26,81	
U04MA310	0,125	M3	Withcrete HM-15/P/40 Central	57,12	7,14	
%0100000	2,027	%	Indirect costs... (s/total)	6,00	12,16	

TOTAL UNITARY COST 214,90

The total unitary cost is TWO HUNDRED FOURTEEN EUROS with NINETY CENTS

D38ID160		UD	CIRCULAR SIGN 90			
U01AA006	0,200	Hr	Foreman	26,87	5,37	
U01AA011	1,200	Hr	Ordinary Laborer	21,30	25,56	
U39AH003	0,500	H.	Truck 5 tm	26,51	13,26	
U39VF060	1,000	Ud	Reflective sign ø=90 cm	117,70	117,70	
U39VM003	3,500	Ml	Galvaniz tube post.80x40x2mm	7,66	26,81	
U04MA310	0,130	M3	Withcrete HM-15/P/40 Central	57,12	7,43	
%0100000	1,961	%	Indirect costs... (s/total)	6,00	11,77	

TOTAL UNITARY COST 207,90

The total unitary cost is TWO HUNDRED SEVEN EUROS with NINETY CENTS

D38ID170		UD	OCTOGONAL SIGN 90			
U01AA006	0,200	Hr	Foreman	26,87	5,37	
U01AA011	1,200	Hr	Ordinary Laborer	21,30	25,56	
U39AH003	0,500	H.	Truck 5 tm	26,51	13,26	
U39VF070	1,000	Ud	Octagonal sign A-90	130,58	130,58	
U39VM003	3,500	Ml	Galvaniz tube post.80x40x2mm	7,66	26,81	
U04MA310	0,130	M3	Withcrete HM-15/P/40 Central	57,12	7,43	
%0100000	2,090	%	Indirect costs... (s/total)	6,00	12,54	

TOTAL UNITARY COST 221,55

The total unitary cost is TWO HUNDRED TWENTY ONE EUROS with FIFTY FIVE CENTS

D38IE010		M2	GALVANIZED STEEL SHEET SIGN			
U01AA006	0,500	Hr	Foreman	26,87	13,44	
U01AA007	0,500	Hr	First Officer	26,11	13,06	
U01AA011	2,000	Hr	Ordinary Laborer	21,30	42,60	
U39AH003	0,050	H.	Truck 5 tm	26,51	1,33	
U39VH0020	1,000	M2	Reflective panel. in sheet steel	97,42	97,42	
U39VM003	6,000	Ml	Galvaniz tube post.80x40x2mm	7,66	45,96	
U04MA310	0,125	M3	Withcrete HM-15/P/40 Central	57,12	7,14	
U39BF101	0,125	M3	Fabr. and Lt. withcrete	5,99	0,75	
%CI	2,217	%	Indirect costs... (s/total)	6,00	13,30	

TOTAL UNITARY COST 235,00

The total unitary cost is TWO HUNDRED THIRTY FIVE EUROS

D38IE050		M2	RA2 REFLECTIVE STEEL SLAT SIGN			
U01AA007	0,250	Hr	First Officer	26,11	6,53	
U01AA011	1,200	Hr	Ordinary Laborer	21,30	25,56	
U39AH003	0,500	H.	Truck 5 tm	26,51	13,26	
U39VM010	1,500	Ml	IPN-12	14,90	22,35	
U39VW020	1,000	M2	Reflective steel slat sign E.G	137,93	137,93	
U04MA310	0,380	M3	Withcrete HM-15/P/40 Central	57,12	21,71	
%CI	2,273	%	Indirect costs... (s/total)	6,00	13,64	

TOTAL UNITARY COST 240,98

The total unitary cost is TWO HUNDRED FORTY EUROS with NINETY EIGHT CENTS

D38IM030		ML	DOUBLE WAVE SAFETY BARRIER			
U01AA006	0,075	Hr	Foreman	26,87	2,02	
U01AA007	0,150	Hr	First Officer	26,11	3,92	
U01AA011	0,300	Hr	Ordinary Laborer	21,30	6,39	
U39AQ001	0,075	H.	Maqui.pile posts barre.segu	29,30	2,20	
U39AH005	0,075	H.	Dump truck 10 tm	50,60	3,80	
U39VÑ025	1,000	Ml	Double wave galva band. 4 m	11,04	11,04	
U39VM007	0,250	Ml	Galvan post. CPN 120 of 1.5 m.	16,18	4,05	
U39VQ002	0,250	Ud	Screw set	2,76	0,69	
U39ZH001	0,250	Ud	Separator	4,29	1,07	
U39VS002	0,040	Ud	Lighthouse catchers	3,07	0,12	
%0100000	0,353	%	Indirect costs... (s/total)	6,00	2,12	

TOTAL UNITARY COST 37,42

The total unitary cost is THIRTY SEVEN EUROS with FORTY TWO CENTS

D38PA030		M3	SPREADING TOPSOIL			
U01AA011	0,009	Hr	Ordinary Laborer	21,30	0,19	
U39AH005	0,010	H.	Dump truck 10 tm	50,60	0,51	
U39AB010	0,010	H.	Shovel w/Tires (CAT-920)	42,26	0,42	
%0100000	0,011	%	Indirect costs... (s/total)	6,00	0,07	

TOTAL UNITARY COST 1,19

The total unitary cost is ONE EUROS with NINETEEN CENTS

D39QC060		M2	HYDROSEEDING ON SLOPES			
U01AA007	0,020	Hr	First Officer	26,11	0,52	
U01AA011	0,020	Hr	Ordinary Laborer	21,30	0,43	
U04PY001	0,150	M3	Water	0,55	0,08	
U40MA615	1,000	M2	Biodegradable organic blanket	1,38	1,38	
U40MA650	0,250	Kg	Complete hydroseeding mix	0,79	0,20	
%0100000	0,026	%	Indirect costs... (s/total)	6,00	0,16	

TOTAL UNITARY COST 2,77

The total unitary cost is TWO EUROS with SEVENTY SEVEN CENTS

D39QE020		UD	MEDIUM TREE FELLING			
U01FR007	3,000	Hr	Gardener	12,69	38,07	
U01FR013	2,000	Hr	Ordinary Laborer	17,70	35,40	
U40SE150	1,000	h	Chainsaw.	24,00	24,00	
%CI	0,975	%	Indirect costs... (s/total)	6,00	5,85	

TOTAL UNITARY COST 103,32

The total unitary cost is ONE HUNDRED THREE EUROS with THIRTY TWO CENTS

BUDGET 2 – BUDGET FOR ADMINISTRATIVE REVIEW

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1. BUDGET FOR ADMINISTRATIVE REVIEW 2

1. BUDGET FOR ADMINISTRATIVE REVIEW

Concept		Price (€)	
		Parcial	Total
1	Construction Budget		2.285.575,76
2	General Spendings, 13%	297.124,85	
3	Industrial Benefit, 6%	137.134,55	
4	Tender Base Budget without TVA (1+2+3)		2.719.835,16
5	VAT, 21%	571.165,38	
6	Tender Base Budget (4+5)		3.291.000.54
7	Expropriations		148.238,78
8	Affected Services		30.000
9	**BUDGET FOR ADMINSITRATIVE REVIEW** (6+7+8)		**3.469.239,32**

Table 5.2.1. Budget for Administrative Review.

The Budget for Administrative Review amounts to the total sum of **THREE MILLION FOUR HUNDRED SIXTY-NINE THOUSAND TWO HUNDRED THIRTY-NINE euros AND THIRTY-TWO cents.**

EXECUTION PLAN

REPORT

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1. OBJECTIVE AND SCOPE OF THE STUDY

This Health and Safety Study is prepared in accordance with the provisions of Real Decreto 1627/1997, de 24 Octubre, which regulates the minimum provisions on health and safety in construction works. Its main purpose is to prevent accidents at work, occupational diseases and possible damage to third parties during the execution of the work.

As established in Real Decreto 1627/1997, which establishes minimum health and safety provisions in construction works, the Administration is obliged to commission the drafting of a health and safety study in works projects in which any of the following cases occur:

a) That the contract execution budget included in the project is equal to or greater than 450,759 euros.

b) That the estimated duration is more than 30 working days, employing at some point more than 20 workers simultaneously.

c) That the estimated volume of labour, understood as the sum of the working days of the total number of workers on site, is greater than 500.

d) Works on tunnels, galleries, underground pipes and dams.

Therefore, due to the fulfillment of the first condition, this Project must include a Health and Safety Study.

This Study examines the specific conditions of execution of the work – including materials, work units, processes and machinery – in order to identify the risks that may affect the health of workers. Based on this assessment, mandatory preventive measures are established to guarantee safety and health in the work environment.

The Study also incorporates the budget corresponding to the health and safety elements necessary for the work, together with its price tables and measurements. The Technical Specifications are also included, which includes the conditions that must be met in relation to these elements.

2. CHARACTERISTICS OF THE WORK

2.1. DESCRIPTION OF THE WORK

The work consists of the improvement of the route as well as the expansion of the platform, including a bike lane on the CA-811 road that connects the towns of Villanueva de la Peña and Herrera de Ibio in the municipality of Mazcuerras.

The projected route contemplates a design speed of 60 km/h and consists of a road with two lanes of 3.5 meters wide, one for each direction of traffic. A 1-metre hard shoulder is also included on the right side of the direction of traffic from Villanueva de la Peña to Herrera de Ibio. On the left side there is a 2-metre-wide bike path ending in a small 0.3m shoulder. The route begins at the intersection of the road with the CA-812 and ends meters before a structure that crosses the Ceceja stream, which is beyond the scope of this project. The structure will have a total length of 1640 meters

A similar distribution of clearing and embankment is planned, the slopes of the same will be restored with vegetation.

2.2. LABOR FORCE EXPECTED

A maximum number of operators on site of **15 workers is expected.**

2.3. HEALTH CENTERS AND EMERGENCIES

- Consultorio Médico de Mazcuerras – Villanueva de la Peña (1 km):
  - Bo. V.Peña-Cotera, 69, 39509 Villanueva de la Peña, Cantabria.
  - Tfno..: 942 701 569
- Centro de Salud Cabezón de la Sal – Cabezón de la Sal (7 km):
  - C. Pintor Rosales, s/n, 39750 Colindres, Cantabria
  - Tfno..: 942 701 569
- Hospital de Sierrallana (16 km):
  - Bo. Ganzo, s/n, 39300 Torrelavega, Cantabria
  - Tfno.: 942 638 500

- Hospital Marqués de Valdecilla (40 km):
  - Av. Valdecilla 25, 39008 Santander, Cantabria.
  - Tfno.: 942 20 25 20

The construction company must indicate the location of the Mutual Insurance Company Assistance Centre to which it is attached, including a location plan in relation to the location of the work. This information must also be placed on the Safety Communications Board, in a place visible to all workers.

Other telephone numbers of interest:

- Guardia Civil: 062
- Emergencias: 112
- Policia Municipal Cabezón de la Sal: 942 70 28 10

3. CONSTRUCTION UNITS

3.1. PREVIOUS WORK

- Layout.
- Signage of the work.
- Removal of enclosures.
- Take-up works.
- Placement of temporary installations.
- Enabling of accesses and roads.

3.2. EARTHWORKS

- Clearing and cleaning of the land.
- Removal and stockpiling of topsoil.
- Excavation of the land.
- Realization of embankments.
- Slope profiling.
- Transport of excavated earth

3.3. DRAINAGE

- Longitudinal drainage: gutters.
- Cross drainage: CDS tubes, nozzles.

3.4. FIRM

- Execution of the esplanade
- Placement of the sub-base.
- Laying the bituminous mixture layers.

3.5. SIGNAGE

- Placement of road markings.
- Installation of vertical signage.
- Installation of containment barriers.

3.6. ENVIRONMENTAL INTEGRATION

- Placement of topsoil.
- Hydroseeding of slopes.

3.7. COMPLETITION WORKS

- Dismantling of auxiliary facilities.
- Replacement of accesses.
- Replacement of existing enclosures.
- Replacement of affected services.

4. MACHINERY, MEANS AND PLANTS

Below is a detail of the machinery that will be required for the execution of the works foreseen in the work:

Earthmoving Machinery

- Compactors
- Graders
- Backhoe Loaders
- Wheel loaders
- Tractors
- Trucks and dumpers

Concreting Media

- Manufacturing plants
- Concrete mixer truck.
- Self-propelled concrete pump.
- Vibrators.

Means of Manufacturing and Installation of Pavements and Pavements

- Manufacturing plants for bituminous mixtures.
- Chipboard pavers.
- Compactors.
- Dump trucks.

Stockpiling and Storage

- Accumulation of land and aggregates.
- Stockpiling of tubes, prefabricated elements, rebar...
- Storage of paints, stripping of forms, fuels...

Auxiliary Facilities

- Aggregate crushing plant.
- Aggregate sorting and separation plant.
- Fixed conveyor belts (large belts).
- Transportable conveyor belts (small belts).
- Temporary electrical installations of work.

Miscellaneous Machinery and Tools

- Hydroseeder
- Crane truck
- Road Marking Painting Machine
- Compressors
- Irrigation trucks
- Dust sweeper
- Post Driving Machine
- Self-propelled marker

5. AUXILIARY MEANS

- Metallic andamios.
- Step ladders.

6. HAND TOOLS

- Chainsaw.
- Brushes, brushes and rollers.
- Level, ruler, square, plumb line.
- Pickaxe, shovel, hoe, pickaxe.
- Hacksaw.
- Ferrallista pliers.
- Pliers, hammers, pliers.

7. IDENTIFICATION OF OCCUPATIONAL HAZARDS

7.1. RISK ACCORDING TO WORK ACTIVITIES

Health and Safety regulations require the identification of both the risks that can be avoided and those that cannot be eliminated, as well as the definition of the corresponding technical measures for each case. For this reason, this section details the potential occupational risks, organised according to the activities or machinery to which they are related.

Earthworks

Clearing and clearing

- Entity (order of magnitude): medium.
- Means for its execution:
  - Removal of minor vegetation, debris, topsoil, etc. with a tractor.
  - Transport to landfill with dump truck.
  - Stockpiling of topsoil for reuse with a shovel.
- Risks:
  - Particle projection.
  - Slope landslides caused by the poor positioning of machinery.
  - Abuses.
  - Falls of people at the same level.
  - Wounds from sharp objects.
  - Insect bites.
  - Dust in the environment.
  - Dust that decreases visibility.
  - Noise.

Felling and removal of trees

- Entity (order of magnitude): reduced.
  - Means for its execution:
  - Felling with a tractor and chopping up, with chainsaws, axes, etc., of the large trees affected by the works.
  - Transport of non-usable materials to landfill by dump trucks.
  - Risks:
  - Cuts or amputations.
  - Injuries from embedding branches or splinters.
  - Insect bites.
  - Abuses.
  - Falls of people at the same level.
  - Falls of people at different levels.
  - Entrapment due to falling trees.
  - Dust in the environment.
  - Dust that decreases visibility.
  - Noise.
  - Excavation by mechanical means
    - Entity (order of magnitude): high.
    - Means for its execution:
    - Excavation with a tracked backhoe.
    - Transport to landfill or on-site employment site with dump trucks.
- Risks:
  - Run over and hit by machinery and construction vehicles.
  - Entrapment of people by machinery.
  - Collisions and overturning of machinery or construction vehicles.
  - Personnel falls at different levels.
  - Landslides or landslides.
  - Induced subsidence in nearby structures.
  - Direct or indirect contacts with power lines.
  - Blows by objects and tools.
  - Falling objects.
  - Flooding due to broken water pipes.
  - Fires or explosions due to leaks or ruptures of oil or gas pipelines.

- Explosion of buried sugar mills.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Embankments and Earth Fills

- Entity (order of magnitude): high.
- Means for its execution:
  - Preparation of the land with a tracked tractor.
  - Dumping of the material with dump trucks.
  - Spreading the material with a tracked tractor.
  - Grading with a motor grader and compacting with a compactor.
  - Surface irrigation with a tanker truck.
- Risks:
  - Run over and hit by machinery and construction vehicles.
  - Entrapment of people by machinery.
  - Collisions and overturning of machinery or construction vehicles.
  - Personnel falls at different levels.
  - Landslides or landslides.
  - Direct or indirect contacts with power lines.
  - Blows by objects and tools.
  - Falling objects.
  - Dust in the environment.
  - Dust that decreases visibility.
  - Noise.

Firms and Pavements

Firm

- Entity (order of magnitude): high.
- Means for its execution:
  - Gravel extension with paver, truck and compactor.
  - Primer and adhesion irrigation with tanker truck.
  - Chipboard paving, with chipboard paver on which the dump trucks unload the material; Compaction with compactors.
- Risks:
  - Falls at the same level.
  - Abuses.
  - Blows and collisions of machinery.
  - Construction traffic accidents.
  - Effects on roads in service.
  - Burns.
  - Dehydration.
  - Entrapment by the moving parts of the machinery.
  - Dust in the environment.
  - Dust that decreases visibility.
  - Noise.

Affected Services

Overhead power transmission lines

- Entity (order of magnitude): low.
- Risks:
  - Falls at different levels.
  - Direct electrical contacts.
  - Indirect electrical contacts.
  - Electrical contacts of the machinery.
  - Diseases caused by working under adverse weather conditions.
  - Overexertion.

Underground power transmission lines

- Entity (order of magnitude): low.

- Risks:
    - Rupture of the channeling.
    - Direct electrical contacts.
    - Electrical contacts of the machinery.
    - Deep falls.
    - Diseases caused by working under adverse weather conditions.
    - Overexertion.

Underground water pipes

- Entity (order of magnitude): low.
- Risks:
    - Rupture of the channeling.
    - Floods.
    - Deep falls.
    - Landslides.
    - Diseases caused by working under adverse weather conditions.
    - Overexertion.

Interference with tracks in service (turnouts, cuts, etc.)

Removal and replacement of elements

- Entity (order of magnitude): low.
- Risks:
    - Abuses.
    - Inhalation of toxic gases released by the paints.
    - Invasion of the roadway with tools or elements.
    - Wounds with tools.
    - Overexertion.
    - Dust in the environment.
    - Dust that decreases visibility.
    - Noise.

Lane Cutting

- Entity (order of magnitude): low.
- Risks:
    - Abuses.
    - Ranges between vehicles.
    - Invasion of the roadway with tools or elements.
    - Noise.

Lane Deviation

- Entity (order of magnitude): medium.
- Risks:
    - Abuses
    - Departures from the road, overturns, overtakes, etc. between vehicles.
    - Invasion of the roadway with tools or elements.
    - Noise.

Miscellaneous Activities

Staking out Earthworks

- Entity (order of magnitude): medium.
- Risks:
    - Traffic accidents "on the way to work".
    - Slope landslides.
    - Falling objects or rocks down the slope.
    - Abuses.
    - Dehydration, sunstroke, sunburn.
    - Torceduras.
    - Animal or insect bites.

- Diseases caused by working under adverse weather conditions.
- Overexertion.
- Dust in the environment.

Signaling, Beaconing and Vehicle Containment Systems

Vertical signage

- Entity (order of magnitude): medium.
- Means for its execution:
  - Transport of the elements by truck.
  - Placement with hand tools.
- Risks:
  - Falls to the same and different level.
  - Falling objects due to manipulation.
  - Overturning of machinery.
  - Abuses.
  - Entrapments between elements.
  - Overexertion.
  - Blows and cuts with tools or other materials: transport, stockpiles...
  - Noises.

Safety barriers

- Entity (order of magnitude): medium.
- Means for its execution:
  - Placement of safety barrier with post driving machine, hand tools and tipping truck.
- Risks:
  - Falls to the same and different level.
  - Falling objects due to manipulation.
  - Abuses.
  - Entrapments between elements.
  - Overexertion.
  - Bumps and cuts with tools or other materials.
  - Noises.

Road markings

- Entity (order of magnitude): medium.
- Means for its execution:
  - Cleaning with a sweeper.
  - Marker marker painting.
- Risks:
  - Falls to the same and different level.
  - Splashing.
  - Run over by vehicles and machinery.
  - Overexertion.
  - Contact with harmful substances.

Drainage works

- Entity (order of magnitude): medium.
- Means for its execution:
  - Preparation of the land, with tractor, loader or backhoe.
  - Pipe placement with a crane truck.
  - Concrete coating with vibrators.
  - Filled with shovels.
- Risks:
  - Crushing by falling suspended loads.
  - Burial due to landslides.
  - Dermatosis.
  - Wounds with tools or other sharp objects.
  - Vehicles fall into ditches on the route.
  - Overexertion.
  - Dust in the environment.
  - Dust that decreases visibility.

- Noise and Vibrations.
- Work in adverse conditions.

Gutters

- Entity (order of magnitude): medium.
- Means for its execution:
  - Preparation of the land with an excavator.
  - Pouring concrete with a concrete mixer truck.
  - Finish with hand tools.
- Risks:
  - Falls to the same and different level.
  - Landslides.
  - Dermatosis.
  - Run over by machinery and vehicles.
  - Overexertion.
  - Bumps and cuts with tools or other materials.
  - Noise and Vibrations.
  - Entrapments with the moving parts of the machinery.
  - Overturning of machinery.
  - Work in adverse conditions.

Environmental integration

Hydroseeding

- Entity (order of magnitude): reduced.
- Means for its execution:
  - Transport and extension of topsoil with dump truck and shovel.
  - Extension of the hydroseeding mixture with hydroseeder.
- Risks:
  - Falls to the same and different level.
  - Landslides.
  - Run over by machinery and vehicles.
  - Hitting moving objects.
  - Thermal contacts.
  - Electrical contacts.
  - Inhalation or ingestion of harmful or toxic substances.
  - Fires and explosions.
  - Traffic accidents.
  - Noise.

7.2. RISKS ACCORDING TO CONSTRUCTION MACHINERY

Earthworks

Tractors

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Wheel loaders

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Collapse of slopes or excavation faces under or on the machine.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Backhoe Loaders

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Collapse of slopes or excavation faces under or on the machine.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Graders

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Compactors

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Trucks and dumpers

- Traffic accidents at junctions or detours to/from the construction site.
- Spillage of the transported material.
- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Concrete

Concreting plants

- Falls at different levels.
- Falls at the same level
- Direct electrical contacts.
- Indirect electrical contacts.
- Crushing by falling suspended loads.
- Entrapments.
- Dermatosis.
- Burns.
- Wounds with sharp objects.
- Noise.

Concrete mixer truck

- Traffic accidents at junctions or detours to/from the construction site.
- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes or ditches in the ground.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Self-propelled concrete pump

- Traffic accidents at junctions or detours to/from the construction site.
- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes or ditches in the ground.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Projections of pumped concrete on workers or the public.
- Detachment or sudden whiplash of concrete hoses and conduits.
- Uncontrolled projection of dry concrete plugs.
- Noise.

Vibrators

- Direct electrical contacts.
- Indirect electrical contacts.
- Hitting other operators with the vibrator.
- Overexertion.
- Low back pain.
- Blowouts in hoses or leaks in nozzles.
- Noise.

Manufacture and installation of firms and pavements

Bituminous mixture manufacturing plants

- Falls at different levels.
- Falls at the same level.
- Direct electrical contacts.
- Indirect electrical contacts.
- Crushing by falling suspended loads.
- Entrapments.
- Burns.
- Fire.
- Unhealthy environment due to fumes.
- Wounds with sharp objects.
- Noise.

Chipboard extension machine

- Running over or hitting people by moving machines.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Vibrations transmitted by the machine.
- Fire.
- Unhealthy environment due to fumes.
- Noise.

Tire Compactor

- Accidents on the construction roads.
- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapments by tools or transmissions.
- Burns in repair or maintenance work.
- Dust in the environment.
- Unhealthy environment due to fumes.
- Noise.

Self-propelled vibrating roller

- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Vibrations transmitted by the machine.
- Dusty atmosphere.
- Unhealthy environment due to bituminous emanations.
- Noise.

Dump truck

- Traffic accidents at junctions or detours to/from the construction site.
- Spillage of the transported material.
- Running over or hitting people by moving machines.
- Sliding and/or overturning of machines on inclined planes of the terrain.
- Machine without control, due to driver abandonment without disconnecting or putting on brakes.
- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Contact of the machine with overhead power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Unhealthy environment due to fumes.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Stockpiling and Storage

Stockpiling of land and aggregates

- Landslides (own or induced).
- Traffic accidents due to poor location of the stockpile.
- Environmental damage and/or invasion of property.
- Dust in the environment.

Stockpiling of tubes, prefabricated elements, rebar, etc.

- Induction of landslides in nearby excavations.
- Collapse of the stockpile.
- Crushing of joints.
- Torceduras.
- Traffic accidents due to poor location of the stockpile.
- Environmental damage and/or invasion of property.
- Overexertion.

Storage of paints, release agents, fuels, etc.

- Inhalation of toxic fumes.
- Fires or explosions.
- Dermatosis and irritation of the eyes due to contact or projection of substances.
- Splashing.
- Environmental effects due to leaks or spills.

Auxiliary facilities

Aggregate crushing plant

- Entrapment by moving parts.
- Direct electrical contacts.
- Indirect electrical contacts.
- Falls at different levels.
- Falls at the same level.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Aggregate sorting and separation plant

- Collapse of the compartments.
- Direct electrical contacts.
- Indirect electrical contacts.
- Falls at different levels.

- Falls at the same level.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows in the bowl throw.
- Dust in the environment.
- Dust that decreases visibility.
- Noise.

Temporary electrical installations

- Direct electrical contacts.
- Indirect electrical contacts.
- Improper manipulation of switches or disconnectors.
- Overvoltage fires.
- Induction of dangerous magnetic fields in other equipment.
- Noises.

Miscellaneous machinery and tools

Crane truck

- Accidents on the way to work.
- Abuses.
- Overturning of the crane.
- Landslides induced in nearby excavations.
- Crushing due to falling suspended load.
- Electrical contact of the boom with overhead lines.
- Overvoltage fires.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.

Compressors

- Fires and explosions.
- "Whip" blows by the hoses.
- Particle projection.
- Blowouts in hoses or nozzles.
- Inhalation of exhaust fumes.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Noise.

Pneumatic hammers

- Particle projection.
- Risk due to incompetence.
- Blows with the hammer.
- Overexertion.
- Contact with buried power lines
- Blowouts in hoses or nozzles.
- Dust in the environment.
- Noise and vibrations.

Saws

- Cuts or amputations.
- Blows with objects thrown off by the disc.
- Fall of the saw at different levels.
- Indirect electrical contacts.
- Particle projection.
- Wounds with sharp objects.
- Overvoltage fires.
- Noises.

Nail fixing gun

- Collisions due to accidental nail shots.

- Burst pressure hose.
- Indirect electrical contacts.
- Pistol drop to different levels.
- Falls to the same level due to excessive thrust.

Welders

- Explosions due to overheating of the bottles.
- Flame recoil explosions.
- Poisoning from leaks in the bottles.
- Fire.
- Burns.
- Fall of the team to different levels.
- Overexertion.
- Crushing of joints.
- Risk due to incompetence.

Lifting machines

- Drops at different levels during assembly or maintenance.
- Overturning of the machine.
- Direct or indirect electrical contacts
- Crushing by falling suspended loads.
- Overvoltage fires.
- Falls at different levels due to dragging or pushing of the load.

Post Driving Machine

- Falls at different levels of people from the machine.
- Vehicle crashes into the machine.
- Contact of the machine with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Dust in the environment.
- Vibrations transmitted by the machine.
- Noise.

Self-propelled marker

- Falls at different levels of people from the machine.
- Collisions of the machine with others or with vehicles.
- Entrapment by tools or transmissions.
- Burns in repair or maintenance work.
- Vibrations transmitted by the machine.

Portable drill

- Accidental drills in the extremities.
- Indirect electrical contacts.
- Drill drop to different levels.
- Falls to the same level due to tripping.
- Noise.

Hand Tools

- Falling tools at different levels.
- Falls of people at the same level.
- Burns in repair or maintenance work.
- Blows or projections of materials from the ground.
- Dust in the environment.
- Vibrations transmitted by the machine.
- Noise.

Ladders

- Falls at different levels.

- Falling objects.
- Hitting moving objects.
- Entrapment between objects.
- Sliding of the ladder on its support.
- Tipping due to incorrect clamping.
- Breakage due to hidden defects.
- Risks of misuse.

8. PREVENTIVE MEASURES

8.1. PREVENTIVE MEASURES ACCORDING TO WORK ACTIVITIES

Layout

Before starting the stakeout, an on-site assessment will be carried out to determine the hazardousness of the area.

Workers will have the necessary personal protective equipment, such as a helmet, reflective vest, gloves, boots, etc.

The team leader carrying out the stakeout will take into account and warn the team of possible risks so that the appropriate precautions are taken.

Clearing and clearing of the land

Before the start of the work, an inspection will be carried out to detect cracks that could affect the stability of the machinery and cause it to overturn.

The weeds will be eliminated by means of the brush cutter and the use of fire should always be avoided.

The machinery will be prevented from circulating next to the slopes and will be guided in the manoeuvres by a person.

The speed must be limited to 20 km/h. The following personal protective equipment will be used at all times: safety helmet, reflective clothing, rubber safety boots, waterproof suits, rubber gloves, hearing protectors and self-filtering masks.

The following collective protection equipment will be provided: wooden stops in ditches and slopes, signage and irrigation will be carried out to prevent the raising of dust.

Excavations

Before starting the work, an inspection will be carried out to locate cracks and possible movements.

The excavation face will never exceed the maximum attack height of the machine arm by more than one meter.

The minimum safety distance to the edge of the excavation shall always be signposted.

Proper maintenance of roads and machinery will be carried out.

The following personal protective equipment will be used at all times: safety helmet, reflective clothing, rubber safety boots, waterproof suits, rubber gloves, hearing protectors and self-filtering masks.

The following collective protection equipment will be provided: passage platforms for the transit of operators, railing at the top of slopes, containers for toxic containment and traffic signaling for machinery

Embankments

All vehicles will be periodically checked and overloaded above the maximum admissible will be prohibited, with both the tare weight and the maximum load being clearly specified.

All accesses and the route of vehicles inside the site will be signposted, and each loading equipment for landfills will be directed by a team leader during the manoeuvres.

It is forbidden for people to be within a radius of less than 5m with respect to the compaction machinery.

The pits, loads and truck boxes will be watered periodically in order to avoid dust raising.

The following personal protective equipment will always be used: safety helmet, safety boots, dust masks, gloves for general use, work overalls.

Gravel construction

The task of paving must be supervised by a competent technician designated as responsible, who will maintain absolute control over the work area at all times.

The paving process will begin by unloading the materials from the truck. The operator in charge must have a clear view of the area and will also be assisted by another operator.

Bituminous mix road construction

The bitumen tank operator shall take into account various prevention measures. Before starting the journey, it must sound the horn and, in case of manoeuvring in reverse, emit an acoustic warning. It is mandatory to wear a seat belt and, if necessary, to use the multipurpose powder extinguisher installed in the cabin. In addition, it must circulate at reduced speeds, taking extreme precautions especially in areas with the presence of stones.

For his part, the compactor operator must also follow certain preventive measures. It is essential to check the correct functioning of the brakes and the reverse gear system before starting the work. During the operation, you must maintain safety distances and exercise extreme caution, especially in the vicinity of slopes and slopes. At the end of the day, the shims must be placed on the machinery to ensure its correct immobilization.

The paver operator, in turn, must ensure that he does not work without the chipboard distribution augers installed. You must also follow the guidance instructions provided by specialized personnel with specific knowledge of the operation of the machine at all times. In the event that the foreman is not present, he must assume responsibility for the operations.

For all these activities, the corresponding personal protective equipment will be used: safety helmet, gloves for general use, safety boots, work overalls, protective glasses, hearing protectors and raincoats.

Drainage

The stockpiles of material will be placed following the appropriate stops and measures to avoid unwanted movements of material.

It will be forbidden for personnel to be placed under loads and all manoeuvres will be carried out under the supervision and direction of specialised personnel.

The following personal protective equipment will always be used: work overalls, safety helmets, safety boots, waterproof suits, dust masks, anti-vibration belts and rubber gloves.

The following collective protection equipment will be provided: passage platforms for the transit of operators, railing at the top of slopes, containers for containing toxins and traffic signaling for machinery.

Signaling and Beaconing

Los operarios extremarán la precaución al colocar la señalización de obras en las vías existentes dado el riesgo de atropello.

El acopio de elementos se hará en lugares destinados a tal fin, evitando la interferencia con la circulación de maquinaria.

Se prohibirá el encendido de llamas o chispas, así como las labores de soldadura, en el área en el que se estén pintando las marcas viales o junto al acopio de pinturas y elementos inflamables.

Será obligatorio el uso de equipos de protección personal, que incluirán monos reflectantes, cascos de seguridad, botas de seguridad, trajes impermeables y mascarillas de protección contra los vapores de pintura utilizados para las marcas viales.

Hydroseeding

The use of a safety helmet is mandatory at all times.

The machines will be sufficiently marked to be seen by the operators.

In areas of poor visibility, an operator will warn traffic of the presence of hydroseeding work.

Operators operating the hydroseeder shall be aware of the potentially health-damaging products contained in the mixture.

The operator will be extremely careful during the projection of the mixture so as not to splash other operators.

The following personal protective equipment will be used: safety helmet, face shield, safety gloves, safety boots, safety glasses, waterproof suits, protective masks.

The following collective protection equipment will be installed: traffic signage, marking of the work area.

8.2. PREVENTIVE MEASURES ACCORDING TO CONSTRUCTION MACHINERY

The following preventive measures will be mandatory to guarantee safety in the work area; the Site Manager must verify compliance with these measures, as well as those proposed in the Health and Safety Plan to be developed by the Contractor.

Both general measurements for all types of heavy machinery and specific for each specific type are listed.

8.2.1. GENERAL MEASUREMENTS FOR HEAVY MACHINERY

Machine Reception

- When you arrive at the construction site, each machine must have in its documentation folder the safety standards intended for operators.
- Upon arrival at the site, each machine must have a properly sealed fire extinguisher and with up-to-date inspections.
- The machines will have anti-tip and anti-impact cabins.
- The operators of the machinery will have been properly trained to operate the machine safely; otherwise, it will be replaced or trained appropriately.
- The cabins shall not be deformed as a result of having overturned.
- The machinery will be equipped with lights and a horn or reversing siren, all of which are in good working order.

Machine Utilization

- Before starting each work shift, the machine controls will be checked to ensure that they are working correctly.
- Access to the machine cab is prohibited when wearing loose clothing, jewellery or accessories that may get caught on the controls and protrusions.
- The horn will be sounded before the machine is moved.
- The seat shall be correctly adjusted so that the operator works comfortably and safely.
- The ascent and descent of the machine will be carried out in the place provided for this purpose, using the steps and handles provided for this purpose and never using the rims, tires and mudguards. The driver shall not jump directly from the machine to the ground, except in the event of imminent danger to the driver.
- Only people authorised by the Site Manager may access the machine.
- The driver will check that all the controls are in neutral position before starting the engine to avoid unforeseen starts.
- The driver will check before starting the journey that there is no danger of running over personnel who are nearby.
- Shims for immobilizing the machine must be installed before releasing the brakes.
- If it is necessary to start the engine using the battery of another machine, always of similar voltage, extreme precautions must be taken, and there must be perfect coordination between the personnel who have to perform the manoeuvre.
- When working with machines whose undercarriage is made of tires, it will be necessary to check that the pressure of these is that recommended by the manufacturer. During tyre inflation, the operator should stand away from the connection point, to avoid damage in the event of a blowout.
- Each time the operator leaves the machine, even for a short period of time, they must lower the equipment or tool to the ground and apply the parking brake. If an absence of more than three minutes is expected, the engine will also stop.
- The operator must warn of any faults or breakdowns in the machine, interrupting work whenever these faults affect the brakes or steering, until the fault is rectified.
- It will be forbidden to get on the machine when it is in motion.
- Circulation and parking will be prohibited less than 3 metres from the edge of trenches and slopes due to the risk of overturning or detachment of the slope.
- When carrying out earthworks on slopes, it will be checked that there are no people or elements at the base of the slope that could be affected by a possible detachment of material.
- Driving with the lights on when, due to dust, the visibility of the driver or other persons towards the machine may be reduced.
- The transport of people in the machine will not be allowed if there is no suitable seat for it.
- The machine will never be used above its mechanical capabilities, i.e. it will not be subjected to excessive loads or driven on too steep slopes.

On-site repairs and maintenance

- Faults in machinery will always be corrected before resuming operations.
- During maintenance operations, the machinery will always remain with the engine stopped, the work tool resting on the ground, the handbrake activated and the machine immobilized with shims.
- Elements that are not part of it must not be supported on the machine, to avoid the risk of fire.
- The radiator cap shall not be hot-lifted; The high-temperature vapours given off can cause burns to the operator.
- The engine and hydraulic system oil change should always be carried out with the engine cold, to avoid burns.

- Protective goggles and waterproof gloves should be worn when changing the machine's battery.
- In the vicinity of batteries, any fire or spark will be ignited.
- The tools used in the handling of batteries must be insulating, to avoid short circuits.
- Avoid placing tools or metal elements on the battery, as they could cause a short circuit.
- Whenever possible, shielded batteries should be used, with the intermediate terminals fully covered.
- During fueling, precautions shall be taken to avoid the proximity of ignition sources that may ignite the fuel.
- The coolant level in the radiator must always be checked with the proper precautions, always eliminating the internal pressure before fully opening the cap.
- When it is necessary to manipulate the electrical system of the machine, the operator must disconnect the motor and remove the key from the switch.
- When hydraulic system pipes need to be welded, they must always be emptied and cleaned of oil.

8.2.2. EARTHWORKS MACHINERY

Bulldozers and tractors

In addition to the general safety measures in machinery, the following specific preventive measures will be established, which will be detailed in a more specific way in the corresponding health and safety plan:

- Driving at a speed of more than 3 km/h during earthworks shall be avoided.
- Tractors will only be allowed to be used on slopes of less than 50%.
- During the clearing work at the base of slopes already built, an inspection of the materials (trees, rocks, etc.) that may represent a risk of accidental detachment on the work area will be carried out. Only once the slope has been properly secured and cleaned up will the machinery work begin.

Wheel loaders

- The shovels will have a first aid kit in perfect condition to be used at any time.
- All engine exhaust points should be checked periodically to ensure that no combustion gases enter the cabin.
- Wheel loaders that must travel on public roads will be authorized to do so.
- Drivers shall check that there is no danger to workers in shafts or trenches near the machine's workplace.
- Drivers, before making new routes, will walk the work path, in order to observe the irregularities that may give rise to vertical or horizontal oscillations of the bucket.
- The machinist will not start the engine of the machine without first making sure that no one is in the machine's operating area.
- The transport or hoisting of personnel inside the bucket is strictly prohibited under any circumstances.
- The bucket will remain as low as possible during earth transport so that the machine can move with maximum stability.
- Ascents or descents in load of the bucket shall always be carried out using low gears.
- Traffic on uneven terrain will be done at low speeds.
- Handling heavy loads in conditions of considerable wind shall be avoided to prevent situations of instability.
- It is strictly forbidden to rest under the shadow cast by the machine when it is stopped.

Graders

- The operator will constantly check the proper position of the blade, adjusting it according to the ground conditions and the work phase in progress.
- Always drive at moderate speed.
- The driver will use the horn when it is necessary to warn of his presence, and whenever he is going to start reversing.
- When leaving the machine, the driver will ensure that it is braked and that it cannot be started by unauthorised persons.
- The operator will wear a helmet whenever he is outside the cab.
- The maintenance and repair operations of the machine will be carried out with this stop and with the blade resting on the ground.
- The stay of people in the work area of the machine will be prohibited.
- Extreme precautions will be taken against slopes and ditches.
- When transferring, you will drive with caution and with the blade raised, without exceeding the width of your machine.
- Special attention will be paid to the reversing manoeuvre, also activating the horn before starting it.
- Casual access of persons, machines, and vehicles to the machine's work area shall not be permitted.

- When stopping, the driver must place the scarifier and the blade on the ground, placing the blade without exceeding the width of the machine.

Backhoe Loaders

- The backhoes used in this work will be equipped with lights and a fully functioning recoil horn.
- It shall be forbidden to carry out work or for persons to remain at a distance equal to the maximum reach of the excavator arm.
- Extreme caution must be taken in the presence of other backhoes working in parallel or any other machine. In such a case, the presence of a signpost will be recommended.
- The internal roads of the work will be kept in good condition to avoid the formation of muddy areas that may hinder the safe circulation of these machines.
- If a clamshell bucket is used, the operator must leave the bucket closed and resting on the ground before leaving the machine.
- The backhoe loader must have the bucket resting on the machine during movements, in order to avoid swaying.
- Ascents or descents of the loaded bucket shall be made at slow speed.
- Transporting people on the backhoe is strictly prohibited to prevent falls, bumps, and other hazards.
- It will be forbidden to carry out earthmoving manoeuvres without first having put the hydraulic immobilisation supports into service.
- The handling of large loads in strong winds will be prohibited.
- If, exceptionally, the backhoe loader is used as a crane, the following precautions must be taken:
- The spoon shall have a ring welded on its outer back expressly for hanging objects.
- Hanging will be done by means of hooks or a safety carabiner incorporated into the rocker.
- The pipes must always be suspended from the ends (two points), in a position parallel to the axis of the trench, with the machine placed in the direction of the trench and on its guideline. A direct-mount fingernail can be used.
- The load will be guided by ropes handled by two operators.
- The maneuver will be directed by a specialist.
- In the event of insecurity of the trench walls, the work will be stopped immediately.
- The backhoe loader shall be repositioned by placing the arm in the direction of travel (except for very short distances).
- It will be forbidden to carry out any other type of work inside the trenches or trenches, in the area within reach of the backhoe arm.
- A hazard sign shall be installed on one right foot, as the limit of the safety zone of the reach of the backhoe arm. This sign will move as the excavation progresses.
- It shall be forbidden to dump the products of excavation with the backhoe to within 2 m of the upper cutting edge of a trench or trench, in order to avoid the risks of overloading the ground.
- When excavating below its bearing plane, the bucket should never be below the chassis.
- During the excavation phase, the machine must never be exposed to the danger of collapse of the excavation face.
- To avoid injury during maintenance operations, the operator will first rest the bucket on the ground, stop the engine, activate the handbrake and lock the machine. Then, it will perform the necessary maintenance tasks.

Compactors

- The operator must have been informed that he is driving a dangerous machine and that he must take specific precautions to avoid accidents.
- The train drivers will be operators of proven skill, in the prevention of risks due to incompetence.
- The land will be watered to reduce dust lift. The use of an anti-dust mask will be necessary in cases of great abundance and persistence of dust.
- The use of helmets or earplugs will be mandatory to prevent possible injuries to the ears.
- Elastic bands will be available on site for use during work with tampers or rollers, in order to protect against the risk of low back pain.
- The area to be compacted will be closed to machinery and construction vehicle traffic.

Trucks and dumpers

- The driver of each truck will be in possession of the mandatory driving licence and will act in accordance with the rules of the highway code and will comply at all times with the signs of the work.
- The access and internal circulation of trucks on the site will be carried out as determined in the plans of the Health and Safety Plan.
- The loading and unloading operations of the trucks shall be carried out in the places indicated in the plans for this purpose.

- The vehicles will be in perfect condition of maintenance and conservation.
- Before starting the loading and unloading maneuvers of the material, in addition to having installed the handbrake of the truck cab, shims will be placed to immobilize the vehicle.
- The ascent and descent of the truck boxes will be done by the stairs.
- Loading and unloading manoeuvres by means of an inclined plane will be governed from the truck bed by a minimum of two operators by means of a lowering rope. In the surroundings at the end of the shot there will be no people.
- The maximum height allowed for loose materials will not exceed the ideal slope of 5% and will be covered with a tarpaulin, in anticipation of collapses.
- The loads will be distributed evenly on the box, compensating the weights, in the most evenly distributed way possible.
- The driver must wear gloves to avoid injury to the hands and safety boots to avoid crushing or blows to the feet. When you leave the cabin, you will need to put on your helmet.
- It will be forbidden to jump to the ground from the load or from the box unless it is to avoid a serious risk.
- Dumpers must be equipped with:
  - Headlights.
  - Rear reversing lights.
  - Turn signal flashing lights.
  - Front and rear marker lights.
  - Top beacon lights on the front of the box.
  - Assisted braking system.
  - Handbrakes.
  - Automatic recoil horn.
  - Roll-proof cabs.
  - Additional elements may be required, such as air-conditioned cabins, tarpaulins to cover the load, among others.
- Before starting each working day, a daily inspection will be carried out to verify the proper functioning of the engine, hydraulic systems, brakes, steering, lights, horns, tires, etc., in order to prevent risks due to malfunctions or breakdowns.
- Access to the cabin and driving will be prohibited to any unauthorized person.
- The circulation of the dumper with the box hoisted will be prohibited. The box will be lowered at the end of the unloading.
- Fuel or other flammable products may not be stored on the truck.
- It will be forbidden to work or stay at distances of less than 10 m from dumper trucks.
- The load of the truck will be watered superficially to avoid possible dust that may affect the surrounding traffic.
- The load shall not exceed the maximum set by the manufacturer.
- Danger signs and prohibition of passage will be installed 15 m from the dumper dumping sites.

8.2.3. MEANS OF MANUFACTURING AND INSTALLATION OF FIRMS AND PAVEMENTS

Bituminous mixture manufacturing plants

- The bituminous mixture manufacturing plants will have lighting, firefighting equipment and signage.
- When planning the location of these facilities, the direction of prevailing winds will be considered to avoid contamination of areas inhabited or frequented by people.
- Pipes carrying hot substances shall be insulated externally to protect personnel and prevent heat loss.
- A fixed circuit for the circulation of vehicles will be established, duly signposted, avoiding, as far as possible, the passage of people through it.
- The accesses, stairs, platforms and walkways, located more than two metres high, will be provided with protections.
- It will be forbidden to light fires or sparks in the vicinity of flammable products.
- Check-ups, repairs and cleaning or maintenance operations will always be carried out with the installation stopped.
- Special attention will be paid to the review of electrical installations, pipe joints and the temperature of materials.

Asphalt agglomerate paver

- Any person other than its operator will not be allowed to remain on the paver in motion.
- The manoeuvres of approaching and pouring asphalt products into the hopper will always be directed by a specialist with experience in this type of work.

- All rescue operators shall remain in position in the ditch or pavements, in front of the machine, during hopper filling operations, to prevent the risks of entrapment and being run over during these manoeuvres.
- The side edges of the paver, in order to prevent entrapment, shall be marked by panels of alternative yellow and black bands.
- Multipurpose fire extinguishers in good condition will be placed on the platform of the machine.
- Operator access to the vibrating screed will be prohibited during paving operations.

Tire Compactor

- No other person than its operator shall be allowed to remain on the compactor.
- The compactor will have visibility and machine position indication lights and an acoustic reversing signal.
- A metal ladder will be available for the raising and lowering of the machine boxes.
- The ladder up to the driving platform and the outer edge of the platform will have a non-slip coating.
- The tyre pressure will be checked before the start of the day.
- The maintenance of the machine's operating condition shall be monitored.
- It shall be forbidden to light fires or sparks during refuelling and checking the machine's battery level.

Self-propelled tandem compactor

- Anyone other than its operator will not be allowed to remain on the compactor, in order to avoid accidents due to falling from the machine.
- All operators on foot in the chipboard pit will remain in position in the ditch or pavements, in front of the compactor, to prevent the risks of entrapment and running over during the movements of the compactor.
- The ladder up to the driving platform and the outer edge of the platform shall have a non-slip coating.
- The operator shall have the obligation to take special care of the stability of the roller when driving on inclined surfaces or by stepping on the edge of the chipboard layer.
- The systematic maintenance of the machine's operating condition shall be monitored.
- Care shall be taken to ensure the prohibition of smoking during the operations of refuelling and checking the level of the machine's battery.
- There will be an anti-vibration seat or, failing that, the use of an anti-vibration belt will be mandatory.

Self-propelled vibrating roller

- It is strictly forbidden for any individual to remain on the road roller, except for its operator, for the purpose of preventing accidents related to falls from the machine.
- All workers in the chipboard work area must remain in position in the gutter or on the pavements, always in front of the compactor, as a precautionary measure against the risk of entrapment and being run over during the movement of the machine.
- The ladder used to access the driving platform and the outer edge of the driving platform shall be provided with a non-slip coating.
- The machine operator shall be responsible for paying particular attention to the stability of the roller, especially when riding on inclined surfaces or when stepping on the edge of the chipboard layer.
- Constant monitoring of the machine's operating condition will be maintained.
- It will focus on education and supervision to ensure that smoking is not carried out during fueling operations and during the machine's battery level check.
- The presence of an anti-vibration seat will be guaranteed or, failing that, the use of an anti-vibration belt will be required.

Dump truck

- The driver of the truck will be in possession of the driving licence and will act with full respect for the rules of the highway code and will respect the signs of the work at all times.
- In the manoeuvre of positioning and coupling in front of the paver, the driver shall act in full compliance with the instructions and direction of the person in charge of the chipboard paving pit, as well as the indications of the warning assistant.
- Once the unloading has been carried out, the box will be lowered before resuming the journey.
- The possible presence of overhead electrical or telephone lines will be taken into account before the box is lifted.
- All inspection or maintenance operations to be carried out with the swingarm raised shall be carried out to ensure that its descent is prevented by interlocking.

8.2.4. MISCELLANEOUS MACHINERY AND TOOLS

Crane truck

- Before starting the loading or unloading process, it will be checked that the vehicle is properly immobilized with shims on all four wheels and on the stabilizer jacks.
- The loading and unloading manoeuvres will be directed by a specialist.
- All hanging hooks, rigging, rocker arms and slings or stirrups shall always be fitted with safety latches.
- The maximum permissible load set by the truck manufacturer shall not be exceeded.
- The crane operator will always have the suspended load in sight and, if this is not possible on any occasion, all his manoeuvres will be directed by an expert signaller.
- It will be forbidden to drag the load.
- The crane truck must never park or circulate less than 2 meters from the edge of trenches or clearings.
- It will be forbidden for people to remain around the crane truck at distances of less than 5 metres, as well as to remain under suspended loads.
- The driver will be prohibited from reversing without the presence and assistance of a signalist, as well as from leaving the truck with a suspended load.
- Access to the cab of the truck or the handling of its controls by unauthorized personnel will not be allowed.
- In crane truck operations, leather gloves and non-slip footwear will be used, as well as a safety helmet when the crane operator leaves the cab.

Compressors

- The compressor will be dragged and placed at its work site more than 2 meters from the edge of trenches or clearings.
- Once positioned, it will be leveled and immobilized with knobs on its wheels.
- Fueling operations will always be carried out with the engine stopped.
- The compressor protective housings will always remain closed except for timely maintenance.
- If the compressor is not of the quiet type, the high sound pressure level in its vicinity shall be clearly marked and warned, and workers operating in that area shall be required to wear hearing protectors.
- The state of conservation of the hoses and nozzles will be systematically checked, looking for possible blowouts and leaks.

Saws

- The saws will have the following protection elements:
- Cutting dividing knife.
- Pusher of the piece to be cut and guide.
- Disc cover housing.
- Protective housing for transmissions and pulleys.
- Watertight switch.
- Grounding.
- They will be positioned in places away from the traffic of vehicles, activities and areas with a risk of people or objects falling.
- The operator who handles the saw will be specifically trained and authorized by the Site Manager for this work.
- The operator will use leather gloves, protective glasses, dust mask, safety footwear and elastic belt.
- The cutting disc and its teeth will be checked to ensure that they are in good condition and that the work area is clean.
- A powder extinguisher will be placed next to the saw.

Fijaclavos pistol

- The operator who handles the nail fixing pistoja will be specifically trained and authorized by the Site Manager for this work.
- Extreme caution should be exercised when nailing work is carried out with other workers around.
- The mandatory use of a safety helmet, leather gloves, wristbands or arm warmers, as well as safety glasses will be required to protect against possible projections.

Oxyacetylene and oxyfuel welding

- The supply, transport and storage of liquefied gas cylinders or cylinders shall always be controlled, expressly ensuring that:
  - The valves are always protected by the corresponding caps.

- The bottles are transported on caged trays or safety trolleys, in an upright position and properly tied, avoiding possible overturning.
- Do not mix different gas bottles in storage.
- Empty bottles are always treated as if they were full for safety.
- Liquefied gas cylinders will not stay in the sun for long periods of time.
- Cylinders should never be used in a horizontal position or with an inclination of less than 45º. The lighters will always be equipped with an anti-flashback valve, placed in both pipes and both at the outlet of the cylinders and at the inlet of the torch.
- The hoses must be checked to ensure that they are in good condition and do not have sharp bends.

Portable drill

- The drills will have double electrical insulation and their electrical equipment will be in watertight compartments.
- It is strictly forbidden to deposit the portable drill on the ground or leave it abandoned when connected to the mains.
- The drills will only be repaired by specialized personnel, and it is forbidden to disassemble them in the pit.
- Workers will wear leather gloves, helmets, safety footwear and protective glasses.

Hand Tools

- They should be checked to ensure that they are in good condition and clean before use. In the same way, they should be cleaned at the end of the task, especially if they are stained with grease or other slippery materials.
- They will be stored on specific shelves or boxes and will not be left abandoned in the work area.
- Operators will use leather helmets, safety boots, helmet and/or protective glasses if necessary.

Post Driving Machine

- The operations of the machine will be directed by qualified personnel.
- A certain order will be established in the piling.
- It is forbidden to climb on the running gear.
- Only authorized personnel may enter the machine.
- All engine exhaust points will be checked periodically.
- The driver, before performing any manoeuvre, must check that there are no people in the vicinity.
- The radiator cap will not open directly; The steam given off can cause burns.

Self-propelled marker

- The machine may only be used by the authorised operator.
- The side edges of the machine shall be marked by panels of alternating yellow and black bands to prevent entrapment.
- Two multipurpose fire extinguishers in good condition will be placed on the platform of the machine.

Ladders

- The stairs will be installed at an angle of 75º to the horizontal.
- The staircase will be attached at the top to the structure; On the bottom, it will have non-slip elements. If it is made up of extendable sections, these must be fixed before use.
- It will be ensured that the ladder is placed on horizontal ground and in a stable way, without the risk of slipping or overturning. In the case of ladders with wheels, they must be immobilized before use.
- The ladder should not be supported by pipes or electrical cables.
- The ladders shall not exceed 5 metres in length.
- When the working height is considerable or the operator must make movements or efforts that compromise stability, the worker must use a safety harness.
- Only one worker may use the ladder at a time.
- The steps must be checked periodically to ensure that they are properly fastened.
- The ascent or descent will never be made with your back to the stairs.
- The raising or lowering of loads shall be carried out in such a way as to ensure the stability of the worker and the ladder at all times.
- Workers must wear non-slip footwear, and must keep the soles and their hands clean of grease or other lubricating substances.

Slings and slings

- A new cable must be cycled with reduced loads before its first use.

- If the cable has been exposed to cold temperatures, it will need to be charged with less weight or heated before use.
- The formation of abrupt bends in the cable must be avoided.
- Slings and slings shall not be left abandoned at the construction site; They shall be kept in a dry and ventilated place protected from adverse atmospheric conditions.
- Ropes, cables or knotted chains shall not be used.
- Slings and slings shall be checked in order to check for deformations, abnormal elongation, thread breakage, wear, corrosion, etc., which make replacement necessary.
- When used to lift loads with sharp edges, a block of soft material, or rounded angles of protection, shall be placed between the chain and the load.
- To join different elements, specific joining rings will be used. Under no circumstances shall they be knotted or tied together directly.
- When slings and slings are loaded, operators should remain at a safe distance due to the risk of injury in the event of breakage.

Santander, July of 2025

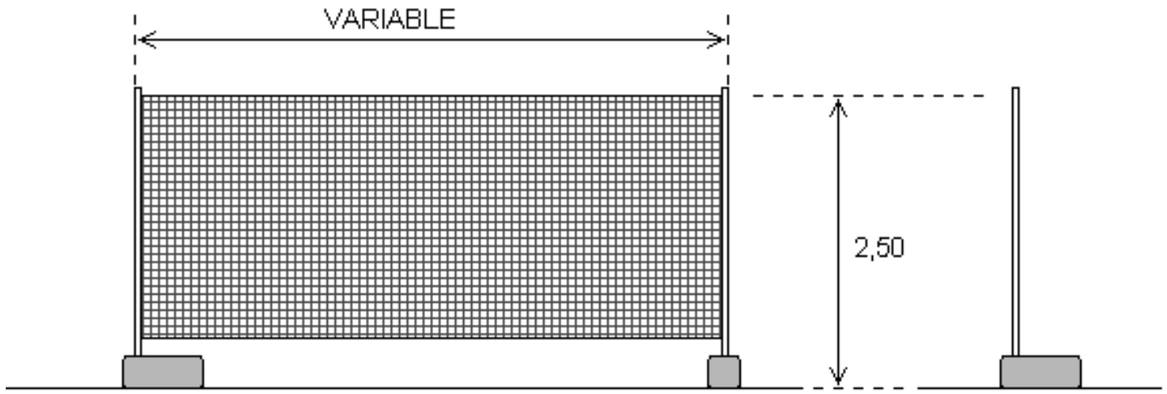
Signed.: Jorge Sáenz Fernández

9. CONCLUSION AND SIGNATURE

This Health and Safety Study includes a detailed description of the work, the planning of the planned tasks, and an analysis of the risks associated with both the activities and the machinery used. The necessary preventive measures are established, as well as the Personal Protective Equipment (PPE) and Collective Protective Equipment (PPE) that must be used.

Based on this Study, the contractor will prepare the Health and Safety Plan adapted to the specific construction processes of the work. Likewise, the incident book will be used in accordance with al Artículo 13 del Real Decreto 1627/1997, it is the responsibility of the safety coordinator – or, failing that, the construction manager – to send the notes to the Labour Inspectorate within a maximum period of 24 hours, in addition to notifying the affected contractor and its workers.

DRAWINGS



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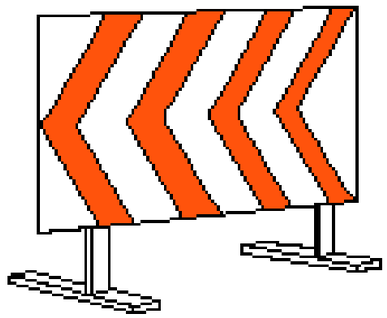

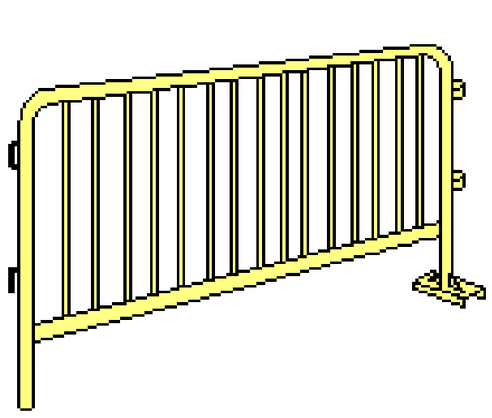

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

Proyecto Fin de Carrera

HEALTH AND SAFETY PLAN

TITLE:

GEOMETRIC REALIGNMENT

AND PLATFORM WIDENING OF CA-811

MUNICIPALITY:
MAZCUERRAS

REGION:
CANTABRIA

AUTHOR:

Jorge Sáenz Fernández

SCALE:

NO SCALE

DATE:

JULY 2025

SHEET N:

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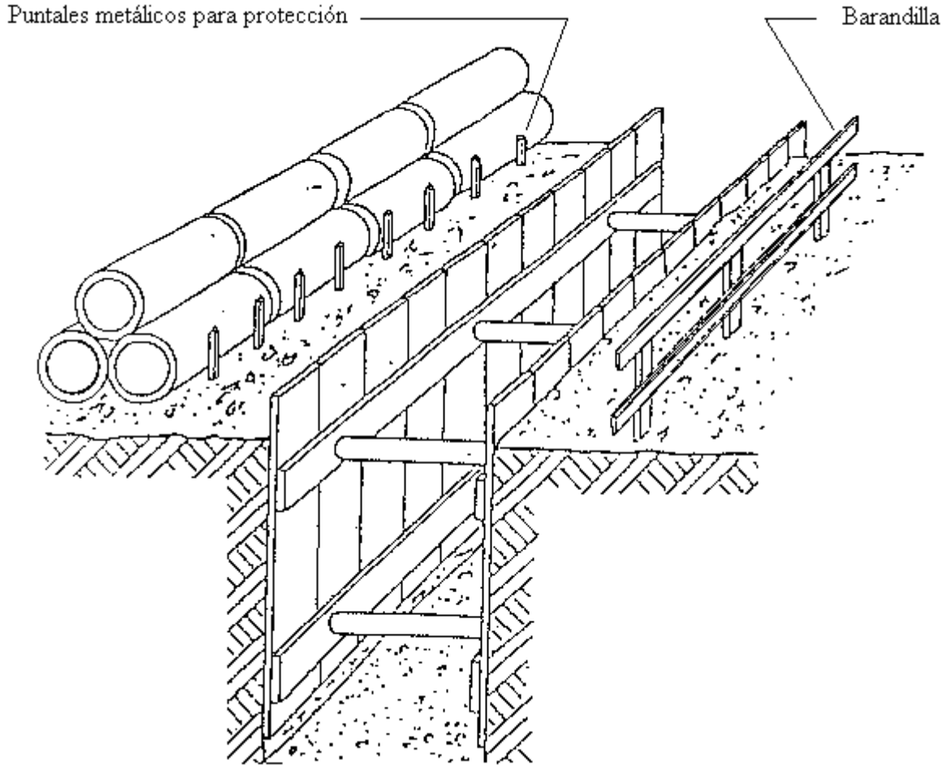

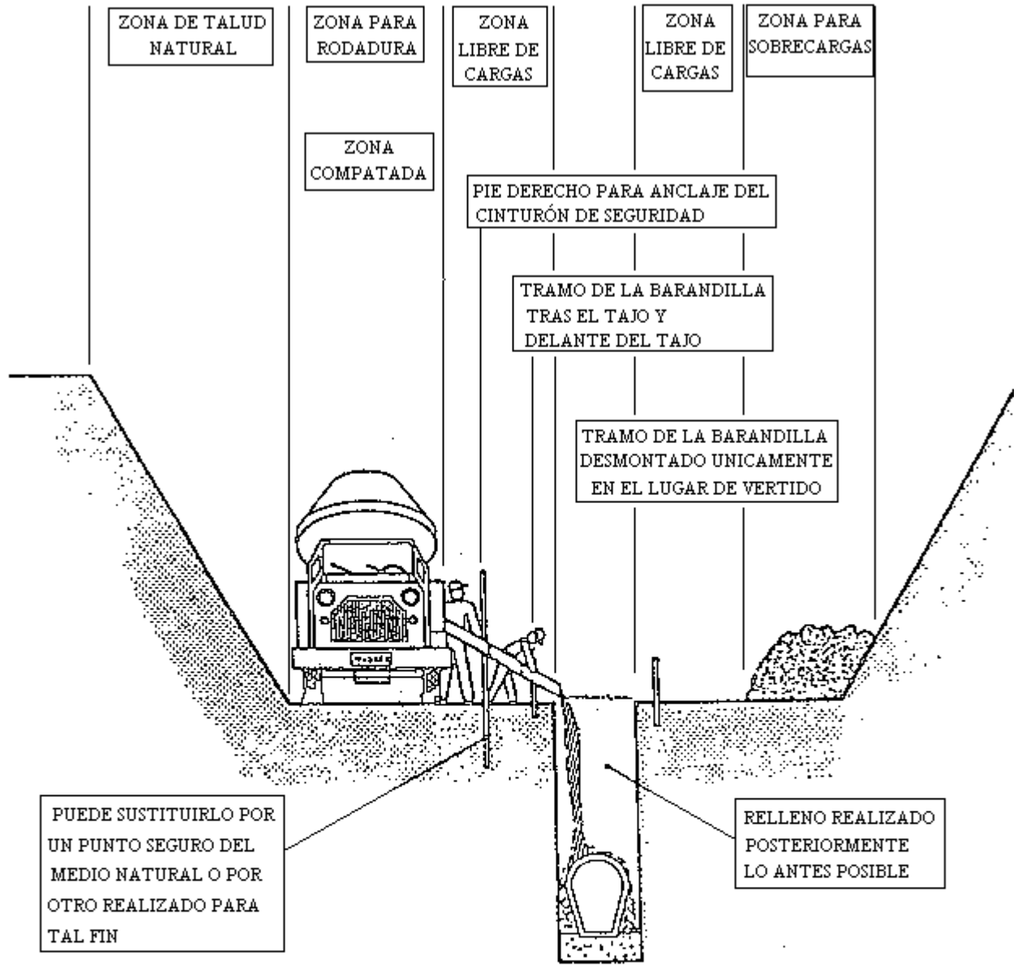

* MIENTRAS SE REALIZA EL HORMIGONADO POR DETRAS DEL TAJO, SE PROCEDE TRAS EL FRAGUADO AL CIERRE DE LA ZANJA

* TRAMO ABIERTO, EL ESTRICTO NECESARIO PARA INSTALAR UN TRAMO DE TUBERIA Y HORMIGONAR EL TRAMO ANTERIOR

* CUANTO MENOR TIEMPO PERMANEZCA ABIERTA LA ZANJA, MAYOR SEGURIDAD, PESE A ELLO, PUEDE NECESITAR ENTIBACIÓN

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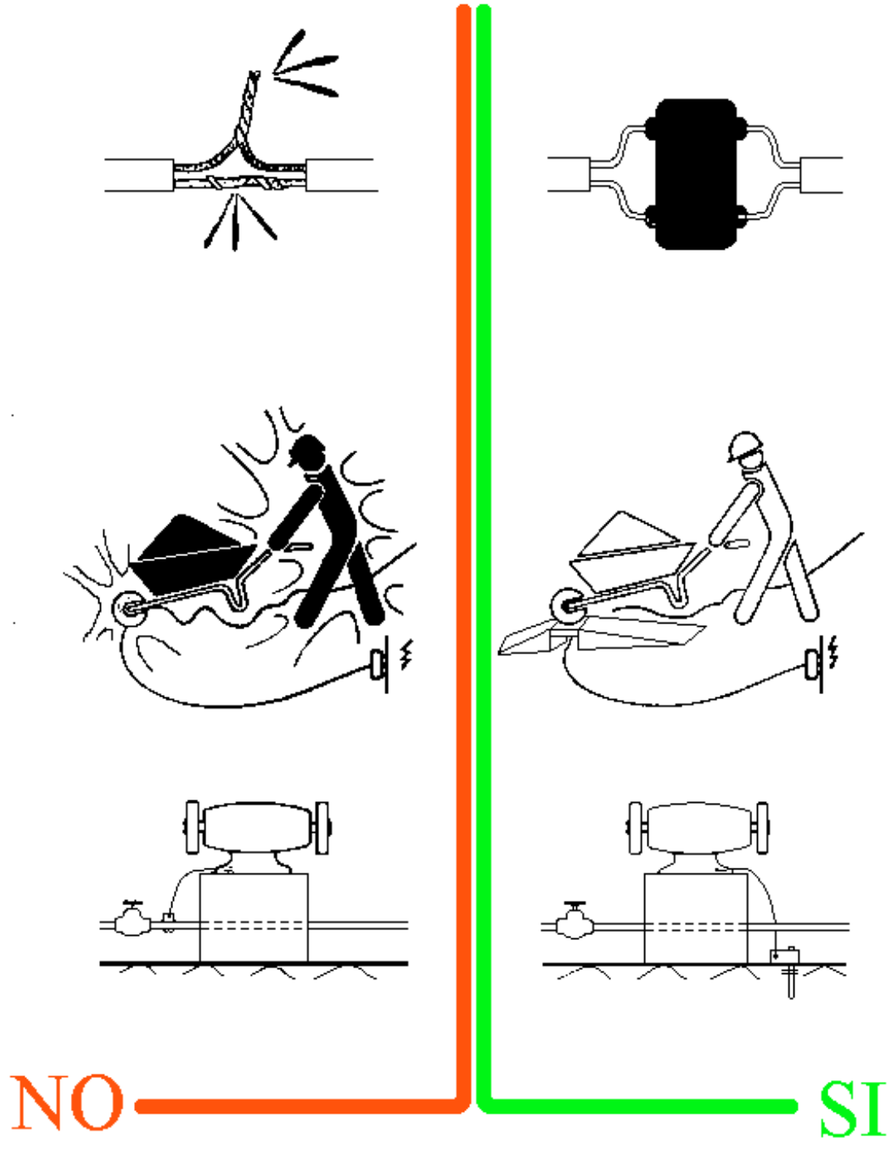

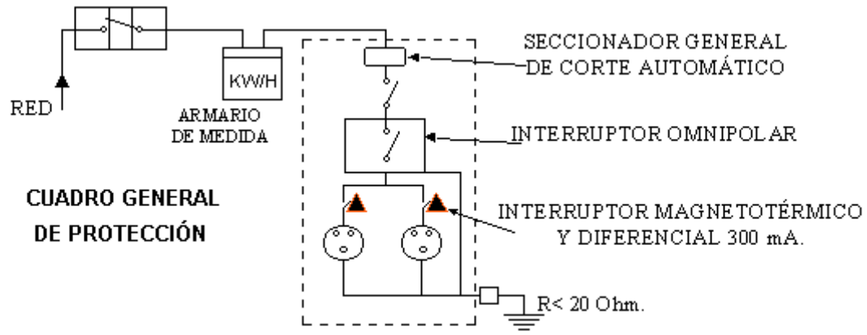

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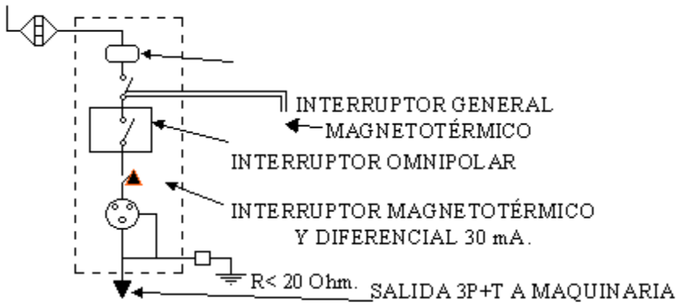
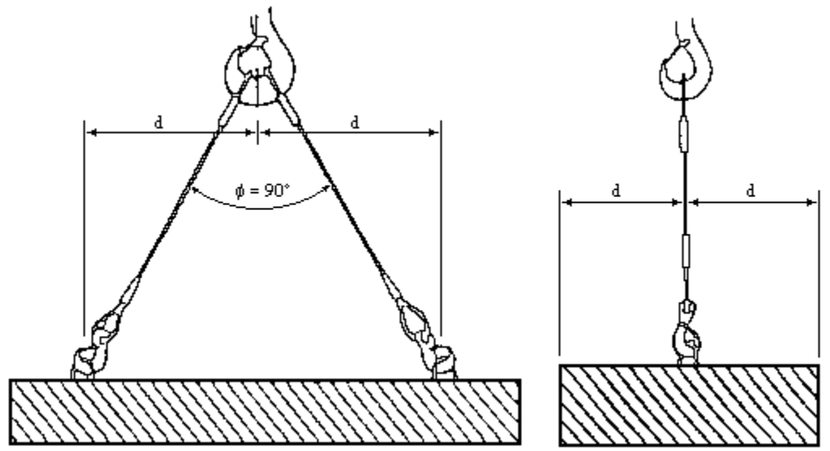
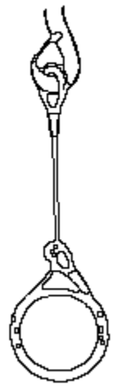
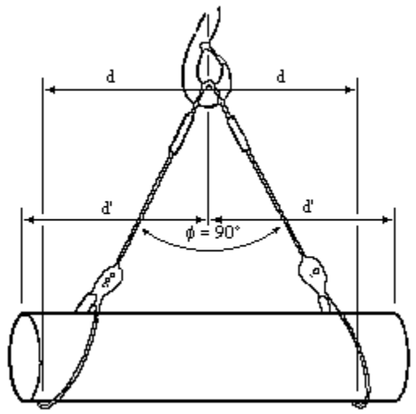


CUADRO SECUNDARIO
PARA ALIMENTACIÓN ÚNICA
(SIERRA, VIBRADOR, MAQUINILLO, ETC.)







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DIMENSIONES EN mm		
L 1	L 2	L 3
594	492	30
420	348	21
297	248	15
210	174	11
148	121	8
105	87	5

MATERIAS INFLAMABLES

MATERIAS EXPLOSIVAS

MATERIAS TÓXICAS

MATERIAS CORROSIVAS

MATERIAS RADIACTIVAS

CARGAS SUSPENDIDAS

VEHÍCULOS DE MANUTENCIÓN

RIESGO ELÉCTRICO

PELIGRO GENERAL

RADIACIONES LÁSER

MATERIAS COMBURENTES

RADIACIONES NO IONIZANTES

CAMPO MAGNÉTICO INTENSO

RIESGO DE TROPEZAR

CAIDAS A DISTINTO NIVEL

RIESGO BIOLÓGICO

BAJAS TEMPERATURAS

MATERIAS NOCIVAS O IRRITANTES

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DIMENSIONES EN mm		
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594	492	30
420	348	21
297	248	15
210	174	11
148	121	8
105	87	5

MATERIAS INFLAMABLES

MATERIAS EXPLOSIVAS

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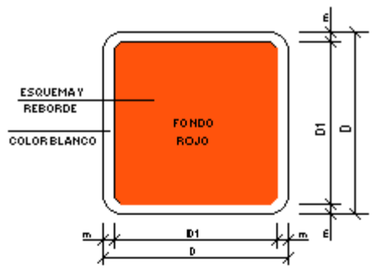

DIMENSIONES EN mm		
D	D 1	M
594	534	30
420	378	21
297	267	15
210	188	11
148	132	8
105	95	5

MANGUERA PARA INCENDIOS

ESCALERA DE MANO

EXTINTOR

TELÉFONO PARA LA LUCHA CONTRA INCENDIOS

DIRECCIÓN QUE DEBE SEGUIRSE
(SEÑAL INDICATIVA ADICIONAL A LAS ANTERIORES)

DIMENSIONES EN mm		
D	D 1	Ø
594	420	44
420	297	31
297	210	17
210	148	16
148	105	11
105	74	8

PROHIBIDO FUMAR

PROHIBIDO FUMAR Y ENCENDER FUEGO

PROHIBIDO PASAR A LOS PEATONES

PROHIBIDO APAGAR CON AGUA

AGUA NO POTABLE

ENTRADA PROHIBIDA A PERSONAS NO AUTORIZADAS

PROHIBIDO A LOS VEHÍCULOS DE MANUTENCIÓN

NO TOCAR

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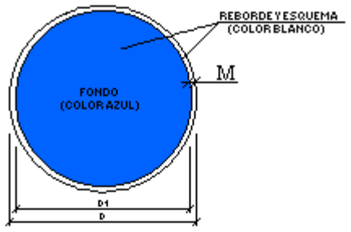


DIMENSIONES EN mm		
D	D 1	M
594	534	30
420	378	21
297	267	15
210	188	11
148	132	8
105	95	5

PROTECCIÓN OBLIGATORIA DE LA VISTA

PROTECCIÓN OBLIGATORIA DE LA CABEZA

PROTECCIÓN OBLIGATORIA DEL OIDO

PROTECCIÓN OBLIGATORIA DE LAS VÍAS RESPIRATORIAS

PROTECCIÓN OBLIGATORIA DE LOS PIES

PROTECCIÓN OBLIGATORIA DE LAS MANOS

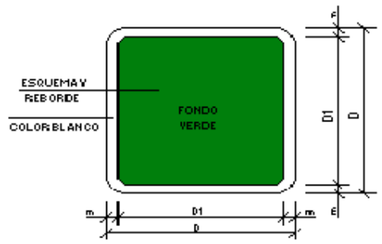
OBLIGACIÓN GENERAL (ACOMPAÑADA, SI PROCEDE, DE SEÑAL ADICIONAL)

PROTECCIÓN OBLIGATORIA DEL CUERPO

PROTECCION OBLIGATORIA DE LA CARA

PROTECCIÓN INDIVIDUAL OBLIGATORIA CONTRA CAÍDAS

VÍA OBLIGATORIA PARA PEATONES



DIMENSIONES EN mm		
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297	267	15
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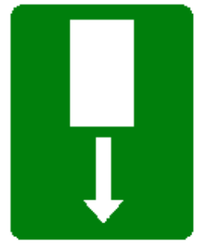
148	132	8
105	95	5



PRIMEROS AUXILIOS

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA
Proyecto Fin de Carrera

HEALTH AND SAFETY PLAN

TITLE:
GEOMETRIC REALIGNMENT
AND PLATFORM WIDENING OF CA-811

MUNICIPALITY:
MAZCUERRAS

REGION:
CANTABRIA

AUTHOR:
Jorge Sáenz Fernández

SCALE:
NO SCALE

DATE:
JULY 2025

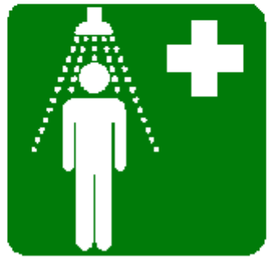
SHEET N:
8

VÍA SALIDA DE SOCORRO

TELÉFONO DE
SALVAMENTO

DIRECCIÓN QUE DEBE SEGUIRSE
(SEÑAL INDICATIVA ADICIONAL A LAS SIGUIENTES)

CAMILLA



DUCHA DE SEGURIDAD

LAVADO DE OJOS

ELEMENTOS LUMINOSOS

CLAVE	SEÑAL	DENOMINACIÓN
TL-1		SEMÁFORO (TRICOLOR)
TL-2		LUZ AMBAR INTERMITENTE
TL-3		LUZ AMBAR ALTERNATIVAMENTE INTERMITENTE
TL-4		TRIPLE LUZ AMBAR INTERMITENTE
TL-5		DISCO LUMINOSO MANUAL DE PASO PERMITIDO
TL-6	STOP	DISCO LUMINOSO MANUAL DE STOP O PASO PROHIBIDO
TL-7		LÍNEA DE LUCES AMARILLAS FIJAS

ELEMENTOS LUMINOSOS

CLAVE	SEÑAL	DENOMINACIÓN
TL-8		CASCADA LUMINOSA (LUZ APARENTEMENTE MOVIL)
TL-9		TUBO LUMINOSO (LUZ APARENTEMENTE MOVIL)
TL-10		LUZ AMARILLA FIJA
TL-11		LUZ ROJA FIJA

ELEMENTOS DE DEFENSA

CLAVE	SEÑAL	DENOMINACIÓN
TD-1		BARRERA DE SEGURIDAD RÍGIDA PORTATIL
TD-2		BARRERA DE SEGURIDAD METÁLICA

SEÑALES DE INDICACIÓN

CLAVE	SEÑAL	DENOMINACIÓN
TS-52		REDUCCIÓN DE UN CARRIL POR LA DERECHA (3 a 2)
TS-53		REDUCCIÓN DE UN CARRIL POR LA IZQUIERDA (3 a 2)
TS-54		REDUCCIÓN DE UN CARRIL POR LA DERECHA (2 a 1)
TS-55		REDUCCIÓN DE UN CARRIL POR LA IZQUIERDA (2 a 1)

ELEMENTOS DE BALIZAMIENTO REFLECTANTES

CLAVE	SEÑAL	DENOMINACIÓN
TB-1		PANEL DIRECCIONAL ALTO
TB-2		PANEL DIRECCIONAL ESTRECHO
TB-3		PANEL DOBLE DIRECCIONAL ALTO
TB-4		PANEL DOBLE DIRECCIONAL ESTRECHO
TB-5		PANEL DE ZONA EXCLUIDA AL TRÁFICO
TB-6		CONO
TB-7		PIQUETE

ELEMENTOS DE BALIZAMIENTO REFLECTANTES

CLAVE	SEÑAL	DENOMINACIÓN
TB-8		BALIZA DE BORDE DERECHO
TB-9		BALIZA DE BORDE IZQUIERDO
TB-10		CAPTAFARO LADO DERECHO E IZQUIERDO
TB-11		HITO DE BORDE REFLEXIVO Y LUMINISCENTE
TB-12		MARCA VIAL NARANJA
TB-13		GUIRNALDA
TB-14		BASTIDOR MÓVIL

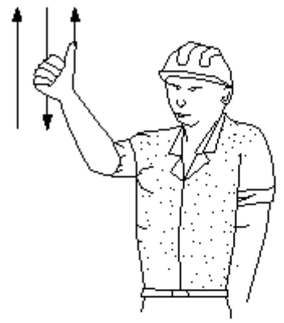
SEÑALES DE INDICACIÓN

CLAVE	SEÑAL	DENOMINACIÓN
TS-60		DESVIO DE UN CARRIL POR CALZADA OPUESTA
TS-61		DESVIO DE UN CARRIL POR CALZADA OPUESTA MANTENIENDO OTRO POR LAS OBRAS
TS-62		DESVIO DE DOS CARRILES POR CALZADA OPUESTA
TS-210		CARTEL CROQUIS

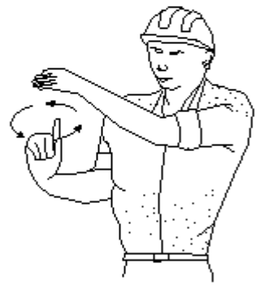
CODIGO DE SEÑALES DE MANIOBRAS

1 LEVANTAR LA CARGA

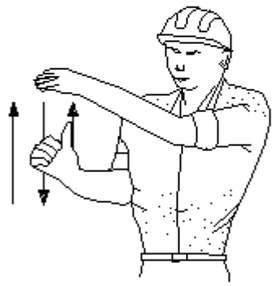
2 LEVANTAR EL AGUILON O PLUMA



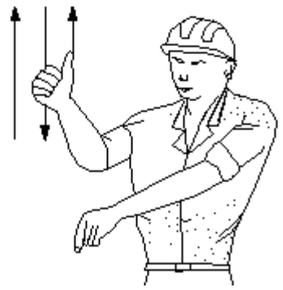
3 LEVANTAR LA CARGA LENTAMENTE



4 LEVANTAR EL AGUILON O PLUMA LENTAMENTE



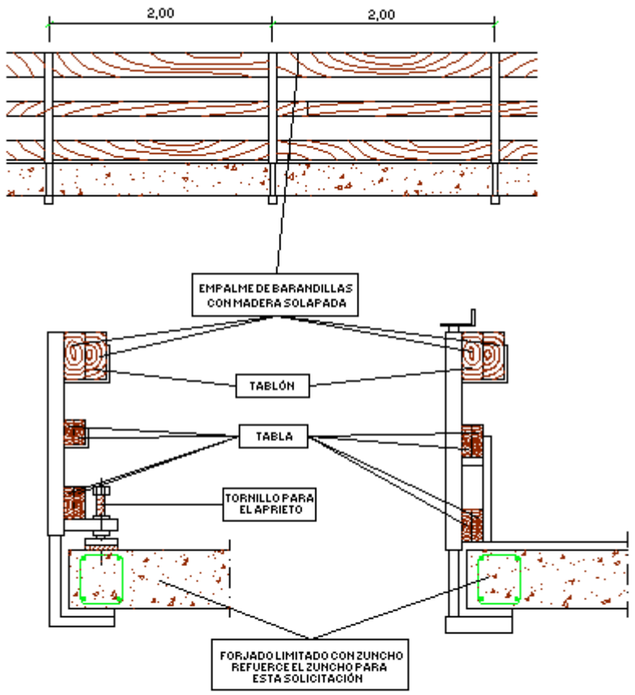
5 LEVANTAR EL AGUILON O PLUMA Y BAJAR LA CARGA

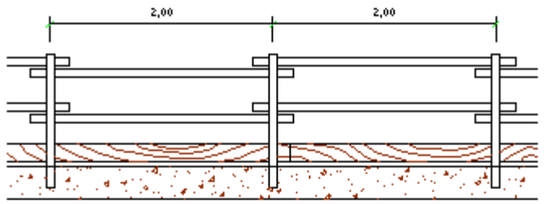


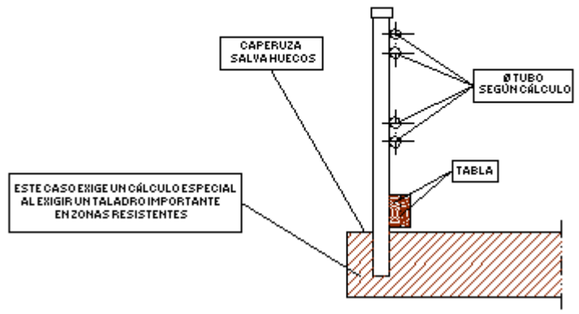
6 BAJAR LA CARGA

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA Proyecto Fin de Carrera	HEALTH AND SAFETY PLAN	TITLE: GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF CA-811	MUNICIPALITY: MAZCUERRAS REGION: CANTABRIA	AUTHOR: Jorge Sáenz Fernández	SCALE: NO SCALE	DATE: JULY 2025	SHEET N: 10

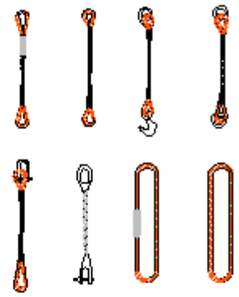
BARANDILLAS







TIPOS DE ESLINGAS



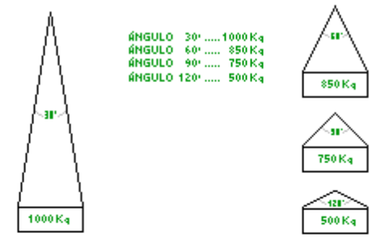
GAZAS

MÉTODO CORRECTO

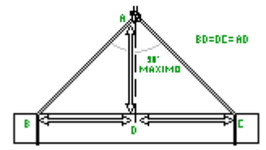
MÉTODOS INCORRECTOS

MANEJO DE MATERIALES

LA MISMA ESLINGA



RELACIÓN ENTRE EL ÁNGULO DE LA ESLINGA Y SU CAPACIDAD DE CARGA



LA CARGA DEBE IR BIEN CENTRADA Y LA ESLINGA NO DEBE TRABAJAR CON ÁNGULOS SUPERIORES A 90º

DIÁMETRO DEL CABLE	NÚMERO DE PERRILLOS	DISTANCIA ENTRE PERRILLOS
Hasta 12 mm	3	6 diámetros
12 mm a 20 mm	4	6 diámetros
20 mm a 25 mm	5	6 diámetros
25 mm a 35 mm	6	6 diámetros

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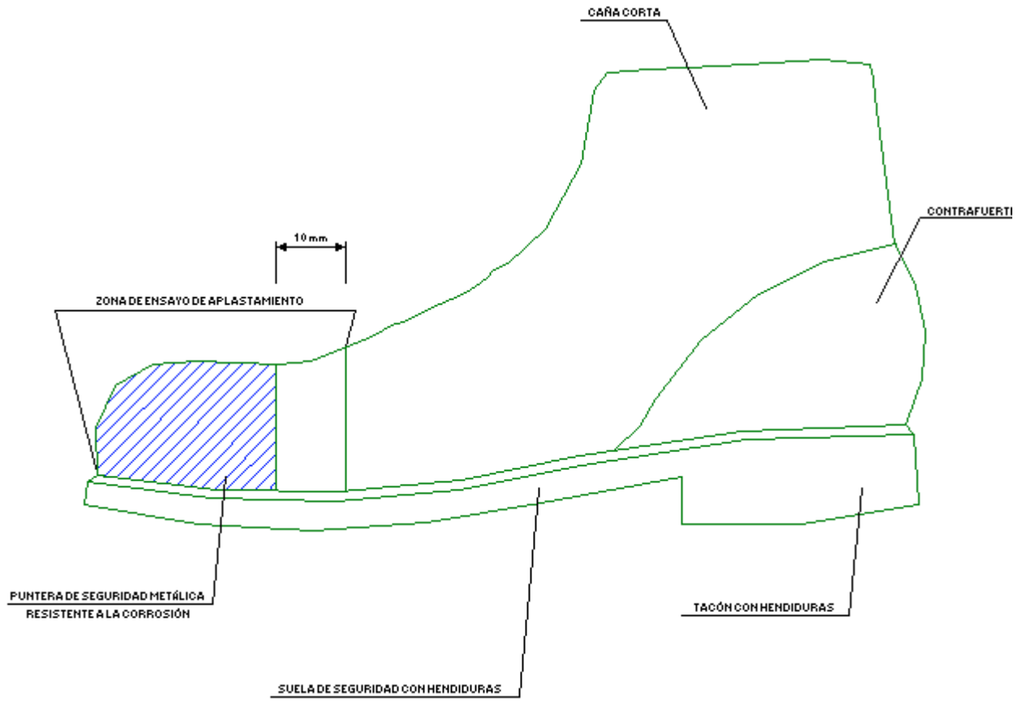
NO SCALE

DATE:
JULY 2025

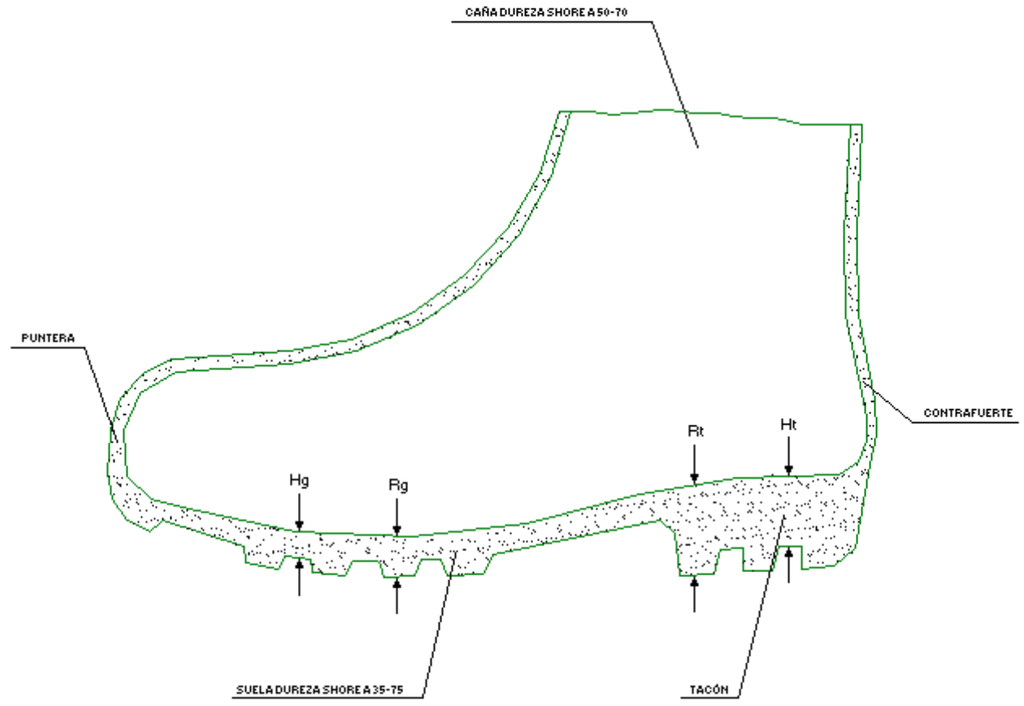
SHEET N:
11

BOTA DE SEGURIDAD CLASE III

BOTAS DE SEGURIDAD CLASE III



BOTA IMPERMEABLE AL AGUA Y A LA HUMEDAD



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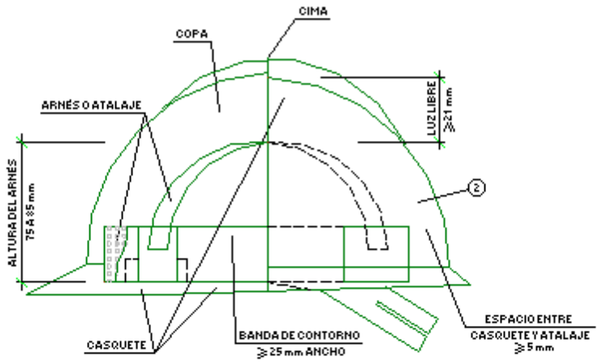
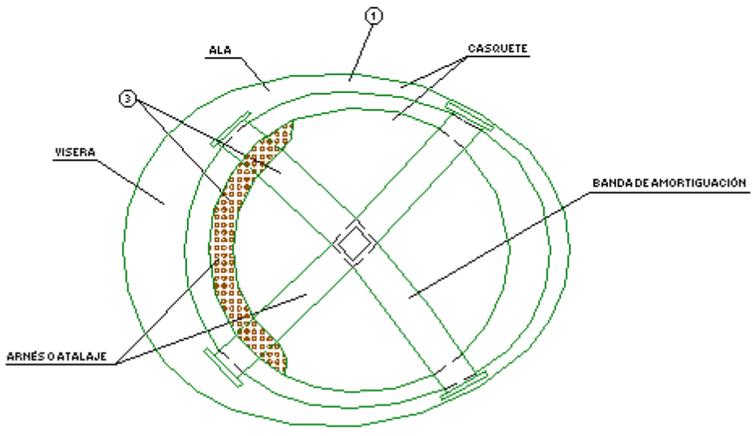
CASCO DE SEGURIDAD NO METÁLICO



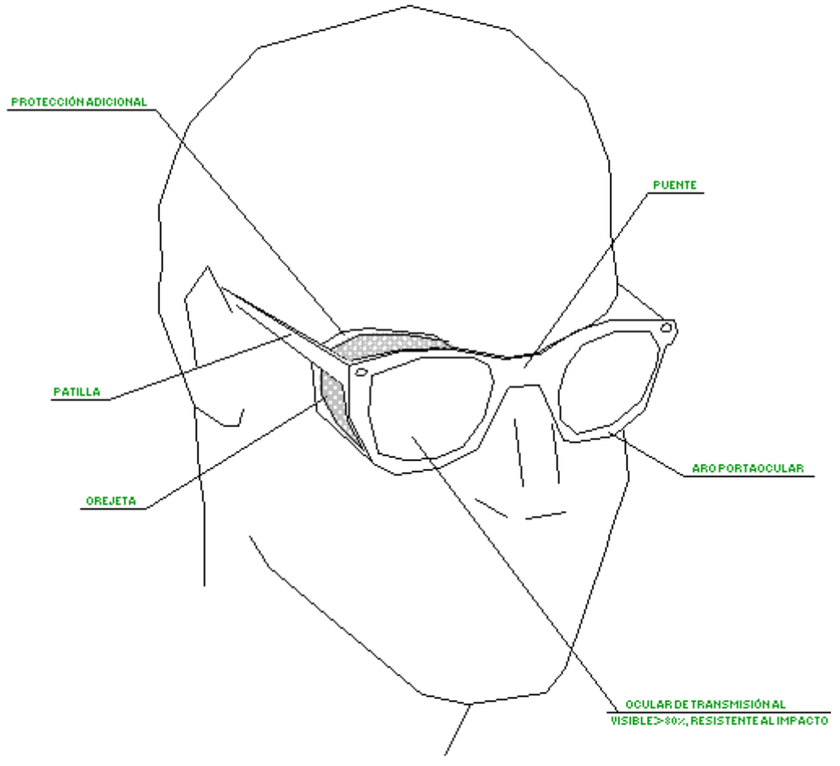


(1) MATERIAL INCOMBUSTIBLE, RESISTENTE A GRASAS, SALES Y AGUA

(2) CLASE N AISLANTE A 1000 V - CLASE E-AT AISLANTE A 25000 V

(3) MATERIAL NO RÍGIDO HIDROFUGO, FÁCIL LIMPIEZA Y DESINFECCIÓN

GAFAS DE MONTURA TIPO UNIVERSAL CONTRA IMPACTO Y ANTIPOLVO



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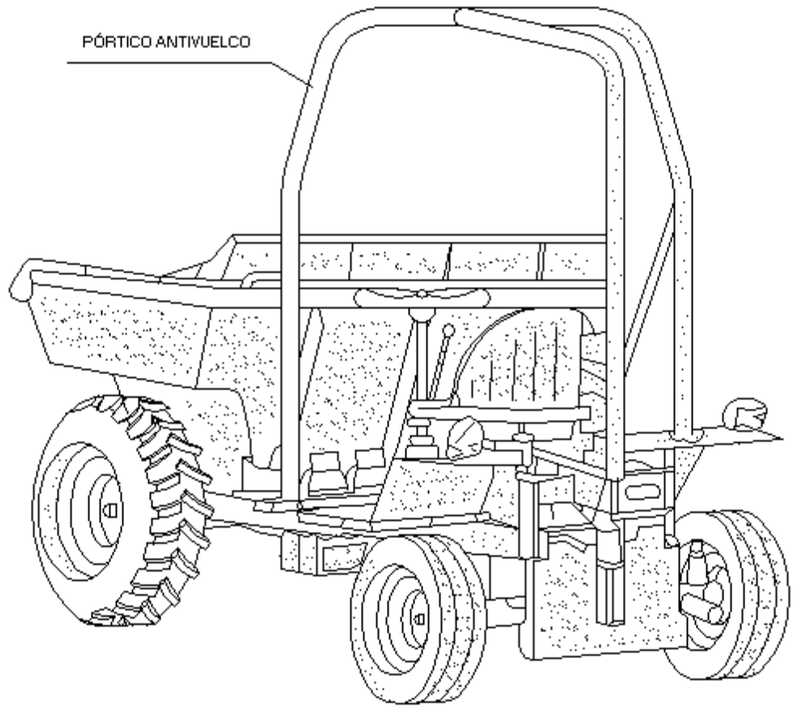
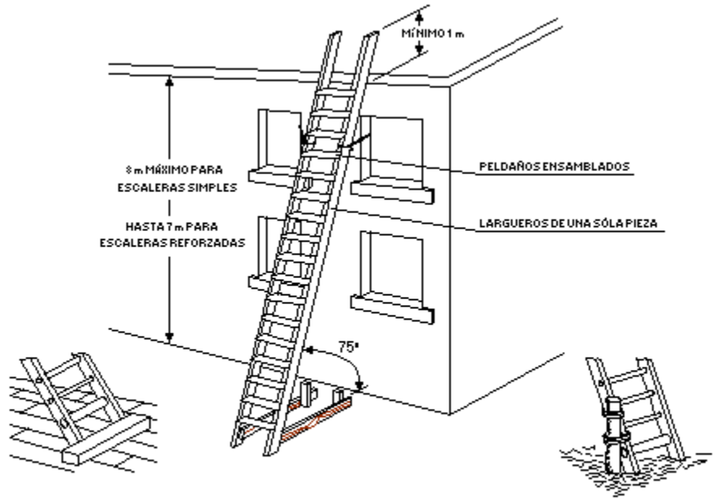
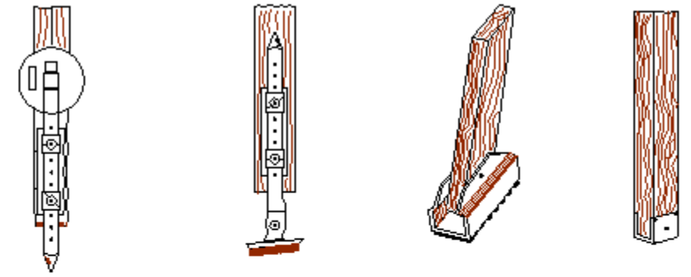
DUMPER



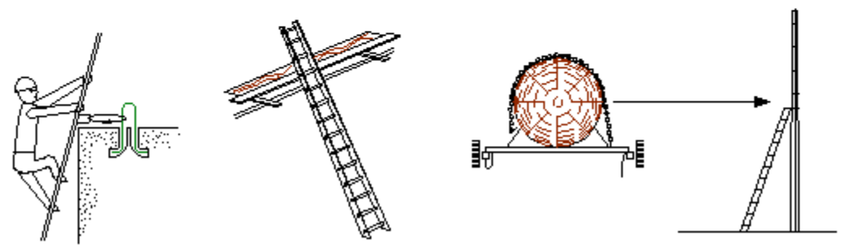
LOS VEHÍCULOS SIN CABINAS CUBIERTAS DEBERÁN SER PROVISTOS DE PÓRTICOS ANTIVUELCO



MECANISMOS ANTIDESLIZANTES



SUJECCIÓN EN LA PARTE SUPERIOR



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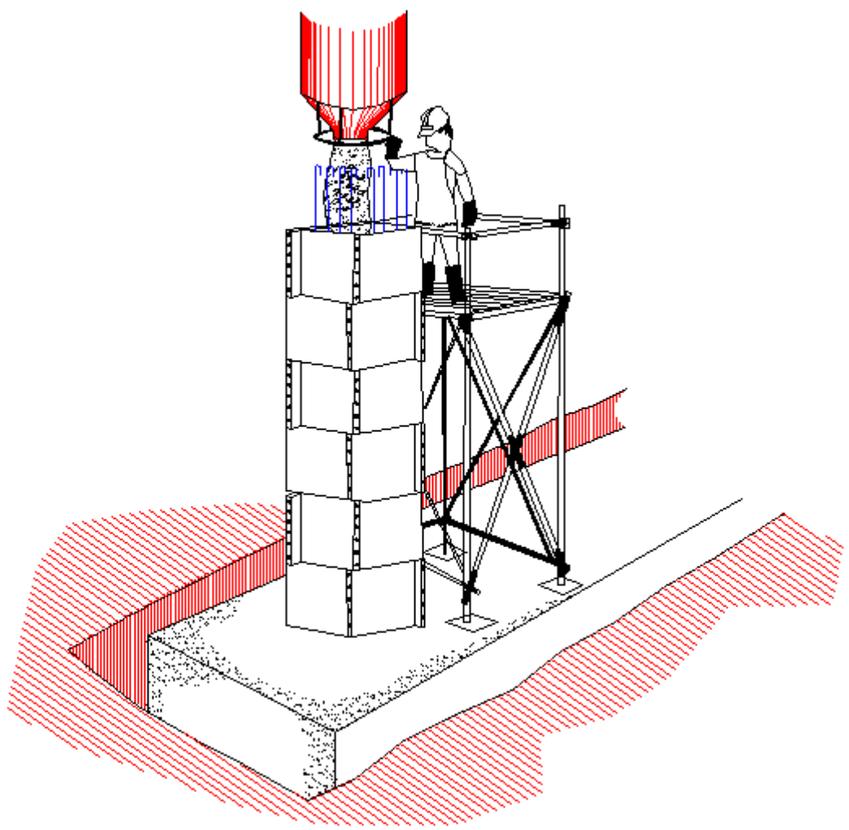
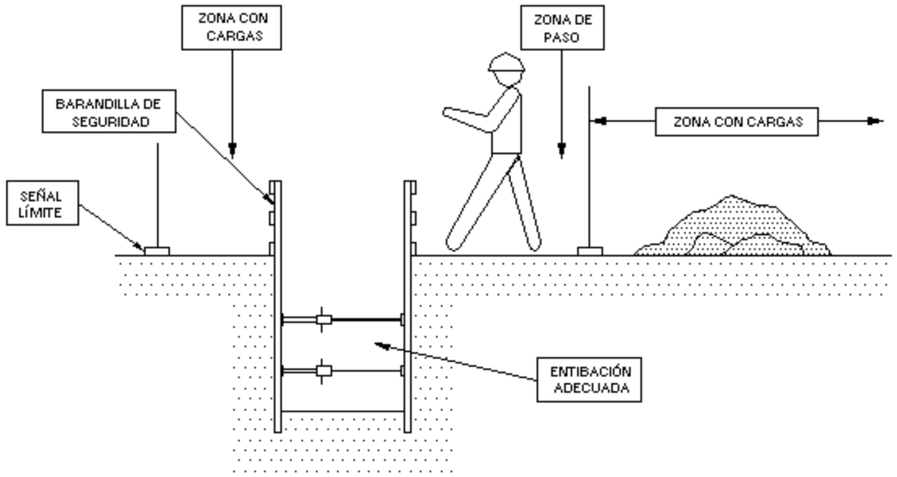
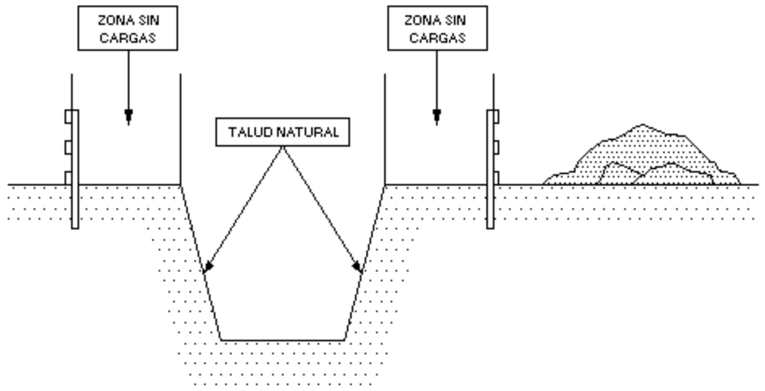
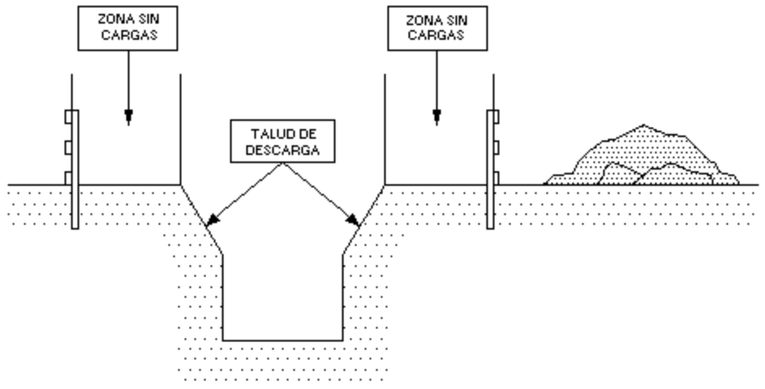
ALZADO DE PILAS SOBRE CIMIENTOS









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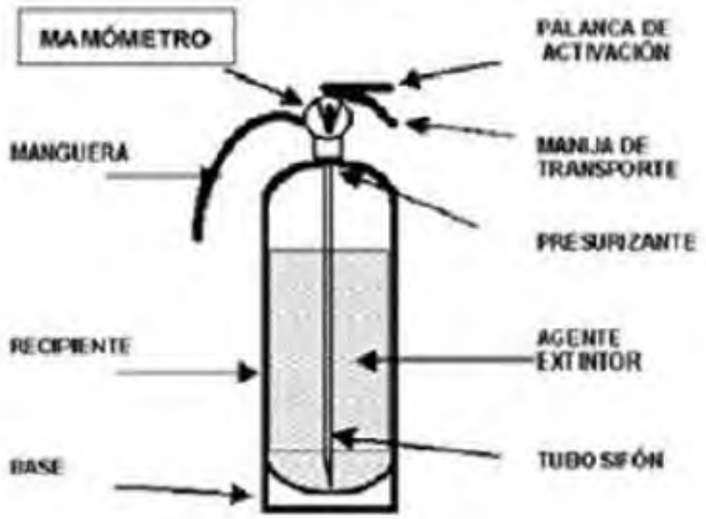
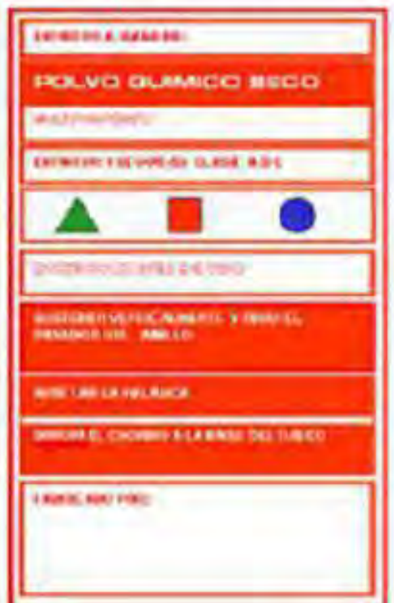
PARTES DE UN EXTINTOR



SISTEMA DE IDENTIFICACIÓN



CLASIFICACIÓN DE LOS FUEGOS

AGENTES DE EXTINCIÓN

A	Agua Presurizada, Espuma, Polvo químico seco ABC
B	Espuma, Dióxido de carbono (CO2), Polvo Químico seco ABC - BC
C	Dióxido de carbono (CO2), Polvo Químico seco ABC - BC
D	Polvo Químico especial

MANTENIMIENTO DEL EXTINTOR

Inspección periódica
Recargar después de ser utilizado
Situación en lugar visible y de fácil acceso
Manómetro con indicación de presión correcta
Verificar la tarjeta de mantenimiento
No presentar deterioros

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS
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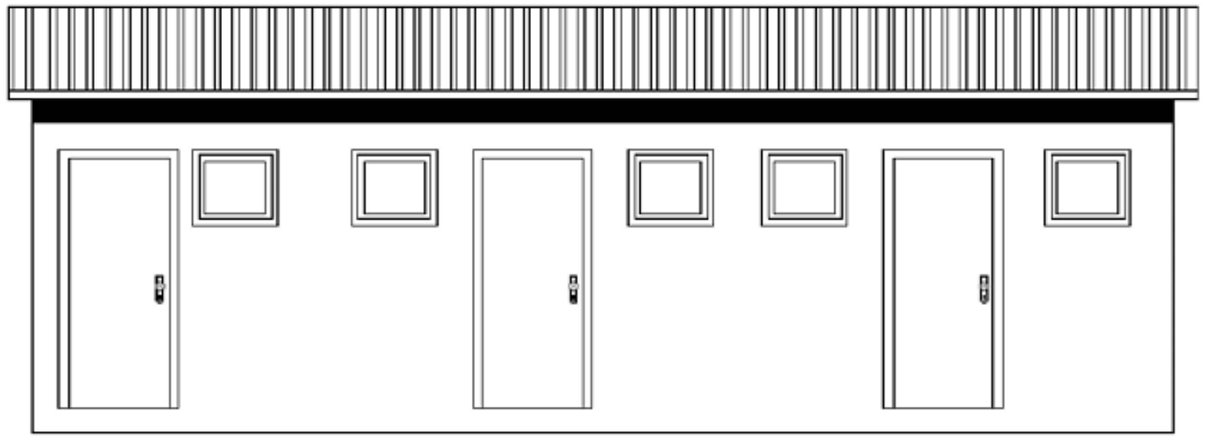
AUTHOR:
Jorge Sáenz Fernández

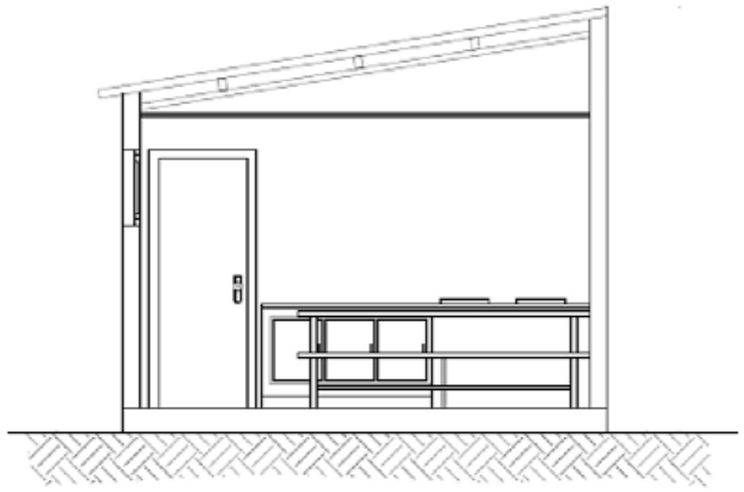
SCALE: NO SCALE

DATE: JULY 2025

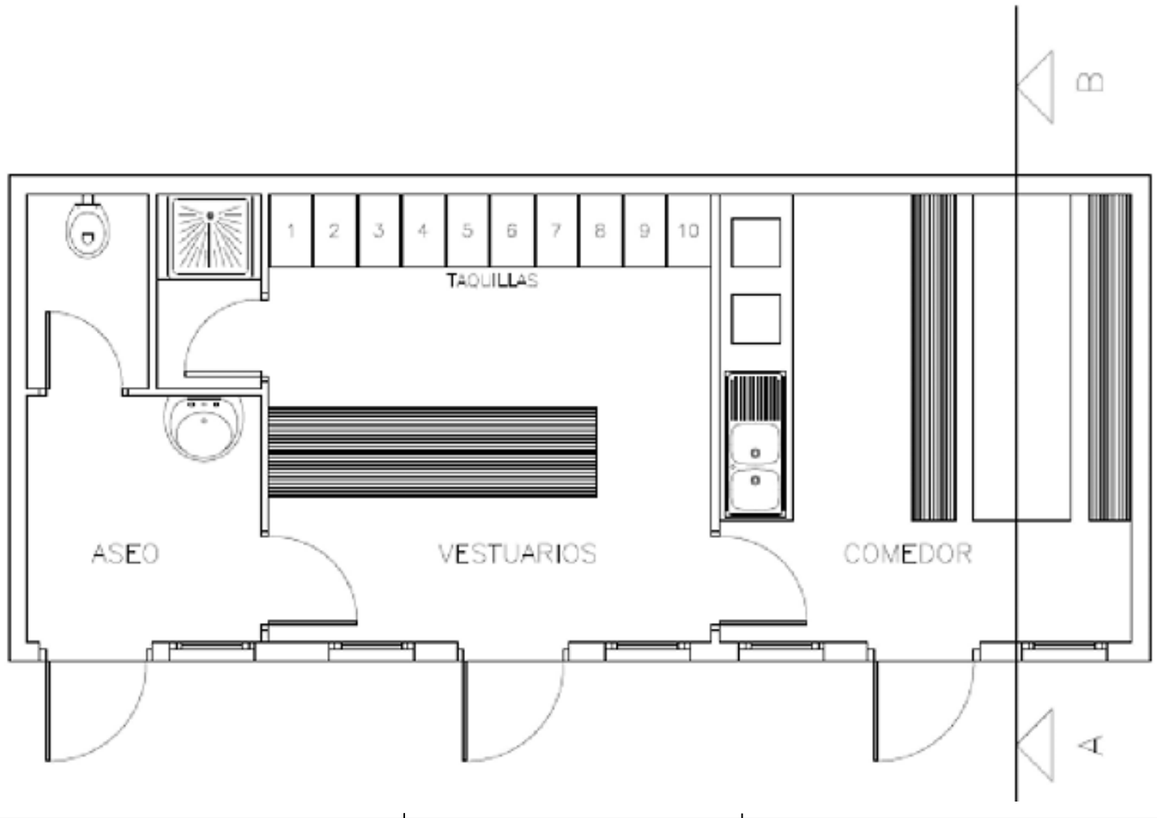
SHEET N: 16

CASETAS DE OBRA





SECCION A–B



ASEO–VESTUARIOS–COMEDOR

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA Proyecto Fin de Carrera	HEALTH AND SAFETY PLAN	TITLE: GEOMETRIC REALIGNMENT AND PLATFORM WIDENING OF CA-811	MUNICIPALITY: MAZCUERRAS REGION: CANTABRIA	AUTHOR: Jorge Sáenz Fernández	SCALE: NO SCALE	DATE: JULY 2025	SHEET N: 17

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1. SCOPE OF APPLICATION

This Specific Technical Specifications is part of the Health and Safety Study. This Specification is drawn up in compliance with the artículo 5 del Real Decreto 1627/1997, de 24 de octubre, on minimum Health and Safety provisions in construction sites.

These Specifications establish the legal and regulatory standards applicable to the work, defining the organisational and technical guidelines necessary for the correct prevention of occupational risks during the course of the works. Specifically, it details the organisation and preventive measures to be adopted by the contractor and, where appropriate, the subcontractors. In addition, it specifies and expands the technical specifications that must be met by the systems, protective equipment and work machines used on the site

These Specifications establish, based on the reference to the legal and regulatory regulations applicable to the work, the organisational and technical requirements required in terms of occupational risk prevention during the construction phase. In particular, the preventive responsibilities of the contractor and, where appropriate, the subcontractors are defined, as well as the actions to be carried out. Likewise, the technical conditions that must be met by the protection systems and equipment to be used on the site are detailed, whether they are part of work equipment and machines or are used independently.

Due to the nature of the conditions to be regulated, the content of these Specifications is largely complemented by the specifications included in the Health and Safety Study Report. It details the preventive technical characteristics that must be met by both work equipment and machinery, as well as individual and collective protection systems and equipment, including aspects such as their composition, transport, storage and replacement, as appropriate. Therefore, these Specifications must be understood to be integrated with the Report, forming a single set of mandatory requirements during the execution of the work

2. LEGISLATION AND STANDARDS

The provisions established in:

Ley 31/1995, de 8 de noviembre, de Prevención de Riesgos Laborales y Normativa de Desarrollo (modifications made by the Ley 54/03 reform of the regulatory framework for the prevention of occupational risks).

- Ley 54/2003, de 12 de diciembre, de Reforma del Marco Normativo de la Prevención de Riesgos Laborales.
- Ley 32/2006, de 18 de octubre, reguladora de la subcontratación en el Sector de la Construcción.
- Real Decreto 171/2004, de 30 de enero, por el que se desarrolla el artículo 24 de la Ley de Prevención de Riesgos Laborales en materia de coordinación de actividades empresariales.
- Real Decreto 1627/1997, de 24 de octubre, establishing the minimum health and safety requirements in construction works.
- Real Decreto 39/1997, de 17 de enero, por el que se aprueba el Reglamento de los Servicios de Prevención.
- Real Decreto 604/2006, de 19 de mayo, por el que se modifica el Real Decreto 39/1997, de 17 de enero, por el que se aprueba el Reglamento de los Servicios de Prevención, y Real Decreto 1627/1997, de 24 de octubre, laying down the minimum health and safety requirements for construction sites. (BOE de 29 de mayo de 2006).
- Real Decreto 1627/2007, de 24 de agosto, by which it is developed la Ley 32/2006, de 18 de octubre, Regulatory of subcontracting in the construction sector.
- Real Decreto 337/2010, de 19 de marzo, amending el Real Decreto 39/1997, de 17 de enero, approving the Reglamento de los Servicios de Prevención; el Real Decreto 1109/2007, de 24 de agosto, by which it is developed la Ley 32/2006, de 18 de octubre, regulation of subcontracting in the construction sector and el Real Decreto 1627/1997, de 24 de octubre, establishing minimum health and safety provisions in construction works.
- Real Decreto 773/1997, de 30 de mayo, on minimum safety and health requirements relating to the use of personal protective equipment by workers.
- Real Decreto 286/2006, de 10 de marzo, on protecting the health and safety of workers from risks related to noise exposure.
- Real Decreto 1311/2005, de 4 de noviembre, on the protection of the health and safety of workers against risks arising or likely to result from exposure to mechanical vibrations.

- Real Decreto 1215/1997, de 18 de julio, which establishes the minimum health and safety provisions for the use of work equipment by workers.
- Real Decreto 2177/2004, de 12 de noviembre, amending the Real Decreto 1215/1997, de 18 de julio, which establishes the minimum health and safety provisions for the use by workers of work equipment in terms of temporary work at height.
- Real Decreto 485/1997, de 14 de abril, on minimum provisions on occupational health and safety signage.
- Real Decreto 614/2001, de 8 de junio, on minimum provisions for the protection of the health and safety of workers against electrical hazards.
- Real Decreto 374/2001, de 6 de abril, on the protection of the health and safety of workers against risks related to chemical agents at work.
- Real Decreto 780/1998, de 30 de abril, amending the Real Decreto 39/1997, de 17 de enero, approving el Reglamento de los servicios de prevención.
- Real Decreto 665/1997, de 12 de mayo, on the protection of workers against risks related to exposure to carcinogens at work.
- Real Decreto 1124/2000, de 16 de junio, amending el Real Decreto 665/1997, de 12 de mayo, on the protection of workers against risks related to exposure to carcinogens at work.
- Real Decreto 349/2003, de 21 de marzo, amending the Real Decreto 665/1997, de 12 de mayo, on the protection of workers against the risks related to exposure to carcinogens at work, and extending its scope to mutagenic agents.
- Real Decreto 664/1997, de 12 de mayo, on the protection of workers from risks related to exposure to biological agents at work.
- Real Decreto 488/1997, de 14 de abril, on minimum safety and health requirements relating to work with equipment including display screens.
- Real Decreto 487/1997, de 14 de abril, on minimum safety and health requirements relating to the manual handling of loads involving risks, in particular back bones, to workers.
- Real Decreto 486/1997, de 14 de abril, which establishes the minimum safety and health provisions in the workplace.
- Real Decreto 1407/1992, de 20 de noviembre, regulating the conditions for the marketing and free intra-Community movement of personal protective equipment
- Orden de 16 de mayo de 1994 amending the transitional period established in Real Decreto 1407/1992, de 20 de noviembre, regulating the conditions for the marketing and free intra-Community movement of personal protective equipment.
- Real Decreto 159/1995, de 3 de febrero, amending the Real Decreto 1407/1992, de 20 de noviembre, which regulates the conditions for the marketing and free intra-Community movement of personal protective equipment.
- Orden, de 20 de febrero de 1997, amending the annex to Real Decreto 159/1995, de 3 de febrero, which in turn modified the Real Decreto 1407/1992, de 20 de noviembre, on the conditions for the placing on the market and free intra-Community movement of personal protective equipment.
- Real Decreto 396/2006, de 31 de marzo, which establishes the minimum health and safety requirements applicable to work with a risk of exposure to asbestos.
- Real Decreto 2291/1985, de 8 de noviembre, approving the Regulations for Lifting and Handling Equipment.
- Real Decreto 1314/1997, de 1 de amending the Lifting and Handling Equipment Regulations approved by Real Decreto 2291/1985, de 8 noviembre.
- Real Decreto 837/2003, de 27 de junio, approving the new amended and consolidated text of the Supplementary Technical Instruction «MIE-AEM-4» of the Lifting and Handling Equipment Regulations, referring to self-propelled mobile cranes.
- Reglamento Electrotécnico de Baja Tensión in effect.
- Reglamento de Líneas Aéreas de Alta Tensión in effect.
- Norma 8.3-IC "Señalización de obras".
- Estatuto de los Trabajadores.
- Convenio Colectivo de la Construcción de Cantabria.
- Other provisions in this area that may be applicable.

3. PREVENTIVE OBLIGATIONS OF THE CONTRACTOR

The contractor contractor, as such, must comply with the requirements established in general as mandatory for employers in the preventive provisions:

Ley 31/1995, de 8 de noviembre, de Prevención de Riesgos Laborales. Amended by the Ley 50/1998, de 30 de diciembre, de Medidas Administrativas, Fiscales y del Orden Social, by the Real Decreto Legislativo

5/2000, de 4 de agosto, approving the consolidated text of la Ley sobre Infracciones y Sanciones en el Orden Social y por la Ley 54/2003, de 12 de diciembre, reform of the regulatory framework for the prevention of occupational risks.

- Real Decreto 39/1997, de 17 de enero, approving the Reglamento de los Servicios de Prevención. Modificado por el Real Decreto 780/1998, de 30 de abril.
- Real Decreto 171/2004, de 30 de enero, by which it is developed the Artículo 24 de la Ley 31/95.
- Circular 1/02 de la Secretaría General de la Consejería de O.P., de 2 de enero de 2002, on the management procedure to be developed from the award of the contract to the start of its execution (BOC de 14/03/2002).

In addition, the Contractor, for the construction work subject to these Specifications, must carry out the actions required by both the previous legislation and the RD 1627/1997, de 24 de octubre, establishing minimum health and safety provisions in construction works, in order to harmonize on site, (where the RD 1627/97, based on coordination and its control), the preventive measures of the entire company, (established in the LPRL and the Regulations, based on preventive planning) with the substantive and technical rules on the safety and health of workers on site.

<u>In any case, the Contractor shall comply with the following requirements in this area, whether or not they are included in the HSP or the BHSP:</u>

- It will effectively comply with the applicable occupational risk prevention regulations established by Artículo 1 de la LPRL.
- The Health and Safety Plan (PSS) to be submitted by the employer will be signed, assuming its content, at least:
    - The Contractor or its Delegate.
    - The Site Manager.

  The security technician of your Prevention Service, your own or someone else, who has collaborated in its preparation or, where appropriate, is its author. (This safety technician will be, on the one hand, a facultative in higher or intermediate engineering, and, on the other, competent in the construction of the work object of this Project, being empowered to exercise the superior function of the RD 39/1997 approving the Regulation of Prevention Services or accrediting the completion of the course with the minimum training programme established in Anexo 8 of the Guía Técnica para la evaluación y prevención de los riesgos laborales relating to the construction works of the Official Institute of Safety and Hygiene at Work).
- It shall submit to the Site Manager the PSS, prepared in accordance with the applicable provisions, within twenty-five (25) calendar days from the day following the date of communication of the award. If, based on the indications or reports of the Health and Safety Coordinator or, where appropriate, of the D.O., it has to be modified, it will be so with the utmost urgency so that the final version returns to the D.O. within fifteen (15) calendar days from the signing of the Contract so that it can be informed (where appropriate, favourably) and processed for approval. All this in accordance with the Circular 1/02 de la Secretaría General de O.P. (BOC del 14- 03-2002).
- The work and activities to be carried out in the execution of the work will at all times adhere to the established preventive planning.
- No activity shall be commenced whose execution procedure does not comply with the provisions of the aforementioned PSS, and it is therefore mandatory for the Contractor to plan in a specific manner, and in time, each and every one of those new activities that may arise in the course of the works. To this end, it must abide by the provisions in this regard, both in the RD 1627/1997 as in the Circular 01/02 de la Secretaría General de O.P.
- These considerations will be extended to possible changes that may occur in the methods and systems of execution of the activities already planned in the current HSP. In any case, these variations or alterations of the HSP, whether as Modification or Adaptation, must be approved by regulation in the manner established in due time before the start of the work in question.

The Contractor shall scrupulously and rigorously comply with its preventive obligations in circumstances of concurrence of activities established in the Artículo 24 de la LPR and developed in the RD 171/2004, both with subcontractors and self-employed workers and with other competing entrepreneurs (for change of affected services, etc.).

- They will attend the Coordination Meetings convened by the coordinator of S. and S. (or, where appropriate, the D.O.), in which the corresponding minutes will be drawn up recording what has been discussed, the agreements and commitments reached, and the signature of the attendees, and will be incorporated into the work's prevention file.
- Through its preventive organization on site, which will guarantee the presence of its preventive resources, it will demand and monitor compliance with the PSS by each and every one of its subcontractors and self-employed workers, regardless of their level, in accordance with the provisions of the Artículos 15, 17 y

24.3 of the LPRL. To this end, it will deliver to each subcontractor, with sufficient time for its analysis, the part of the PSS that concerns it, so that, once studied, it can attend the next Coordination Meeting, in addition to complying with it in the execution.

It will also urge subcontractors to transmit the content of the PSS to their workers, demanding the corresponding Receipt, which will be archived for the work's preventive documentation. As established in the legislation, the main contractor will be affected by the joint and several liability derived from breaches of the subcontractors.

- It will inform and provide appropriate instructions to its workers, subcontractor companies and its self-employed workers, both on the measures to be adopted with regard to their safety and health on site and on what is discussed in the Coordination Meetings.
- They will keep all preventive measures in good condition, taking into account that they are responsible for the disposition and correct use and use of these by workers at the right time, so that they avoid risks before they appear. Therefore, before starting each activity, a member of the contractor's preventive organization on site will check that the safety measures are really ready and prepared to be placed. It is the obligation of the Contractor to guarantee the condition, stability and reliability of these.
- In relation to personal protective equipment, the Contractor is responsible for ensuring that all workers on the site have all the equipment indicated in the PSS or in the applicable provisions for each type of activity; it is also responsible not only for providing protective equipment, but also for ensuring that it is used properly.
- Without prejudice to the provisions of paragraph subcontracting of the Artículo C704.104 of these Specifications, the Contractor must inform the health and safety coordinator, in due time, of the incorporation of any contractor, subcontractor or self-employed worker to the work.
- They must immediately notify the health and safety coordinator or, where appropriate, the D.O., of all accidents and incidents that occur on the site, regardless of their severity, as well as blank accidents (without sick leave). After the first communication, it shall submit a complete report on the matter, also providing the information generated, where appropriate, by the intervention of the Labour and Social Security Inspectorate, the Health and Safety Cabinet and other institutions. The above documentary provision will also be made when the aforementioned bodies intervene for any other preventive cause, whatever it may be.

<u>Presence of preventive resources. Preventive organization of the Contractor on site</u>

For the proper fulfillment of the contractor's preventive obligations in the context of the Artículo C704.101, more specifically those relating to the integration of preventive activity (as established by Artículo 1 del RD 39/97 and the reforms introduced in the Ley 54/2003), the presence of preventive resources on the site (according to the new Artículo 32 bis de la Ley 31/95 and to the new fourteenth additional provision thereof) and the coordination of concurrent activities (Artículo 24 de la Ley y RD 171/2004), the contractor will have on site the equipment and preventive organization established herein with a minimum character, which must be specified in the HSP

Under the dependence and maximum management of the employer or, where appropriate, of the Contractor's Delegate (who may establish in the PSS the hierarchies, specific organization and responsibilities in the way he deems appropriate according to his own business organization, maintaining the qualifications and knowledge required here at least in each position) the following will be appointed:

- Physician in Charge or Responsible for the fulfillment of the obligations of the employer in the work, who will have a continuous presence on the site in order to monitor the effective compliance with the HSP: The Contractor's Delegate or preferably the Site Manager (if they do not coincide) for the type of work that requires it; in the rest of the works, at least General Manager or similar.
- Prevention Technician, appointed by the company for this work, who must plan preventive measures, train and inform its workers, communicate and investigate accidents and incidents, be in contact with the health and safety coordinator during the execution of the work, supervise the rest of the Contractor's preventive personnel, organize and direct preventive coordination with other companies competing in the work, and other functions of a similar nature.
- Worker in charge of safety on site, with the obligations to monitor compliance with the provisions of the HSP with regard to the activities carried out by their company, as well as to verify the application of the prevention regulations by the rest of the subcontractors and self-employed workers. Depending on the magnitude and dispersion of the activities carried out by the company, if necessary, a worker will be appointed, in pits that due to their magnitude and complexity so require, at the discretion of the Contractor, a worker in charge of each pit.
- Worker in charge of the equipment and maintenance of the condition of the Personal Protective Equipment of all workers.
- Worker In charge of keeping the health and safety file of their company updated and complete on site.

- Worker in charge of controlling the access of authorised persons to the work and the way in which this task is carried out, taking into account, where appropriate, the compatibility with public traffic and other needs of use of the road subject to the work.

Depending on the magnitude of the activities to be carried out, depending on the work, the figures included in the previous paragraphs, with the exception of that of the prevention technician, may even fall on a worker. The definitive establishment of this organization will be carried out in the PSS, and the RD 171/2004.

The Contractor is obliged to incorporate into its HSP, regardless of what the HSP or the BHSP indicates in this regard, the list of personnel who will perform these functions, as well as their dedication to them, in accordance with and under the minimum conditions established in this Article. Before the start of the work, the D.O. and the coordinator of H. y S. will be notified in writing by said personnel, without prejudice to the fact that during the execution they make justified changes, which must also be communicated in the same way.

4. MEASURES PRIOR TO THE START OF THE WORK

4.1. GENERAL CONDITIONS

No work must begin on the site without the prior approval of the Health and Safety Plan to be drawn up by the Construction Company.

Before the start of the work, the premises and hygiene and welfare services for the workers must be installed.

Before starting any type of work on the site, it will be a requirement that the contractor has been granted the relevant permits, licenses and regulatory authorizations, such as: placement of fences or enclosures, signage, diversions and cuts of pedestrian and vehicle traffic, accesses, stockpiles, etc.

Before the start of any work on the site, the relevant protections must be carried out, where appropriate, against annoying, harmful, unhealthy or dangerous activities that are carried out in the vicinity of the work site and that may affect the health of the workers.

4.2. PREVIUS INFORMATION

Before undertaking any of the operations or preparatory work for the execution of the work, the contractor must be informed of all those aspects that may affect the required health and safety conditions. To this end, it will obtain prior information relating, fundamentally, to:

- Easements or impediments to networks of facilities and services and other hidden elements that may be affected by the works or interfere with their progress.
- Intensity and type of traffic on the roads adjacent to the work, as well as dynamic loads caused by it, for the purpose of evaluating the possibilities of landslides, subsidence or other actions capable of producing risks of accidents during the execution of the work.
- Vibrations, tremors or other similar effects that may be produced by activities or work that are or are to be carried out in the vicinity of the work site and may affect the safety and hygiene conditions of workers.
- Activities that take place in the vicinity of the work site and may be harmful, unhealthy or dangerous to the health of workers.

4.3. AFFECTED SERVICES

Before starting any work on the site, it must be defined which public or private service networks may interfere with its performance and may cause a risk to the health of workers or third parties.

In the case of overhead power lines that cross or are close to the work area in such a way as to interfere with the execution of the work, work must not begin until they have been modified by the supply company. To this end, the company itself will be requested to unload the line or divert it.

If the above is not feasible, minimum safety distances will be considered, measured between the nearest point with tension and the closest part of the worker's body or tool, or the machine, always taking into account the most unfavourable situation. It must be monitored at all times that the minimum safety distances referred to are maintained.

In the case of underground gas, water or electricity networks that affect the work, before starting any work, the exact position of the same must be assured, for which the necessary information will be collected, in case of doubt, from the affected companies, managing the possibility of diverting them or leaving them without service. These operations must be carried out by the aforementioned companies. If this is not feasible, it will be identified

on the ground and, once the network has been located, it will be signposted marking its direction, route and depth, also indicating the safety area and placing visible signs warning of the danger and corresponding protections.

4.4. ACCESSES, INTERNAL CIRCULATION AND DELIMITATION OF THE WORK

At all entrances to the work, signs will be placed indicating "No passage to any person outside the work", "The use of a helmet is mandatory", and, at vehicle accesses, the sign indicating "Entry and exit of vehicles".

Vehicles, before going out on public roads, must have a horizontal stretch of consistent or paved terrain, of a length of no less than one and a half times the distance between axes or 6 meters. If this is not possible, auxiliary signalling personnel will be available to carry out the manoeuvres.

Ramps for the movement of trucks and/or machines will have a minimum width of 4.5 meters, widening in curves. Their slopes will not be greater than 12 and 8%, respectively, depending on whether they are straight or curved sections. In any case, the manoeuvrability of the vehicles used must be taken into account.

The areas for loading, unloading, stockpiling and storage must be delimited and delimited.

5. GENERAL MEASURES DURING THE EXECUTION OF THE WORK

5.1. GENERAL

During the execution of any work or work unit:

- The indications of the Technical Specifications of the project and the orders and instructions of the Project Management will be followed at all times, as far as the process of execution of the work is concerned.
- In relation to the health and safety of workers, the requirements of the Study, the rules contained in the Health and Safety Plan and the orders and instructions issued by the person responsible for monitoring and controlling it will be observed.
- The health and safety measures adopted must be reviewed and inspected with the necessary periodicity and the frequencies planned to carry out this task must be recorded in detail.
- Work will be ordered to be suspended when there are unfavourable weather conditions (strong winds, rain, snow, etc.).

After any unit of work has been completed:

- The necessary collective protective equipment and safety measures will be provided to avoid new potential risk situations.
- Workers will be given the necessary warnings and instructions in relation to the use, conservation and maintenance of the part of the work executed, as well as the collective protections and safety measures in place.

Once the work is completed, the equipment and auxiliary means, tools, surplus materials and debris will be removed from the work site or area.

5.2. WORKPLACES

Mobile or fixed workplaces located above or below ground level shall be solid and stable, taking into account:

The number of workers who occupy them.
The maximum loads that, if any, they may have to support, as well as their distribution and possible lateral thrusts.
The external influences that could affect them.

For the above purposes, they must have the appropriate structures for their type of use and the loads they can support or suspend must be indicated by means of signs or inscriptions.

In the event that the support and other elements of these workplaces do not have intrinsic stability, their stability must be guaranteed by means of appropriate and safe fasteners, in order to avoid any involuntary displacement of the whole or part of it.

The stability and solidity indicated must be checked periodically and, in particular, after any change in the height or depth of the workplace.

Workplaces must be subject to the corresponding technical maintenance that allows the fastest possible correction of deficiencies that may affect the safety and health of workers, as well as cleaning that guarantees adequate hygiene conditions.

The area occupied by the personnel dedicated to sampling and on-site testing tasks shall be sufficiently delimited and signposted.

5.3. SPECIAL RISK AREAS

In general, two areas of special risk are considered:

- Access to the work. Access to the work will be made at the points where it cuts with the existing roads and at the ends. In these areas, both workers on foot and operators who enter or leave operating machinery or construction vehicles must exercise extreme caution due to the presence of vehicles circulating on the road.
- Structure. The execution of the structure is not considered, which will be the subject of a separate project. The risk of falls from a height will only be taken into account when extending the pavements, providing the signage and vehicle containment elements and, in general, any activity carried out on the structure.

In addition, areas of the construction site which pose serious risks, such as fuel warehouses, transformer stations, etc., must be equipped with devices to prevent unauthorized workers from entering them.

Appropriate measures must be taken to protect workers authorised to enter danger areas and only those workers who have received adequate information may access areas or enclosures of serious and specific risk.

Danger zones must be clearly visible and intelligible signposted and areas of express and conditional prohibition must be delimited and marked.

5.4. TRANSIT ZONES

The transit areas and traffic routes of the work, including stairs and fixed ladders, must be calculated, located, conditioned and prepared for use, in such a way that they can be used easily, safely and in accordance with the use for which they have been intended.

It shall be ensured that workers employed in the vicinity of such transit areas or traffic routes are not at risk.

When means of transport are used on traffic routes, sufficient safety distances or adequate means of protection for pedestrians must be provided.

Those places on the site where workers must circulate and which, due to the recentness of their construction, because they are not completely finished or for any other reason, pose a danger must have steps or walkways formed by planks of a minimum width of 60 cm, and other similar elements, so that the safety of the personnel who must circulate on them is guaranteed. unless the area in question is accessed with a prohibition of passage through it.

Walkways located more than 2 metres above the ground or floor must have a minimum width of 60 cm, must have a joined floor and must have 90 cm high railings and 20 cm high skirting boards. The walkways must have easy and safe access and must be kept free of obstacles. The necessary measures must be taken to prevent the floor from being slippery.

Care shall be taken not to load the floors or work platforms more than to the extent necessary for the execution of the work, proceeding to the lifting of the materials in accordance with these needs.

Openings and openings which, due to their special situation, are dangerous shall be suitably protected by solid railings, meshes and other similar solid and stable elements, in accordance with the needs of the work.

Where wooden ladders are required, their beams shall be in one piece.

Therefore, the junction of two ladders will not be allowed, and the steps must be well assembled, without allowing them to be only nailed.

Traffic routes intended for vehicles and machines must be located at a sufficient distance from pedestrian crossings, corridors, etc.

Transit areas and traffic routes must be kept free at all times of objects and obstacles that prevent their proper use and may be a cause of risk to workers and must also be clearly marked, signposted and sufficiently illuminated.

All those areas that are left without protection will be condemned to avoid dangerous approaches, with their corresponding signage.

5.5. SPECIAL HAZARD JOBS

The handling and storage of substances likely to produce dust, fumes, odours, corrosive gases or mists, or radiation, which particularly endanger the health or life of workers, shall be carried out in isolated premises or

enclosures and by as few workers as possible, taking due precautions, unless the implementing Regulations do not prescribe otherwise.

The use of these substances shall preferably be carried out in closed appliances, which prevent the harmful element from escaping into the environment and, if this is not possible, the emanations, mists, vapours and gases produced shall be captured by means of suction at their place of origin, to prevent their diffusion.

An effective general ventilation system, natural or artificial, will also be installed to constantly renew the air in these premises.

Personnel employed in work with special risks will be previously instructed by competent technicians and must demonstrate their proficiency by means of an examination or theoretical-practical test.

Containers containing explosive, corrosive, toxic or infectious, irritating or radioactive substances shall be labelled, indicating their contents and the precautions for their use and handling by the workers who must use them.

Persistent or particularly annoying odours must be avoided by means of the most effective collection and expulsion systems and, if this is impossible, respiratory masks must be used.

Workers exposed to corrosive, irritating, toxic and infectious substances or dangerous radiation must be provided with appropriate work clothes and personal protection elements and shall be informed verbally and by means of written instructions of the risks inherent in their activity and the means provided for their defence.

5.6. NOISES AND VIBRATIONS

Noise and vibrations must be avoided and reduced, as far as possible, at their source of origin, trying to reduce their propagation to the workplace.

The anchoring of machines and appliances that produce noise, vibrations or tremors shall be carried out with the most effective techniques, in order to achieve their optimum static and dynamic balance, such as benches whose weight is greater than 1.5 to 2.5 times that of the machine they support, by isolation of the general structure or by other technical resources.

Machines that produce annoying noise or vibrations shall be properly isolated. Extreme care and maintenance shall be taken of machinery and apparatus that produce annoying or dangerous vibrations for workers and especially the moving organs and devices for transmitting the vibrations generated by them.

From 80 decibels and provided that the noise level is not reduced by other procedures, personal protection devices such as earplugs, helmets, etc., must be used, and from 110 decibels such protection must be extreme to avoid painful or serious sensations completely.

Machines or tools that cause tremors must be equipped with forks or other damping devices and the worker who uses them must be provided with anti-vibration protection equipment.

Motor operating machines which produce tremors or vibrations shall be provided with seats with shock absorbers and their drivers shall be provided with appropriate personal protective equipment, such as goggles, gloves, etc.

5.7. LOW VOLTAGE ELECTRIC CURRENT

Operators shall not approach any low-voltage element at a distance of less than 0.50 m unless they have the appropriate protections, protective glasses, helmets, insulating gloves and tools precisely protected for working at low voltage. If it is suspected that the element is under high voltage, while the successful contractor ascertains the tension to which it is subjected, the operators and the tools they use will be obliged, with appropriate signage, to keep a distance of no less than 4 m.

In the event that the work interferes with a low-voltage overhead line that cannot be removed, the corresponding protection gantries will be installed, maintaining the gantry lintel in all directions at a minimum distance of 0.50 m from the conductors

Protections against indirect contact shall be achieved by suitably combining the MI BT Supplementary Technical Instructions. 039, 021 and 044 of the Electrotechnical Regulations for Low Voltage.

The earthing of all possible masses will be combined with the residual current circuit breakers, in such a way that in the external environment of the work, possibly humid at times, no mass will ever take on a voltage equal to or greater than 24 volts.

The earth is obtained by means of one or more copper-coated steel pikes, with a minimum diameter of 14 millimetres and a minimum length of 2 metres. In the case of several pikes, the distance between them will be at

least their length and a half, and their heads will always be 50 centimeters below the ground. If there are several, they will be joined in parallel. The conductor will be copper of 35 square millimeters in section. The ground will have a resistance of less than 20 ohms.

It will be connected to the earthing connections of all the general panels of low voltage works. All possible masses must be grounded.

All lighting outputs of the general low-voltage panels will be equipped with a 30 mA sensitivity residual current circuit breaker and all the power outputs of these panels will be equipped with a 300 mA sensitivity residual current circuit breaker.

The earthing will be measured again at the driest time of the year.

5.8. HIGH VOLTAGE ELECTRIC CURRENT

Whenever there are high voltage elements belonging to the work or interfering with it, the Contractor will be obliged to know the exact voltage; To do so, they will contact the electricity distribution company or the entity that owns the live element.

Depending on the voltage, minimum safety distances will be considered for work in the vicinity of live installations, measured between the nearest point with voltage and any extreme part of the operator's body or the tools used.

- Voltage from 1 to 18 kV: 0.50 m
- Voltage from 18 kV to 35 kV: 0.70 m
- Voltage from 35 kV to 80 kV: 1.30 m
- Voltage from 80 kV to 140 kV: 2.00 m
- Voltage from 140 kV to 250 kV: 3.00 m
- Voltage greater than 250 kV: 4.00 m

If the work interferes with a high-voltage overhead line, the protection gantries will be mounted, maintaining the lintel of the gantry in all directions at a minimum distance of 4 m from the conductors. If this does not allow the passage of vehicles and operators to remain below the lintel, the table given above shall be followed.

Work on high-voltage installations will be carried out by specialised personnel, and by at least two people so that they can be assisted. The following precautions shall be taken:

- Open all voltage sources with a visible cut, using switches and disconnectors that ensure that they cannot be closed untimely.

Interlocking or blocking, if possible, of the cutting apparatus.

Recognition of the absence of tension.

Ground and short-circuit all possible sources of voltage.

Place the appropriate safety signs delimiting the work area.

The service of a high-voltage electrical installation will only be restored when it is completely certain that no one is working on it.

The operations leading to commissioning shall be carried out in the following order.

1. At the workplace, the earthing and supplementary protective equipment shall be removed, and the head of the work shall, after the last examination, give notice that the work has been completed.
2. At the source of the feed, once the communication that the work has been completed has been received, the signalling material will be removed and the cutting and manoeuvring devices will be unlocked.

When, for the needs of the work, it is necessary to assemble high voltage equipment, such as a high voltage line and power transformer, and it is necessary to give them voltage, due care shall be taken to comply with the Reglamento sobre Condiciones Técnicas y Garantías de Seguridad en Centrales Eléctricas, Subestaciones y Centros de Transformación, and especially its Instrucciones Técnicas Complementarias MIE-RAT 09 y 13.

5.9. ORDER AND CLEANLINESS OF THE WORK

Internal circulation routes, transit areas and workplaces, as well as workers' hygiene and welfare services, must always be kept in a good state of health and hygiene, for which the necessary cleaning will be carried out.

The floors of the transit areas, as well as those of the premises, must always be free of obstacles, protrusions, holes, sharp or sharp elements, slippery substances and, in general, of any element that may cause a risk to the health and safety of workers.

In premises and transit areas likely to produce a large amount of dust, cleaning shall be carried out by wet means, or cleaning by wet means.

All premises must be cleaned periodically, as often as necessary.

When work is continuous, extreme precautions must be taken to avoid unpleasant or harmful effects of dust and residues and the hindrance that cleaning itself may cause at work.

Cleaning operations shall be carried out with greater care in the vicinity of places occupied by machines, appliances or devices the use of which is most dangerous. The pavement shall not be waterlogged and shall be kept clean of oil, grease or other slippery matter.

Operators responsible for cleaning the premises, workplaces or elements of the work facilities that pose a danger to their health when carrying it out, shall be provided with appropriate protective equipment.

Appliances, machines and installations must always be kept in a good state of cleanliness by the workers in charge of their operation.

Detergents should preferably be used as cleaning or degreasing liquids. In cases where it is essential to clean or degrease with petrol or other petroleum products, smoking will be prohibited in the vicinity, which will be suitably warned.

5.10. FIRE PREVENTION

The Contractor shall take all appropriate measures to:

Avoid fire hazards.
Quickly and effectively extinguish any fire outbreaks.
Ensure the rapid and safe evacuation of people in the event of a fire.

Sufficient and appropriate means must be provided for the storage of potentially flammable materials. Access to premises where potentially flammable materials are stored or stockpiled shall be limited only to authorised personnel.

Smoking shall be prohibited in all places where there are potentially flammable or easily burning materials, and signs shall be installed to warn of this prohibition.

In all the premises and confined places of the work, particularly tunnels, excavation shafts, and other closed works, where flammable gases, vapours or dusts may pose dangers, the following must be done:

- Use only properly protected electrical appliances, machines or installations.
- Avoid bare flames or any other similar source of combustion.
- Post notices announcing the smoking ban.
- Quickly take all rags, waste and clothing impregnated with oil or other substances that pose a risk of spontaneous combustion to a safe place.
- Provide adequate ventilation.
- Combustible materials must not be allowed to accumulate in the workplace, which must be stored in a suitable place and container.
- Periodic inspections must be carried out of the places where there is a risk of fire.

Autogenous welding and oxy-fuel operations, as well as all other hot work, must be carried out under the supervision of a competent foreman or foreman, and always by specialist and competent personnel, after all appropriate and required precautions have been taken to avoid the risk of fire.

The workplaces, to the extent of their characteristics, shall be equipped with:

- Adequate and sufficient firefighting equipment, which is well visible and easily accessible.
- An adequate supply of sufficient water at the necessary pressure.

The competent health and safety technician must inspect, at appropriate intervals, the fire-fighting equipment, which must always be in perfect condition and operation. Access to firefighting equipment and facilities must be kept clear at all times.

All foremen and foremen, and the necessary number of workers, shall be instructed in the operation of fire-fighting equipment and installations, so that there is a sufficient number of persons trained to deal with a fire on all shifts.

Workers must be instructed on the means of evacuation provided in the event of fire. All emergency exits, provided for in the event of fire, shall be adequately signposted.

The means provided for evacuation will be kept clear at all times, maintaining periodic inspections, especially in the case of areas of restricted and difficult access such as the tunnel.

Appropriate means shall be installed to raise the alarm in the event of fire. This alarm must be perfect and clearly audible in all places where workers are operating.

Notices must be posted in clearly visible places indicating:

- Location of the nearest alarm device.
- Telephone number and address of the nearest intervention and rescue services.

5.11. LIFTING LOADS

The passage of people under suspended loads must be avoided and, whenever possible, the lifting area of the loads must be delimited.

For the lifting of loose materials, pans will be used whose sides have a protection based on mesh or sheet metal, which prevents loads from coming out. In no case shall the loads exceed the edges of the trays.

For the lifting of props, planks, etc., and materials of similar characteristics, the pieces will be previously tied to prevent them from sliding and, therefore, falling parts from the load as a whole.

For lifting pastes (mortars, concretes, etc.), buckets with discharge gates and support legs will be used. Filling it will not overflow the edge.

Operators who must pick up loads from aloft must wear a seat belt, unless there are safety railings that protect the gap. In any case, as a complementary measure, the operator may use extension cords that facilitate the approach of the loads, although their length must be limited to avoid falls into the void.

Instructions will be given so that no suspended loads are left on other operators, or on areas outside the work that may affect people, vehicles or other constructions.

The crane operator will be placed in a place that has sufficient visibility and if this is not possible, he will use the assistance of other people who warn him by means of pre-established signal systems. It will be forbidden to remain under the loads suspended by the cranes.

6. WORK TEAMS

6.1. PREVIOUS TERMS

Any machine, apparatus, instrument or installation used at work shall be selected in such a way that it does not cause additional risks to the safety and health of workers and/or third parties.

Work equipment and its constituent elements or appliances attached to them shall be designed and constructed in such a way that persons are not exposed to dangers when they are assembled, used and maintained in accordance with the conditions laid down by the manufacturer.

The different parts of the equipment, as well as their constituent elements, must be able to withstand over time the stresses to which they will be subjected, as well as any other external or internal influences that may arise under the normal conditions of use envisaged.

The equipment to be used will be based on the specific conditions and characteristics of the work to be carried out and on the risks existing in the workplace and will comply with the standards and provisions in force that are applicable to them, depending on their type, use and subsequent handling by the workers. The work equipment may not be used for operations and under conditions for which it is not suitable.

6.2. SIGNAGE

The work team must carry the warnings and signs essential to guarantee the safety of workers.

The drive systems of a work equipment that have an impact on safety must be clearly visible and identifiable and, where appropriate, be identified with appropriate signage.

6.3. PROTECTION MEASURES

All work equipment must be suitable to protect workers against the risks of fire or heating of the equipment itself, or of emanations of gases, dusts, liquids, vapours or other substances produced by or in it used or stored.

Work equipment must be suitable to prevent the risk of explosion of the equipment itself or of substances produced by or in it used or stored.

All work equipment must be adequate to protect exposed workers against the risk of direct and indirect contact with electricity.

To avoid the loss of stability of the work equipment, especially during normal operation, appropriate technical measures shall be taken, in accordance with the conditions of installation and use laid down by the manufacturer.

Any work equipment involving risks due to gases, vapours or liquids or dust emissions shall be provided with suitable collection and/or extraction devices close to the source of those hazards.

Equipment capable of emitting ionising radiation or other radiation that may affect human health shall be provided with effective protection systems.

6.4. INFORMATION AND INSTRUCTIONS

The worker will be provided with information on the work equipment, its use, use and required maintenance, through graphic brochures and, if necessary, through training courses in such subjects; with warning, in addition, of foreseeable risks and abnormal situations. The graphic or verbal information must be understandable to the workers concerned. Workers who operate or maintain equipment with specific hazards will receive mandatory and special training on such equipment.

Appropriate instructions and means shall be provided for the transport of the equipment in order to carry it out with the least possible danger. For these purposes, in stationary equipment:

- The weight of the equipment or removable parts of it that weigh more than 500 kg shall be indicated.
- The transport position that guarantees the stability of the equipment shall be indicated and the equipment shall be secured appropriately.
- Equipment or parts thereof that are difficult to tie shall be provided with attachment points of appropriate resistance; In all cases, the form of mooring will be indicated, at least in Spanish.
- The necessary instructions will be given so that the assembly of the work equipment can be carried out correctly and with the least possible risk.
- The necessary instructions will be provided for the normal operation of the work equipment, indicating the spaces for manoeuvring and dangerous areas that may affect people as a result of their incident.

6.5. CONDITIONS NECESSARY FOR USE

When the use of work equipment may present a specific risk to the safety or health of workers, the company shall adopt the necessary measures to avoid it.

The equipment shall contain appropriate devices or protections aimed at avoiding the risk of entrapment at the points of operation, such as fixed guards, body compartment devices, stop bars, automatic feeding devices, etc.

The company will adopt the necessary measures to ensure that the work equipment made available to the workers is suitable for the work units to be carried out and suitably adapted for this purpose, so that the safety and health of the workers is not compromised when using them.

Equipment equipped with rotating elements whose breakage or detachment may cause damage must be equipped with a protection system that retains any fragments and prevents their impact on people.

Where there are parts of the equipment whose loss of attachment may give rise to hazards, additional precautions must be taken to prevent such parts from impinging on persons.

Equipment must be designed, constructed, assembled, protected and, if necessary, maintained to dampen the noise and vibrations produced, so as not to cause damage to human health. In any case, the emission by them of noise of a level higher than the limits established by the regulations in force at any given time will be avoided.

Any work equipment that involves risks due to falling objects, projections, explosions or breakages of its elements or the material it works with must be equipped with safety devices appropriate to these risks.

When the moving parts of a work equipment present a risk of mechanical contact that may lead to accidents, they must be equipped with protectors or devices that prevent access to dangerous areas or that stop dangerous manoeuvres before access to such areas.

Protectors and protective devices:

- They must be of solid construction.
- They must not cause additional risks.
- They must not be easy to remove or render unusable.
- They must be located at a sufficient distance from the dangerous area.

- They should not limit the observation of the work cycle more than necessary.
- They must allow the interventions essential for the placement and/or replacement of the elements, as well as for maintenance work, limiting access only to the sector in which the work is to be carried out and, if possible, without dismantling the protector or protective device.

Parts of work equipment that reach high or very low temperatures must be protected, where appropriate, against the risks of contact or proximity of workers.

All work equipment must be provided with clearly identifiable devices that allow it to be isolated from each of its energy sources. They may only be connected again when there is no danger to the workers concerned.

The operator operating a piece of equipment must be able to ascertain, from his or her workplace, that there are no people in the dangerous areas affected by the equipment. If this is not possible, the start-up must always be automatically preceded by a safe system, such as an acoustic and/or visual signal. The signals emitted by these systems must be perceptible and understandable easily and unambiguously.

Drive systems must be safe. A breakdown or damage to them should not lead to a dangerous situation. They may not cause, in their handling, additional risks. Likewise, they must not carry risks as a result of involuntary manipulation.

The start-up of a work equipment must only be possible by voluntary action on a drive system provided for this purpose.

Each piece of work equipment must be equipped with a drive system that allows it to be stopped completely in safe conditions. Work equipment stop orders will take precedence over start-up orders.

If a piece of equipment stops, even momentarily, due to a failure in its power supply and its unexpected start-up can pose a danger, it will not be able to start automatically when the power supply is restored.

If the shutdown of a piece of equipment occurs due to the action of a protection system, restarting will only be possible after the safety conditions have been restored and after activation by the body that orders the start-up.

7. TEMPORARY FACILITIES

7.1. GENERAL

Installations must be constructed in such a way that they do not constitute a fire or explosion hazard and so that persons are adequately protected against the risks of electrocution by direct or indirect contact.

For the construction and selection of equipment and prevention devices for temporary installations, consideration must be given to the type and power of the energy distributed, the external conditions of influence and the competence of the persons having access to the various parts of the installation.

7.2. ELECTRICAL INSTALLATIONS

Assembly and installation

The installation must necessarily be assembled by specialised personnel under the orders of a qualified technician.

Once the assembly has been completed and before it is put into service, the contractor must make available to the person responsible for monitoring the Safety Plan the certification accrediting the provisions of the previous paragraph.

Electrical panels

They shall be placed in places where there is no risk of falling materials or objects from work carried out at higher levels, unless specific protection is used to avoid the risks of such a contingency. This protection will be extended both to the place where each square is located and to the access area for people who must approach it.

All the panels of the provisional electrical installation will be duly separated from the places where machines and vehicles pass through and always within the site of the work.

Access to the place where each of the paintings is located will be free of objects and materials that obstruct the passage, such as debris, material storage areas, etc.

The base on which the people who must access the panels for handling them will step on will consist of a platform of insulating material, raised from the ground by at least 25 cm. To avoid the risks derived from possible waterlogging.

There will be a general table from which the derivations for other auxiliaries will be taken, thus facilitating the connection of machines and portable equipment and avoiding long power lines.

As far as possible, the general panel will be placed in a place close to the work offices or where the people in charge of maintaining the installation are located.

Grounding

The structures of machinery and equipment and the covers of their motors when they operate at more than 24 volts and are not double-insulated, as well as the metal covers of all electrical devices inside or on boxes, must be connected to the earthing installation.

The resistance to earth will depend on the sensitivity of the residual current circuit breaker of the origin of the installation. The earthing circuits shall form an electrically continuous line in which no masses or metallic elements, whatever they may be, may be included in series.

It is forbidden to insert disconnectors, fuses or switches in earth circuits.

The minimum conditions of the constituent elements of the installation must comply with the prescriptions of the Electrotechnical Regulations for Low Voltage, in its Instruction 039.

The electrodes may be made of copper or galvanized iron and used in the form of a spike or plates.

In the case of spades:

- The minimum diameter of copper ones will be 14 mm.
- The minimum outer diameter of galvanised iron tyres shall be 25 mm.
- The minimum length, in both cases, will be 2 m.

In the case of plates:

- The minimum thickness of copper masks will be 2 mm.
- The minimum thickness of galvanized iron will be 2.5 mm.
- In no case shall the useful surface of the slab be less than 0.5 m2.

The use of other materials must be adjusted to the requirements of the aforementioned Regulation and be subject to appropriate calculation, carried out by a specialist technician. Electrodes that do not meet these minimum requirements will be rejected.

The ground should preferably be wet.

7.3. DRINKING WATER FACILITIES

The construction company will provide its staff with drinking water, providing running water taps distributed throughout various parts of the site, in addition to the dining and service areas.

All supply points will be signposted and it will be clearly indicated whether it is drinking or non-drinking water.

If there is no drinking water, there will be a drinking water service with clean containers, preferably plastic for their cleaning possibilities and to avoid breakage.

In case of doubt as to potability, the relevant tests will be requested from an approved laboratory, and its consumption will be prohibited until its condition of being suitable for human consumption has been confirmed. Until then, the provisions of the previous section will be taken into account.

If there are drinking and non-potable water pipes, extreme precautions will be taken to avoid contamination.

It will be taken into account that they are separated from areas of interference with the electrical installation.

They will also be placed in places where there is no risk of falling materials or objects from work carried out at higher levels.

7.4. HYGINE AND WELLNESS FACILITIES AND SERVICES

The changing rooms, dining rooms, toilets, washbasins and showers to be provided on site will be defined in the Health and Safety Plan, in accordance with the specific applicable regulations and, specifically, with the apartados 15 a 18 de la Parte A del Real Decreto 1627/1.997. In any case, there will be one toilet for every 25 workers, usable by them and located less than 50 metres from the workplaces; one toilet for every 10 workers; and a locker or

suitable place to leave clothes and personal effects per worker. Drinking water shall also be available on the site in sufficient quantity and under adequate conditions for use by the workers.

There will always be a first aid kit, located in a construction site, in adequate conditions of conservation and content and easily accessible, signposted and with indication of the emergency telephone numbers. There must be at least one worker trained in the provision of first aid on site.

All the facilities and services on the site will be defined in the Health and Safety Plan. The Site Manager will designate specific personnel for the cleaning and conservation functions of the facilities.

The design of the facilities and services will take into account the following conditions:

- When workers have to wear work clothes, they must have appropriate clothing at their disposal. The changing rooms must be easily accessible, have sufficient dimensions and have seats and facilities for each worker. Where circumstances so require, work clothes must be able to be stored separately from street clothes and personal effects; In this case, a double locker or a single locker associated with a specific wall hanger may be used.
- The recommended surface area of the changing rooms can be estimated at 2.00 m2 per worker. In general, this area will include the lockers, as well as the benches and seats, provided that this allows the use of the facilities without difficulties or inconvenience for the workers.
- The minimum height of these premises will be 2.50 m.
- The lockers will have a lock and will have enough capacity to store clothes and footwear.
- Appropriate showers must be made available to workers in sufficient numbers. Showers must be of adequate dimensions to allow any worker to wash themselves without obstacles and in hygienic conditions. Showers must have running water, both hot and cold. If showers or washbasins and changing rooms are separated, communication between them should be easy.
- In all construction works, appropriate showers and washbasins will be available in a minimum number of 1 shower and 1 sink for every 10 workers or fraction of others working the same day. The minimum dimensions of the tray will be 70 x 70 cm.
- Workers must have special rooms equipped with a sufficient number of toilets and washbasins in the vicinity of their workstations, rest rooms, changing rooms and showers. The minimum endowment will be:
    - One toilet for every 25 men and one for every 15 women.
    - One sink for each toilet.
    - One urinal for every 25 men.
- All the units mentioned refer to people who coincide in the same work shift.
- In linear extension works, toilets will also be installed in the most significant pits or with a concentration of workers, which may be biochemical, those that have a connection to the general sanitation network whenever possible, or a system for the accumulation of sewage and subsequent collection of these, with the specific precautions of this type of installation.
- Changing rooms, showers, washbasins and toilets shall be separated for men and women: their separate use shall be provided. In the toilets intended for women, special and closed containers will be placed to deposit sanitary napkins or similar.
- The installations will have the corresponding installation of electricity, earthing and other factors established in the specific regulations, both in electricity and sanitation.

The cost of installation and maintenance of the workers' hygiene and welfare services will be borne by the contractor, without prejudice to whether or not they are included in the budget for the work and, if so, they are remunerated by the Administration in accordance with such budgets, provided that they are actually carried out.

8. SIGNAGE

Two types of construction site signage are distinguished: signage that affects workers on site and that which corresponds to external traffic affected by the work.

In the first case, the requirements established by the Real Decreto 485/1997, de 14 de abril,

The signalling and traffic beaconing, on the other hand, are regulated by the Norma 8.3-IC de la Dirección General de Carreteras, as befits its content and technical application. This distinction does not exclude the possible complement of traffic signalling during the work when it is required for the safety of workers working in the vicinity of said traffic, in order to avoid accidental interference of the latter in the work areas. Such supplements, when deemed necessary, must be included in the health and safety plan for the work.

9. PERSONAL PROTECTIONS

9.1. GENERAL DESCRIPTION

All personal protective equipment shall conform to the standards contained in the Reales Decretos 542/2020 y 773/1997. In addition, as long as they are not modified by the above, the following shall be considered applicable: Normas Técnicas Reglamentarias M.T. de homologación de los equipos, in application of the Orden de 17 de mayo de 1974 which regulates the approval of the means of personal protection of workers.

As a general rule, ergonomic personal protective equipment has been chosen in order to avoid refusal to use it. All personal protective equipment used on the construction site will be "CE" marked, according to PPE standards.

Personal protective equipment that complies with the indication expressed in the previous point is authorized for use during its period of validity. When their expiry date arrives, they will be deposited in an orderly stockpile, which will be reviewed by the health and safety coordinator during the execution of the work so that he authorises their disposal. Personal protective equipment in use that is broken will be replaced immediately, leaving a written record in the construction office of the reason for the change and the name of the company and the person receiving the new personal protective equipment, in order to give the maximum possible seriousness to the use of these protections.

The rules for the use of personal protective equipment will be in accordance with the provisions of the regulations in force.

In cases where there is no official Approval Standard, they will be of adequate quality to the respective performance requested, for which a report of the tests carried out will be requested from the manufacturer.

When due to work circumstances there is a faster deterioration in a certain garment or equipment, it will be replaced, regardless of the expected duration or delivery date.

Any protective clothing or equipment that has undergone a limit treatment (the maximum for which it was designed) will be discarded and replaced immediately.

Those garments that have acquired more looseness or tolerances than those accepted by the manufacturer due to their use will be replaced immediately.

All clothing or personal protective equipment, and any element of collective protection, shall be adequately designed and sufficiently finished so that its use never represents a risk or damage in itself.

9.2. WORK SUIT

They will be made in various cuts and made in one piece, with a double front zipper closure, with a short section in the pelvis area to the waist. They will have six pockets: two at chest height, two front and two back, in the back of pants, each of them closed by a zipper. It will be equipped with a lumbar elastic adjustment band on the back at the waist level. They will be made of cotton, in yellow or orange colors. They will have a CE mark, according to E.P.I. standards.

The work suit or coverall will comply with the following standards: UNE 863/96, UNE 1149/96.

9.3. PVC WATERPROOF SUIT

It will be made in yellow or orange in heat-sealed PVC, consisting of a jacket and trousers. The jacket will be equipped with two front side pockets and a single-breasted closure. The trousers will be fastened and adjusted at the waist by means of a cotton tape embedded in it.

CE marked, according to E.P.I. standards.

9.4. REFLECTIVE VEST

Formed by bib and back, it will be made of breathable, reflective or captadioptic synthetic fabrics, with white, yellow or orange colors. Adjustable at the waist with "Velkro" straps.

Reflective vests must comply with the following standards: UNE.EN 471/95, UNE.EN 966/95.

9.5. SAFETY HELMET

The helmets used by the operators can be of the following types:

- Class N: helmets for normal use, insulating for low voltage (1,000 V).
- Class E: class E-AT insulators for high voltage (25,000 V) and class E-B resistant to very low temperatures (-15ºC) are distinguished.

The cap will be attached to the head by means of a harness or harness, which will guarantee a correct and ergonomic fastening. The adjustable fastening strap in contact with the chin will be fixed at two or more points.

The free span, the distance between the inner part of the top of the crown (the highest part of the cap) and the upper part of the harness will always be greater than 21 millimetres.

The height of the harness, measured from the lower edge of the contour band to the highest area of the harness, shall vary from 75 millimetres to 85 millimetres, from the smallest to the largest possible size.

The mass of the complete hull, determined under normal conditions and excluding accessories, shall in no case exceed 450 grams. The width of the contour band shall be at least 25 millimetres.

The helmets will be made of non-combustible materials that are resistant to grease, salts and atmospheric elements.

The parts that are in contact with the user's head will not affect the skin and will be made of rigid, water-repellent material that is easy to clean and disinfect.

The cap shall have a smooth surface, with or without ribs, rounded edges and shall be free of edges and dangerous protrusions, both externally and internally. It will not have roughness, cracks, bubbles or defects that reduce its resistant and protective characteristics.

Neither the attachment areas nor the harness itself will cause damage or exert uncomfortable pressure on the wearer's head.

Between the caps and the harness there shall be an aeration space of no less than five millimetres, except in the harness-cap coupling area.

The type model must have been subjected to the following tests:

- Shock test, by means of a steel firing pin, without any part of the harness or cap breaking.
- Perforation test, by means of a steel punch, without penetration exceeding 8 millimetres.
- Flame resistance test, without flame for more than fifteen seconds or dripping.
- Electrical test, subjected to a voltage of 2 kV, 50 Hz for three seconds. The leakage current may not exceed 3 mA. In the drilling test, raising the voltage to 2.5 kV for fifteen seconds will not exceed 3 mA either. In the case of the E-AT class hull, the insulation and perforation test voltages will be 25 kV and 30 kV respectively; in both cases the leakage current may not exceed 10 mA. In the case of the E-B class hull, in the type model, shock and perforation tests will be carried out, with good results having been conditioned to -15º ± 2º C.

All helmets used by operators shall be approved in accordance with the specifications and tests contained in the Norma Técnica Reglamentaria MT-1, Resolución de la Dirección General de Trabajo del 14/12/1974.

Safety helmets shall comply with the following standards: UNE.EN 397/95, UNE.EN 966/95.

9.6. SAFETY FOOTWEAR

Safety footwear shall consist of class III safety boots, provided with a metal safety toe cap to protect the toes against risks due to falling objects, blows and crushing, and a safety sole to protect the soles of the feet against punctures.

The boot must properly cover the foot and be attached to it, allowing it to develop a movement appropriate to the work. It will be free of imperfections and will be treated to prevent deterioration by water or moisture. The lining and other internal parts shall not produce harmful effects, allowing, as far as possible, perspiration. Its weight will not exceed 800 grams. It will have cushioning reinforcements made of elastic material. Both the toe cap and the safety sole must be an integral part of the boot, and may not be separated without it being destroyed. The material shall be appropriate to the performance of use, shall be free of burrs and edges and shall be assembled in such a way that it does not in itself entail risk or cause damage to the user. All metal elements that have a protective function must be resistant to corrosion.

The type model must be subjected to the following tests:

- Crush resistance test on the toe box up to 1,500 kg (14,715 N), and the free span during the test will be greater than 15 millimetres, not breaking.
- Impact test, maintaining a minimum free span and not detecting breakage.
- Perforation test, by means of a punch with a minimum drilling force of 110 Kg (1079 N.) on the sole, without any perforation being observed.

- Folding test by means of a tape measure, allowing the angle formed by the sole and heel to be varied from 0º to 60º, with a frequency of 300 cycles per minute and up to 10,000 cycles. No breaks, cracks or alterations should be observed.
- Corrosion test in a salt spray chamber, maintained during the test time, and without showing signs of corrosion.

All class III safety boots used by operators shall be approved in accordance with the specifications and tests contained in the Norma Técnica Reglamentaria MT-5, Resolución de la Dirección General de Trabajo del 31-1-1980.

Safety boots shall comply with the following standards: UNE.EN 344/93, UNE.EN 345/93, UNE.EN 345-2/96, UNE.EN 346/93, UNE.EN 346-2/96, UNE.EN 347/93, UNE.EN 347-2/96.

9.7. WATERPROOF FOOTWEAR

The waterproof and moisture-proof boots to be used by the operators will be class N, and class E may also be used.

Waterproof boots must adequately cover the foot and, at least, the lower third of the leg, allowing the user to develop adequate movement when walking in most jobs. They must be made of natural or synthetic rubber or other synthetic products, not rigid, and provided that they do not affect the user's skin.

They shall be free of imperfections or deformations that reduce their properties, as well as holes, foreign bodies or other defects that may impair their functionality.

The materials of the sole and heel must have adherent characteristics such as to prevent slipping, both on dry floors and on those that are affected by water.

The material of the boot will have properties such that they prevent the passage of ambient humidity into the interior.

The waterproof boot shall be manufactured, if possible, in a single piece, and a closure system designed in such a way that the boot remains watertight may be adopted.

They may be made with or without support, without lining or lined inside, with one or more layers of non-absorbent fabric, which do not produce harmful effects on the user.

The surface of the sole and heel, when in contact with the ground, shall be provided with protrusions and indentations, open towards the ends to facilitate the removal of adhered material.

Waterproof boots shall be flexible enough not to cause discomfort to the wearer and shall be designed so that they are easy to put on.

When the locking system or any other accessory is metallic, it must be resistant to corrosion.

The thickness of the shaft must be as homogeneous as possible, avoiding irregularities that may alter its quality, functionality and performance.

The standard model will pass the following tests:

- Hot aging.
- Cold aging.
- Humidity.
- Impermeability.
- Punch drilling.

All waterproof boots must be approved in accordance with the specifications and tests of the Norma Técnica Reglamentaria M-27, Resolución de la Dirección General de Trabajo del 3-12-1981.

9.8. HEARING PROTECTION

The hearing protector to be used by the operators shall be at least class E.

The protector will consist of two caps that are conveniently adjusted on each side of the head by means of padded elements, with the outer pinna of the ears being inside them, and the harness fastening system.

The type model will have been tested by a person with a hearing loss of no more than 10 dB with respect to a normal audiogram in each of the ears and for each of the test frequencies, called "listening"

The reference threshold shall be defined as the minimum sound pressure level capable of producing an auditory sensation in the hearing room and without a hearing protector. The test threshold shall be the minimum sound pressure level capable of producing auditory sensation in the hearing at the test site and with the type hearing protector in place, and tested. Attenuation shall be the difference, expressed in decibels, between the test threshold and the reference threshold.

Pure tones of the following frequencies shall be used as test signals for the attenuation measurement at the threshold: 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz.

For low frequencies of 250 Hz, the minimum attenuation sum will be 10 dB. For medium frequencies of 500 to 4000 Hz, the minimum attenuation is 20 dB, and the minimum attenuation sum is 95 dB. For high frequencies of 6000 and 8000 Hz, the minimum attenuation sum will be 35 dB.

All hearing protectors used by operators shall be approved by the tests contained in the Norma Técnica Reglamentaria MT-2, Resolución de la Dirección General de Trabajo del 28-6-1975.

Hearing protection headphones must comply with the following standards: UNE.EN 352-1/94, UNE.EN 352-2/94, UNE.EN 352-3/94.

9.9. SAFETY GLOVES

Safety gloves shall be for general use anti-cut, anti-puncture, and anti-erosion for handling materials, objects, and tools.

They will be made of natural or synthetic materials, not rigid, impermeable to the aggressive materials of common use and with adequate mechanical characteristics. They will be free of holes, cracks or any deformation or imperfection that reduces their properties.

They will adapt to the configuration of the hands, making them comfortable to use. They will not be ambidextrous in any case.

The size, measured by the perimeter of the contour of the glove at the base of the fingers, will be appropriate for the operator.

The length, the distance expressed in millimeters, from the tip of the middle finger or middle finger to the edge of the glove, i.e. the limit of the sleeve, shall generally be 320 millimeters or less. In other words, gloves, in general, will be short, except in those cases where they have to be used for special work, 320 millimetres to 430 millimetres, or lengths greater than 430 millimetres.

The materials that enter into its composition and formation will never produce dermatoses.

Gloves made of full grain leather and canvas must comply with the UNE.EN 388/95 standard.

Gloves made of waterproofed cotton canvas must comply with the UNE.EN 388/95 standard.

9.10. ELECTRICAL INSULATING GLOVES

The electrical insulating gloves that the operators will use will be for action on low voltage installation, up to 1,000 V, or for high voltage installation manoeuvring up to 30,000 V.

In the gloves, high-quality rubber, natural or synthetic, or any other material with similar insulating and mechanical characteristics may be used as raw material in their manufacture, and may or may not have an inner coating of natural textile fibres. In the case of gloves with such a coating, it shall cover the entire inner surface of the glove.

They will be free of seams, cracks or any deformation or imperfection that reduces their properties.

Dyes and other additives may be used in the manufacturing process, provided that they do not diminish their characteristics or cause dermatoses.

They will adapt to the configuration of the hands, making them comfortable to use. They will not be ambidextrous in any case.

Low-voltage insulators shall be normal gloves, with a length from the tip of the middle or middle finger to the edge of the glove less than or equal to 430 millimetres. The high voltage insulators will be long, longer than 430 millimeters. The thickness will be variable, depending on the various points of the glove, but the maximum will be 2.6 millimeters.

In the type model, the tensile strength shall not be less than 110 kg/cm2, the elongation at break shall not be less than 600 per cent and the permanent deformation shall not exceed 18 per cent.

They shall be subjected to an ageing test, after which they shall maintain at least 80 per cent of the value of their mechanical characteristics and retain the electrical properties indicated.

The low-voltage gloves will have a leakage current of 8 mA subjected to a voltage of 5,000 V and a piercing voltage of 6,500 V, all measured with a frequency source of 50 Hz. The high-voltage gloves will have a leakage current of 20 mA at a test voltage of 30,000 V and a piercing voltage of 35,000 V.

All electrically insulating gloves used by operators shall be approved in accordance with the specifications and tests set forth in the la Norma Técnica Reglamentaria MT-4, Resolución de la Dirección General de Trabajo del 28-7-1975.

9.11. SAFETY GLASSES

Safety glasses shall be universally framed against impacts, at least class A, and shall be suitable for class D.

The glasses must be light in weight and well finished, with no burrs or sharp or sharp edges. They can be easily cleaned and will tolerate periodic disinfection without reducing their performance. There shall be no clearances in the adjustment of the eyepieces to the mount. They shall have sufficient ventilation to prevent as far as possible fogging of the eyepieces under normal conditions of use.

All metal parts or elements, in the type model, shall be subjected to corrosion testing, and the appearance of appreciable points of corrosion shall not be observed. The non-metallic materials contained therein shall not ignite when subjected to a temperature test of 500 °C.

The eyepieces shall be firmly fixed to the frame and shall not detach as a result of a steel ball impact of 44 grams in mass, from a height of 130 cm, repeated three consecutive times.

They shall be made of any material for ophthalmic use, provided that they withstand the corresponding tests. They will have a good finish, and will not present surface or structural defects that could alter the user's normal vision. Its transmission, measured with a spectrophotometer, will be greater than 89%.

If the type model passes the 44-gram steel ball impact test, from a height of 130 cm, repeated three times, it will be class A. If it passes the punch impact test, it will be class B. If it exceeds the impact of lead pellets of 4.5 millimeters in diameter, it will be class C. In the event that it passes all the aforementioned tests, it will be classified as class D.

All safety glasses shall be approved in accordance with the specifications and tests contained in the Norma Técnica Reglamentaria MT-16, Resolución de la Dirección General de Trabajo del 14-6-1978.

The testing of safety glasses against projections and impacts shall comply with the following standards: UNE.EN 167/96, UNE.EN 168/96.

9.12. DUST MASKS

They will be approved in all cases.

The constituent materials of the body of the mask may be metallic, elastomeric or plastic. They will not produce dermatoses and their odour may not cause disorders in the worker. They will be non-combustible or slow-burning. The materials of the harness straps will be elastomers and will have the characteristics mentioned above.

The masks can be of different sizes, and will always have dimensions such that they perfectly cover the entrances to the respiratory tract.

The filter connection piece will not leak in its coupling.

With regard to the inhalation valve, its leakage may not exceed 2,400 ml/min on exhalation, and its pressure loss on inhalation may not exceed 25 millimetres of water column.

In the exhalation valves, the leakage on inhalation may not exceed 40 ml/min, and their pressure loss on exhalation shall not exceed 25 millimetres of water column.

The body of the mask will offer a good fit with the user's face and its joints with the different constituent elements will close hermetically.

All dust masks used by operators will be approved in accordance with the specifications and tests contained in la Norma Técnica Reglamentaria MT-7, Resolución de la Dirección General de Trabajo del 28-7-1975.

9.13. GIRDLE FOR OVEREXERTION

It will be manufactured in various sizes, made with synthetic and lightweight elastic material. It can be adjustable by means of "Velkro" closures. With CE mark., according to PPE standards.

It will be used for all loading, unloading and shoulder-carrying work of heavy objects and all those others subject to the risk of overexertion according to the risk analysis contained in the Report of this Study.

10. COLLECTIVE PROTECTIONS

10.1. GENERAL PRESCRIPTION

The requirements determined below are complemented by what has been stated in relation to collective protections in the Report of this Study.

The cost of acquiring, building, assembling, storing and maintaining the collective protection equipment used in the work will be borne by the corresponding contractor or subcontractors, being considered budgetarily as indirect costs of each unit of work in which they must be used, as corresponds to minimum auxiliary elements of production, required by regulation and independent of the administrative labor classification of the work and, consequently, independent of their specific budgeting. The collective protections that are considered, without prejudice to specific regulations that may be applicable, of minimum use required in the work, for the different productive units of the work.

Without prejudice to the foregoing, the budget for this health and safety study does include the collective protection systems and signage that must be provided for their application in the set of activities and movements on the site or in a set of pits, without strict application to a specific work unit. Consequently, these costs will be remunerated by the Administration in accordance with this budget, provided that they are effectively disposed of in the work.

The Health and Safety Plan to be drawn up by the Contractor shall respect the requirements and may only modify them in a justified manner, and such modifications shall be approved by the Health and Safety Coordinator during the execution of the work.

Collective protections will comply with the provisions of current legislation regarding dimensions, resistances, construction aspects, anchors and other characteristics, in accordance with their protective function.

They will be new, brand new, if their components have a recognised expiry date, or if this is specified in their corresponding section within these Specifications.

Before it is necessary to use them, the protections will be stored on site with the ideal storage conditions for their good conservation. They will be examined by the person designated by the contractor in terms of health and safety on site to check if their quality corresponds to that defined in this Study and in the Health and Safety Plan.

They will be installed prior to the start of any work that requires their assembly. In this way, the commencement of work or activity requiring collective protection is prohibited until it is fully set within the scope of the risk it neutralises or eliminates.

The Work Execution Plan will specify the date of assembly, maintenance, change of location and removal of each of the collective protections referred to in this Study.

Collective protections in use in which deterioration is observed with an effective reduction in their real quality will be dismantled immediately. The damaged component will be replaced and the collective protection will be reassembled once the problem has been resolved. While this operation is being carried out, the works protected by the deteriorated section will be suspended and the area will be effectively isolated to avoid accidents. These operations will be protected by the use of personal protective equipment. In any case, these situations are assessed as an intolerable risk.

During the execution of the work, it may be necessary to vary the mode or arrangement of the installation of the collective protection provided for in the approved Health and Safety Plan. If this involves a modification of the content of the Health and Safety Plans to specify exactly the new arrangement or form of assembly, these must be approved by the Health and Safety Coordinator.

The Contractor, in accordance with current legislation, will be responsible for the assembly, maintenance and removal of the collective protection by its own means or by subcontracting. In the event of failure of the protections, they will be obliged to keep them in their intended position of use and mounted until the necessary investigation is carried out, informing the Health and Safety Coordinator.

The correct assembly and use of the collective protection defined in this Study is preferable to the use of personal protective equipment to defend against the same risk. Consequently, the change of use of collective protection to that of personal protective equipment will not be admitted.

10.2. PROTECTION AND DELIMITATION FENCES

The autonomous fences for the protection and delimitation of spaces will be made of welded metal tubes, will have a minimum height of 90 cm and will be painted in bright white, yellow or orange, keeping their paint in a correct state of conservation and not showing signs of rust or bent or broken elements at any time.

10.3. RAILINGS AND WALKWAYS

The railings of walkways and work platforms will have sufficient resistance by themselves and by their fixing and anchoring system, to guarantee the retention of workers, even in situations of impact due to displacement or violent collapse.

The overall reference resistance of the railings shall be equal to or greater than 150 kg/m.

All walkways and work platforms shall have a minimum width of 60 cm and, when they are located more than 2.00 metres above the ground, shall be provided with railings at least 90 cm high, with intermediate slats and skirting boards of at least 15 cm.

10.4. LADDERS

Ladders shall always be provided with non-slip shoes and shall be sufficiently stable. Ladders linked to each other on site or arranged on uneven or unstable surfaces, such as boards, bricks or other loose materials, shall never be used.

10.5. ELECTRICITY PROTECTION

The resistance of the earthing connections shall not exceed that guaranteed by a maximum voltage of 24 V, in accordance with the sensitivity of the residual current circuit breaker, which shall be at least 30 mA for lighting and 300 mA for force.

It will be checked periodically that the disconnection occurs when the test button of the residual current circuit breaker is pressed, and it is absolutely mandatory to carry out a review of the circuit breaker by specialised personnel or to replace it, when the disconnection does not occur.

All general electrical panels, fully isolated in their active parts, will be provided with a general omnipolar cut-off switch, capable of leaving the entire work area without service. Distribution boards must have all their metal parts connected to the ground.

All electrical elements, such as fuses, circuit breakers and switches, shall be of closed equipment, capable of making accidental electrical contact of persons or things impossible, as well as the connection terminals, which shall be provided with suitable protectors.

Switches, one per socket, shall be provided in the general electrical panel, in order to allow the sockets to which machinery of 10 or more amperes is to be connected to be left without power, so that it is possible to plug in and unplug the machine in the absence of current. The load-bearing boards of socket outlets of auxiliary electrical panels shall be effectively fixed to rigid elements, in such a way as to prevent accidental disconnection of the power supply conductors, as well as contacts with metal elements that may cause electric shocks to persons or objects.

Portable electric lamps shall have an insulating handle and lamp protection device, having a 24-volt supply or, failing that, be powered by means of a circuit separation transformer.

All electrical machines must be grounded, with the maximum permitted resistance of the electrodes or plates of 5 to 10 ohms, having cables with double waterproof insulation and a sufficiently resistant cover.

The connection hoses to the earth sockets shall have an additional wire for connection to the ground pole of the socket.

10.6. FIRE EXTINGUISHERS

The work extinguishers will be made of multipurpose powder and will comply with the Norma UNE 23010, placing themselves in the places with the greatest risk of fire, at a height of 1.50 meters above the ground. They will be adequately signposted.

11. SAFETY WORKFORCE

This section includes the following units:

- Health and Safety Committee. Composed of a security technician with the rank of manager, two workers with the rank of 2nd officer, an assistant and a security guard with the rank of 1st officer, considering at least one meeting per month. It is paid by the hour.
- Occupational health and safety training. It is considered one hour a week and is made to order. It is paid by the hour.
- Mandatory medical examination. It will apply to all workers at the start of the works. It is paid per unit, with the units corresponding to the number of workers.
- Cleaning and maintenance equipment. One hour per day is considered for temporary work installations. It is paid by the hour.
- Hiring of a first aid company. Its objective is to help workers in the event of an accident and includes transfer by ambulance to the appropriate medical center. It is paid by months.

12. ACTION IN THE EVENT OF AN ACCIDENT

The Contractor shall inform the Health and Safety Coordinator, in due time, of the incorporation of any contractor, subcontractor or self-employed worker to the work.

They must immediately notify the Health and Safety Coordinator or, where appropriate, the Site Manager, of all accidents and incidents that occur on the site, regardless of their severity, as well as blank accidents (without sick leave). After the first communication, it shall submit a complete report on the matter, also providing the information generated, where appropriate, by the intervention of the Labour and Social Security Inspectorate, the Health and Safety Cabinet and other institutions. The above documentary provision will also be made when the aforementioned bodies intervene for any other preventive cause, whatever it may be.

The Contractor must include the following principles of relief within its Health and Safety Plan:

- The injured worker will have absolute priority. You will be treated immediately in order to prevent the aggravation or progression of the injuries.
- In the event of a fall from a height or an electrical accident, taking into account that there may be serious injuries, primary care precautions will be taken on site, applying special techniques for the immobilization of the injured person until the arrival of the ambulance and resuscitation in the event of an electrical accident.
- In case of manifest seriousness, the injured person will be evacuated by stretcher and ambulance. The use of private transport will be avoided as far as possible, according to the good judgment of the people who initially attend to the injured person, because of what they imply in terms of risk and discomfort for the injured person.
- The Contractor will reflect in the Health and Safety Plan the own, joint or contracted health infrastructure that it has to guarantee the care of the injured and their evacuation.
- The Contractor shall indicate in the Health and Safety Plan the name and address of the nearest health care centre, provided for the health care of the injured persons, according to its organisation.

The Contractor is obliged to install a series of signs with characters visible from 2 m away, in which the workers and other people participating in the work are informed of the necessary information to know the healthcare centre, its address, contact telephone number, etc. Signs will be installed at the entrance to the site, in the construction office, in the dining room, in the changing rooms, in the staff toilets and inside each first aid kit. This obligation is considered a fundamental condition for achieving the effectiveness of health care in the event of an accident at work.

Likewise, it must include in its Health and Safety Plan a recommended itinerary to evacuate possible accidents, in order to avoid errors in extreme situations that could aggravate the injuries of the injured person.

12.1. FIRST AID KIT

On the site and in the places indicated, there will be first aid kits containing the following articles:

- Hydrogen peroxide.
- 96 proof alcohol.
- Iodine tincture.
- "*Mercurochrome*" or "*crystalmin*".
- Ammonia.
- Sterile gauze.

- Sterile hydrophilic cotton.
- Anti-allergic adhesive tape.
- Anti-hemorrhagic tourniquets.
- Water or ice bag.
- Sterilized gloves.
- Clinical thermometer.
- Self-adhesive dressings.
- Antispasmodics.
- Analgesics.
- Emergency heart tonics.
- Disposable syringes.

13. HEALTH AND SAFETY PLAN

The Contractor is obliged to draft, before the start of the works, the corresponding Health and Safety Plan (HSP), in which the forecasts contained in this Study are developed, specified and complemented, adapted to the means and methods of execution to be used, in accordance with the provisions of el artículo 7 del Real Decreto 1627/1997, de 24 de octubre.

This Plan must be sent to the public administration that awarded the work for approval, accompanied by the report of the Health and Safety Coordinator, who will also be responsible for supervising its application during execution. One copy of the Plan will remain available at all times to the Project Management and another will be made available to the workers' representatives.

Santander, July of 2025

Signed: Jorge Sáenz Fernández

BUDGET

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1. MEASUREMENTS

Cap1	**PROVISIONAL WORK RECORDS**			
Cap1.1	**PREFA HUT RENTAL. WORK**			
D41AA210	**Ud PREFA BOOTH RENTAL. OFFICE**	**16,00**	**129,22**	**2.067,52**
	A month of rental of a prefabricated shed for a 6x2.35 m construction site, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.			
D41AA310	**Ud PREFA BOOTH RENTAL. DINING ROOM**	**16,00**	**110,47**	**1.767,52**
	A month for renting a prefabricated shed for a 6x2.35 m construction room, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.			
D41AA320	**Ud RENTAL OF A CHANGING ROOM SHED.**	**32,00**	**120,51**	**3.856,32**
	A month of rental of a prefabricated shed for construction changing rooms of 6x2.35 m., with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.			
D41AA420	**Ud A.A/2INOD,2SHOWER,LAV.3G,THERMOS**	**32,00**	**222,27**	**7.112,64**
	You rent a prefabricated shed for construction toilets of 4.10x1.90 m. with two toilets, two showers, a sink with three taps and an electric water heater of 50 liters capacity; with the same characteristics as offices. Water-repellent plywood floor with non-slip and wear-resistant phenolic layer. Fiberglass sanitary pieces finished in white Gel-Coat and non-slip paint. Interior wooden doors in the compartments. Plumbing installation with polybutylene pipes and electrical installation for 220 V single-phase current. protected with automatic switch.			
D41AA601	**Ud PREFA BOOTH RENTAL. WAREHOUSE**	**16,00**	**110,47**	**1.767,52**
	A month of rental of a prefabricated shed for a 6x2.35 m construction warehouse, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet enclosure with a pre-lacquered paint finish. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.			
D41AA820	**Ud TRANSPORT OF PREFABRICATED SHED**	**6,00**	**234,69**	**1.408,14**
	Transport of prefabricated shed to site, including unloading and subsequent collection.			

TOTAL Cap1.1 ..... 17.979,66

Cap1.2	**PROVISIONAL CONNECTIONS**			
D41AE001	**Ud ACOMET. PROV. ELECT. TO BOOTH.**	**4,00**	**102,44**	**409,76**
	Provisional electricity connection to construction sheds.			
D41AE101	**Ud ACOMET. PROV. FONTAN. TO BOOTH.**	**4,00**	**90,38**	**361,52**
	You. Provisional plumbing connection to construction sheds.			
D41AE201	**Ud ACOMET. PROV. SANEAMT. TO BOOTH.**	**4,00**	**74,98**	**299,92**
	Provisional sanitation connection to construction sheds.			
	TOTAL Cap1.2 ..... 1.071,20			
Cap1.3	**FURNITURE AND EQUIPMENT**			
D41AG201	**Ud INDIVIDUAL METAL LOCKER.**	**20,00**	**14,71**	**294,20**
	Individual metal locker with 1.78 m. high key placed. (10 uses)			
D41AG210	**Ud POLYPROPYLENE BENCH 5 PERS.**	**4,00**	**23,39**	**93,56**
	Ud. Polypropylene bench for 5 people with metal supports, placed. (10 uses)			
D41AG401	**Ud INDUSTRIAL SOAP MAKER.**	**6,00**	**6,90**	**41,40**
	Ud. Industrial use soap dish with soap dispenser, in stainless steel, placed. (10 uses)			
D41AG410	**Ud INDUS TOILET PAPER HOLDER. C/CERRADUR**	**4,00**	**6,91**	**27,64**
	Ud. Industrial use roll holder with lock, in stainless steel, placed. (10 uses)			
D41AG610	**Ud HEATS MEALS 25 SERVINGS**	**2,00**	**100,34**	**200,68**
	You heat meals for 25 servings, placed. (20 uses)			
D41AG630	**Ud MELAMINE TABLE 10 PEOPLE.**	**2,00**	**24,13**	**48,26**
	Ud. Metal dining table with a capacity of 10 people, and melamine top placed. (10 uses)			
D41AG700	**Ud 800 L GARBAGE TANK.**	**1,00**	**18,80**	**18,80**
	Ud. 800-liter capacity garbage tank made of injected polyethylene, steel and rubber bands, with wheels for transport, placed. (10 uses)			
D41AG801	**Ud FIRST AID KIT.**	**3,00**	**21,43**	**64,29**
	You. First aid kit installed.			
D41AG820	**Ud PORTABLE EVACUATION STRETCHER**	**1,00**	**6,78**	**6,78**
	Portable stretcher for evacuations, placed. (20 uses)			
	TOTAL Cap1.3 795,61			
	TOTAL Cap1 ..... 19.846,47			

Cap2	**SIGNAGES**			
Cap2.1	**SIGNALS**			
D41CA010	**Ud STOP I SIGNAL/SUPPORT.**	**8,00**	**41,39**	**331,12**
	Standardised octagonal stop sign of D=600 mm, with 80x40x2 mm galvanised iron metal support and 1.3 m in height including proportional part for opening the shaft, concreting, placing and dismantling. (3 uses)			
D41CA040	**Ud INDICAT SIGN. RISK I/DROWSINESS**	**8,00**	**20,66**	**165,28**
	Ud. Risk indicative sign of 0.30x0.30 m. with galvanized iron metal support 80x40x2 mm. and 1.3 m. high, including opening of the well, concreting, placement and dismantling.			
D41CA240	**Ud INDICAT SIGN. RISK WITHOUT SO.**	**8,00**	**8,53**	**68,24**
	Ud. Risk indicative sign of 0.30x0.30 m., without metal support, whether or not placed and dismantled			
	TOTAL Cap2.1 564,64			
Cap2.2	**TICKETS**			
D41CC020	**Ud CONSTRUCTION FENCE WITH TRIPOD.**	**20,00**	**5,19**	**103,80**
	Ud. 800x200 mm. one-band construction fence with tripod, finish in normal paint two colors red and white, including placement and disassembly. (20 uses)			
D41CC210	**Ml HANGING FENCE SIGNAGE.**	**40,00**	**7,17**	**286,80**
	Ml. Hanging signage fence made of plastic material painted in red and white, including fastening cord, metal support, placement and dismantling.			
D41CC230	**Ml R/B BEACON TAPE.**	**800,00**	**2,33**	**1.864,00**
	Ml. Plastic buoying tape painted in two colors, red and white, including placement and disassembly.			
	TOTAL Cap2.2 ..... 2.254,60			
	TOTAL Cap2 ..... 2.819,24			

Cap3	**PERSONAL PROTECTIONS**			
Cap3.1	**HEAD PROTECTIONS**			
D41EA001	**Ud SAFETY HELMET.**	**20,00**	**3,05**	**61,00**
	Ud. Safety helmet with sweater, CE approved.			
D41EA201	**Ud SCREEN. SECURITY. FOR WELDING.**	**5,00**	**12,31**	**61,55**
	Ud. Safety screen for welding, CE approved.			
D41EA210	**Ud PARTICLE SCREEN.**	**8,00**	**13,25**	**106,00**
	Ud. Particle protection screen with head harness and rigid clear polycarbonate visor, CE approved.			
D41EA220	**Ud GOGGLES AGAINST IMPACTS.**	**20,00**	**11,36**	**227,20**
	Ud. Anti-scratch impact glasses, CE approved.			
D41EA230	**Ud DUST GOGGLES.**	**20,00**	**2,52**	**50,40**
	Ud. Colorless visitor type dust glasses, CE approved.			
D41EA401	**Ud DUST MASK.**	**20,00**	**2,84**	**56,80**
	Ud. Dust mask, approved.			
D41EA410	**Ud MASK REPLACEMENT FILTER.**	**30,00**	**0,69**	**20,70**
	Ud. Mask replacement filter, approved.			
D41EA601	**Ud HEARING PROTECTORS.**	**20,00**	**7,89**	**157,80**
	You. Hearing protectors, approved.			
	TOTAL Cap3.1			**741,45**
Cap3.2	**TOTAL BODY PROTECTION**			
D41EC001	**Ud OVERALLS.**	**20,00**	**16,41**	**328,20**
	You. Work overalls, CE approved.			
D41EC010	**Ud RAINCOAT.**	**20,00**	**9,47**	**189,40**
	Ud. Work raincoat, CE approved.			
D41EC030	**Ud SUEDE WELDER APRON**	**5,00**	**14,70**	**73,50**
	Ud. Suede apron for welder grade A, 60x90 cm. CE approved.			
D41EC050	**Ud REFLECTIVE BIB BUT./AMAR.**	**20,00**	**18,93**	**378,60**
	Ud. Butane or yellow reflective bib, CE approved.			
D41EC401	**Ud CLASS A SEAT BELT.**	**6,00**	**66,89**	**401,34**
	Class A safety belt (fastening), with adjustable rope of 1.8 m. with rope guard and 2 carabiners, CE approved.			
D41EC500	**Ud ANTI-LUMBAGO BELT**	**20,00**	**17,45**	**349,00**
	Ud. Anti-lumbago belt buckle, CE approved.			
D41EC510	**Ud OVEREXERTION ELASTIC GIRDLE.**	**20,00**	**33,45**	**669,00**
	Ud. Elastic girdle for overexertion protection with shoulder pads and velcro closure, CE approved.			
D41EC550	**Ud REGULAR MOORING ROPE. POLYAM.**	**6,00**	**15,63**	**93,78**
	UD. Adjustable mooring rope length 1.10-1.80 mts, made of high tenacity polyamide of 14 mm in diameter, i/ PVC coated polymide ring, CE approved.			
D41EC520	**Ud TOOL BELT.**	**20,00**	**21,00**	**420,00**
	Tool belt, approved.			
	TOTAL Cap3.2			**2.902,82**
Cap3.3	**HAND AND ARM PROTECTIONS**			
D41EE001	**Ud PAIR INDUSTRIAL LATEX GLOVES**	**20,00**	**1,76**	**35,20**
	Ud. Pair of orange industrial latex gloves, CE approved.			
D41EE010	**Ud PAIR 100% NEOPRENE GLOVES**	**20,00**	**2,52**	**50,40**
	Ud. Pair of 100% neoprene, CE approved.			
D41EE020	**Ud PAIR OF WELDING GLOVES 34 CM**	**4,00**	**7,89**	**31,56**
	Ud. Pair of welder's gloves lined suede fireproof, length 34 cm., CE approved.			
D41EE030	**Ud PAIR OF INSULATING GLOVES.**	**4,00**	**27,00**	**108,00**
	Ud. Pair of insulating gloves for electrician, approved.			
	TOTAL Cap3.3			**225,16**
Cap3.4	**FOOT AND LEG PROTECTIONS**			
D41EG005	**Ud PAIR OF ENGINEER'S WATER BOOTS**	**20,00**	**25,87**	**517,40**
	Ud. Pair of engineer's wellington boots, lined, with zipper, brown, CE approved.			
D41EG010	**Ud PAIR OF SAFETY BOOTS. PUNT. SERR.**	**20,00**	**24,61**	**492,20**
	Ud. Pair of S2 safety boots suede/canvas with toe cap and metallic, CE approved.			
D41EG030	**Ud PAIR OF INSULATING BOOTS.**	**4,00**	**26,19**	**104,76**
	Ud. Pair of insulating boots for electrician, CE approved.			
D41EG401	**Ud PAIR OF SOLDERING IRON GAITERS**	**4,00**	**10,41**	**41,64**
	Ud. Pair of suede grad A welder gaiters, CE approved.			
	TOTAL Cap3.4			**1.156,00**
	TOTAL Cap3			**5.025,43**

Cap4	**COLLECTIVE PROTECTIONS**			
Cap4.1	**HORIZONTAL PROTECTIONS**			
D41GA001	**M2 HORIZONTAL NET PROTEC. HOLLOW.**	**60,00**	**4,73**	**283,80**
	M2. Horizontal net for protection of holes made of polyamide wire D=4 mm. and mesh of 75x75 mm. even placement and disassembly.			
D41GA201	**M2 GAP PROTECTION MESH.**	**60,00**	**3,81**	**228,60**
	M2. Electrowelded mesh 15x15 cm. D=4 mm. for gap protection, including placement and disassembly.			
	TOTAL Cap4.1			**512,40**
Cap4.2	**VERTICAL PROTECTIONS**			
D41GC210	**Ml RAILING, STRUTS AND PLANK.**	**150,00**	**5,99**	**898,50**
	Ml. Railing with support of telescopic struts and three planks of 0.20x0.07 m., including placement and disassembly.			
D41GC450	**Ml MET LATTICE. PREF.**	**300,00**	**7,75**	**2.325,00**
	Ml. 3x2ml movable panel type metal trellis. formed by tube and grid supports of 15x15cm rod D=3mm with Aluzín weather protection, and prefabricated concrete foot for double support.			
	TOTAL Cap4.2			**3.223,50**
	TOTAL Cap4			**3.735,90**

Cap5	**SAFETY WORKFORCE**			
D41IA001	**H. HEALTH AND SAFETY COMMITTEE**	**24,00**	**54,87**	**1.316,88**
	H. Safety committee composed of a security technician with the rank of manager, two workers with the rank of 2nd officer, an assistant and a security guard with the rank of 1st officer, considering at least one meeting per month.			
D41IA020	**H. SAFETY AND HYGIENE TRAINING**	**48,00**	**14,42**	**692,16**
	H. Training on safety and hygiene at work, considering one hour a week and carried out by a manager.			
D41IA040	**Ud MANDATORY MEDICAL EXAMINATION**	**15,00**	**43,33**	**649,95**
	You. Mandatory medical examination.			
D41IA201	**H. CLEANING AND CANNING EQUIPMENT**	**500,00**	**21,16**	**10.580,00**
	H. Cleaning and conservation team of provisional work facilities, considering one hour a day of 2nd officer and assistant.			
	TOTAL Cap5			**13.238,99**
	TOTAL			**44.666,03**

2. PRICE TABLE N1

D41AA210 Ud A month of rental of a prefabricated shed for a 6x2.35 m construction site, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

129,22
ONE HUNDRED TWENTY NINE EUROS with TWENTY TWO CENTS

D41AA310 Ud A month for renting a prefabricated shed for a 6x2.35 m construction room, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

110,47
ONE HUNDRED TEN EUROS with FORTY SEVEN CENTS

D41AA320 Ud A month of rental of a prefabricated shed for construction changing rooms of 6x2.35 m., with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

120,51
ONE HUNDRED TWENTY EUROS with FIFTY ONE CENTS

D41AA420 Ud You rent a prefabricated shed for construction toilets of 4.10x1.90 m. with two toilets, two showers, a sink with three taps and an electric water heater of 50 liters capacity; with the same characteristics as offices. Water-repellent plywood floor with non-slip and wear-resistant phenolic layer. Fiberglass sanitary pieces finished in white Gel-Coat and non-slip paint. Interior wooden doors in the compartments. Plumbing installation with polybutylene pipes and electrical installation for 220 V single-phase current. protected with automatic switch.

222,27
TWO HUNDRED TWENTY TWO EUROS with TWENTY SEVEN CENTS

D41AA601 Ud A month of rental of a prefabricated shed for a 6x2.35 m construction warehouse, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet enclosure with a pre-lacquered paint finish. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

110,47
ONE HUNDRED TEN EUROS with FORTY SEVEN CENTS

D41AA820 Ud Transport of prefabricated shed to site, including unloading and subsequent collection.

234,69
TWO HUNDRED THIRTY FOUR EUROS with SIXTY NINE CENTS

D41AE001 Ud Provisional electricity connection to construction sheds.

102,44
ONE HUNDRED TWO EUROS with FORTY FOUR CENTS

D41AE101 Ud You. Provisional plumbing connection to construction sheds.

90,38
NINETY EUROS with THIRTY EIGHT CENTS

D41AE201 Ud Provisional sanitation connection to construction sheds.

74,98
SEVENTY FOUR EUROS with NINETY EIGHT CENTS

D41AG201 Ud Individual metal locker with 1.78 m. high key placed. (10 uses)

14,71
FOURTEEN EUROS with SEVENTY ONE CENTS

D41AG210 Ud Ud. Polypropylene bench for 5 people with metal supports, placed. (10 uses)

23,39
TWENTY THREE EUROS with THIRTY NINE CENTS

D41AG401 Ud Ud. Industrial use soap dish with soap dispenser, in

stainless steel, placed. (10 uses)

6,90
SIX EUROS with NINETY CENTS

D41AG410 Ud Ud. Industrial use roll holder with lock, in stainless steel, placed. (10 uses)

6,91
SIX EUROS with NINETY ONE CENTS

D41AG610 Ud You heat meals for 25 servings, placed. (20 uses)

100,34
ONE HUNDRED EUROS with THIRTY FOUR CENTS

D41AG630 Ud Ud. Metal dining table with a capacity of 10 people, and melamine top placed. (10 uses)

24,13
TWENTY FOUR EUROS with THIRTEEN CENTS

D41AG700 Ud Ud. 800-liter capacity garbage tank made of injected polyethylene, steel and rubber bands, with wheels for transport, placed. (10 uses)

18,80
EIGHTEEN EUROS with EIGHTY CENTS

D41AG801 Ud You. First aid kit installed.

21,43
TWENTY ONE EUROS with FORTY THREE CENTS

D41AG820 Ud Portable stretcher for evacuations, placed. (20 uses)

6,78
SIX EUROS with SEVENTY EIGHT CENTS

D41CA010 Ud Standardised octagonal stop sign of D=600 mm, with 80x40x2 mm galvanised iron metal support and 1.3 m in height including proportional part for opening the shaft, concreting, placing and dismantling. (3 uses)

41,39
FORTY ONE EUROS with THIRTY NINE CENTS

D41CA040 Ud Ud. Risk indicative sign of 0.30x0.30 m. with galvanized iron metal support 80x40x2 mm. and 1.3 m. high, including opening of the well, concreting, placement and dismantling.

20,66
TWENTY EUROS with SIXTY SIX CENTS

D41CA240 Ud Ud. Risk indicative sign of 0.30x0.30 m., without metal support, whether or not placed and dismantled

8,53
EIGHT EUROS with FIFTY THREE CENTS

D41CC020 Ud Ud. 800x200 mm. one-band construction fence with tripod, finish in normal paint two colors red and white, including placement and disassembly. (20 uses)

5,19
FIVE EUROS with NINETEEN CENTS

D41CC210 Ml Ml. Hanging signage fence made of plastic material painted in red and white, including fastening cord, metal support, placement and dismantling.

7,17
SEVEN EUROS with SEVENTEEN CENTS

D41CC230 Ml Ml. Plastic buoying tape painted in two colors, red and white, including placement and disassembly.

2,33
TWO EUROS with THIRTY THREE CENTS

D41EA001 Ud Ud. Safety helmet with sweater, CE approved.

3,05
THREE EUROS with FIVE CENTS

D41EA201 Ud Ud. Safety screen for welding, CE approved.

12,31
TWELVE EUROS with THIRTY ONE CENTS

D41EA210 Ud Ud. Particle protection screen with head harness and rigid clear polycarbonate visor, CE approved.

13,25
THIRTEEN EUROS with TWENTY FIVE CENTS

D41EA220 Ud Ud. Anti-scratch impact glasses, CE approved.

11,36
ELEVEN EUROS with THIRTY SIX CENTS

D41EA230 Ud Ud. Colorless visitor type dust glasses, CE approved.

2,52
TWO EUROS with FIFTY TWO CENTS

D41EA401 Ud Ud. Dust mask, approved.

2,84
TWO EUROS with EIGHTY FOUR CENTS

D41EA410 Ud Ud. Mask replacement filter, approved.

0,69
CERO EUROS with SIXTY NINE CENTS

D41EA601 Ud You. Hearing protectors, approved.

7,89
SEVEN EUROS with EIGHTY NINE CENTS

D41EC001 Ud You. Work overalls, CE approved.

16,41
SIXTEEN EUROS with FORTY ONE CENTS

D41EC010 Ud Ud. Work raincoat, CE approved.

9,47

NINE EUROS with FORTY SEVEN CENTS

D41EC030 Ud Ud. Suede apron for welder grade A, 60x90 cm. CE approved.

14,70

FOURTEEN EUROS with SEVENTY CENTS

D41EC050 Ud Ud. Butane or yellow reflective bib, CE approved.

18,93

EIGHTEEN EUROS with NINETY THREE CENTS

D41EC401 Ud Class A safety belt (fastening), with adjustable rope of 1.8 m. with rope guard and 2 carabiners, CE approved.

66,89

SIXTY SIX EUROS with EIGHTY NINE CENTS

D41EC500 Ud Ud. Anti-lumbago belt buckle, CE approved.

17,45

SEVENTEEN EUROS with FORTY FIVE CENTS

D41EC510 Ud Ud. Elastic girdle for overexertion protection with shoulder pads and velcro closure, CE approved.

33,45

THIRTY THREE EUROS with FORTY FIVE CENTS

D41EC520 Ud Tool belt, approved.

21,00

TWENTY ONE EUROS

D41EC550 Ud UD. Adjustable mooring rope length 1.10-1.80 mts, made of high tenacity polyamide of 14 mm in diameter, i/ PVC coated polymide ring, CE approved.

15,63

FIFTEEN EUROS with SIXTY THREE CENTS

D41EE001 Ud Ud. Pair of orange industrial latex gloves, CE approved.

1,76

ONE EUROS with SEVENTY SIX CENTS

D41EE010 Ud Ud. Pair of 100% neoprene, CE approved.

2,52

TWO EUROS with FIFTY TWO CENTS

D41EE020 Ud Ud. Pair of welder's gloves lined suede fireproof, length 34 cm., CE approved.

7,89

SEVEN EUROS with EIGHTY NINE CENTS

D41EE030 Ud Ud. Pair of insulating gloves for electrician, approved.

27,00

TWENTY SEVEN EUROS

D41EG005 Ud Ud. Pair of engineer's wellington boots, lined, with zipper, brown, CE approved.

25,87

TWENTY FIVE EUROS with EIGHTY SEVEN CENTS

D41EG010 Ud Ud. Pair of S2 safety boots suede/canvas with toe cap and metallic, CE approved.

24,61

TWENTY FOUR EUROS with SIXTY ONE CENTS

D41EG030 Ud Ud. Pair of insulating boots for electrician, CE approved.

26,19

TWENTY SIX EUROS with NINETEEN CENTS

D41EG401 Ud Ud. Pair of suede grad A welder gaiters, CE approved.

10,41

TEN EUROS with FORTY ONE CENTS

D41GA001 M2 M2. Horizontal net for protection of holes made of polyamide wire D=4 mm. and mesh of 75x75 mm. even placement and disassembly.

4,73

FOUR EUROS with SEVENTY THREE CENTS

D41GA201 M2 M2. Electrowelded mesh 15x15 cm. D=4 mm. for gap protection, including placement and disassembly.

3,81

THREE EUROS with EIGHTY ONE CENTS

D41GC210 Ml Ml. Railing with support of telescopic struts and three planks of 0.20x0.07 m., including placement and disassembly.

5,99

FIVE EUROS with NINETY NINE CENTS

D41GC450 Ml Ml. 3x2ml movable panel type metal trellis. formed by tube and grid supports of 15x15cm rod D=3mm with Aluzín weather protection, and prefabricated concrete foot for double support.

7,75

SEVEN EUROS with SEVENTY FIVE CENTS

D41IA001 H. H. Safety committee composed of a security technician with the rank of manager, two workers with the rank of 2nd officer, an assistant and a security guard with the rank of 1st officer, considering at least one meeting per month.

54,87

FIFTY FOUR EUROS with EIGHTY SEVEN CENTS

D41IA020 H. H. Training on safety and hygiene at work, considering one hour a week and carried out by a manager.

14,42

FOURTEEN EUROS with FORTY TWO CENTS

D41IA040 Ud You. Mandatory medical examination.

43,33

FORTY THREE EUROS with THIRTY THREE CENTS

D41IA201 H. H. Cleaning and conservation team of provisional work facilities, considering one hour a day of 2nd officer and assistant.

21,16

TWENTY ONE EUROS with SIXTEEN CENTS

Santander, July of2025

Signed.: Jorge Sáenz Fernández

3. BUDGET BY CHAPTERS

Cap1 PROVISIONAL WORK RECORDS

Cap1.1 PREFA HUT RENTAL.WORK

D41AA210 **UdPREFA BOOTH RENTAL.**

OFFICE **16,00** **129,22** **2.067,52**

A month of rental of a prefabricated shed for a 6x2.35 m construction site, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

41AA310 **UdPREFA BOOTH RENTAL.**

DINING ROOM **16,00** **110,47** **1.767,52**

A month for renting a prefabricated shed for a 6x2.35 m construction room, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

D41AA320 **UdRENTAL OF A**

CHANGING ROOM SHED. **32,00** **120,51** **3.856,32**

A month of rental of a prefabricated shed for construction changing rooms of 6x2.35 m., with a metal structure using cold-formed profiles and a ribbed and galvanized sheet metal enclosure with a pre-lacquered paint finish. Interior insulation with glass wool combined with expanded polystyrene. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

D41AA420 **Ud**

A.A/2INOD,2SHOWER,LAV.3G,THERMOS **32,00** **222,27** **7.112,64**

You rent a prefabricated shed for construction toilets of 4.10x1.90 m. with two toilets, two showers, a sink with three taps and an electric water heater of 50 liters capacity; with the same characteristics as offices. Water-repellent plywood floor with non-slip and wear-resistant phenolic layer. Fiberglass sanitary pieces finished in white Gel-Coat and non-slip paint. Interior wooden doors in the compartments. Plumbing installation with polybutylene pipes and electrical installation for 220 V single-phase current. protected with automatic switch.

D41AA601 **UdPREFA BOOTH RENTAL.**

WAREHOUSE **16,00** **110,47** **1.767,52**

A month of rental of a prefabricated shed for a 6x2.35 m construction warehouse, with a metal structure using cold-formed profiles and a ribbed and galvanized sheet enclosure with a pre-lacquered paint finish. P.V.C. coating on floors and melamine board on walls. Anodised aluminium windows, with sliding protection blinds, including electrical installation with interior distribution of lighting and power with 220 V external socket.

D41AA820 **UdTRANSPORT OF**

PREFABRICATED SHED **6,00** **234,69** **1.408,14**

Transport of prefabricated shed to site, including unloading and subsequent collection.

TOTAL Cap1.1 ..... 17.979,66

Cap1.2 PROVISIONAL CONNECTIONS

D41AE001 **UdACOMET. PROV. ELECT.**

TO BOOTH. **4,00** **102,44** **409,76**

Provisional electricity connection to construction sheds.

D41AE101 **UdACOMET. PROV.**

FONTAN. TO BOOTH. **4,00** **90,38** **361,52**

You. Provisional plumbing connection to construction sheds.

D41AE201 **UdACOMET. PROV.**

SANEAMT. TO BOOTH. **4,00** **74,98** **299,92**

Provisional sanitation connection to construction sheds.

TOTAL Cap1.2 ..... 1.071,20

Cap1.3 FURNITURE AND EQUIPMENT

D41AG201 **UdINDIVIDUAL METAL**

LOCKER. **20,00** **14,71** **294,20**

Individual metal locker with 1.78 m. high key placed. (10 uses)

D41AG210 **UdPOLYPROPYLENE**

BENCH 5 PERS. **4,00** **23,39** **93,56**

Ud. Polypropylene bench for 5 people with metal supports, placed. (10 uses)

D41AG401 **UdINDUSTRIAL SOAP**

MAKER. **6,00** **6,90** **41,40**

Ud. Industrial use soap dish with soap dispenser, in stainless steel, placed. (10 uses)

D41AG410 **UdINDUS TOILET PAPER**

HOLDER. C/CERRADUR **4,00** **6,91** **27,64**

Ud. Industrial use roll holder with lock, in stainless steel, placed. (10 uses)

D41AG610 **UdHEATS MEALS 25**

SERVINGS **2,00** **100,34** **200,68**

You heat meals for 25 servings, placed. (20 uses)

D41AG630 **UdMELAMINE TABLE 10 PEOPLE.**
2,00 24,13 48,26
Ud. Metal dining table with a capacity of 10 people, and melamine top placed. (10 uses)

D41AG700 **Ud800 L GARBAGE TANK.**
1,00 18,80 18,80
Ud. 800-liter capacity garbage tank made of injected polyethylene, steel and rubber bands, with wheels for transport, placed. (10 uses)

D41AG801 **UdFIRST AID KIT.**
3,00 21,43 64,29
You. First aid kit installed.

D41AG820 **Ud PORTABLE EVACUATION STRETCHER**
1,00 6,78 6,78
Portable stretcher for evacuations, placed. (20 uses)

TOTAL Cap1.3 795,61

TOTAL Cap1 ..... 19.846,47

Cap2 SIGNAGES

Cap2.1 SIGNALS

D41CA010 **Ud** **STOP I**
SIGNAL/SUPPORT. **8,00** **41,39** **331,12**

Standardised octagonal stop sign of D=600 mm, with 80x40x2 mm galvanised iron metal support and 1.3 m in height including proportional part for opening the shaft, concreting, placing and dismantling. (3 uses)

D41CA040 **UdINDICAT SIGN. RISK**
I/DROWSINESS **8,00** **20,66** **165,28**

Ud. Risk indicative sign of 0.30x0.30 m. with galvanized iron metal support 80x40x2 mm. and 1.3 m. high, including opening of the well, concreting, placement and dismantling.

D41CA240 **UdINDICAT SIGN. RISK**
WITHOUT SO. **8,00** **8,53** **68,24**

Ud. Risk indicative sign of 0.30x0.30 m., without metal support, whether or not placed and dismantled

TOTAL Cap2.1 564,64

Cap2.2 TICKETS

D41CC020 **UdCONSTRUCTION FENCE**
WITH TRIPOD. **20,00** **5,19** **103,80**

Ud. 800x200 mm. one-band construction fence with tripod, finish in normal paint two colors red and white, including placement and disassembly. (20 uses)

D41CC210 **MlHANGING FENCE**
SIGNAGE. **40,00** **7,17** **286,80**

Ml. Hanging signage fence made of plastic material painted in red and white, including fastening cord, metal support, placement and dismantling

.

D41CC230 **MIR/B BEACON TAPE.**
800,00 **2,33** **1.864,00**

Ml. Plastic buoying tape painted in two colors, red and white, including placement and disassembly.

TOTAL Cap2.2 ..... 2.254,60

TOTAL Cap2 ..... 2.819,24

Cap3 PERSONAL PROTECTIONS

Cap3.1 HEAD PROTECTIONS

D41EA001 **UdSAFETY HELMET.**
20,00 **3,05** **61,00**
Ud. Safety helmet with sweater, CE approved.

D41EA201 **UdSCREEN. SECURITY.**
FOR WELDING. **5,00** **12,31** **61,55**
Ud. Safety screen for welding, CE approved.

D41EA210 **UdPARTICLE SCREEN.**
8,00 **13,25** **106,00**
Ud. Particle protection screen with head harness and rigid clear polycarbonate visor, CE approved.

D41EA220 **UdGOGGLES AGAINST**
IMPACTS. **20,00** **11,36** **227,20**
Ud. Anti-scratch impact glasses, CE approved.

D41EA230 **UdDUST GOGGLES.**
20,00 **2,52** **50,40**
Ud. Colorless visitor type dust glasses, CE approved.

D41EA401 **UdDUST MASK.**
20,00 **2,84** **56,80**
Ud. Dust mask, approved.

D41EA410 **UdMASK REPLACEMENT**
FILTER. **30,00** **0,69** **20,70**
Ud. Mask replacement filter, approved.

D41EA601 **UdHEARING PROTECTORS.**
20,00 **7,89** **157,80**
You. Hearing protectors, approved.

TOTAL Cap3.1 741,45

Cap3.2 TOTAL BODY PROTECTION

D41EC001 **Ud OVERALLS.**
20,00 **16,41** **328,20**
You. Work overalls, CE approved.

D41EC010 **Ud RAINCOAT.**
20,00 **9,47** **189,40**
Ud. Work raincoat, CE approved.

D41EC030 **UdSUEDE WELDER APRON**
5,00 **14,70** **73,50**
Ud. Suede apron for welder grade A, 60x90 cm. CE approved.

D41EC050 **UdREFLECTIVE BIB**
BUT./AMAR. **20,00** **18,93** **378,60**
Ud. Butane or yellow reflective bib, CE approved.

D41EC401 **UdCLASS A SEAT BELT.**
6,00 **66,89** **401,34**
Class A safety belt (fastening), with adjustable rope of 1.8 m. with rope guard and 2 carabiners, CE approved.

D41EC500 **UdANTI-LUMBAGO BELT**
20,00 **17,45** **349,00**
Ud. Anti-lumbago belt buckle, CE approved.

D41EC510 **Ud**
OVEREXERTIONELASTIC GIRDLE. **20,00** **33,45** **669,00**
Ud. Elastic girdle for overexertion protection with shoulder pads and velcro closure, CE approved.

D41EC550 **UdREGULAR MOORING**
ROPE. POLYAM. **6,00** **15,63** **93,78**
UD. Adjustable mooring rope length 1.10-1.80 mts, made of high tenacity polyamide of 14 mm in diameter, i/ PVC coated polymide ring, CE approved.

D41EC520 **UdTOOL BELT.**
20,00 **21,00** **420,00**
Tool belt, approved.

TOTAL Cap3.2 ..... 2.902,82

Cap3.3			**HAND AND ARM PROTECTIONS**
D41EE001			**UdPAIR INDUSTRIAL LATEX GLOVES**
	20,00	**1,76**	**35,20**

Ud. Pair of orange industrial latex gloves, CE approved.

D41EE010			**UdPAIR 100% NEOPRENE GLOVES**
	20,00	**2,52**	**50,40**

Ud. Pair of 100% neoprene, CE approved.

D41EE020			**UdPAIR OF WELDING GLOVES 34 CM**
	4,00	**7,89**	**31,56**

Ud. Pair of welder's gloves lined suede fireproof, length 34 cm., CE approved.

D41EE030			**UdPAIR OF INSULATING GLOVES.**
	4,00	**27,00**	**108,00**

Ud. Pair of insulating gloves for electrician, approved

TOTAL Cap3.3	**225,16**

Cap3.4			**FOOT AND LEG PROTECTIONS**
D41EG005			**UdPAIR OF ENGINEER'S WATER BOOTS**
	20,00	**25,87**	**517,40**

Ud. Pair of engineer's wellington boots, lined, with zipper, brown, CE approved.

D41EG010			**UdPAIR OF SAFETY BOOTS. PUNT. SERR.**
	20,00	**24,61**	**492,20**

Ud. Pair of S2 safety boots suede/canvas with toe cap and metallic, CE approved.

D41EG030			**UdPAIR OF INSULATING BOOTS.**
	4,00	**26,19**	**104,76**

Ud. Pair of insulating boots for electrician, CE approved.

D41EG401			**UdPAIR OF SOLDERING IRON GAITERS**
	4,00	**10,41**	**41,64**

Ud. Pair of suede grad A welder gaiters, CE approved.

TOTAL Cap3.4	**1.156,00**
TOTAL Cap3	**5.025,43**

Cap4 COLLECTIVE PROTECTIONS

Cap4.1 HORIZONTAL PROTECTIONS

D41GA001			**M2HORIZONTAL NET**	
PROTEC. HOLLOW.	**60,00**	**4,73**		**283,80**

M2. Horizontal net for protection of holes made of polyamide wire D=4 mm. and mesh of 75x75 mm. even placement and disassembly.

D41GA201			**M2GAP PROTECTION**	
MESH.	**60,00**	**3,81**		**228,60**

M2. Electrowelded mesh 15x15 cm. D=4 mm. for gap protection, including placement and disassembly.

TOTAL Cap4.1 512,40

Cap4.2 VERTICAL PROTECTIONS

D41GC210			**MIRAILING, STRUTS AND**	
PLANK.	**150,00**	**5,99**		**898,50**

Ml. Railing with support of telescopic struts and three planks of 0.20x0.07 m., including placement and disassembly.

D41GC450			**MIMET LATTICE. PREF.**	
300,00	**7,75**		**2.325,00**	

Ml. 3x2ml movable panel type metal trellis. formed by tube and grid supports of 15x15cm rod D=3mm with Aluzín weather protection, and prefabricated concrete foot for double support.

TOTAL Cap4.2 ..... 3.223,50

TOTAL Cap4 ..... 3.735,90

Cap5 SAFETY WORKFORCE

D41IA001			**H.HEALTH AND SAFETY**	
COMMITTEE	**24,00**	**54,87**	**1.316,88**	

H. Safety committee composed of a security technician with the rank of manager, two workers with the rank of 2nd officer, an assistant and a security guard with the rank of 1st officer, considering at least one meeting per month.

D41IA020			**H.SAFETY AND HYGIENE**	
TRAINING	**48,00**	**14,42**	**692,16**	

H. Training on safety and hygiene at work, considering one hour a week and carried out by a manager.

D41IA040			**UdMANDATORY MEDICAL**	
EXAMINATION	**15,00**	**43,33**	**649,95**	

You. Mandatory medical examination.

D41IA201			**H.CLEANING AND**	
CANNING EQUIPMENT	**500,00**	**21,16**	**10.580,00**	

H. Cleaning and conservation team of provisional work facilities, considering one hour a day of 2nd officer and assistant.

TOTAL Cap5 ..... 13.238,99

..... TOTAL

..... 44.666,03

4.

Santander, July of 2025

Signed.: Jorge Sáenz Fernández

5. BUDGET SUMMARY

Cap1	PROVISIONAL WORK RECORDS	19.846,47 44,43
Cap2	SIGNAGES	2.819,24 6,31
Cap3	PERSONAL PROTECTIONS	5.025,43 11,25
Cap4	COLLECTIVE PROTECTIONS	3.735,90 8,36
Cap5	SAFETY WORKFORCE.....	13.238,99 29,64
	CONSTRUCTION BUDGET	44.666,03

The total Health and Safety Plan Budget rises to FORTY NINE THOUSAND ONE HUNDRED THIRTY TWO EUROS with SIXTY THREE CENTS

Santander, July of 2025

Signed.: Jorge Sáenz Fernández

EXECUTION PLAN 2 – COORDINATION WITH OTHER AGENCIES

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2. PUBLIC ENTITIES 2

3. SERVICE COMPANIES 2

1. INTRODUCTION

This annex lists the public and private entities that may be affected during the execution of the works.

2. PUBLIC ENTITIES

The following public entities can be involved in the construction:

- Gobierno de Cantabria.
- Ayuntamiento de Mazcuerras.
- Confederación Hidrográfica del Norte.
- Consejería de Fomento, Ordenación del Territorio y Medio Ambiente del Gobierno de Cantabria.
- Instituto de Hidráulica Ambiental.
- Instituto de Seguridad y Salud.

3. SERVICE COMPANIES

The following companies provide services to the project area and may need to be contacted if they are affected:

- Electric supply network (Viesgo Distribución)
- Telephone network (Telefónica de España S.A.)
- Water supply network (Aqualia Gestión Integral del Agua S.A.)
- Gas supply network
- Transport infrastructure network

EXECUTION PLAN 3 – WASTE MANAGEMENT

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1. INTRODUCTION

This annex sets out the procedures applied to ensure proper waste management, based on Real Decreto 105/2008, de 1 de febrero, which regulates the Production and Management of Construction and Demolition Waste as well as Decreto 72/2010, de 28 de octubre, which governs this matter within the Autonomous Community of Cantabria.

During the implementation of this annex, the construction and demolition waste generated by the works will be identified, the estimated quantity of each type of waste will be assessed, and preventive measures will be defined to ensure proper on-site management. In addition, a list of authorized construction and demolition waste recycling facilities in Cantabria is included.

2. WASTE PRODUCER AND HOLDER

Two key roles are distinguised in waste management.

2.1. WASTE PRODUCER

The property owner is considered responsible, as they are the one who ultimately decides to undertake construction or demolition.

This owner must include in the construction project a waste management study for the construction and demolition waste to be generated. This study must include, among other elements, an estimate of the expected waste quantities, the general preventive measures to be implemented, the final destination of the waste, and a cost assessment for its management, which must be incorporated into the project budget.
In the case of the project described herein, the waste producer is the Projects and Works Department of the Directorate-General for Public Works of the Government of Cantabria.

2.2. WASTE HOLDER

The holder is the party responsible for executing the works, who has direct control over the waste generated during construction.

This individual or entity is required to submit to the project owner a Construction and Demolition Waste Management Plan detailing how the waste management strategy outlined in the project will be implemented. Additionally, the holder must assume the costs associated with this management and provide the producer with documentation certifying the proper handling of the waste.
The holder is also responsible for the on-site separation of different waste fractions, such as concrete, bricks, tiles, ceramics, metals, wood, glass, plastic, paper, and cardboard, among others.
For the works covered by this project, the construction company awarded the contract will act as the waste holder.

3. IDENTIFICACIÓN DE RESIDUOS

Waste identification is carried out in accordance with Lista Europea de Residuos stablished by Decisión 2014/955/UE de la Comisión Europea, tal como se recoge en la Ley 7/2022, de 8 de abril, on waste and contaminated soils for a circular economy.
As a result of the execution of the works, construction and demolition waste will be generated, which is detailed in the following table:

Code	Waste	Description
17 05 04	Soil	Surplus excavated soils or soils unsuitable for embankment formation due to their characteristics.
17 01 01	Concrete	Excess concrete remaining in the ready-mix truck from the batching plant.
17 02 01	Wood	Waste from pallets, non-reusable formwork, or other sources.
17 02 03	Plastics	Waste from pallet wrappings or other packaging materials.
17 03 02	Bituminous Mixture	Excess bituminous mixture in the truck from the plant or from the paver.
17 04	Metals	Removal of vertical signs or other metallic elements, excess reinforcement steel, or similar materials..

Table 6.3.1 Waste generated during the execution of the works.

4. WASTE ESTIMATION

The volume of waste in cubic meters (m³) is estimated as 10% of the project area in square meters (m²). Assuming an average density of 1.5 t/m³, the mass of generated waste is also derived. Thus, for an area of 27,176.65 m², the estimated waste volume is 2,717.67 m³, equivalent to 4,076.50 tonnes of waste.

Soil waste is considered the surplus from excavation works that is not used for embankment compensation and will therefore be sent to landfill.

The remaining identified waste on site is estimated according to percentages of the total waste weight:

	%	Tn	d	V
Theoretical Weight Assessment by Type of Construction and Demolition Waste (CDW)	% in weight (CC.AA Madrid)	Tonnes of each type of CDW	Density type (between 1,5 and 0,5)	m³ Volume of Waste
CDW: Non-stony nature				
1. Asphalt	0,050	203,82	1,30	156,79
2. Wood	0,040	163,06	0,60	271,77
3. Metals	0,030	122,29	1,50	81,53
4. Paper	0,003	12,23	0,90	13,59
5. Plastic	0,015	61,15	0,90	67,94
6. Glass	0,000	0,00	1,50	0,00
7. Gypsum	0,000	0,00	1,20	0,00
TOTAL estimation	0,138	**562,56**		**591,61**
RCD: Stony nature				
1. Sand, Gravel, and other Aggregates	0,040	163,06	1,50	108,71
2. Concrete	0,120	489,18	1,50	326,12
3. Bricks, Tiles, and other Ceramics	0,075	305,74	1,50	203,82
4. Stone	0,050	203,82	1,50	135,88
TOTAL estimation	0,285	**1.161,80**		**774,53**

Table 6.3.2. Waste estimation based on percentages of the total waste weight..

4.1. WASTE MANAGEMENT COST

Using the unit costs for each type of waste, the total waste management cost is calculated, as shown in the following table.

A.- ESTIMATION OF CONSTRUCTION AND DEMOLITION WASTE (CDW) TREATMENT COST (calculation without deposit)				
Type of CDW	Estimation(m³)	Management price at Plant / Landfill / Quarry / Operator (€/m³)	Amount (€)	Percentage of the Construction Budget
A1 CDW Level I				
Excavated soils and rock materials	1913,62	3,70	7.080,39	0,3372%
Orden 2690/2006 CAM stablishes limits between 40 - 60.000 €				**0,3372%**
A2 CDW Level II				
CDW of Stony Nature	774,53	10,00	7.745,35	0,3688%
CDW of Non-Stony Nature	591,61	10,00	5.916,15	0,2817%
Potentially Hazardous CDW	643,18	10,00	6.431,81	0,3063%
Orden 2690/2006 CAM stablishes a minimmum limit of 0,2% of the construction budget				**0,9568%**

B.- OTHER MANAGEMENT COSTS		
B1.- % of Budget to Cover CDW Level I	5,29	0,0003%
B2.- % of Budget to Cover CDW Level II	0,00	0,0000%
B3.- % of Construction Budget for management costs, rentals, etc.	2.100,00	0,1000%

TOTAL BUDGET FOR CDW MANAGEMENT PLAN	**29.278,49**	**1,3942%**

Table 6.3.3. Budget for Waste Management

The total waste management cost amounts to €29,278.49. This amount will be added to the overall budget as a separate chapter.

5. WASTE PREVENTION MEASURES ON SITE

Different measures will be implemented aimed at minimizing waste generation during the execution of the works. These actions will be mandatory and integrated into the Waste Management Plan, which must be prepared prior to the commencement of the works. The measures will include both general criteria and specific actions depending on the type of waste.

5.1. GENERAL MEASURES

- Efforts will be made to minimize the use of raw materials, not only to reduce project costs but also to decrease the amount of waste generated during execution.
- Materials will be stored outside traffic areas on site, kept packaged and protected until use, to prevent waste caused by damage or breakage.
- An area will be designated for storing surplus materials that can be reused, promoting their recovery instead of disposal.

5.2. SPECIFIC MEASURES

5.2.1. EXCAVATED SOILS

- Whenever possible, excavated soils will be reused as fill material.
- The topsoil layer will be reserved for later use (see Annex 16 – Environmental Integration).
- The use of inert materials and waste from construction and demolition activities will be promoted for restoring degraded areas, site conditioning, or fills.
- Specific areas will be designated for soil storage and machinery movement to prevent excessive soil compaction.

5.2.2. CONCRETE

- The arrival of concrete trucks will be efficiently coordinated to prevent the onset of setting, which would otherwise require returning the concrete to the plant and increase waste generation.
- Whenever possible, fresh concrete leftovers will be reused.

5.2.3. WOOD

- Wood cuts will be made with the necessary precision to maximize their use, ensuring they always meet the required specifications.
- Waste will be stored separately to later be recycled, reused, or disposed of in authorized landfills.

5.2.4. PLASTIC

- Efforts will be made to avoid the use of unnecessary packaging.
- Priority will be given to suppliers who package their products aiming to minimize waste generation.
- Preference will also be given to suppliers who use packaging made from recycled, recyclable, or biodegradable materials.

5.2.5. BITUMINOUS MIXTURE

- The arrival of bituminous mix trucks will be efficiently organized, covering the mix with tarpaulins to prevent cooling or contamination, thus avoiding returns to the plant and waste generation.
- Efforts will be made to avoid excess by placing orders strictly according to actual needs.

5.2.6. SCRAP METAL AND REINFORCEMENT STEEL

- Materials will be stored protected from weather conditions to prevent deterioration due to corrosion.
- Efforts will be made to reuse leftover materials and promote recycling of those that can be valorized.

6. RECYCLING PLANTS IN CANTABRIA

The following table, extracted from the 2017–2023 Waste Plan of the Autonomous Community of Cantabria, lists the authorized construction and demolition waste recycling plants in Cantabria:

	GESTOR	CAPACIDAD	OPERACIÓN
Planta de reciclado de RCD	SADISA, S.L.	80.000 t/año	Valorización
Planta de reciclado de RCD	VALORIA RESIDUOS, S.L.	362.800 t/año	Valorización
Planta de reciclado de RCD	RECICLAJES CAMARGO, S.L.	90.000 t/año	Valorización
Planta de reciclado de RCD	**EXCAVACIONES JOSMAN, S.L.**	**3.600 t/año**	**Valorización**

Table 6.3.4. Authorized recycling plants in Cantabria

Additionally, the following map shows the landfills in the region. Since 2012, the El Mazo landfill ceased operations and the non-hazardous waste landfill in Castañeda (IACAN) was opened to replace it. This landfill accepts non-hazardous waste.

Map 6.3.1. Landfills in Cantabria

EXECUTION PLAN 4 – CONSTRUCTION SCHEDULE

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2. SCHEDULE CALCULATION 2

2.1. PrECESSION AND SUCCESION RELATIONSHIPS 2

3. CONSTRUCTION SCHEDULE 3

3.1. GANTT DIAGRAM 3

1. INTRODUCTION

This annex sets out the planning of the activities planned during the execution of the work, as well as their scheduling. To do this, the time needed for each activity is first estimated, considering the yields associated with each work unit. With these durations, the Gantt chart is made. Finally, the material execution budget is presented, distributed by months.

2. SCHEDULE CALCULATION

To determine the execution period of the different work units, the following expression is used, which allows the number of hours required to complete each unit to be calculated. This estimate considers both performance constraints – whether mechanical equipment or personnel – and the overall efficiency of the work.

$$needed\ hours = \frac{limiting\ productivity \cdot measurement}{construction\ efficiency}$$

Work efficiency accounts for the actual working time of an operator or a machine over the scheduled time. The Gantt chart shown considers the performances of the machinery that appear in the Presto, any change in efficiency can be adjusted from the definition of the performance of the different work units in the Microsoft Project file

Once the hours necessary for the execution of the entire unit of work have been obtained, the required days are obtained by dividing between the working day (8 h/day) and its equivalence in months considering 22 working days per month.

It is considered that certain work units can overlap and develop simultaneously with several teams of labor and machinery working at the same time. In these cases, the longest of the execution times of the overlapping work units will be taken.

2.1. PRECESSION AND SUCCESION RELATIONSHIPS

Four types of pre-recession and succession relationships are considered between the different activities:

- FS: Finish - start. The successor will begin when the predecessor ends.
- FF: Finish-finish. The successor will end when the predecessor ends.
- SS: Start-Start. Both activities will begin at the same time.
- SF: Start-Finish. The successor activity will end when the predecessor activity begins.

In any activity, you can add lags of a certain number of days.

3. CONSTRUCTION SCHEDULE

In total, the estimated execution time of the work is **10.32 months** (227 working days). Considering that the execution of the work begins on September 1, 2025, the work would end on July 15, 2026. The following table shows a summary of the work plan:

Task Name	Duration	Start	Finish
CA-811	**227 days**	**01/09/2025**	**15/07/2026**
START DATE	1 day	01/09/2025	02/09/2025
EARTHWORKS	**93 days**	**02/09/2025**	**09/01/2026**
DRAINAGE	**45 days**	**04/09/2025**	**06/11/2025**
FIRM	**111 days**	**13/11/2025**	**17/04/2026**
SIGNAGE	**30 days**	**17/04/2026**	**29/05/2026**
PLANTATIONS	**33 days**	**29/05/2026**	**15/07/2026**
WASTE MANAGEMENT	227 days	01/09/2025	15/07/2026
HEALTH AND SAFETY	227 days	01/09/2025	15/07/2026

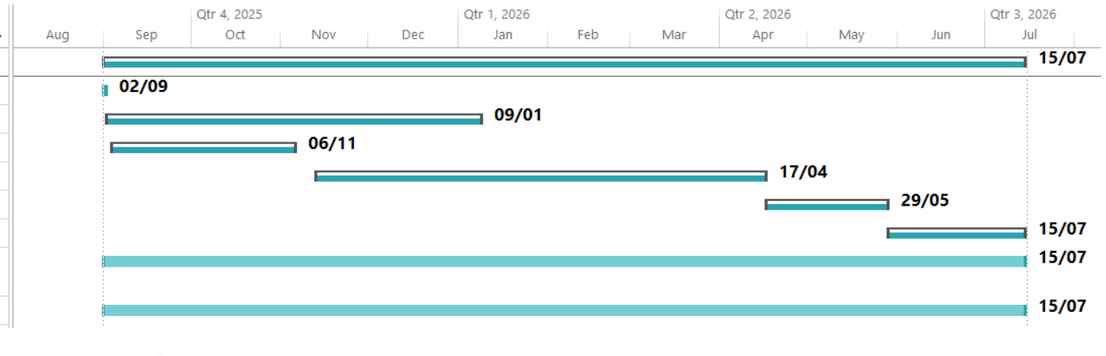
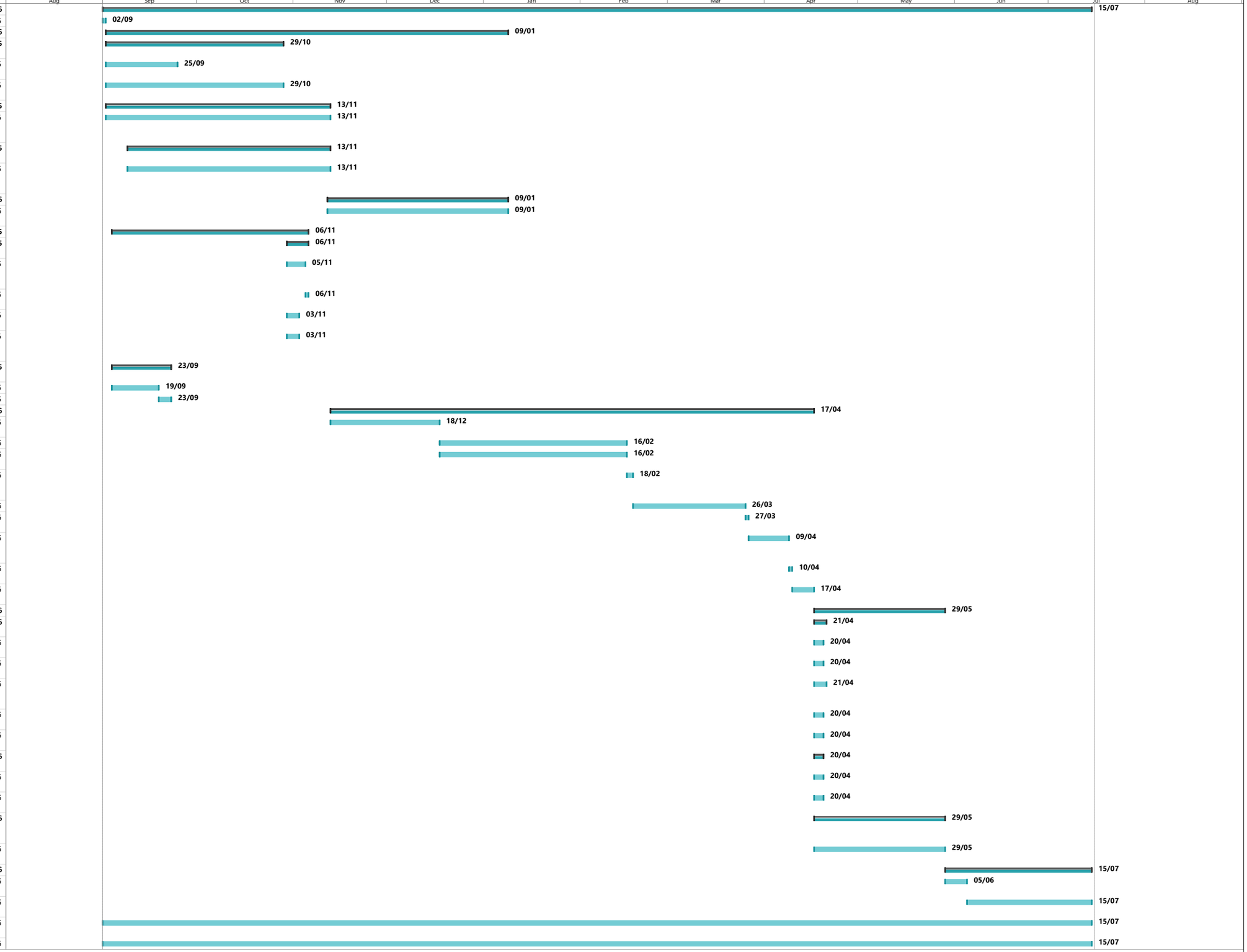


Figure 6.4.1. Construction Schedule.

3.1. GANTT DIAGRAM

The complete Gantt diagram corresponding to the work plan is also attached.

ID	Task Mode	Task Name	Duration	Start	Finish
1		**CA-811**	**227 days**	**01/09/2025**	**15/07/2026**
2		START DATE	1 day	01/09/2025	02/09/2025
3		**EARTHWORKS**	**93 days**	**02/09/2025**	**09/01/2026**
4		**PRELIMINARY WORK**	**41 days**	**02/09/2025**	**29/10/2025**
5		MEDIUM TREE FELLING	17 days	02/09/2025	25/09/2025
6		LAND CLEANING	41 days	02/09/2025	29/10/2025
7		**EXCAVATIONS**	**52 days**	**02/09/2025**	**13/11/2025**
8		EXCAV/TTE, T. VEGET. M/MECHANIC	52 days	02/09/2025	13/11/2025
9		**BACKFILLS AND EMBANKMENTS**	**47 days**	**09/09/2025**	**13/11/2025**
10		EMBANKMEN FROM EXCAVATION	47 days	09/09/2025	13/11/2025
11		**TERMINATION**	**42 days**	**12/11/2025**	**09/01/2026**
12		SLOPE FINISHING	42 days	12/11/2025	09/01/2026
13		**DRAINAGE**	**45 days**	**04/09/2025**	**06/11/2025**
14		**TRANSVERSE DRAINAGE**	**5 days**	**30/10/2025**	**06/11/2025**
15		TUBE D=180CM H.V.REC.	4 days	30/10/2025	05/11/2025
16		NOZZLE FINS O.F. 180 CM	1 day	05/11/2025	06/11/2025
17		MANHOLE 2.50>H>4.00	2 days	30/10/2025	03/11/2025
18		A. GANTRY/BOW REBATE	2 days	30/10/2025	03/11/2025
19		**LONGITUDINAL DRAINAGE**	**13 days**	**04/09/2025**	**23/09/2025**
20		GUTTER VA-7!	11 days	04/09/2025	19/09/2025
21		Gutter linning	2 days	19/09/2025	23/09/2025
22		**FIRM**	**111 days**	**13/11/2025**	**17/04/2026**
23		SUITABLE SOIL EMBANKMENT	25 days	13/11/2025	18/12/2025
24		CEMENT FLOOR	42 days	18/12/2025	16/02/2026
25		CEMENT FOR STABILIZATION	42 days	18/12/2025	16/02/2026
26		ECR-0 EMULSION CURED AND	2 days	16/02/2026	18/02/2026
27		ARTIFICIAL SAVE	26 days	18/02/2026	26/03/2026
28		C60BF4 IMP EMULSION	1 day	26/03/2026	27/03/2026
29		MBC AC 22 BIN 50/70 S LIMESTONE	9 days	27/03/2026	09/04/2026
30		C60B3 ADH EMULSION	1 day	09/04/2026	10/04/2026
31		ASPHALT BITUMEN 50/70	5 days	10/04/2026	17/04/2026
32		**SIGNAGE**	**30 days**	**17/04/2026**	**29/05/2026**
33		**VERTICAL SIGNAGE**	**2 days**	**17/04/2026**	**21/04/2026**
34		CIRCULAR SIGN 90	1 day	17/04/2026	20/04/2026
35		RA2 REFLECTIVE	1 day	17/04/2026	20/04/2026
36		GALVANIZED STEEL SHEET SIGN	2 days	17/04/2026	21/04/2026
37		TRIANGULAR SIGN 135	1 day	17/04/2026	20/04/2026
38		OCTOGONAL SIGN 90	1 day	17/04/2026	20/04/2026
39		**HORIZONTAL SIGNAGE**	**1 day**	**17/04/2026**	**20/04/2026**
40		ROAD MARK 10 CM	1 day	17/04/2026	20/04/2026
41		REALLY PAINTED	1 day	17/04/2026	20/04/2026
42		**VEHICLE CONTAINMENT SYSTEMS**	**30 days**	**17/04/2026**	**29/05/2026**
43		DOUBLE WAVE	30 days	17/04/2026	29/05/2026
44		**PLANTATIONS**	**33 days**	**29/05/2026**	**15/07/2026**
45		SPREADING TOPSOIL	5 days	29/05/2026	05/06/2026
46		HYDROSEEFING ON SLOPES	28 days	05/06/2026	15/07/2026
47		WASTE MANAGEMENT	227 days	01/09/2025	15/07/2026
48		HEALTH AND SAFE	227 days	01/09/2025	15/07/2026



Project: CA 811
Date: July 2025

Task | Milestone | Project Summary | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | External Tasks | Deadline | Manual Progress
Split | Summary | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | External Milestone | Progress

ID	Task Mode	Task Name	Cost	Details	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August
1		**CA-811**	**2.281.390,22 EUR**	Work																								
				Cost	813.321,42 ...	133.359,92 E...	88.008,06 EUR	68.454,19 EUR	47.618,97 EUR	964.177,95 ...	96.374,27 EUR	46.056,23 EUR	24.019,25 EUR															
2		START DATE	0,00 EUR	Work																								
				Cost																								
3		**EARTHWORKS**	**149.660,57 EUR**	Work																								
				Cost	52.971,00 EUR	58.760,31 EUR	23.211,27 EUR	11.622,79 EUR	3.095,20 EUR																			
4		**PRELIMINARY WORK**	**28.021,36 EUR**	Work																								
				Cost	16.549,15 EUR	11.472,21 EUR																						
5		MEDIUM TREE FEL	4.649,40 EUR	Work																								
				Cost	4.649,40 EUR																							
6		LAND CLEANING A	23.371,96 EUR	Work																								
				Cost	11.899,75 EUR	11.472,21 EUR																						
7		**EXCAVATIONS**	**39.340,79 EUR**	Work																								
				Cost	15.793,06 EUR	17.400,73 EUR	6.147,00 EUR																					
8		EXCAV/TTE, T. VEC	39.340,79 EUR	Work																								
				Cost	15.793,06 EUR	17.400,73 EUR	6.147,00 EUR																					
9		**BACKFILLS AND EMBANKMENTS**	**61.074,20 EUR**	Work																								
				Cost	20.628,79 EUR	29.887,37 EUR	10.558,04 EUR																					
10		EMBANKMENT FR	61.074,20 EUR	Work																								
				Cost	20.628,79 EUR	29.887,37 EUR	10.558,04 EUR																					
11		**TERMINATION**	**21.224,22 EUR**	Work																								
				Cost			6.506,23 EUR	11.622,79 EUR	3.095,20 EUR																			
12		SLOPE FINISHING A	21.224,22 EUR	Work																								
				Cost			6.506,23 EUR	11.622,79 EUR	3.095,20 EUR																			
13		**DRAINAGE**	**767.503,21 EUR**	Work																								
				Cost	738.804,85 ...	14.859,38 EUR	13.838,98 EUR																					
14		**TRANSVERSE DRAINAGE**	**28.698,36 EUR**	Work																								
				Cost		14.859,38 EUR	13.838,98 EUR																					
15		TUBE D=180CM H.	11.766,21 EUR	Work																								
				Cost		5.515,41 EUR	6.250,80 EUR																					
16		NOZZLE FINS O.F.	6.965,25 EUR	Work																								
				Cost			6.965,25 EUR																					
17		MANHOLE 2.50>H	2.392,64 EUR	Work																								
				Cost		2.243,10 EUR	149,54 EUR																					
18		A. GANTRY/BOW F	7.574,26 EUR	Work																								
				Cost		7.100,87 EUR	473,39 EUR																					
19		**LONGITUDINAL DRAINAGE**	**738.804,85 EUR**	Work																								
				Cost	738.804,85 ...																							
20		GUTTER VA-75	487.910,50 EUR	Work																								
				Cost	487.910,50 ...																							
21		Gutter linning.	250.894,35 EUR	Work																								
				Cost	250.894,35 ...																							
22		**FIRM**	**1.128.529,87 EUR**	Work																								
				Cost	13.032,22 EUR	50.789,05 EUR	43.174,17 EUR	47.880,22 EUR	35.961,77 EUR	937.692,44 ...																		
23		SUITABLE SOIL EMBA	55.456,27 EUR	Work																								
				Cost	13.032,22 EUR	42.424,05 EUR																						
24		CEMENT FLOOR	90.665,76 EUR	Work																								
				Cost		8.365,00 EUR	43.174,17 EUR	39.126,59 EUR																				
25		CEMENT FOR STABIL	0,00 EUR	Work																								
				Cost																								
26		ECR-0 EMULSION CU	4.054,08 EUR	Work																								
				Cost				4.054,08 EUR																				
27		ARTIFICIAL SAVE	42.500,27 EUR	Work																								
				Cost				4.699,55 EUR	35.961,77 EUR	1.838,95 EUR																		
28		C60BF4 IMP EMULSI	5.782,63 EUR	Work																								
				Cost						5.782,63 EUR																		
29		MBC AC 22 BIN 50/7	361.418,70 EUR	Work																								
				Cost						361.418,70 ...																		
30		C60B3 ADH EMULSIC	2.770,16 EUR	Work																								
				Cost						2.770,16 EUR																		
31		ASPHALT BITUMEN 5	565.882,00 EUR	Work																								
				Cost						565.882,00 ...																		
32		**SIGNAGE**	**126.970,40 EUR**	Work																								
				Cost						18.701,87 E...	87.812,27 EUR	20.456,27 EUR																	
33		**VERTICAL SIGNAGE**	**4.505,22 EUR**	Work																								
				Cost						4.505,22 EUR																		
34		CIRCULAR SIGN 90	1.663,20 EUR	Work																								
				Cost						1.663,20 EUR																		
35		RA2 REFLECTIVE S	1.197,67 EUR	Work																								
				Cost						1.197,67 EUR																		
36		GALVANIZED STEE	1.207,90 EUR	Work																								
				Cost						1.207,90 EUR																		
37		TRIANGULAR SIGN	214,90 EUR	Work																								
				Cost						214,90 EUR																		
38		OCTOGONAL SIGN	221,55 EUR	Work																								
				Cost						221,55 EUR																		
39		**HORIZONTAL SIGNA**	**2.721,18 EUR**	Work																								
				Cost						2.721,18 EUR																		
40		ROAD MARK 10 CM	2.361,60 EUR	Work																								
				Cost						2.361,60 EUR																		
41		REALLY PAINTED SURFACE	359,58 EUR	Work																								
				Cost						359,58 EUR																		
42		**VEHICLE CONTAINMENT SYSTEMS**	**119.744,00 EUR**	Work																								
				Cost						11.475,47 E...	87.812,27 EUR	20.456,27 EUR																	
43		DOUBLE WAVE SAFETY BARRIER	119.744,00 EUR	Work																								
				Cost						11.475,47 E...	87.812,27 EUR	20.456,27 EUR																	
44		**PLANTATIONS**	**34.781,65 EUR**	Work																								
				Cost									17.037,96 EUR	17.743,69 EUR														
45		SPREADING TOPSOIL	3.970,91 EUR	Work																								
				Cost									3.970,91 EUR															
46		HYDROSEEFING ON SLOPES	30.810,74 EUR	Work																								
				Cost									13.067,05 EUR	17.743,69 EUR														
47		WASTE MANAGEMENT	29.278,49 EUR	Work																								
				Cost	3.370,88 EUR	3.544,24 EUR	3.081,95 EUR	3.544,24 EUR	3.390,14 EUR	3.081,95 EUR	3.390,14 EUR	3.390,14 EUR	2.484,82 EUR															
48		HEALTH AND SAFETY	44.666,03 EUR	Work																								
				Cost	5.142,47 EUR	5.406,94 EUR	4.701,69 EUR	5.406,94 EUR	5.171,86 EUR	4.701,69 EUR	5.171,86 EUR	5.171,86 EUR	3.790,74 EUR															

APPENDICES

APPENDICES 1 - ACCESIBILITY

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1. INTRODUCTION

An accessible environment is one that has been designed to be used safely and efficiently by the widest possible range of people, regardless of whether they have a disability. This approach involves broadening the traditional concept of "standard" design to include criteria that accommodate the diversity of users who interact with or live in that environment.

The United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities, adopted by the General Assembly in its 48th session through Resolution 48/96 of December 20, 1993, address this principle in Section II, which is dedicated to key areas for ensuring equal participation.

Article 5. Accessibility

States should recognize the overall importance of accessibility as part of the process of achieving equal opportunities in all areas of society. For people with disabilities of all kinds, States should:

a) establish action programs to make the physical environment accessible, and

b) adopt measures to ensure access to information and communication.

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a) Access to the Physical Environment

1. States should take measures to eliminate obstacles to participation in the physical environment. These measures may include the development of standards and guidelines, as well as consideration of enacting legislation to ensure access to various environments in society—such as housing, buildings, public transport services and other modes of transportation, streets, and open public spaces.
2. States should ensure that architects, construction professionals, and other stakeholders involved in the design and construction of the built environment have access to appropriate information on disability policy and the measures required to ensure accessibility.
3. Accessibility measures must be integrated from the outset into the planning, design, and construction of the physical environment.
4. Organizations of persons with disabilities must be consulted when standards and regulations to ensure accessibility are being developed. These organizations should also be involved at the local level, from the initial planning stages of public infrastructure projects, to maximize the potential for accessible outcomes.

b) Access to Information and Communication

5. Persons with disabilities, and where appropriate their families and advocates, must have access—at all stages of life—to comprehensive information about diagnosis, rights, available services, and support programs. This information should be presented in a format accessible to persons with disabilities.
6. States should develop strategies to ensure that information and documentation services are accessible to various groups of persons with disabilities. In order to provide access to written information for persons with visual impairments, braille, audio recordings, large print, and other suitable technologies should be used. Similarly, appropriate technologies should be used to make oral information accessible to persons with hearing impairments or comprehension difficulties.
7. The use of sign language should be considered in the education of deaf children, as well as for their families and communities. Interpretation services in sign language should also be provided to facilitate communication between deaf individuals and others.
8. The needs of persons with other communication disabilities must also be taken into account.
9. States should encourage the media—especially television, radio, and newspapers—to make their content and services accessible.
10. States must ensure that new computerized information and data systems intended for public use are accessible to persons with disabilities from the outset, or are adapted to become accessible.
11. Organizations of persons with disabilities must be consulted when developing measures to provide access to information services for such individuals.

2. CHARACTERISTICS OF AN ACCESSIBLE

2.1. ACCESIBILITY IN SIGNING AND EXTERIOR BOARDS

2.1.1. GENERAL DESCRIPTION

Informational signs and panels located in outdoor environments are intended to provide information, guide, recommend, advise, or warn about specific aspects of the urban setting. This information may relate to the location of certain places, route orientation, risk prevention, identification of buildings, or points of tourist interest, among others. The objective is to ensure that any person—whether a resident or a visitor—can navigate and understand the urban environment clearly, safely, and accessibly.

However, when such information is not presented in multiple accessible formats, individuals with various functional limitations may experience difficulties accessing it independently. This could result in situations of disorientation or even potential risk.

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2.1.2. ELEMENTS THAT GUARANTEE ACCESIBILITY

Below are the various components that contribute to ensuring full accessibility of outdoor signage and informational panels::

- **Support Structure**: The support element must not pose an obstacle or risk. Therefore, it should not include protruding parts without a base on the ground, and its design must avoid sharp corners or edges..
- **Location**:
    - Vertical signs: Preferably implemented as plaques or flag signs, with a minimum clear height of 2.20 meters from the bottom edge to allow pedestrian passage. On narrow sidewalks, they should be wall-mounted; on sidewalks wider than 1.50 meters, they should be installed near the kerb.
    - Informational panels: Must not obstruct pedestrian flow. Their placement should allow them to be easily visible and legible from an appropriate distance. On wide sidewalks, they may have one or more readable sides, provided a minimum clear width of 1.50 meters is maintained on each side. On narrower sidewalks, only one side may be used. In all cases, sufficient clearance must be ensured for pedestrian circulation.

The information displayed should be legible from a distance of up to 5 meters. As a general rule, these elements should be installed at a height between 1.45 and 1.75 meters, with an optimal center height of 1.60 meters, including those containing tactile information. It is also recommended to include secondary tactile signage between 95 and 125 cm in height—ideally at 1.10 meters—particularly in areas with high child presence.

Along pedestrian routes, directional signs should be placed at the beginning, end, and at all direction changes. If the route is long, signage must be reinforced with intermediate directional signs or orientation maps. The language and terminology used in all signs must be clear, simple, and consistent throughout the route.

- **Panels**: Should have a clearly defined border, and the information must be clear and easy to read. Readable typefaces such as Verdana, Arial, Helvetica, or Universal are recommended, with proper spacing between letters and simple, uniform strokes.

• **Colour Contrast**: High-contrast colour combinations should be used. Text must clearly stand out against the background of the panel, and the panel itself should contrast with its surrounding environment:

- If the background is dark (e.g., dark brick, stone, or vegetation), use a panel with a white background and dark letters (black, blue, or green).
- If the background is light (e.g., light brick or white wall), use a dark panel (black, blue, etc.) with white or yellow text.

To reduce glare, off-white tones are preferable to pure white, and excessive colour usage should be avoided.

• **Materials**: Glossy or reflective surfaces should be avoided. If glass is used, it must be frosted or matte to prevent glare.

• **Sensory Modalities**: Information should be presented using visual, auditory, and/or tactile formats to ensure accessibility for individuals with various sensory abilities.

• **Maps and Layout Plans**: These should be available in at least visual and tactile formats. The tactile version may use different textures to distinguish between types of information.

•Electronic Information Points:

In public spaces, electronic information devices may be installed and must be designed to be accessible to all users. Their height and configuration should allow frontal approach by wheelchair users. Materials used must be durable and resistant to weather conditions and other external factors, and their design should facilitate adequate and regular maintenance.

• Environmental Conditions:
It is essential to ensure adequate lighting during both daytime and nighttime hours. Situations causing glare or reflections from natural or artificial light must be avoided. This can be achieved through protective elements such as canopies, or by placing the devices in locations where sunlight does not obstruct screen visibility or cause heat-related risks on touch surfaces. In the case of artificial lighting, it should be installed externally to the device or panel.

• Other Considerations:
It is important that any intervention or modification in urban space does not pose a risk to persons with disabilities, especially those with visual impairments.

Accessible spaces such as parking areas, buildings, outdoor elevators, and other facilities must be properly identified using the International Symbol of Accessibility (ISA) or, where appropriate, with specific icons for other types of disabilities or functional limitations.

3. ACCESIBILITY IN PAVEMENTS

3.1. GENERAL DESCRIPTION

Pavement is one of the key components in pedestrian routes due to the multiple functions it performs, including:

- Serving as a base and connection with the ground.
- Providing an aesthetic finish to the environment.
- Acting as a continuous medium for orientation and information.

One of the most relevant functions of pavement, from an informational and wayfinding perspective, is its ability to convey clear and effective messages through its texture, color, and the sound produced when walked on. This is especially useful for people with visual impairments and for those with reduced mobility.

The appropriate selection of pavement type is crucial to promote personal autonomy for these groups. Moreover, the condition of the pavement can have a direct impact on fall prevention, particularly among older adults.

3.2. REQUIREMENTS FOR ACCESIBLE PAVEMENTS

Accessible pavements must meet a series of fundamental requirements, including durability, slip resistance under both dry and wet conditions, and the absence of irregularities unrelated to the design of the paving elements themselves. In general terms, an accessible pavement should be:

- **Stable**, as is the case with materials such as hydraulic tiles or natural stone, avoiding loose surfaces like soil, gravel, or sand. In parks and gardens, compacted soil paths are acceptable, provided they are well stabilized.
- **Slip-resistant** under all conditions. On-site testing is essential, simulating conditions that may promote slipping (e.g., dust accumulation or watering), to ensure the pavement remains non-slip even in these scenarios.
- **Free of irregularities** not inherent to the material, which implies correct installation and, above all, proper maintenance to guarantee good condition over time.

In urban environments, elements such as manhole covers, grates, or tree pits must be perfectly flush with the pavement surface. Joints should not exceed 10 mm in width and must have a strength comparable to the surrounding pavement. Additionally, raised features and tactile studs should not protrude more than 7 mm to prevent tripping hazards and ensure pedestrian safety.

3.3. SPECIAL PAVEMENTS

Special pavements are those that, through their color, texture, or sound, provide useful information to facilitate movement and improve safety for people with visual impairments. This information can be perceived both when walking and when using a white mobility cane. These pavements are mainly divided into two types: tactile and color-contrasted pavements.

- **Tactile Pavements**

  These serve to provide warnings and directional guidance. The tactile button pavements used conform to the specifications of UNE 127029 “Prefabricated tactile concrete tiles, rough structures formed by raised studs in bands perpendicular to the direction of travel.”

  Grooved tactile tiles are also used to mark changes in level and direction, installed continuously. This latter technique is employed to alert users to potential hazards.

  The correct use of tactile pavements is a great aid for people with visual impairments. However, excessive or improper use can have the opposite effect, causing confusion and leading users to make unsafe decisions.

There is a subtype known as audible tactile pavements, which are detectable strips through the sound of the cane, mainly used to guide visually impaired cane users, especially at pedestrian crossings.

- **Color-Contrasted Pavements**

  These pavements are used to warn of potential hazards or to differentiate areas within a route. Thanks to chromatic contrast, people with visual impairments can improve their visual orientation. Their use is limited to specific zones where this function is necessary and must always ensure a sufficient level of contrast with the surrounding environment to be effective.

4. ACCESIBILITY IN PUBLIC WORKS

4.1. GENERAL DESCRIPTION

In any city, regardless of its size, it is common for public works to be carried out in public spaces. These works may involve sidewalk maintenance, trench excavation for pipe repair or installation, cable laying, facade rehabilitation, or the construction of new buildings and urban facilities. Such interventions directly affect the usual routes of both vehicles and pedestrians, altering the normal safety conditions expected for everyday use of the public space. Therefore, these works can pose a significant risk of accidents, especially for individuals with functional limitations—whether physical, sensory, or cognitive.

It is essential to promote greater awareness among construction companies and municipal authorities about the need to minimize, from the outset, the risks and inconveniences these works cause to the public. To achieve this, it is considered imperative to intervene in three key phases of the process, always taking into account the specific needs of people with disabilities.

4.2. MEASURES TO ENSURE FULL ACCESIBILITY

Next, we propose a series of criteria to be applied at each of these three key stages:

a) Construction site safety design

- Scaffolding: Scaffold supports must be installed flush against the building façade, ensuring sufficient free space on the sidewalk to allow pedestrian passage, with a minimum width of 90 cm. The scaffolding system must comply with safety standard HD-1000 and must not include elements with sharp edges or dangerous corners.
- Bracing diagonals: These must be clearly marked with easily detectable horizontal bars. Likewise, vertical supports should be marked so that anyone can easily locate them. Horizontal structures located in pedestrian areas must be installed at a minimum height of 2.20 m to avoid impact hazards.
- Work and storage zones: Whenever possible, these areas should be located on the roadway rather than occupying sidewalk space, so as not to interfere with pedestrian traffic.

b) Construction site signage

- Fencing: The perimeter of the construction area must be delimited by beacons firmly anchored to the ground, placed so they are difficult to move and leaving no gaps between them. All equipment, tools, and materials must remain within this fenced zone. For trenches, when not in use, steel plates must cover them to ensure safety. The use of ropes, cables, or similar elements as signaling means is not allowed.
- Obstacle perception: Beacons must include visual signaling through flashing lights. If fencing is properly arranged, no additional audible signaling is necessary. Protective and signaling elements must be detectable by visually impaired or blind individuals before reaching the hazard. Furthermore, adequate lighting in the work zone is essential to improve visibility and safety.

c) Alternative routes

- If the construction requires scaffolding installation that interferes with regular pedestrian routes, it is essential to establish alternative pathways that are obstacle-free, correctly signposted, with a minimum width of 1.50 meters and a clear height of at least 2.20 meters. These routes must also include effective protection measures against the possible falling of tools, debris, or materials.
- In cases where the detour requires leaving the sidewalk and walking on the roadway, the new path must be fully fenced on both sides. The side adjacent to the roadway should be equipped with luminous and acoustic beacons, as well as appropriate vertical signage, to ensure visibility for both pedestrians and drivers. It is recommended to level the roadway and sidewalk using a ramp or intermediate piece with an anti-slip surface, which also allows water drainage towards the drains. This element should be clearly distinguishable from its surroundings through differences in color and texture.
- When crossing trenches is necessary, pedestrian metal walkways at least 1.00 meter wide must be installed, equipped with side railings, protective toe boards, and an anti-slip surface to ensure safe passage.

d) Other precautions

- All leftover materials and waste generated by the construction must be continuously collected, ensuring that the pedestrian passage zone remains clean and free of obstacles at all times.

APPENDICES 2 – EXPROPRIATIONS AND COMPENSATIONS

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1. INTRODUCTIOn 2

2. EXPROPRIATIONS 2

3. EXPROPRIATION PLANS 2

1. INTRODUCTION

This annex defines the land plots that must be included in the expropriation file to be processed by the Government of Cantabria, with the purpose of securing the land required for the execution of the works.

The valuation of the affected assets will be carried out in accordance with Nota de Servicio 4/2010, de 7 de julio, regarding the study of expropriations in Road Alignment Projects of the Directorate-General for Roads, as well as the provisions Ley 5/1996, de 17 de diciembre, de Carreteras de Cantabria.

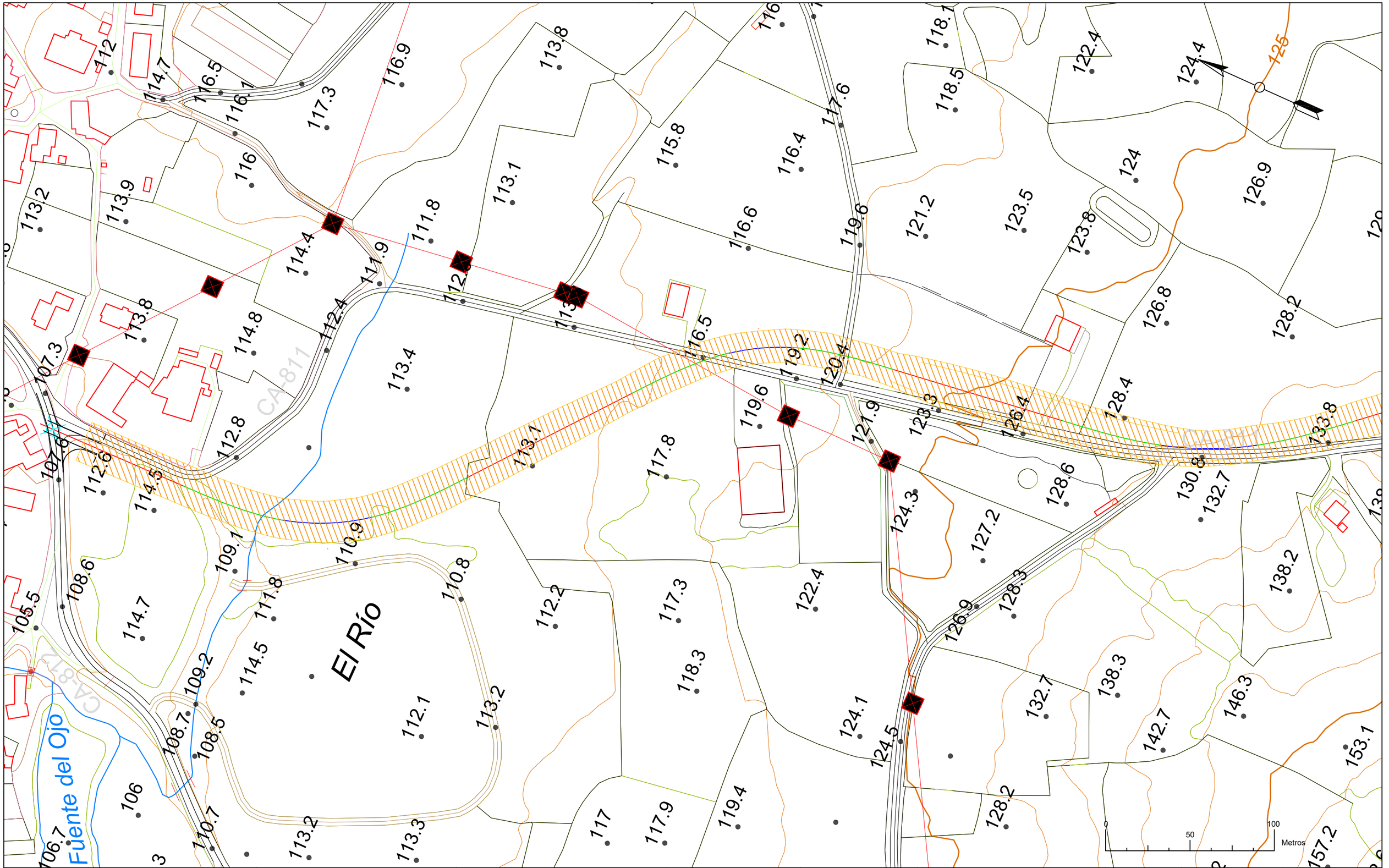
2. EXPROPRIATIONS

In accordance with Artículo 18 de la Ley 5/1996, de 17 de diciembre, de Carreteras de Cantabria, the expropriation boundary includes the land occupied by the road, its functional elements, as well as an additional strip of 3 meters on each side of the outer edge of the embankment, measured horizontally and perpendicular to it.

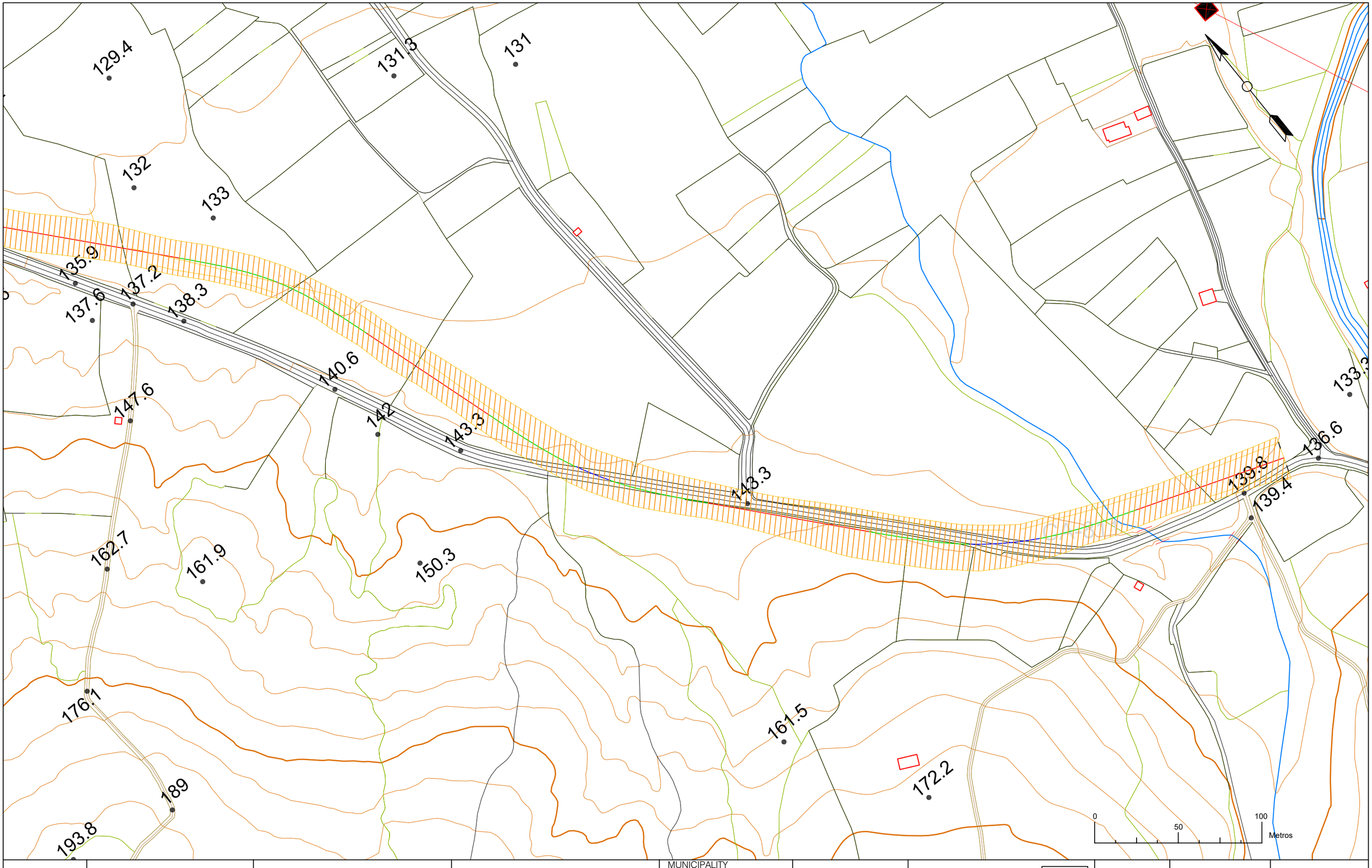
The entire route of the new bypass runs through land classified as rural, for which a unit cost of €4/m² has been estimated for the compensation arising from the expropriation procedure for the acquisition of such land.
The total area of rural land to be expropriated amounts to 37,059.684 m², resulting in an estimated total compensation cost of **148,238.776 €** for the affected parcels. This value will be incorporated into the Budget for Administrative Review.

3. EXPROPRIATION PLANS

Attached below are two 1:1000 scale drawings of the expropriated area within the project study zone.



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Expropriations	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET SHEET 1 OF 2



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Expropriations	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET SHEET 2 OF 2

APPENDICES 3 – AFFECTED SERVIECES

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1. INTRODUCTION 2

2. AFFECTED SERVICES..... 2

1. INTRODUCTION

This annex lists the various existing utilities within the project area and identifies any potential impacts they may experience, in order to assess the need for their relocation or replacement.

2. AFFECTED SERVICES

Although the exact extent of the impact on existing utilities cannot be determined, it is estimated that the execution of the works may affect telephone, water supply, and sewer networks. Additionally, it is known that an overhead telephone line at KP 0+420 and one or more low-voltage overhead power poles will be affected. This estimate is based on the location of the project, which passes through rural areas. Therefore, an approximate cost of **30,000 €** is considered for the relocation or replacement of the affected utilities.

APPENDICES 4 – CONTRACTOR CLASSIFICATION

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1. INTRODUCTION 2

2. CONTRACTOR CLASSIFICATION 2

3. CONCLUSION 2

1. INTRODUCTION

This annex establishes the classification of the contractor by group, subgroup, and category to be required in the project tender. The following regulations will apply:

- Ley 9/2017, de 8 de noviembre, de Contratos del Sector Público.
- Real Decreto 1098/2001, de 12 de octubre, por el que se aprueba el Reglamento general de la Ley de Contratos de las Administraciones Públicas.
- Real Decreto 773/2015, de 28 de agosto, por el que se modifican determinados preceptos del Reglamento General de la Ley de Contratos de las Administraciones Públicas, aprobado por el Real Decreto 1098/2001, de 12 de octubre.

According to Artículo 77 de la Ley 9/2017, contractor classification is mandatory for construction contracts with an estimated value equal to or greater than €500,000.

2. CONTRACTOR CLASSIFICATION

The average annual amount is calculated as the estimated contract value multiplied by 12 and divided by the execution period of the respective section in months.

$$Anuality = Estimated\ value\ of\ the\ contract \cdot \frac{12}{Construction\ period}$$

Estimated value of contract (€)	Construction (meses)	Mean Anuality (€)
2.719.835,16	10,32	3.162.599,02

Table 7.4.1. Classification.

According to Artículo 79 del Real Decreto 773/2015, which in its sole article amends, among others, Artículo 11 del Real Decreto 1098/2001, the classification will be defined based on a group, a subgroup, and a specific category determined from the previously calculated average annual amount.

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Category	Mean anuality (€)
1	≤ 150.000
2	150.000 – 360.000
3	360.000 – 840.000
4	840.000 – 2.400.000
5	2.400.000 – 5.000.000
6	> 5.000.000

Table 7.4.2. Categories.

Thus, this average annual amount corresponds to category 5

3. CONCLUSION

Therefore, the contractor is required to have the following classification once the contract is awarded:

Chapter	Group	Subgroup	Category
Obra	G – Viales y pistas	4 – Con firmes de mezcla bituminosa	5

Table 24.3. Contractor Classification

APPENDICES 5 – PRICE ADJUSTMENT FORMULA

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1. INTRODUctioN ..... **¡Error! Marcador no definido.**

2. PRICE ADJUSTMENT FORMULA 2

3. TERMS OF APPLICATION 2

4. CONCLUSION 2

1. INTRODUCTION

This annex describes the price adjustment and outlines its conditions of application. It is based on the following regulations:

- Ley 2/2015, de 30 de marzo, de desindexación de la economía española.
- Real Decreto 1359/2011, de 7 de octubre, por el que se aprueba la relación de materiales básicos y las fórmulas-tipo generales de revisión de precios de los contratos de obras y de contratos de suministro de fabricación de armamento y equipamiento de las Administraciones Públicas.
- Orden Circular 31/2012, de 12 de diciembre de 2012, sobre propuesta y fijación de fórmulas polinómicas de revisión de precios en los proyectos de obras de la Dirección General de Carreteras.

2. PRICE ADJUSTMENT FORMULA

El Real Decreto 1359/2011 establishes the following formula for construction projects involving road pavements with bituminous mixtures:

$$K_t = 0{,}01 * \frac{A_t}{A_0} + 0{,}05 * \frac{B_t}{B_0} + 0{,}09 * \frac{C_t}{C_0} + 0{,}11 * \frac{E_t}{E_0} + 0{,}01 * \frac{M_t}{M_0} + 0{,}01 * \frac{O_t}{O_0} + 0{,}02 * \frac{P_t}{P_0}$$

$$+0{,}01 * \frac{Q_t}{Q_0} + 0{,}12 * \frac{R_t}{R_0} + 0{,}17 * \frac{S_t}{S_0} + 0{,}01 * \frac{U_t}{U_0} + 0{,}39$$

Where:

- K_t Theoretical revision coefficient at execution time t.
- A_t Aluminum cost index at execution time t.
- A_0 Aluminum cost index at the bidding date.
- B_t Bituminous materials cost index at execution time t.
- B_0 Bituminous materials cost index at the bidding date.
- C_t Cement cost index at execution time t.
- C_0 Cement cost index at the bidding date.
- E_t Energy cost index at execution time t.
- E_0 Energy cost index at the bidding date.
- M_t Wood cost index at execution time t.
- M_0 Wood cost index at the bidding date.
- O_t Plants cost index at execution time t.
- O_0 Plants cost index at the bidding date.
- P_t Plastic products cost index at execution time t.
- P_0 Plastic products cost index at the bidding date
- Q_t Chemical products cost index at execution time t.
- Q_0 Chemical products cost index at the bidding date.
- R_t Aggregates and rocks cost index at execution time t.
- R_0 Aggregates and rocks cost index at the bidding date.
- S_t Steel materials cost index at execution time t.
- S_0 Steel materials cost index at the bidding date.
- U_t Copper cost index at execution time t.
- U_0 Copper cost index at the bidding date

Para llevar a cabo la revisión de precios, se determinará el producto del precio contratado inicialmente por el coeficiente K_t que proporciona la fórmula.

3. TERMS OF APPLICATION

In order to apply, Ley 2/2015 stablishes the following conditions:

- At least 20% of the contract amount must have been executed.
- At least 2 years must have elapsed since the contract formalization.

4. CONCLUSION

Given that the execution time of the works is less than 2 years, price adjustment will not apply unless the duration extends beyond 2 years due to reasons beyond the Contractor's control.

APPENDICES 6 – PHOTOGRAPHIC REPORT

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1. INTRODUCTION 2

2. PHOTOGRAPHIC REPORT 2

1. INTRODUCTION

A series of photographs of the project road's condition prior to construction works are included in the following appendix, in order to provide a better understanding of the project.

2. PHOTOGRAPHIC REPORT

Photo 1. Intersection of CA-812 with CA-811. P.K. 0+000 (in the forward direction).

Photo 2 – Intersection of CA-812 with CA-811..

Photo 3 – Intersection of CA-812 with CA-811.

Photo 4 – From P.K. 0+040 to 0+090 (in the forward direction).

Foto 5.- Del P.K. 0+080 al 0+100 (sentido directo).

Photo 6. – From P.K. 0+110 to 0+180 (forward direction).

Photo 7. – From P.K. 0+180 to 0+250 (forward direction).

Photo 8. – From P.K. 0+250 to 0+420 (forward direction).

Photo 9. – From P.K. 0+260 to 0+500 (forward direction).

Photo 10. – From P.K. 0+500 to 0+260 (reverse direction).

Photo 11. – From P.K. 0+640 to 0+700 (forward direction).

Photo 12. – P.K. 0+720. Intersection of CA-811 with local road.

Photo 13. – From P.K. 0+740 to 0+900 (forward direction).

Photo 14. – From P.K. 0+860 to 0+920 (forward direction).

Photo 15. – From P.K. 0+920 to 1+000 (forward direction).

Photo 16. – From P.K. 1+000 to 1+120 (forward direction).

Photo 17. – From P.K. 1+200 to 1+100 (reverse direction).

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Photo 18. – From P.K. 1+200 to 1+300 (forward direction).

Photo 19. – From P.K. 1+300 to 1+440 (forward direction).

Photo 20. – From P.K. 1+460 to 1+540 (forward direction).

Photo 21. – From P.K. 1+500 to 1+580 (forward direction).

).

Photo 22. – From P.K. 1+580 to 1+620 (forward direction).

APPENDICES - DRAWINGS

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Site Plan	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 1.1 SHEET 1 OF 1

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

Construction Project

TITLE

Geometric Realignment and Platform Widening of CA-811

MUNICIPALITY

Mazcuerras

REGION

Cantabria

DRAWING

Location

AUTHOR

Jorge Sáenz Fernández

SCALE

1:5000

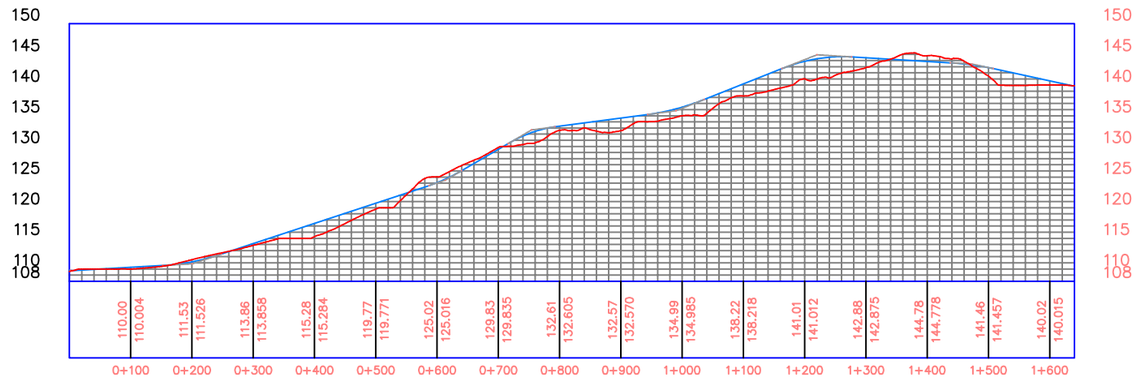
DATE

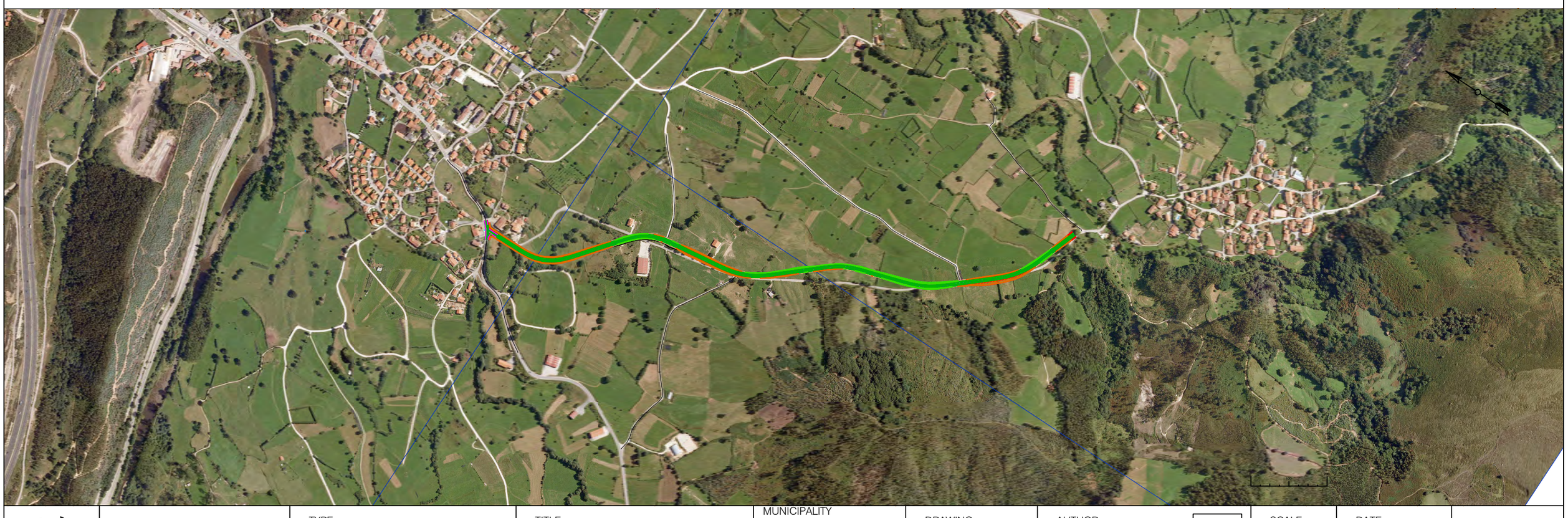
July 2025

SHEET 1.2

SHEET 1 OF 1

PERFIL: CA-811_ALINEACION





ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Profile and Plan	AUTHOR Jorge Sáenz Fernández	SCALE 1/5.000	DATE July 2025	SHEET 2.1 SHEET 1 OF 1

SHEET 1 OF 2

SHEET 2 OF 2

El Río

Arroyo de la Fuente del Ojo

CA-811

425

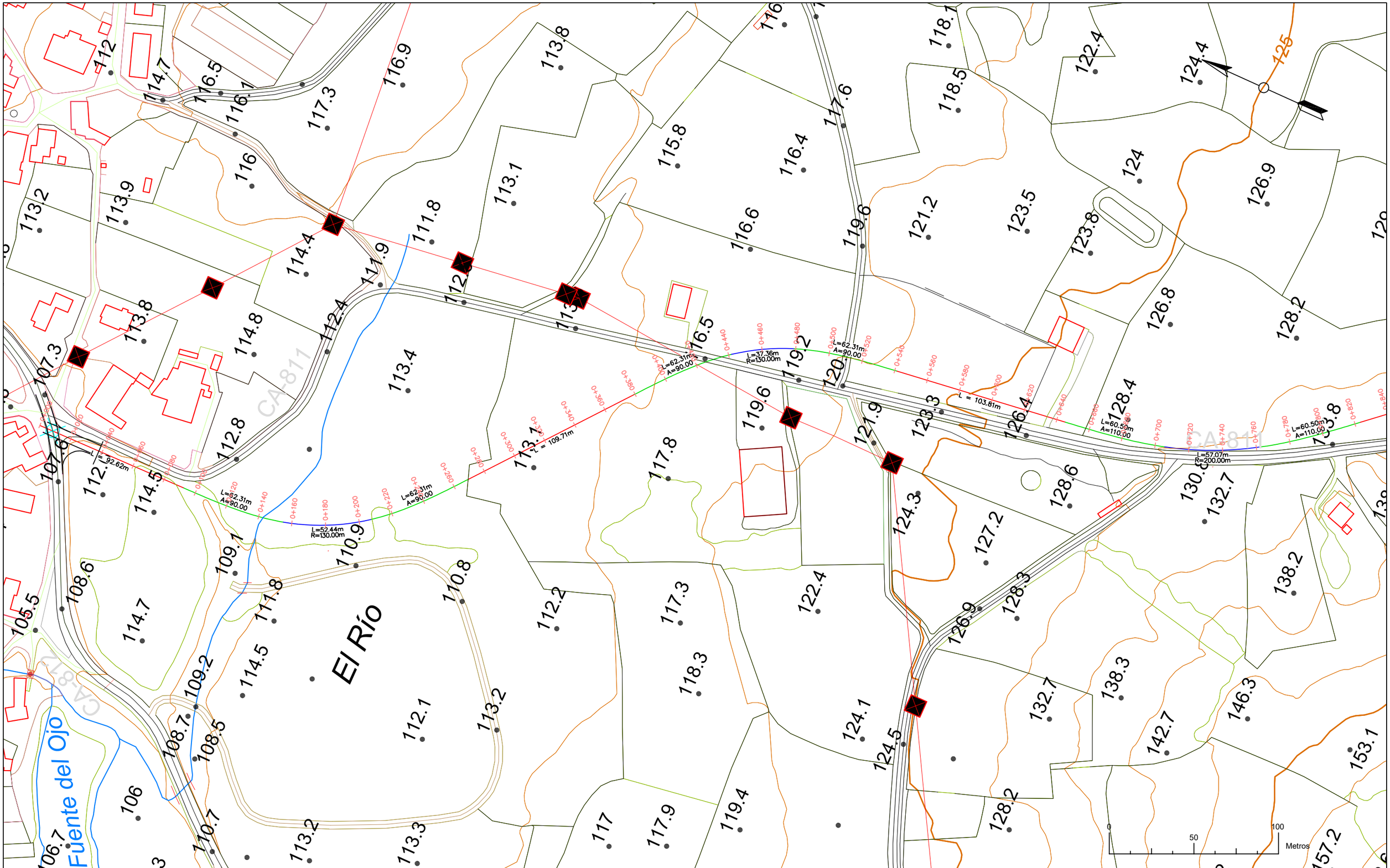
161.5

175

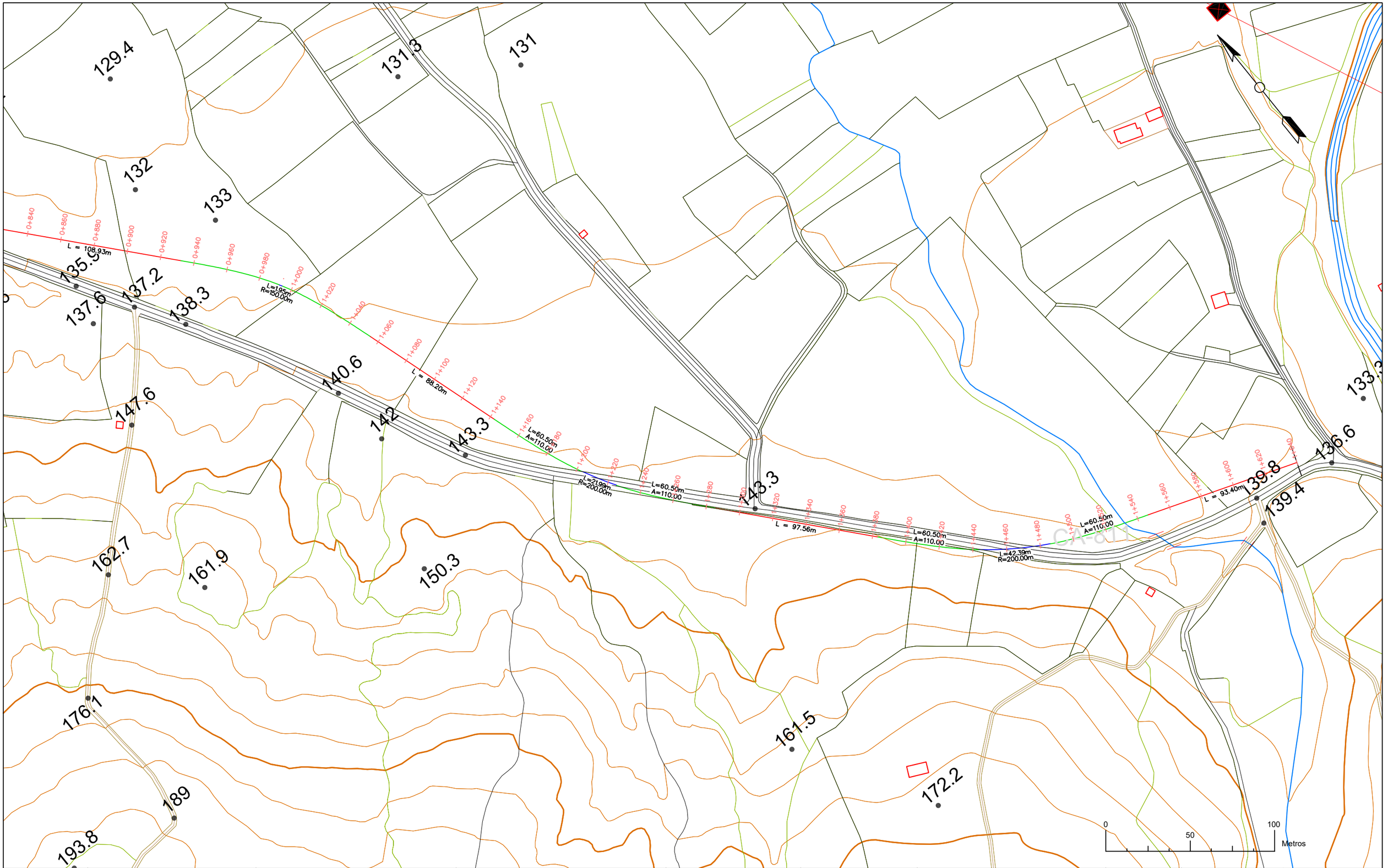
200

0 250 500 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Sheet Index	AUTHOR Jorge Sáenz Fernández	SCALE 1:2000	DATE July 2025	SHEET 2.2 SHEET 1 OF 1

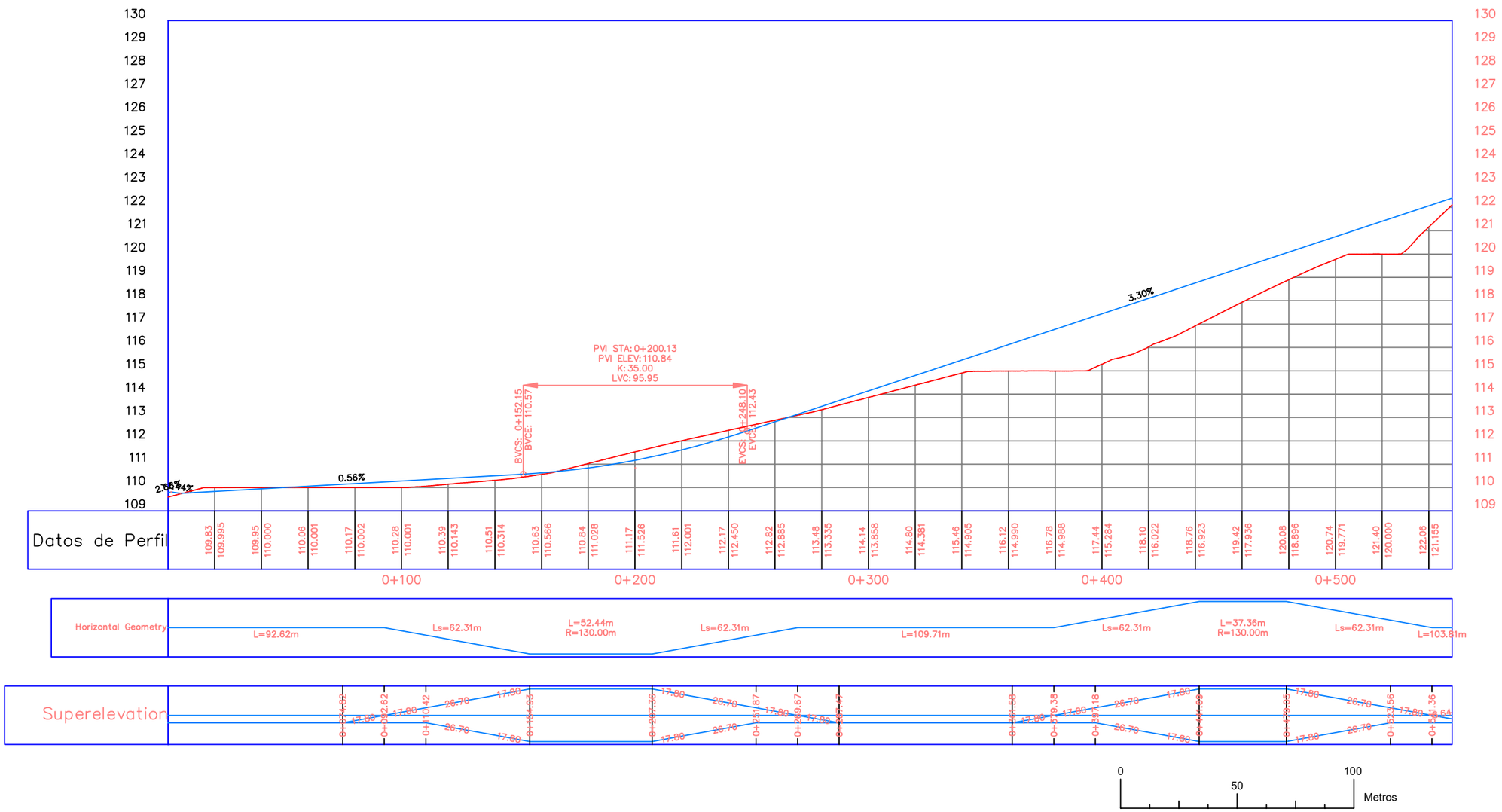


ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Stacking Out	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 3.1 SHEET 1 OF 2



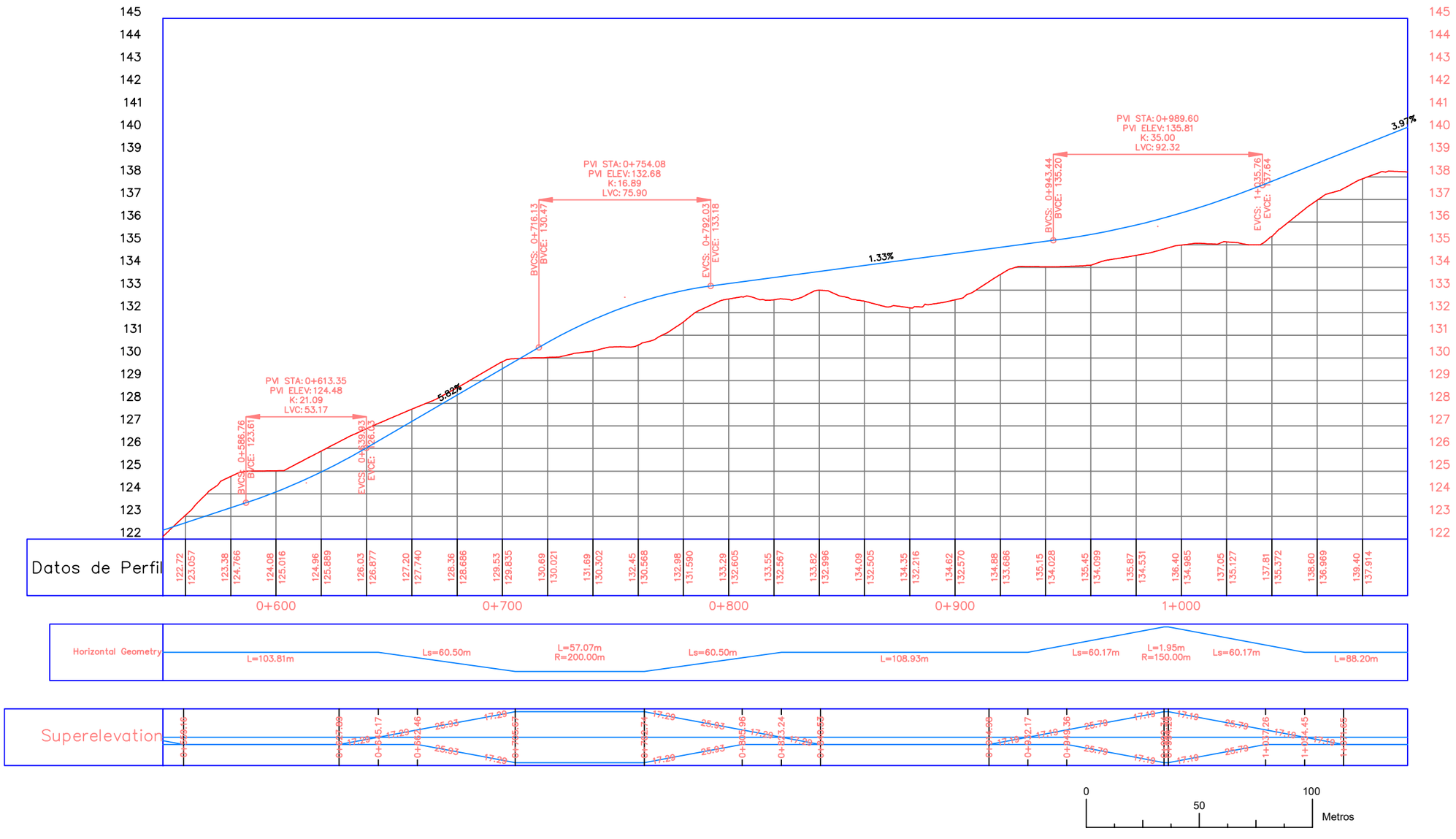
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Stacking Out	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 3.1 SHEET 2 OF 2

PERFIL: CA-811_ALINEACION



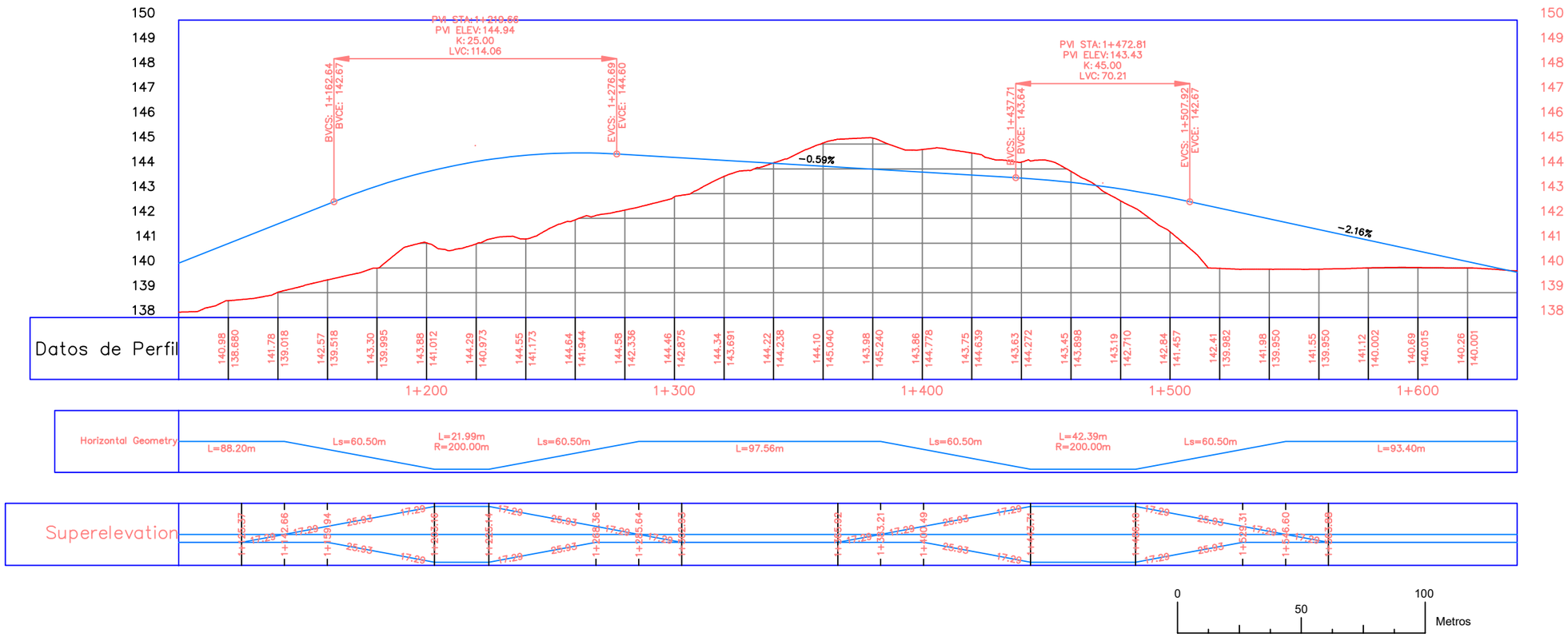
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING LONGITUDINAL PROFILE	AUTHOR Jorge Sáenz Fernández	SCALE V 1:100 H 1:1000	DATE July 2025	SHEET 3.2 SHEET 1 OF 3

PERFIL: CA-811_ALINEACION

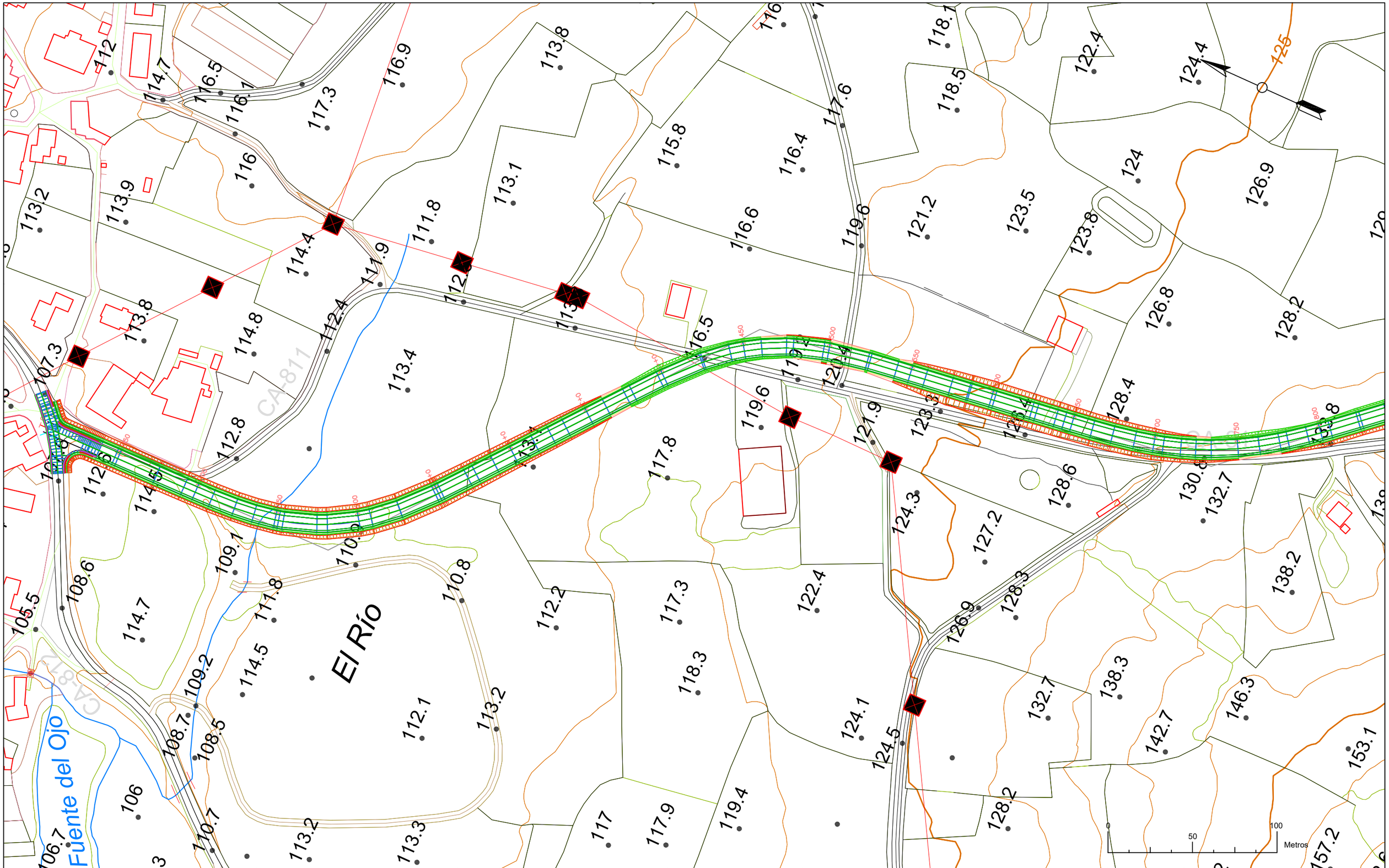


ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING LONGITUDINAL PROFILE	AUTHOR Jorge Sáenz Fernández	SCALE V 1:100 H 1:1000	DATE July 2025	SHEET 3.2 SHEET 2 OF 3

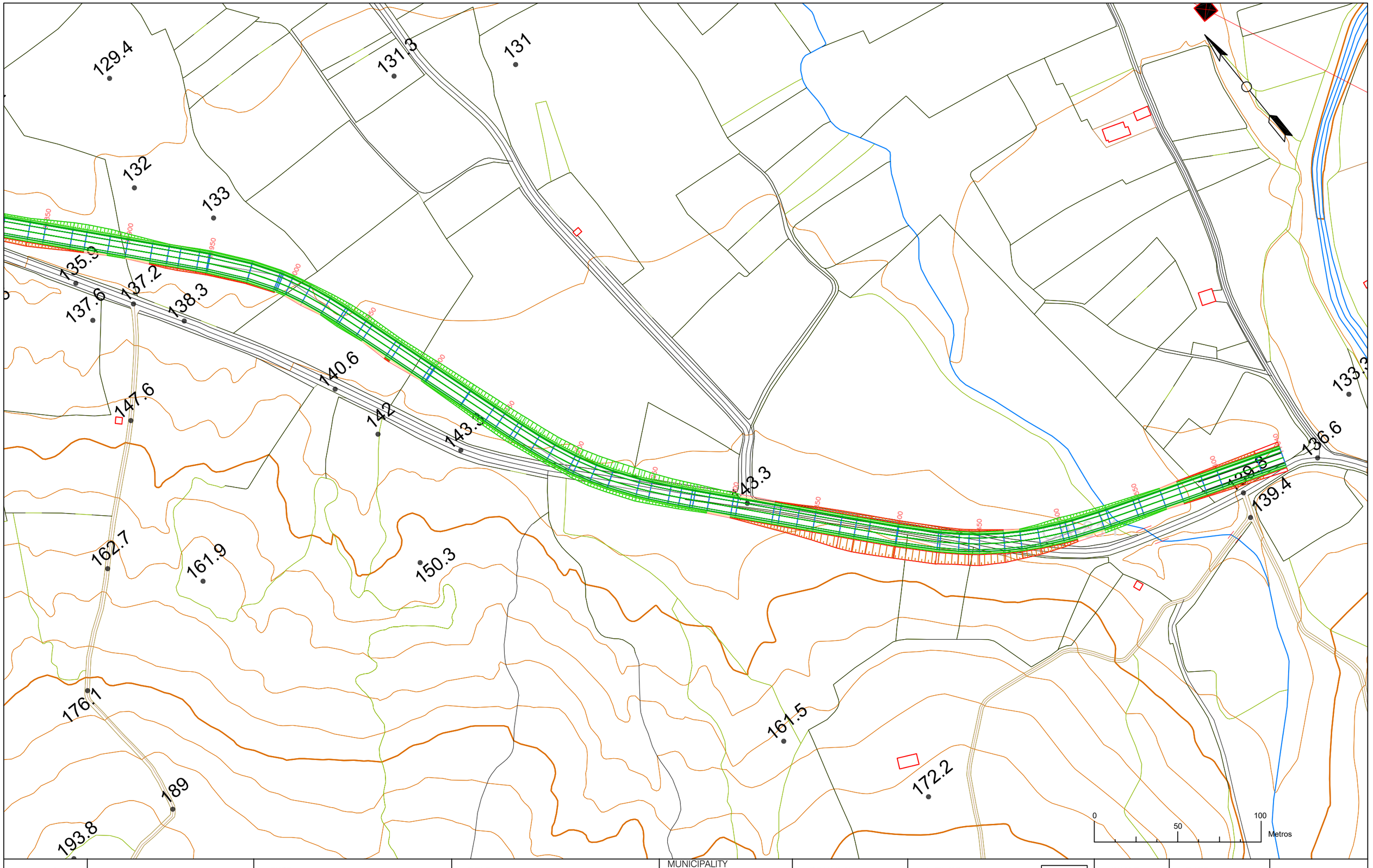
PERFIL: CA-811_ALINEACION



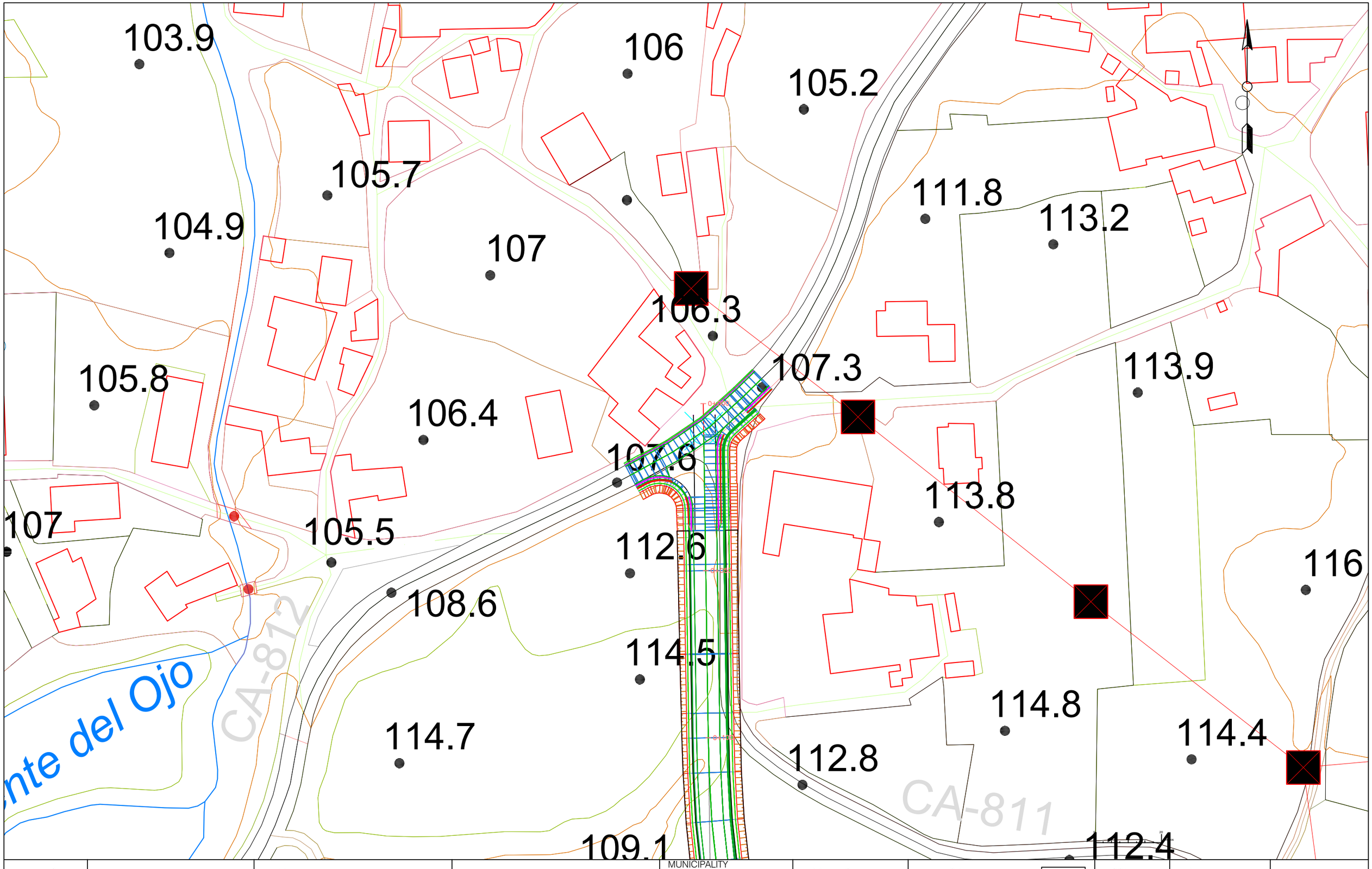
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING LONGITUDINAL PROFILE	AUTHOR Jorge Sáenz Fernández	SCALE V 1:100 H 1:1000	DATE July 2025	SHEET 3.2 SHEET 3 OF 3



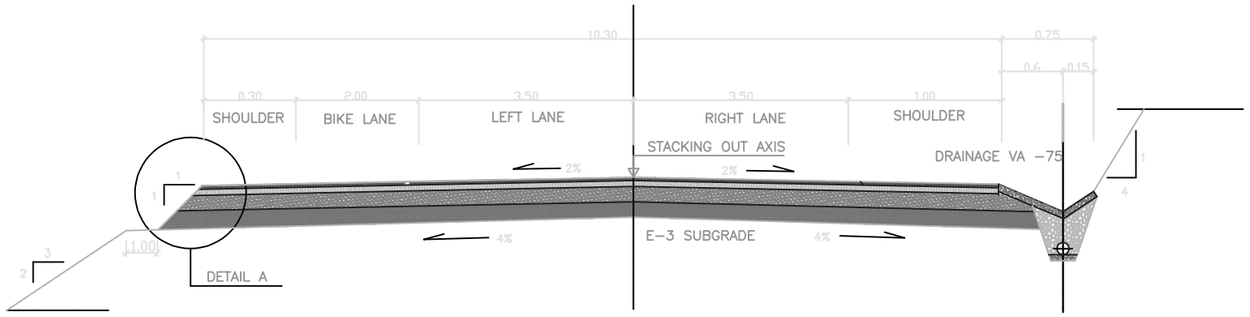
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Plan View	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 3.3 SHEET 1 OF 2



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Plan View	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 3.3 SHEET 2 OF 2

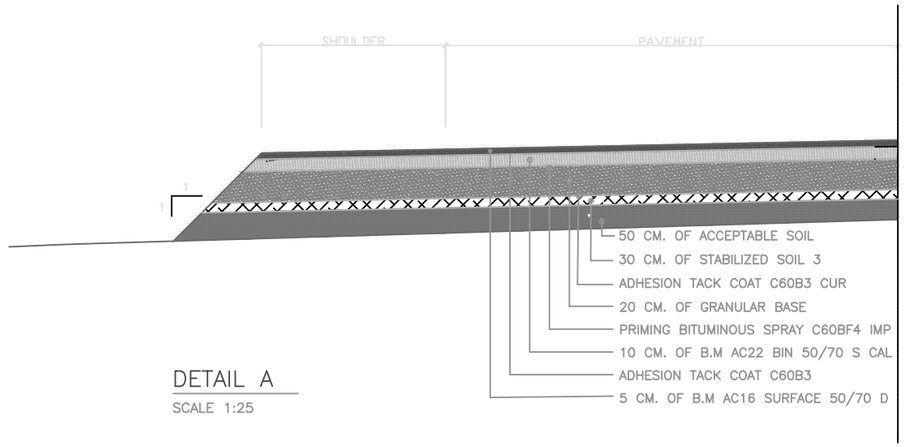


ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING CA-812 Intersection	AUTHOR Jorge Sáenz Fernández	SCALE 1/500	DATE July 2025	SHEET 3.4 SHEET 1 OF 1



CROSS SECTION IN STRAIGHT SEGMENTS

SCALE 1:50



DETAIL A

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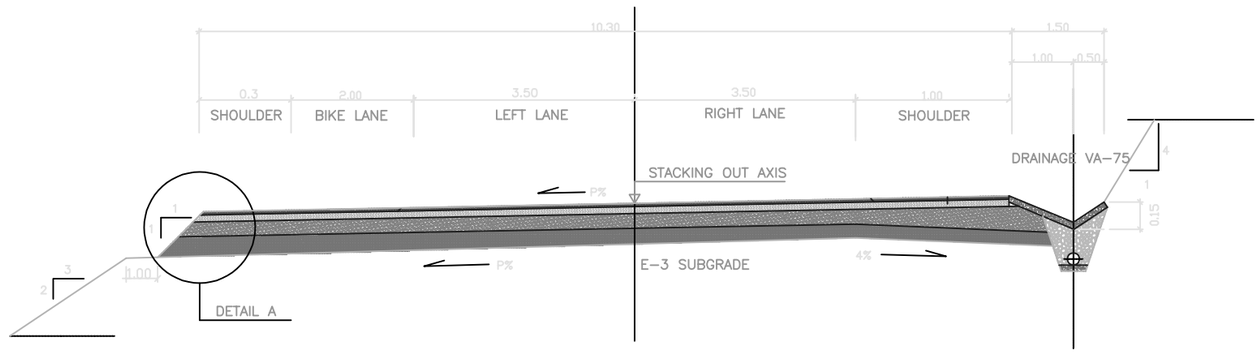


CROSS SECTION IN CURVED SECTIONS

SCALE 1:50

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Road Section	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 4.1 SHEET 1 OF 1

0+040

0+060

0+080

0+100

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 1 OF 22

0+120

0+140

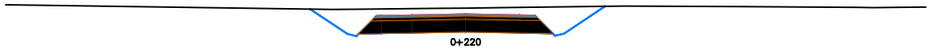
0+160

0+180

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 2 OF 22

0+200



0+220

0+240

0+260

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 3 OF 22

0+280

0+300

0+320

0+340

0 10 20 Metros

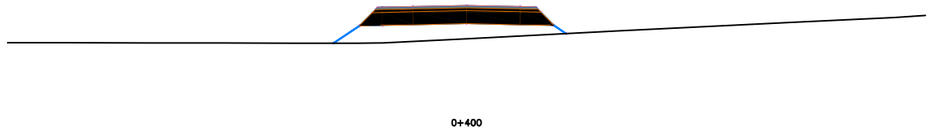
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 4 OF 22

0+360

0+380

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 5 OF 22



0+400

0+420

0+440

0+460

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 6 OF 22

0+480

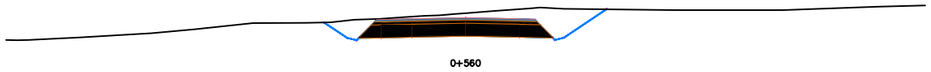
0+500

0+520

0+540

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 7 OF 22



0+560

0+580

0+600

0+620

0+640

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 8 OF 22

0+660

0+680

0+700

0+720

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 9 OF 22

0+740

0+760

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 10 OF 22

0+780

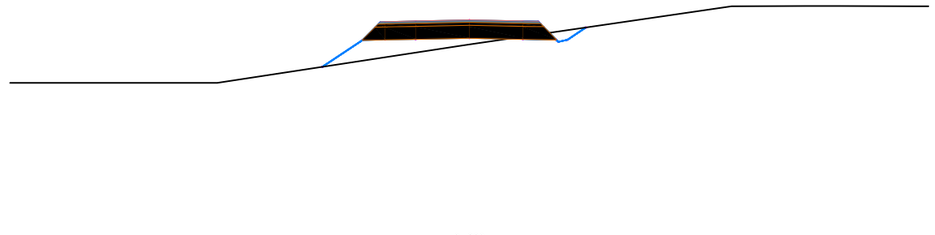
0+800

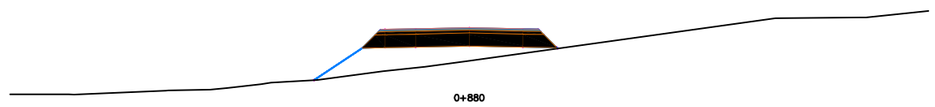
0+820

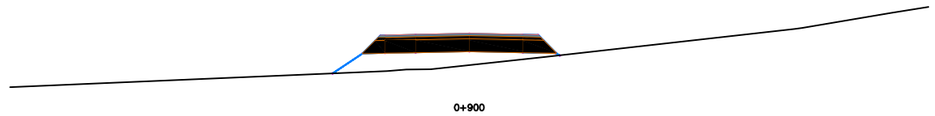
0+840

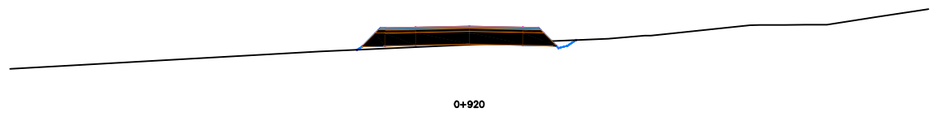
0 10 20 Metros

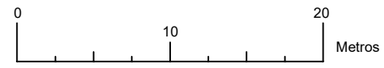
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 11 OF 22











ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 12 OF 22

0+940

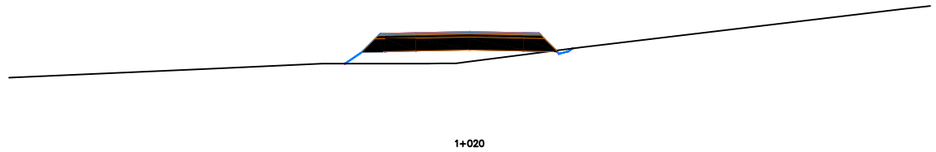
0+960

0+980

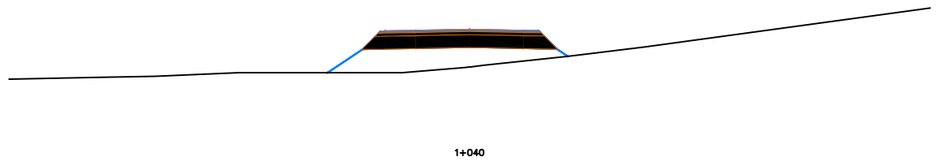
1+000

0 10 20 Metros

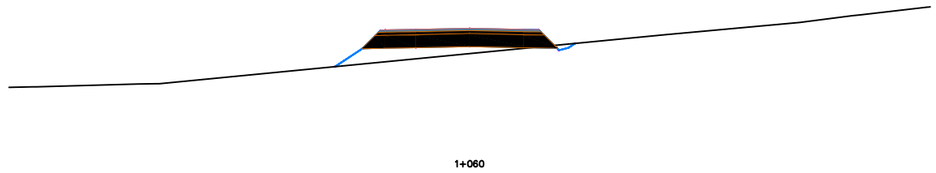
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 13 OF 22



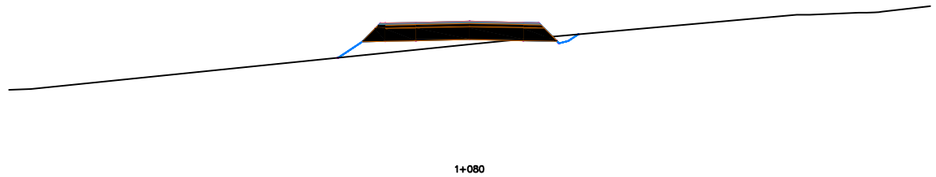
1+020



1+040



1+060



1+080

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 14 OF 22

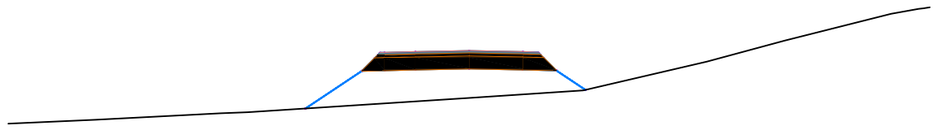
1+100

1+120

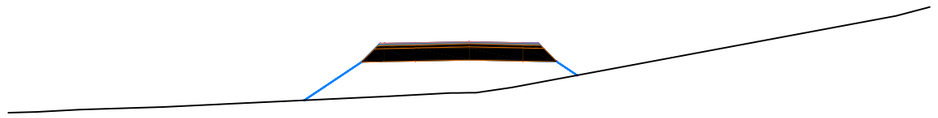
1+140

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 15 OF 22



1+160



1+180

1+200

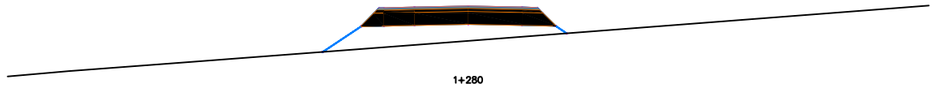
1+220

0 10 20 Metros

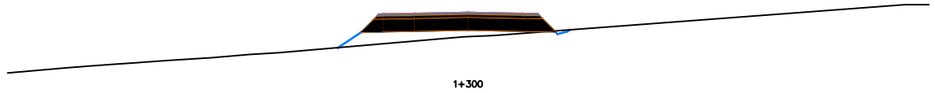
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 16 OF 22

1+240

1+260



1+280



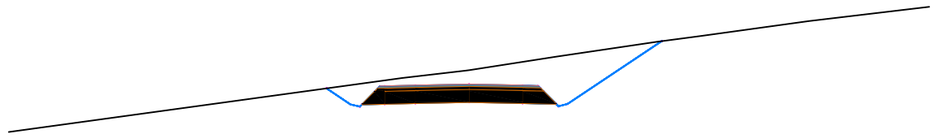
1+300

0 10 20 Metros

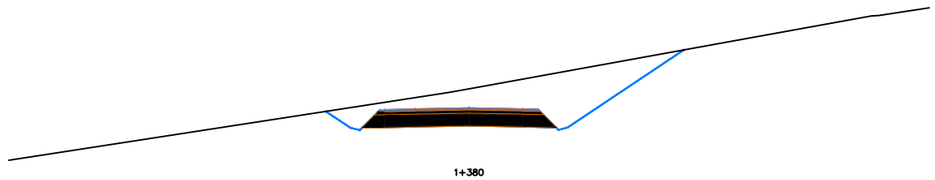
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 17 OF 22

1+320

1+340



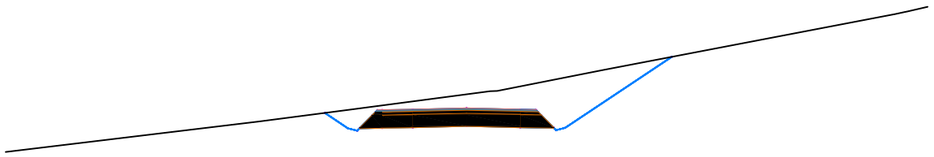
1+360



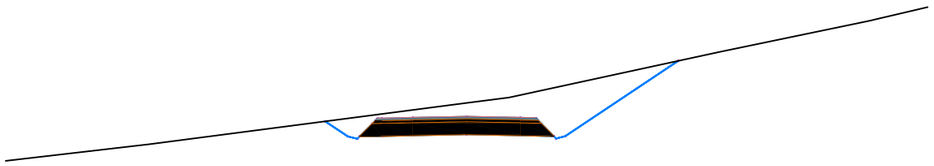
1+380

0 10 20 Metros

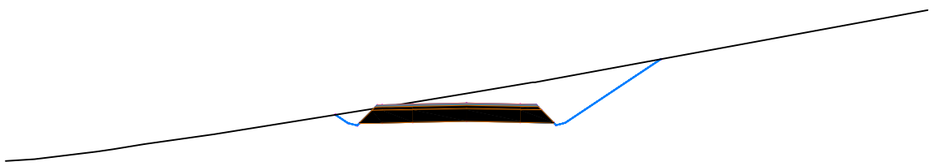
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 18 OF 22



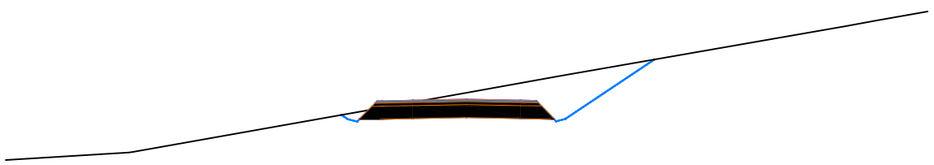
1+400



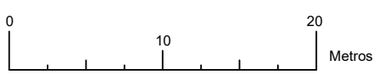
1+420



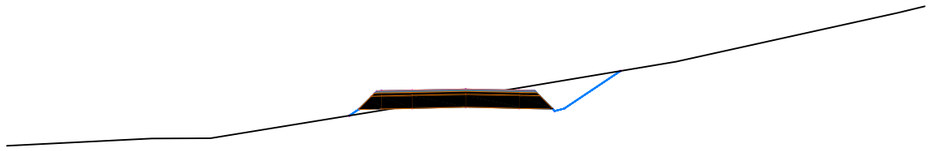
1+440



1+460



	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández		SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 19 OF 22



1+480

1+500

1+520

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 20 OF 22

1+540

1+560

1+580

0 10 20 Metros

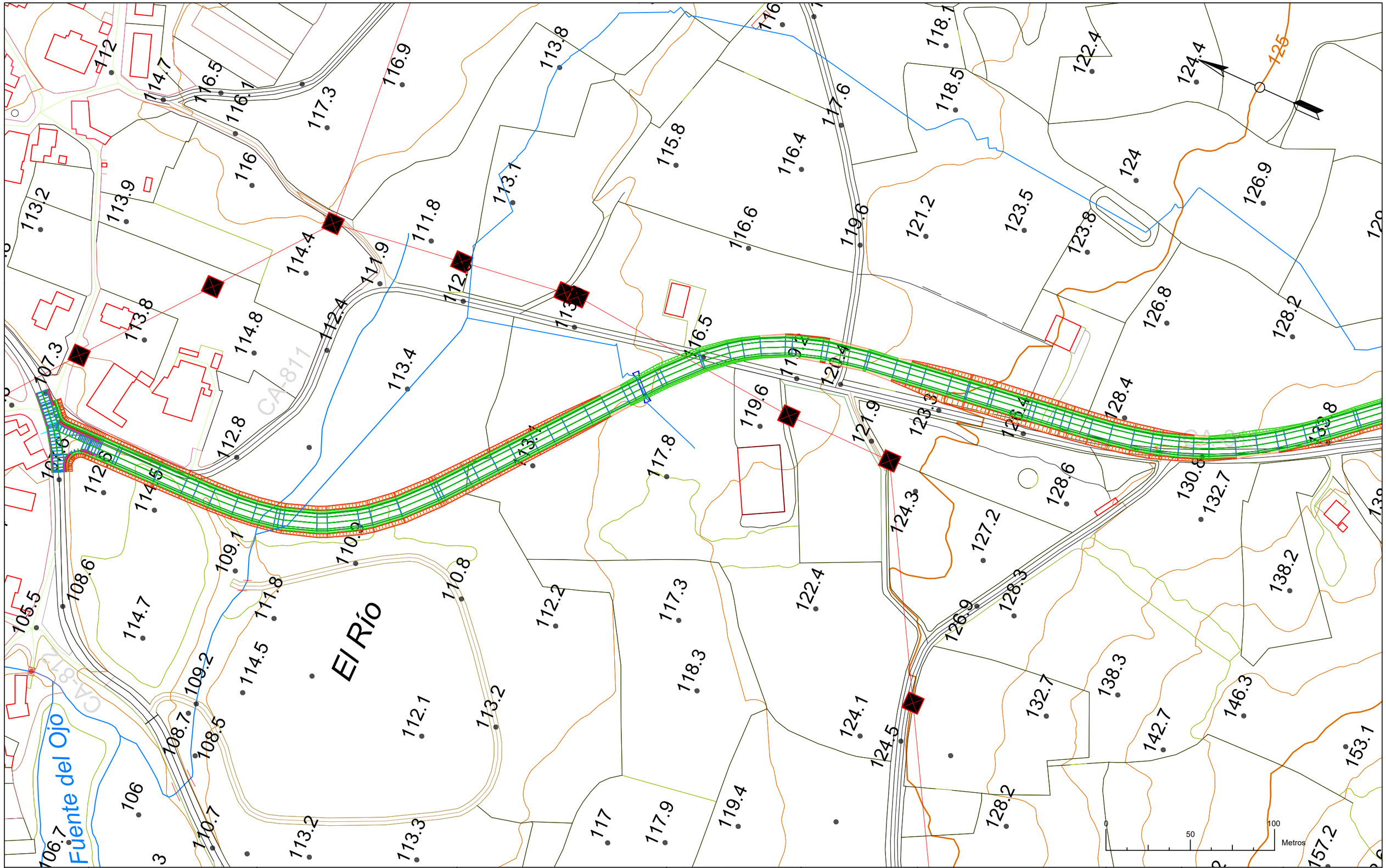
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 21 OF 22

1+600

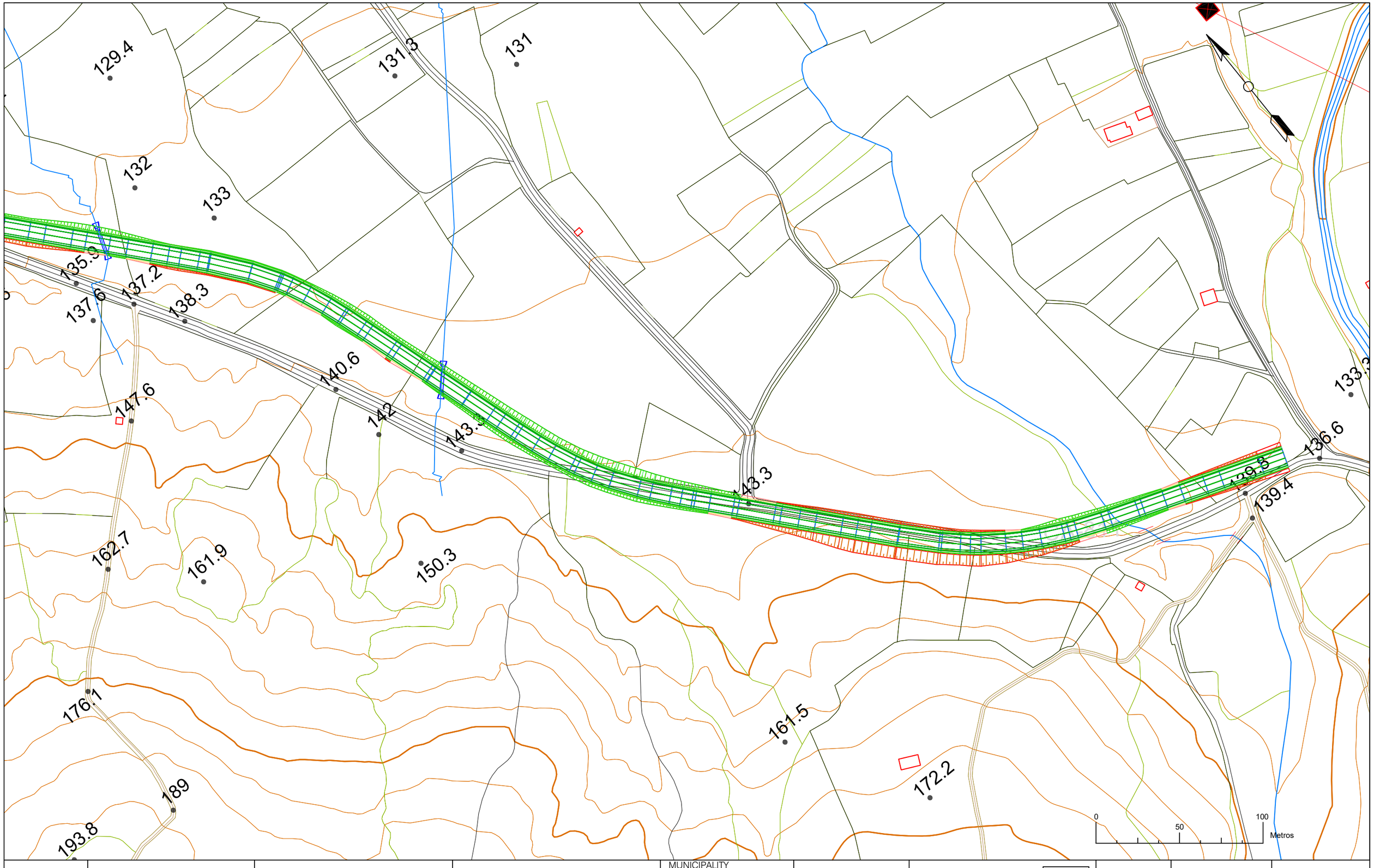
1+620

0 10 20 Metros

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Road Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Cross Sections	AUTHOR Jorge Sáenz Fernández	SCALE 1/200	DATE July 2025	SHEET 4.2 SHEET 22 OF 22



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Drainage	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 5.1 SHEET 1 OF 2



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE: Construction Project

TITLE: Geometric Realignment and Platform Widening of CA-811

MUNICIPALITY: Mazcuerras

REGION: Cantabria

DRAWING: Drainage

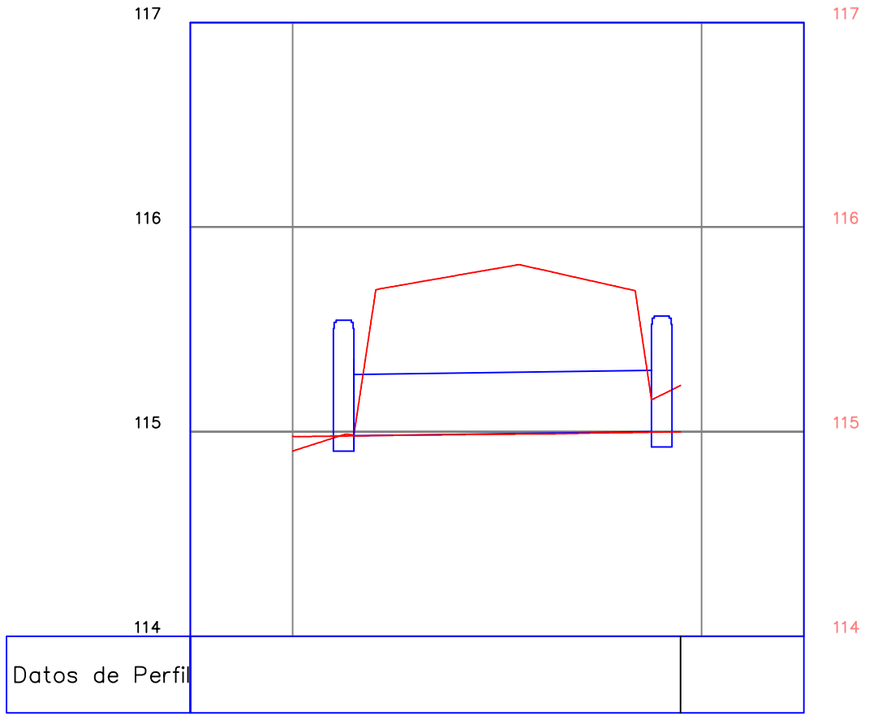
AUTHOR: Jorge Sáenz Fernández

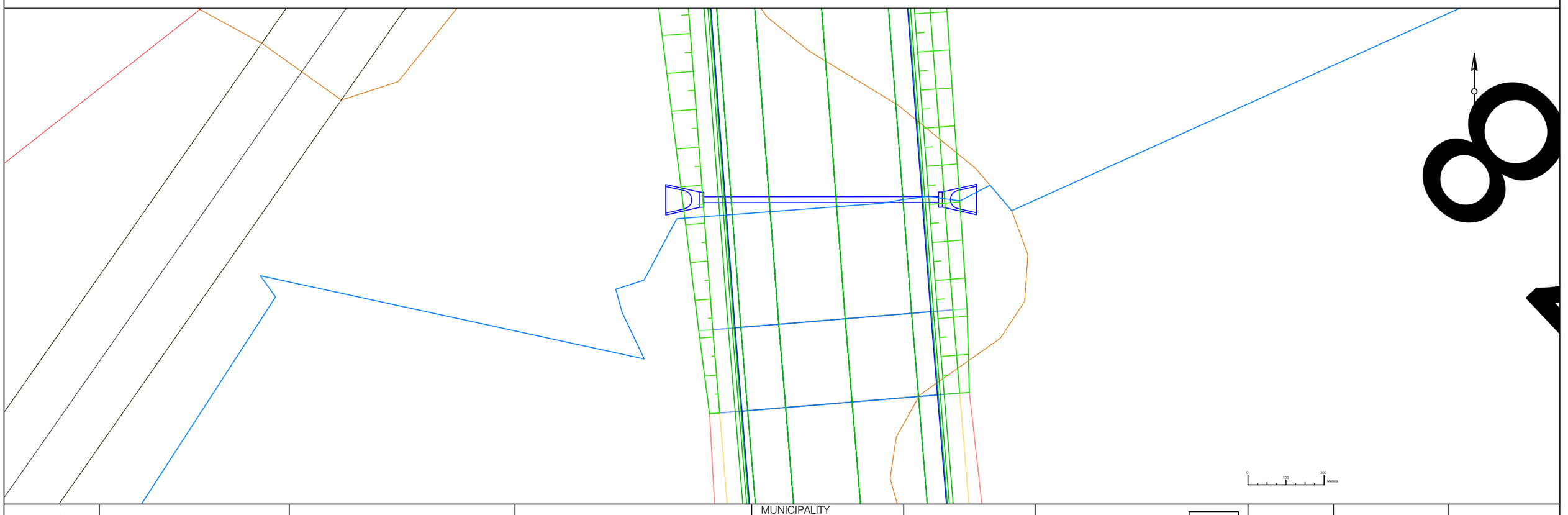
SCALE: 1:1000

DATE: July 2025

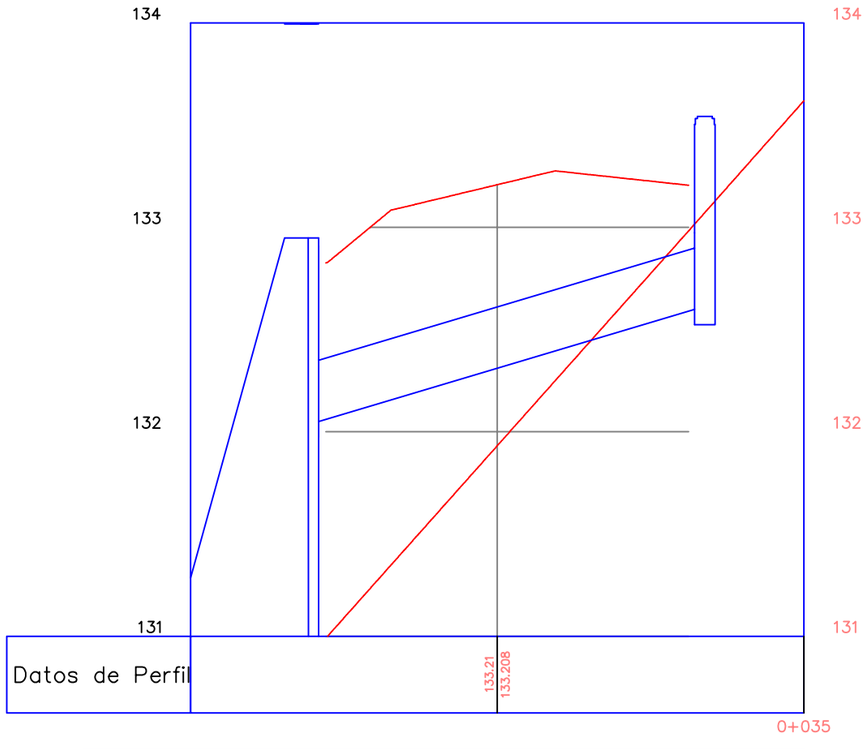
SHEET 5.1

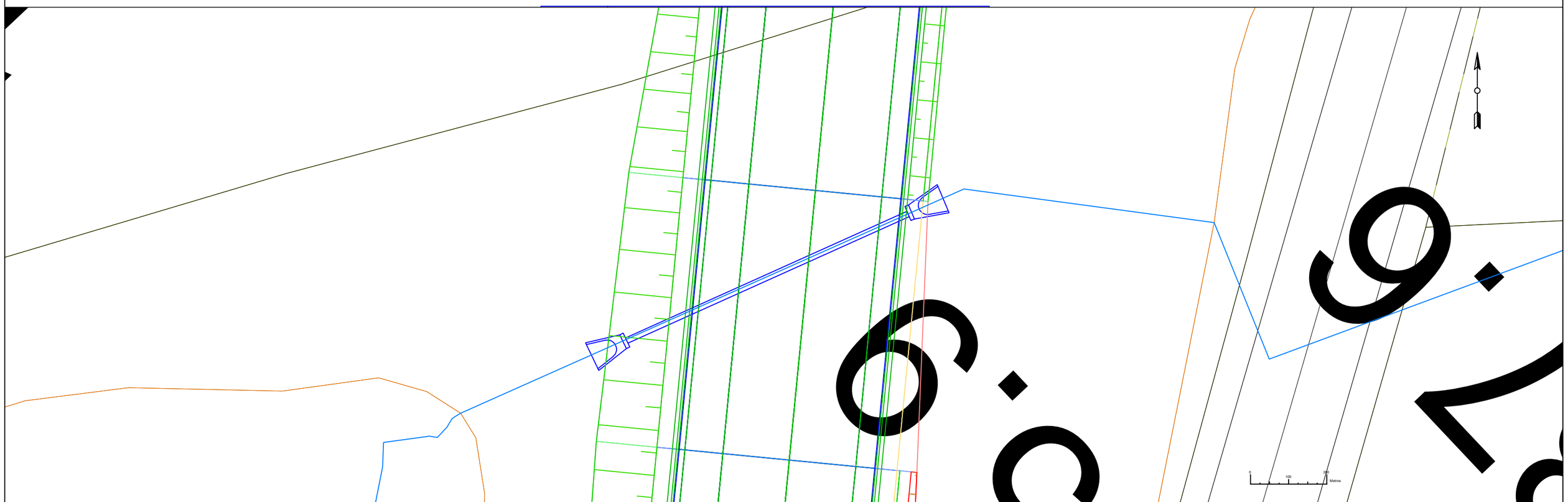
SHEET 2 OF 2



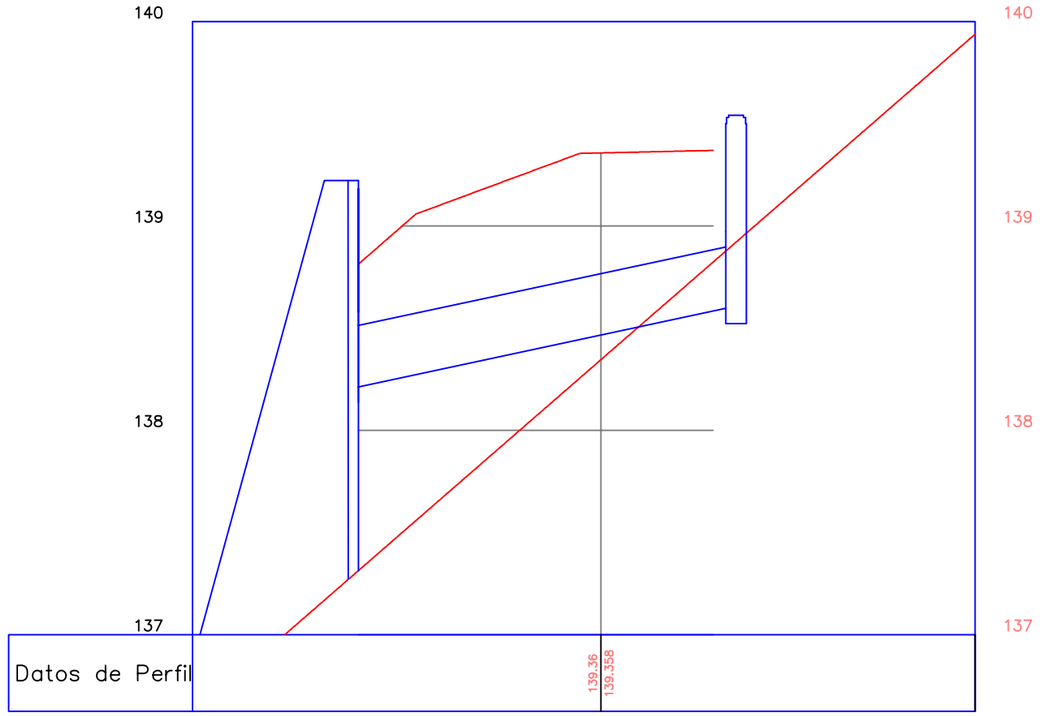


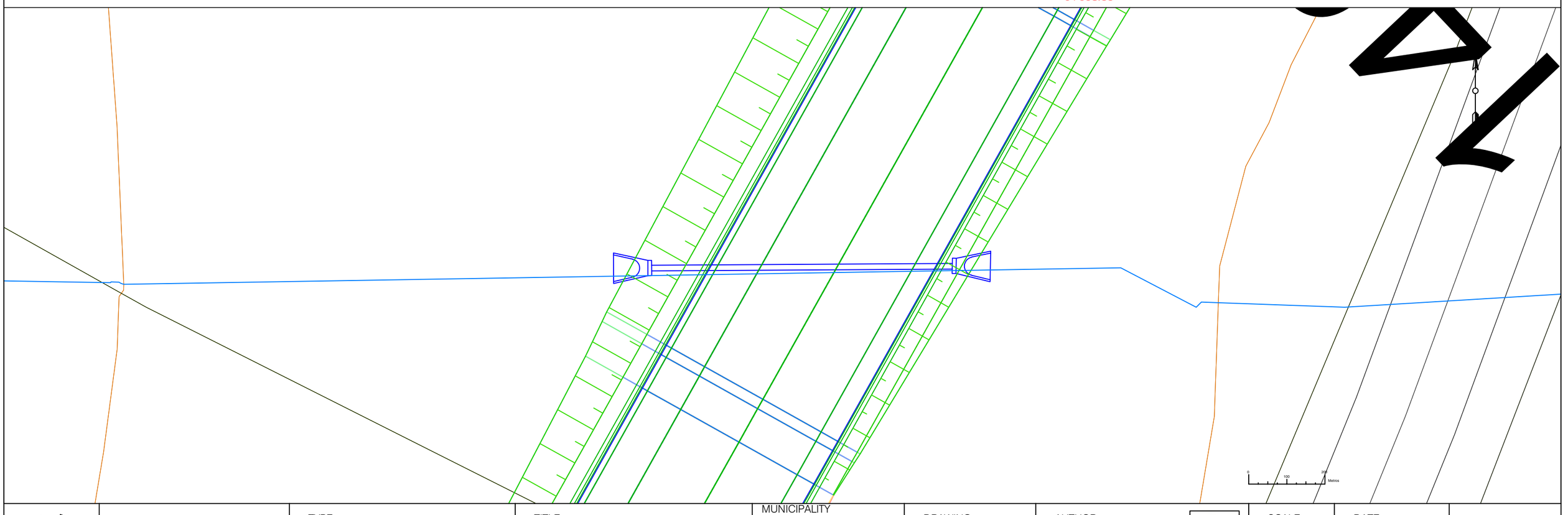
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Project Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING CDS PK 0+380	AUTHOR Jorge Sáenz Fernández	SCALE 1/100	DATE July 2025	SHEET 5.2.1 SHEET 1 OF 3



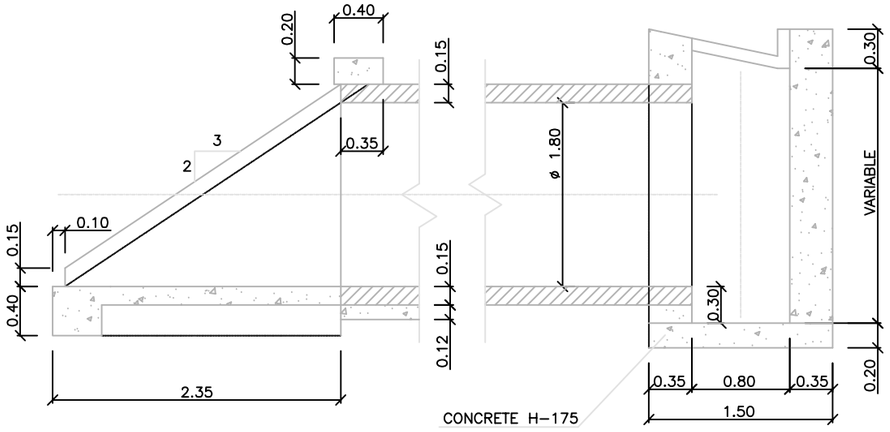


ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Project Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING CDS PK 0+880	AUTHOR Jorge Sáenz Fernández	SCALE 1/100	DATE July 2025	SHEET 5.2..2 SHEET 2 OF 3

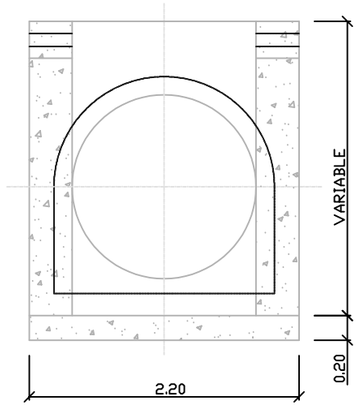




ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING CDS PK 1+100	AUTHOR Jorge Sáenz Fernández	SCALE 1/100	DATE July 2025	SHEET 5.2.3 SHEET 3 OF 3



A–A SECTION
SCALE 1:25



B–B SECTION
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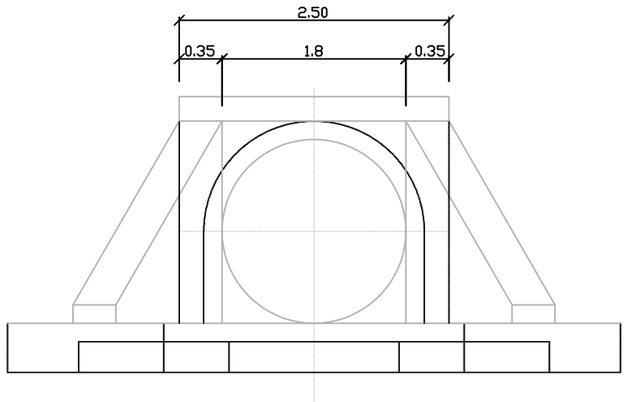
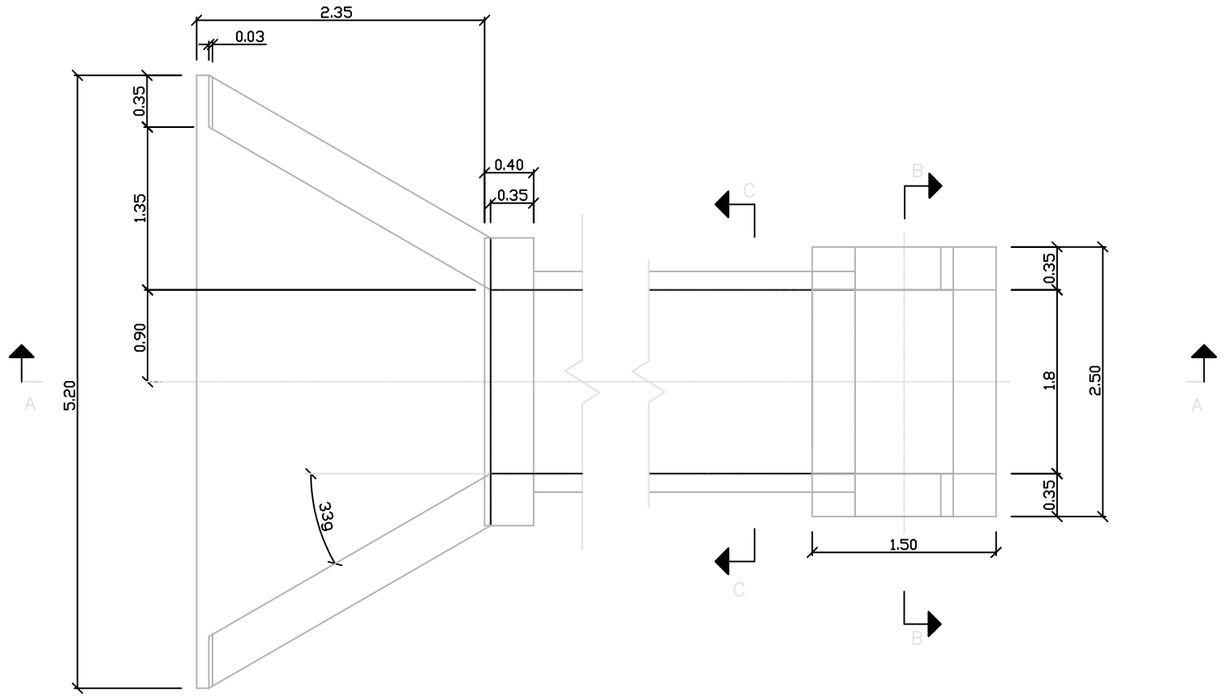
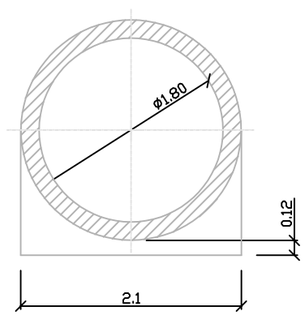


INLET VIEW
SCALE 1:25

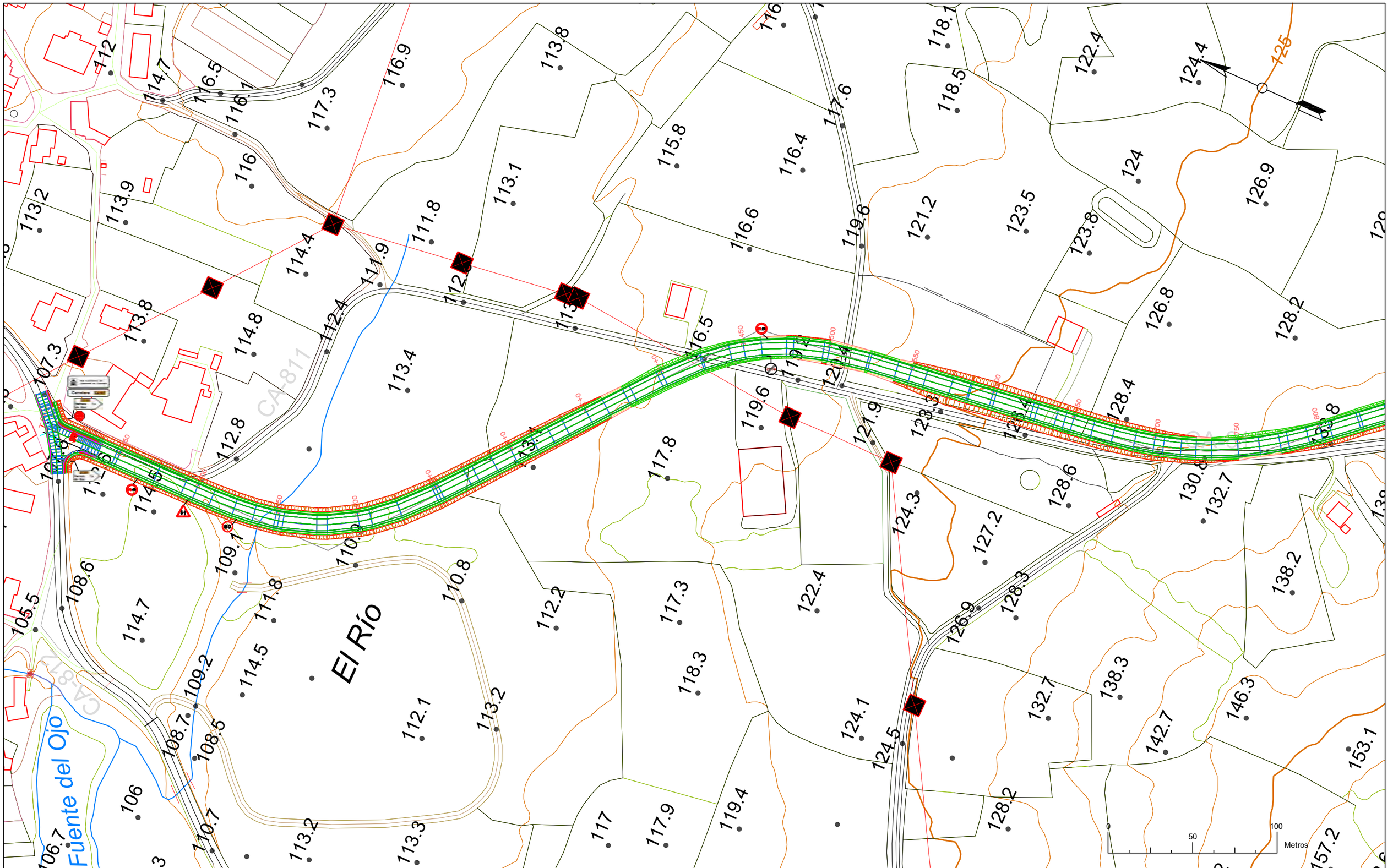


PLAN VIEW
SCALE 1:25

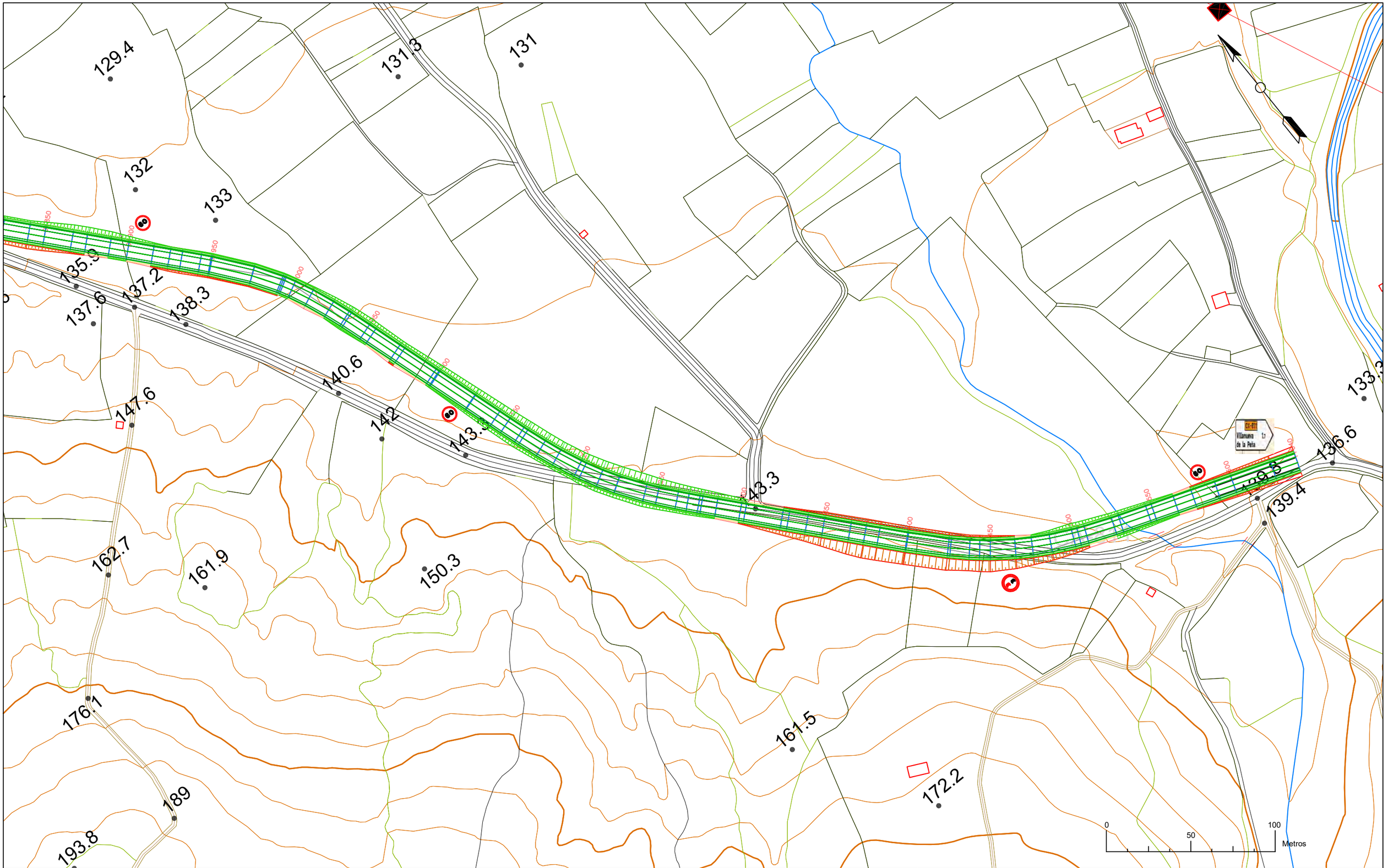


C–C SECTION
SCALE 1:25

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Drainage Detail	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 5.3 SHEET 1 OF 1



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Signage	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 6.1 SHEET 1 OF 2



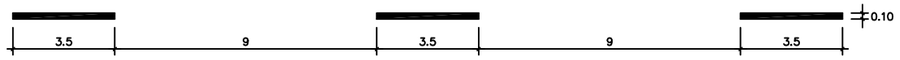
ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Signage	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 6.1 SHEET 2 OF 2

INTERMITENT LONGITUDINAL MARKS

ROADS WITH 60 Km/h < VM < 100 Km/h

FOR NORMAL LANE SEPARATION

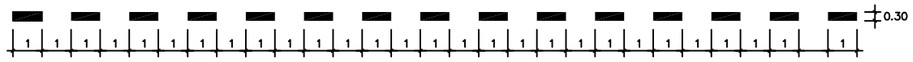
M–1.2



ROADS WITH VM < 60Km/h

FOR THE SEPARATION OF SPECIAL LANES OR ACCELERATION/DECELERATION LANES

M–1.7



CONTINUOUS LONGITUDINAL MARKS

ROADS WITH VM. < 100 Km/h.

FOR SEPARATION OPPOSING DIRECTIONS OF TRAFFIC ON TWO OR THREE LANE ROADWAYS

M–2.2

FOR LANE BORDER

M–2.6

CONTINUOUS TRANSVERSAL MARKS

STOP LINE

DISCONTINUOUS TRANSVERSAL MARKS

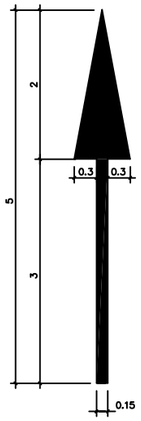
YIELD LINE

DIRECTION OR LANE SELECTION ARROWS

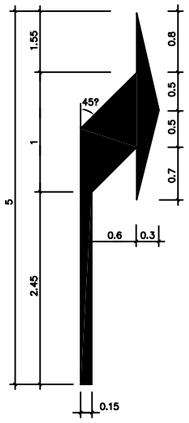
LANE WITH VM 60 Km/h.

M–5.2

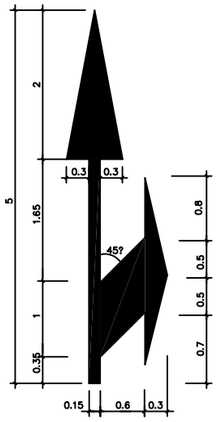
1. FORWARD



2. RIGHT



3. FORWARD OR RIGHT

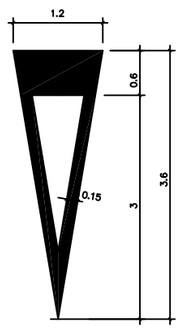


M–6.3

HORIZONTAL STOP SIGNS

M–6.5

YIELD SIGN

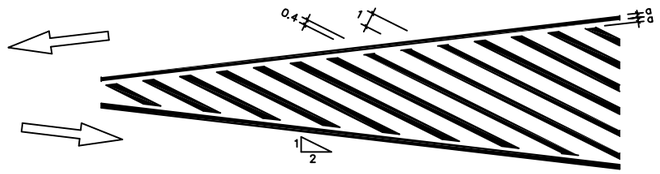


HATCHED MARKING

ROAD WITH VM < 60 Km/h.

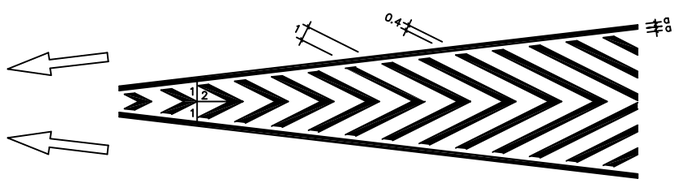
M–7.2

A. TWO WAY CIRCULATION



B. ONE WAY CIRCULATION (DIVERGENT)

C. ONE WAY CIRCULATION (CONVERGENT)



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Signage Details	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 6.2 SHEET 1 OF 5

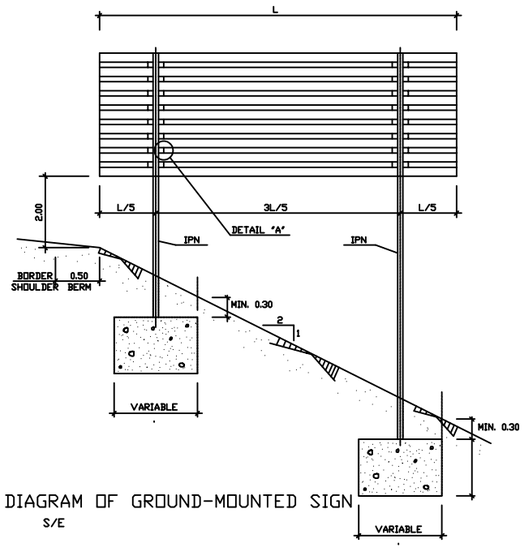
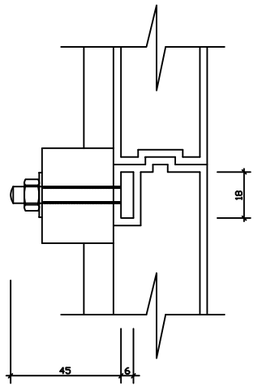
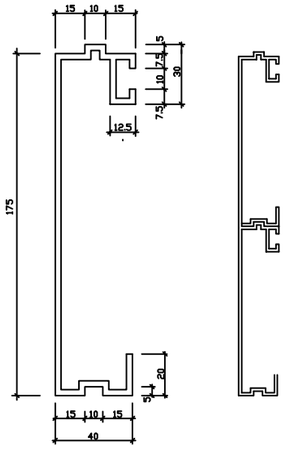


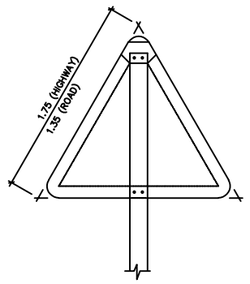
DIAGRAM OF GROUND-MOUNTED SIGN
S/E

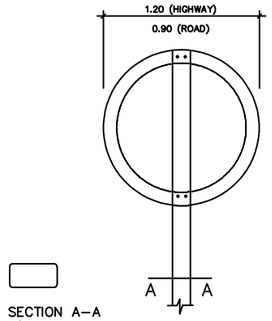


DETAIL "A"
S/E
MEASURES in mm

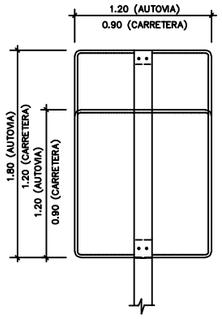


ALUMINUM PROFILES FOR SUSPENDED SIGNS
S/E
MEASURES in mm

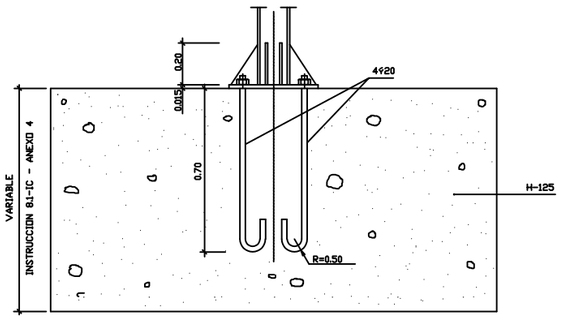




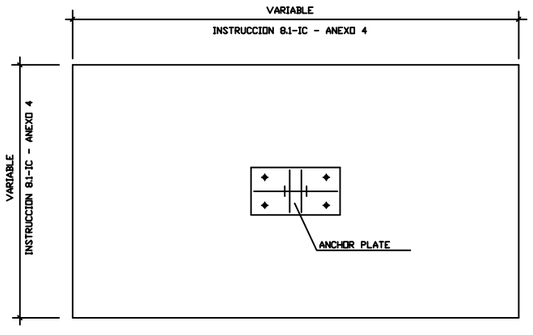
SECTION A–A
S/E



CODE SIGNS DETAILS
S/E

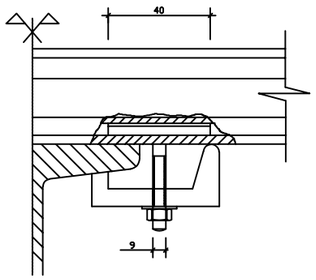


FRONT

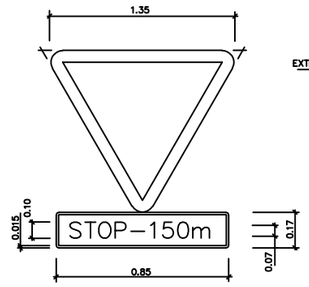


TOP VIEW

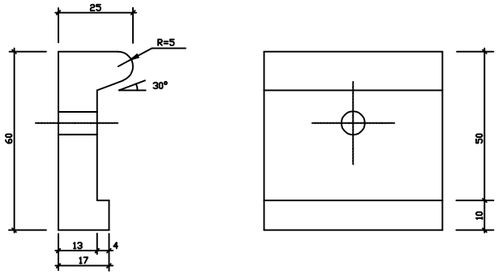
FOUNDATION AND ANCHORAGE
S/E



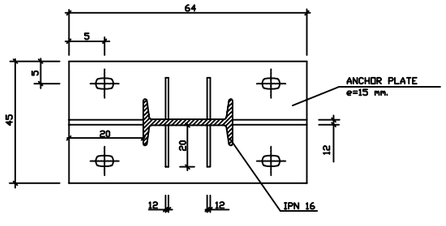
DETAIL OF FASTENING AND FITTING OF ALUMINUM PROFILES
S/E
MEASURES in mm



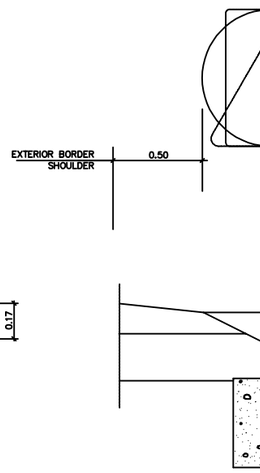
COMPLEMENTARY STOP SIGN
S/E



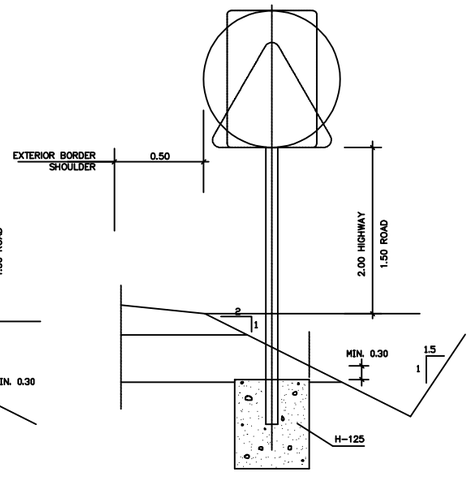
FASTENING ELEMENT DETAIL
S/E
Measures in mm



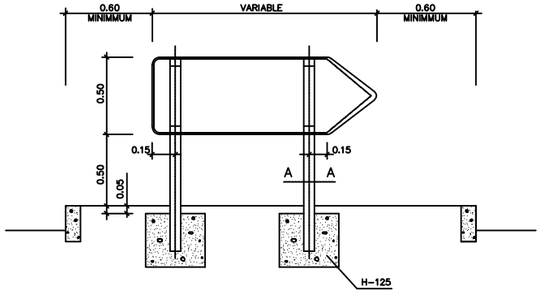
ANCHOR PLATE AND STIFFENERS
S/E



LOCATION AND FOUNDATION OF FILL SIGNS
E. 1:20



LOCATION AND FOUNDATION OF CUT SIGNS
E. 1:20



LOCATION AND FOUNDATION OF DIRECTION ARROWS IN TRAFFIC ISLANDS
E. 1:20

NOTES:

THE SUPPORT SIGNS WILL BE MADE OUT OF GALVANIZED STEEL

IN CASE OF L IN A L–750 SIGNS IS LARGER THAN 3m THERE WILL BE A THIRD POST AT A DISTANCE L/2 WITH SAME FOUNDATION AS THE PREVIOUS
.

SIGN REVERSA WILL BE MADE OUT OF A NEUTRAL COLOUR

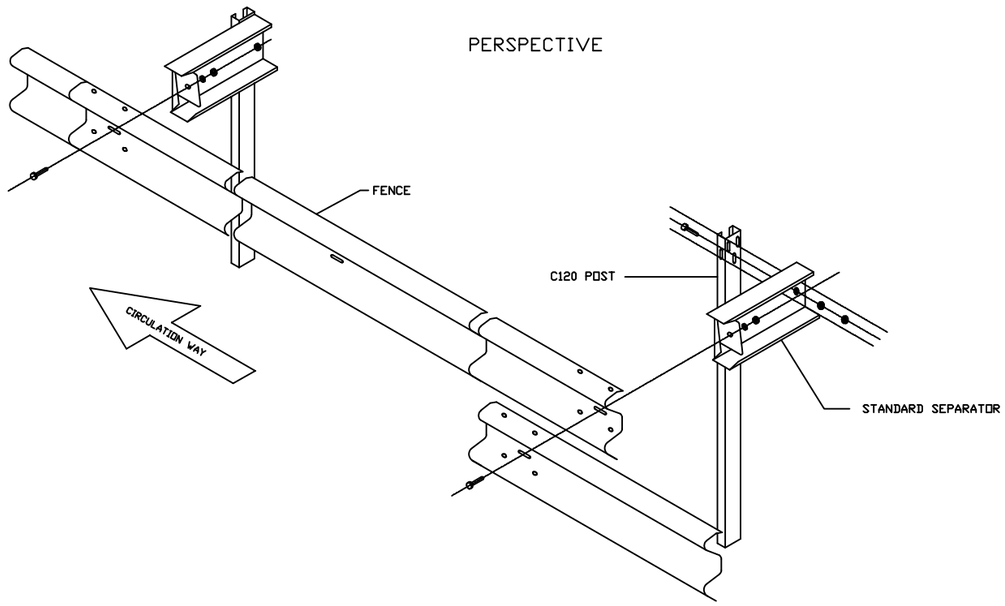
EVERY SIGN, PLATES AND FOUNDATIONS WILL BE SPECIFIED IN THE TECHNICAL SPECIFICATIONS DOCUMENT
.

CONCRETE H–125 DIMENSIONS WILL BE SPECIFIED IN ANEX 4 OF 8.1–IC PROVISIONAL JULY 1990
.

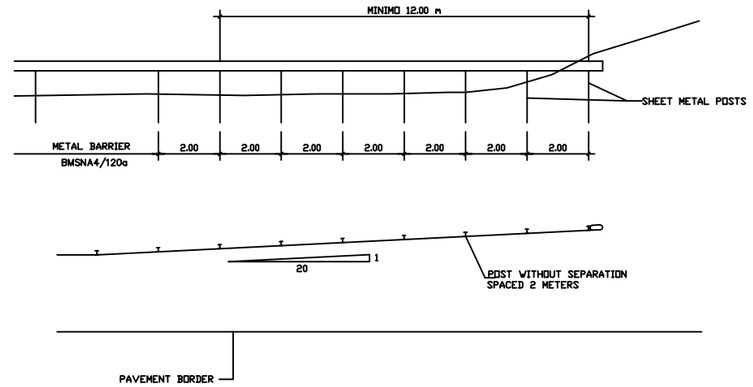
SUPPORT SIGNS WILL HAVE THE DIMENSIONS STABLISHED IN NORMA 8.1–IC

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Signage Details	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 6.2 SHEET 2 OF 5

PERSPECTIVE

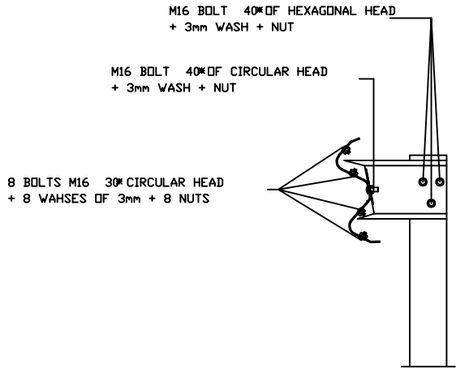


SLOPE FIXED SUPPORT

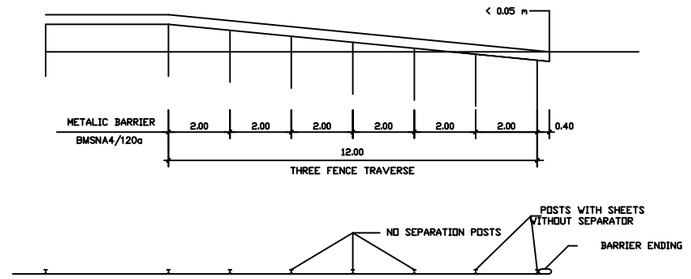


BARRIER SECTION

BMSNA4/120a

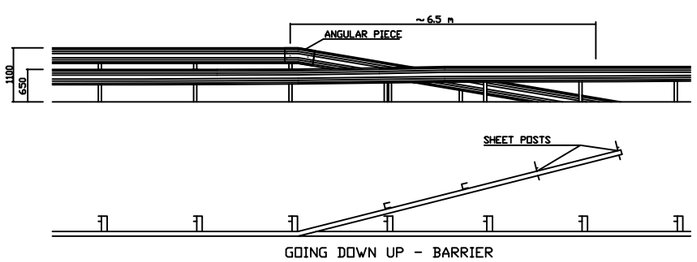


LONG TRAVERSE

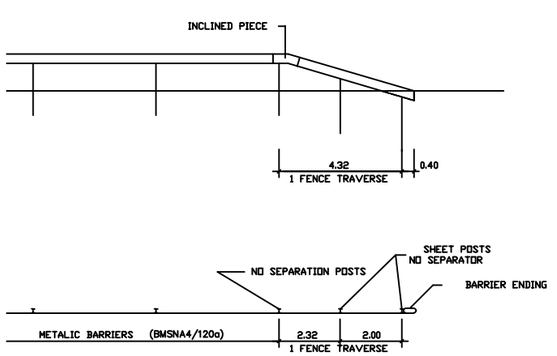


TRANSITIONS AND BARRIER END

TRANSITION OF BMSNC TO BMSNA



SHORT TRAVERSE



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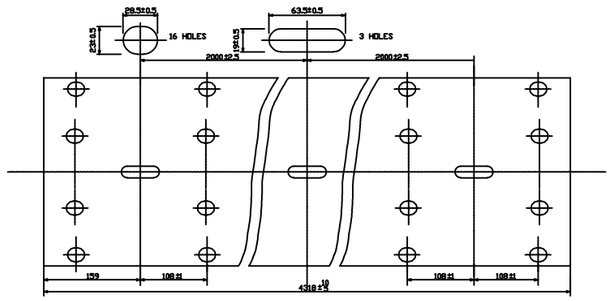
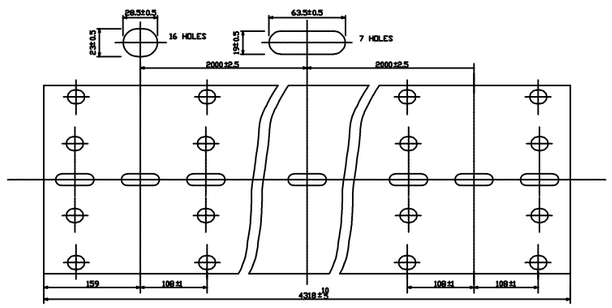
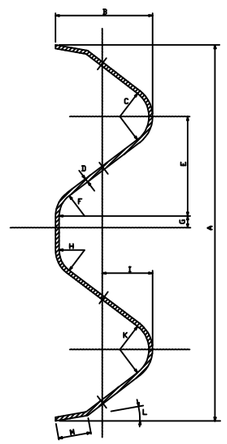
STANDARD SAFETY BARRIER
E. 1:40



DESMONTABLE STRAIGHT BARRIER
E. 1:40

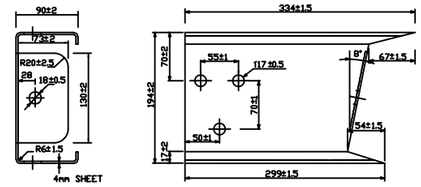


W BEAM PROFILE
E. 1:20

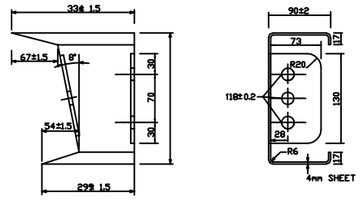


	NOMINAL	TOLER. -	TOLER. +
A	310	0	6
B	80	0	6
C	24	-2	2
D	3	-	-
E	82	-1	2
F	24	-2	2
G	14	-0.5	-
H	24	-2	2
I	39	-2	3
J	81	0	3
K	24	-2	2
L	10*	-3*	3*
M	27	-1	1

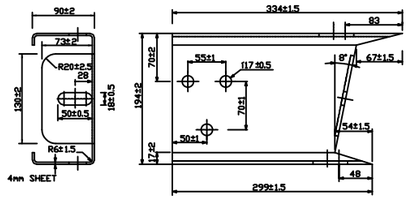
STANDARD SEPARATOR
E. 1:4



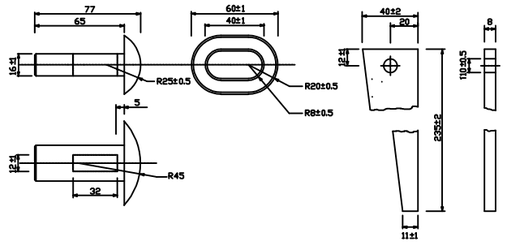
SHORT SEPARATOR
E. 1:4



ABATIBLE SEPARATION BARRIER
E. 1:4

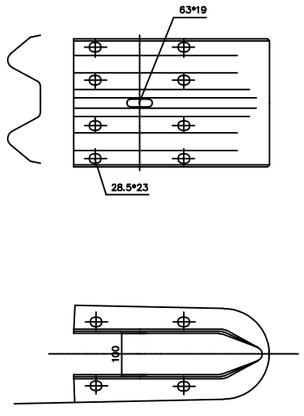


BOLT AND PIN
E. 1:2

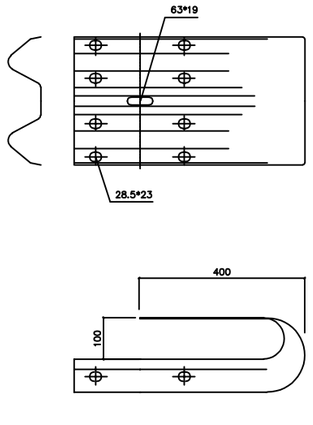


TERMINALS AND SPECIAL PIECES

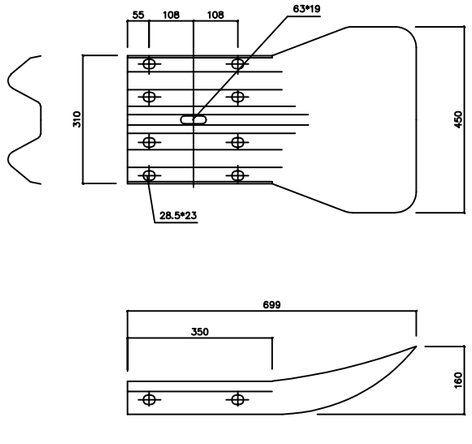
TOPE FINAL DE BARRERA DOBLE



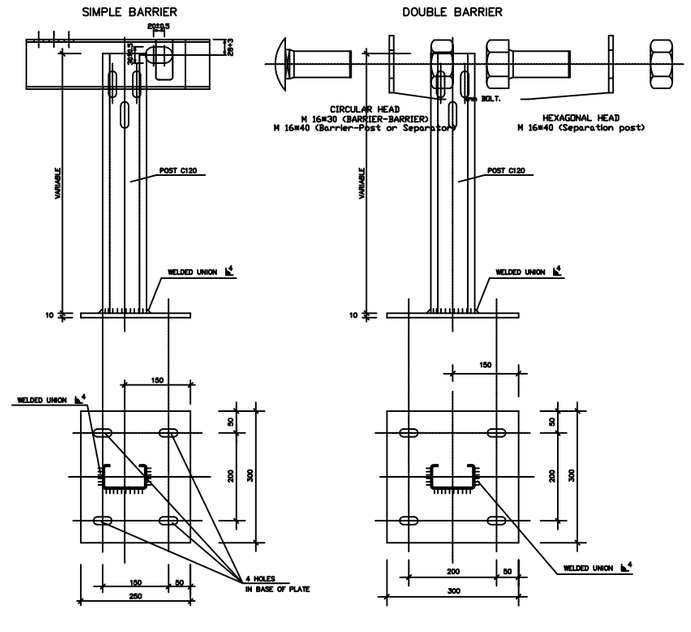
TOPE FINAL DE BARRERA SIMPLE



FINAL DE BARRERA EN "COLA DE PEZ"



SIMPLE BARRIER / DOUBLE BARRIER



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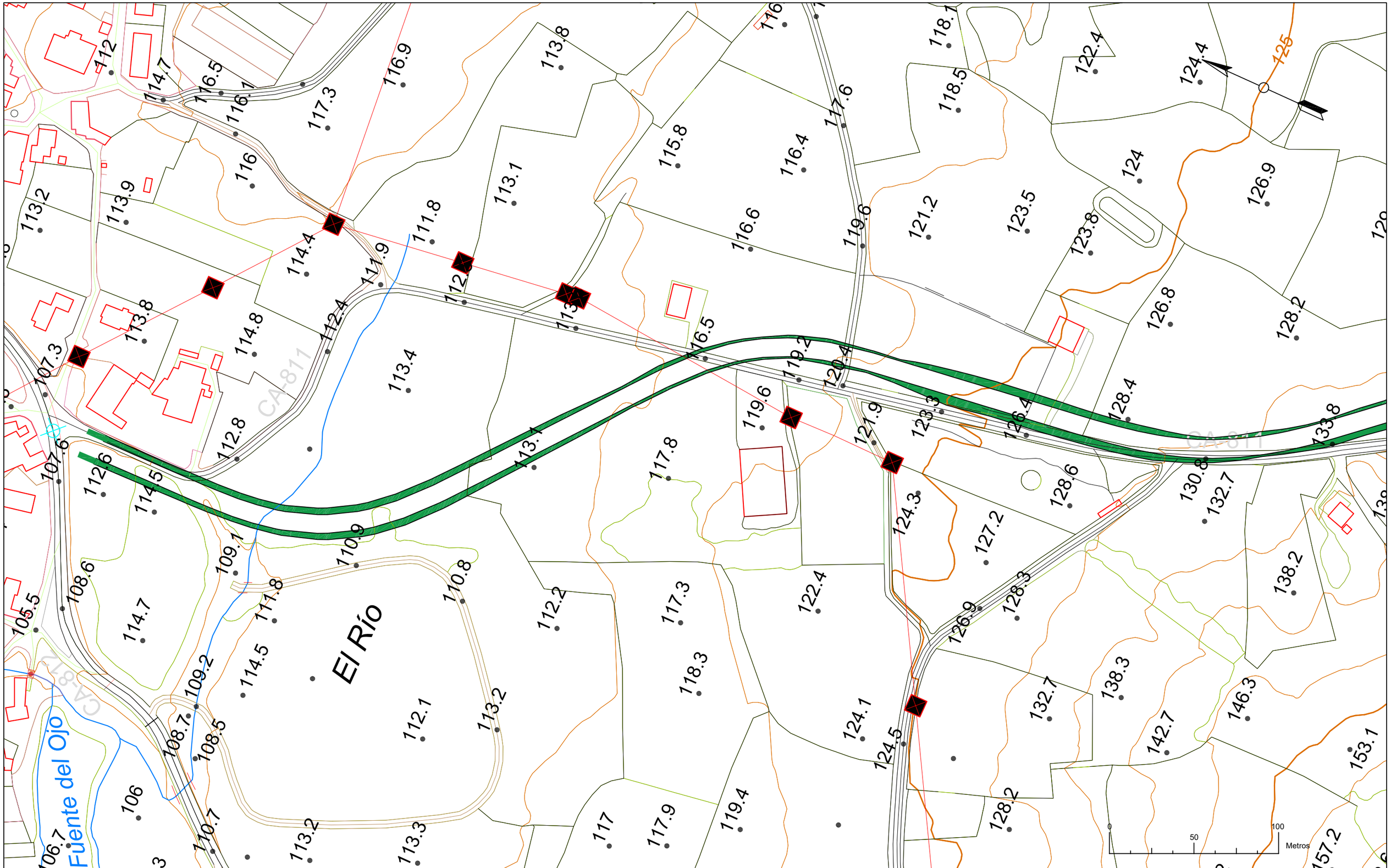
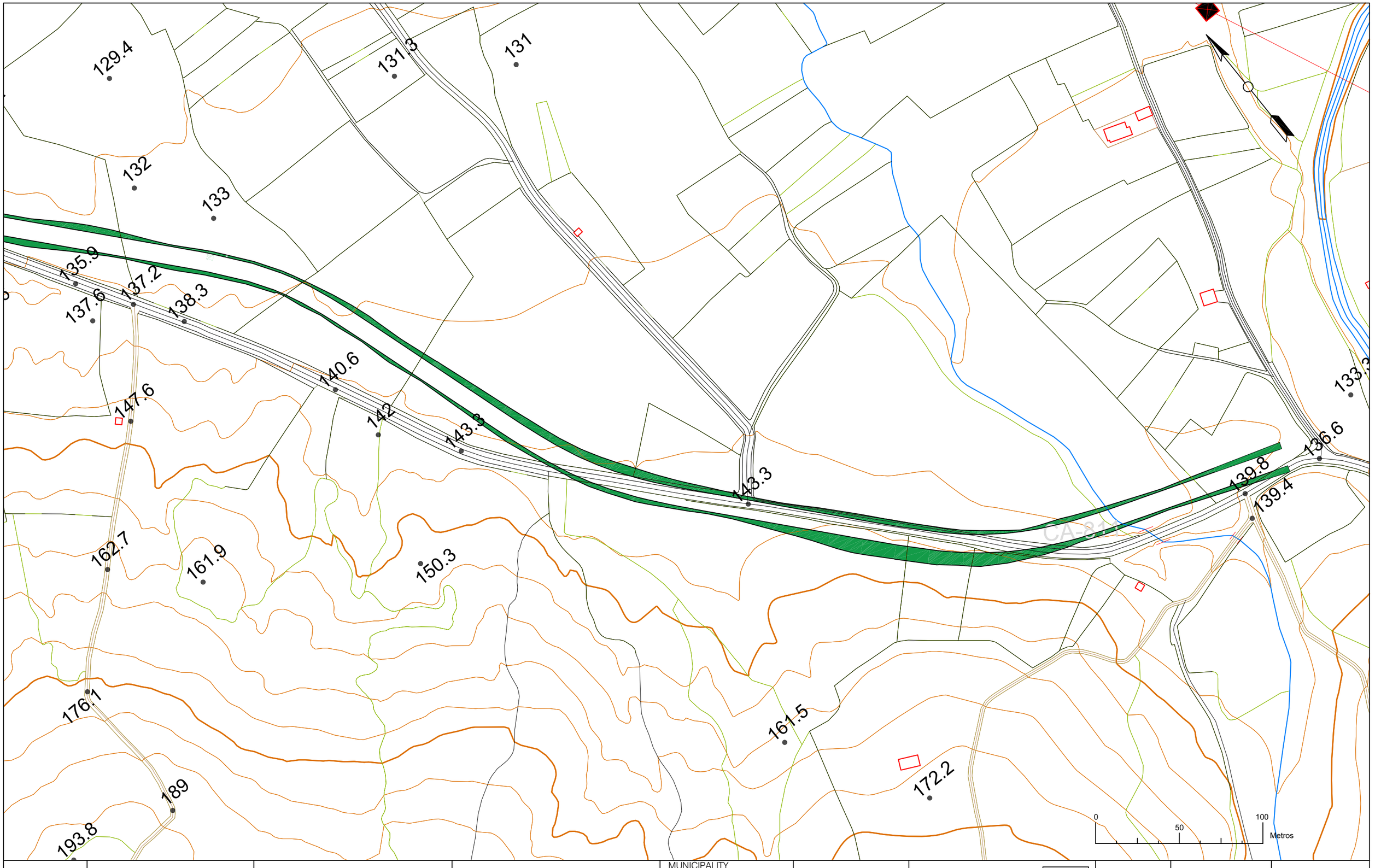
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Signage Details	AUTHOR Jorge Sáenz Fernández	SCALE	DATE July 2025	SHEET 6.2 SHEET 5 OF 5



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Slope Vegetation	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 7 SHEET 1 OF 2



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE Construction Project	TITLE Geometric Realignment and Platform Widening of CA-811	MUNICIPALITY Mazcuerras REGION Cantabria	DRAWING Slope Vegetation	AUTHOR Jorge Sáenz Fernández	SCALE 1:1000	DATE July 2025	SHEET 7 SHEET 2 OF 2

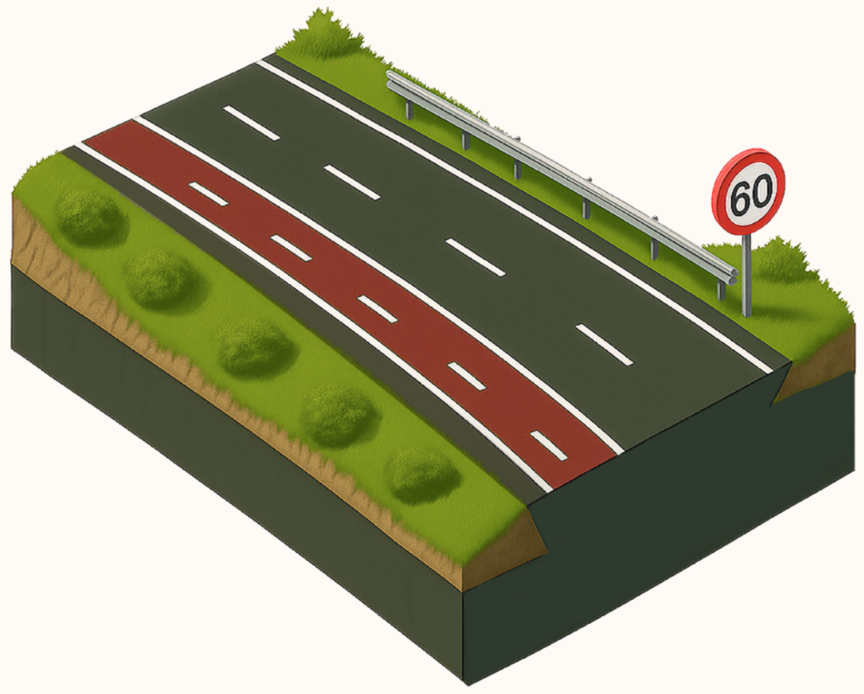
MEJORA DE TRAZADO Y AMPLIACIÓN DE PLATAFORMA DE CARRETERA CA-811

Tramo: Villanueva de la Peña - Herrera de Ibio

TRABAJO FIN DE GRADO

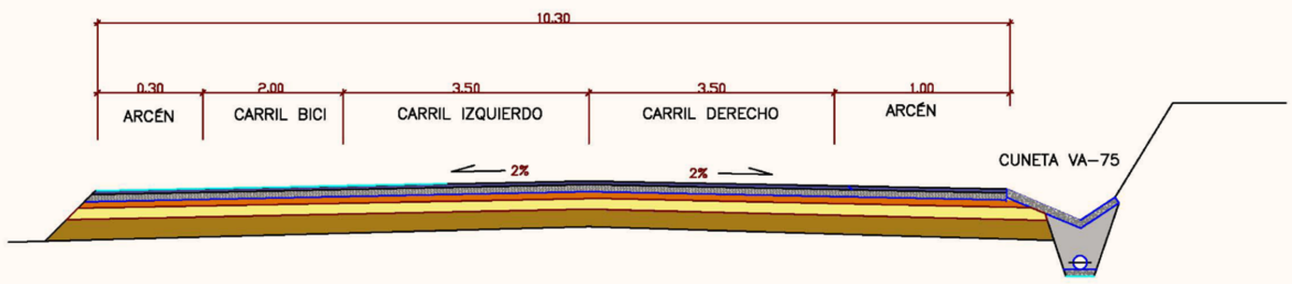
Objetivo del proyecto

El proyecto busca mejorar la carretera CA-811 con un nuevo trazado y la ampliación de su plataforma, incluyendo un carril bici entre Villanueva de la Peña y Herrera de Ibio. Esta actuación, considerada de nueva construcción, solucionará el mal estado actual de la vía, mejorará la seguridad y fomentará un estilo de vida más saludable y sostenible para la comunidad local.



Estructura del firme

- 50 cm de suelo adecuado
- 30 cm de suelo estabilizado con cemento (S-EST-3)
- Riego de Curado C60B3 CUR
- 20 cm de Zahorra superficial
- Riego de imprimación C60BF4 IMP
- 10 cm de Mezcla Bituminosa AC22 BIN 50/70 S CALIZA
- Riego de adherencia C60B3 ADH
- 5 cm de Mezcla bituminosa AC16 SURF 50/70 D



Descripción de las obras

- Mejora del trazado en planta y en alzado, aumentando los radios de las curvas y cambiando los acuerdos verticales para adecuarlos a la normativa vigente.

- Ampliación de la calzada original, disponiendo una sección formada por dos carriles de 3,50 m, arcenes de 1,00 m y 0,3 m y un carril bici de 2,00 m.

- Dimensionamiento del nuevo firme, considerando un suelo de tipo tolerable y una categoría de tráfico T41.

Presupuesto

· EXPLANACIONES	149.660,57€
· DRENAJE	767.503,21€
· FIRMES	1.132.715,41€
· SEÑALIZACIÓN	126.970,40€
· PLANTACIONES	34.781,65€
· GESTION DE RESIDUOS	29.278,49€
· SEGURIDAD Y SALUD	44.666,03€
P.E.M.	**2.285.575,76€**
P.B.L.	**3.291.000,54€**

Plan de obra