

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

PROJECT FOR THE PLATFORM IMPROVEMENT OF ROAD CA-661, ACCESS TO “LA BUSTA”

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TRABAJO FIN DE GRADO

RESUMEN DEL PROYECTO DE FIN DE GRADO: MEJORA DE LA PLATAFORMA DE LA CARRETERA CA-661, ACCESO A LA BUSTA.

Santos Diego Cruz

Palabras clave: CA-661, La Busta, Soba, Proyecto, Mejora, Plataforma.

PLANTEAMIENTO, OBJETO Y DEFINICIÓN DEL PROYECTO

El siguiente proyecto define la mejora de trazado de la carretera CA-661, que da acceso a San Juan de la Cistierna y llega hasta el barrio de La Busta, a cinco kilómetros de su nacimiento. La mejora de la carretera es necesaria por las siguientes razones, entre otras: pavimento en mal estado, sistemas de drenaje escasos y obstruidos por la vegetación de la zona, precariedad, y en tramos ausencia, de señalización, tanto horizontal como vertical, inexistencia de sistemas de contención de vehículos en tramos de fuerte pendiente y curva...

El tráfico de la carretera, principalmente debido a las poblaciones situadas a lo largo de la traza de esta, es escaso. Pero a pesar de ello, mantener la carretera en su estado vigente comprometería la seguridad y la salud de los vecinos de la población de San Juan de la Cistierna y del municipio de Soba que frecuentan la misma.

SOLUCIÓN ADOPTADA

Trazado

La solución adoptada consiste en la mejora del pavimento existente, así como de la ampliación de la plataforma para permitir el paso de vehículos en ambos sentidos de circulación correctamente, y el cambio del trazado en tramos de peligrosidad, especialmente en curvas.

El objetivo del proyecto no ha sido la construcción de una carretera de grandes prestaciones, sino aumentar la seguridad del tramo actual. Se tratará por tanto de reutilizar lo máximo posible la anterior carretera.

La mejora se llevará a cabo a lo largo de los primeros 2,1 kilómetros de la traza, y se realizará considerando una velocidad de proyecto de 40 km/h.

Movimiento de Tierras

Debido a la presencia de un terreno duro y resistente a lo largo de los 2,1 kilómetros de proyecto, se ha tomado la decisión de emplear unos taludes, tanto en terraplén como en desmonte, de 0,5 H/1V. Dicha consideración, teniendo en cuenta la pendiente del terreno, dureza antes mencionada del material y la topografía de la zona, montañosa, es apropiada y facilitará el uso de la tierra excavada en desmonte como recurso de relleno para terraplenes.

Drenaje

El drenaje de la carretera servirá para desaguar el agua proveniente de precipitación, único factor que afecta a la hidrología de la zona.

Es por la topografía del área de proyecto, que en zonas separa la carretera y la cota del terreno considerablemente, que se ha decidido tomar una solución mixta en lo que al drenaje transversal respecta. Hay tramos, en los que la carretera está situada en una cota cercana al terreno, donde se ubicarán sistemas de drenaje transversal convencionales. En otros tramos, sin embargo, donde la cota del terreno difiere ampliamente con aquella de la carretera, se colocarán secciones puentes estratégicamente de tal forma que se pueda evacuar en ellas el agua de lluvia recogida y así también salvar recursos económicos y espaciales en lo que a la construcción de rellenos y terraplenes respecta.

El drenaje longitudinal se llevará a cabo con cunetas VA-75 a lo largo de la traza de la carretera.

Firmes y Pavimento

Ante la necesidad de disponer de una explanada de categoría E2, y habiendo considerado que el suelo de la explanación es suelo tolerable, se ha decidido formar una explanada de 75 cm de altura de suelo seleccionado. Para la selección del firme se ha obtenido una categoría de tráfico pesado T42. Se ha establecido el uso de la sección 4221 del catálogo de secciones de firme, disponiendo de 5 cm de mezcla bituminosa y 25 de zahorra artificial. La estructura del firme será la siguiente:

- 75 cm de suelo seleccionado.
- 25 cm de zahorra artificial.
- Riego de imprimación tipo C60BF4 IMP.
- 5 cm de capa de rodadura con mezcla bituminosa en caliente tipo "AC16 surf 50/70 S" Ofita.

Presupuesto

El presupuesto de ejecución material asciende en el proyecto a 580.252,54 euros. A este valor se le añade un 13% sobre gastos industriales además de un 6% de beneficio industrial para obtener el presupuesto de base de licitación sin I.V.A., dando un valor de 690.500,52 euros. Añadiendo el 21% del I.V.A. se obtiene el presupuesto de base de licitación, dando un valor de 835.505,63 euros. Para hallar el presupuesto de inversión, hay que añadir al presupuesto base de licitación los costes de expropiaciones, que son 284.580 euros y servicios afectados, que son otros 20.000 euros. El presupuesto de inversión asciende entonces a **1.140.085,63** euros.

SUMMARY OF THE FINAL DEGREE PROJECT: IMPROVEMENT OF THE CA-661 ROAD PLATFORM, ACCESS TO 'LA BUSTA'

Santos Diego Cruz

Key words: CA-661, La Busta, Soba, Proyecto, Mejora, Plataforma.

PROYECT APPROACH, PURPOSE AND DEFINITION OF THE PROJECT

The following project defines the improvement of the layout of the CA-661 highway, which provides access to San Juan de la Cistierna and extends to the La Busta neighborhood, five kilometers from its origin. The road improvement is necessary for the following reasons, among others: poor pavement conditions, limited drainage systems obstructed by vegetation in the area, poor and, in some sections, absent signage, both horizontal and vertical, and the lack of vehicle restraint systems on steep slopes and curves.

Traffic on the road is light, mainly due to the towns located along its route. Despite this, maintaining the road in its current condition would compromise the safety and health of the residents of the town of San Juan de la Cistierna and the municipality of Soba who frequently use it.

ADOPTED SOLUTION

Layout

The solution adopted consists of improving the existing pavement, widening the platform to allow proper passage of vehicles in both directions, and changing the layout in dangerous sections, especially on curves.

The objective of the project was not to build a high-performance road, but rather to increase the safety of the current section. Therefore, the goal will be to reuse the existing road as much as possible.

The improvement will be carried out along the first 2.1 kilometers of the route, considering a design speed of 40 km/h.

Earthworks

Due to the presence of hard, resilient soil along the 2.1-kilometer project, the decision was made to use slopes of 0.5 H/1 V for both the fill and cut. This approach, taking into account the ground gradient, the aforementioned hardness of the material, and the mountainous topography of the area, is appropriate and will facilitate the use of the excavated earth as fill for embankments.

Drainage

The road drainage will serve to drain water from precipitation, the only factor affecting the hydrology of the area.

Due to the topography of the project area, which in some areas considerably separates the road and the ground level, a mixed solution has been decided for cross drainage. There are sections where the road is located at an elevation close to the ground level, where conventional cross drainage systems will be installed. In other sections, however, where the ground level differs significantly from that of the road, bridge sections will be strategically placed to allow the drainage of collected rainwater, thus saving both economic and spatial resources in terms of the construction of fills and embankments.

Longitudinal drainage will be carried out with VA-75 ditches along the road.

Road Structure

Given the need for a category E2 esplanade, and considering the leveling surface to be tolerable, it was decided to create a 75 cm high esplanade of selected soil. The pavement was selected for heavy traffic category T42. Section 4221 of the pavement section catalog was used, with 5 cm of bituminous mix and 25 cm of artificial gravel. The pavement structure will be as follows:

- 75 cm of selected soil.
- 25 cm of artificial gravel.
- C60BF4 IMP primer.
- 5 cm of wearing course with hot-mix bituminous mix type "AC16 Surf 50/70 S" (Ophite).

Budget

The project's material execution budget amounts to €580,252.54. A 13% industrial expenses tax and a 6% industrial profit tax are added to this value to obtain the base tender budget excluding VAT, giving a value of €690,500.52. Adding the 21% VAT tax gives the base tender budget, giving a value of €835,505.63. To obtain the investment budget, the expropriation costs, which amount to €284,580, and affected services, which amount to another €20,000, must be added to the base tender budget. The investment budget then amounts to €1,140,085.63.

9 INDUSTRIA, INNOVACIÓN E INFRAESTRUCTURAS



OBJETIVOS DE DESARROLLO SOSTENIBLE

OBJETIVO 9: CONSTRUIR INFRAESTRUCTURAS RESILIENTES, PROMOVER LA INDUSTRIALIZACIÓN SOSTENIBLE Y FOMENTAR LA INNOVACIÓN.

DESCRIPCIÓN DEL OBJETIVO

El objetivo 9 pretende construir infraestructuras resilientes, promover la industrialización sostenible y fomentar la innovación.

El crecimiento económico, el desarrollo social y la acción por el clima dependen en gran medida de las inversiones en infraestructuras, el desarrollo industrial sostenible y el progreso tecnológico. Ante la rápida evolución del panorama económico mundial y el aumento de las desigualdades, el crecimiento sostenido debe implicar una industrialización que, en primer lugar, haga accesibles las oportunidades a todas las personas y, en segundo lugar, se apoye en la innovación y en infraestructuras resistentes.

La industria manufacturera mundial, considerada uno de los motores del crecimiento económico global, ha venido experimentando un declive constante debido a los aranceles y las tensiones comerciales, incluso antes del inicio de la pandemia de la COVID-19. El declive de la industria manufacturera provocado por la pandemia ha tenido graves repercusiones en la economía mundial.

Esto se debe principalmente a la elevada inflación, los cambios en el precio de la energía, las continuas interrupciones en el suministro de materias primas y productos intermedios, y la desaceleración de la economía mundial.

Mientras que los países menos adelantados (PMA) de Asia han realizado progresos considerables, los PMA de África tendrían que cambiar la trayectoria actual e intensificar significativamente sus avances para alcanzar el objetivo de aquí a 2030. Sin embargo, las industrias de tecnología media-alta y alta mostraron sólidas tasas de crecimiento.

METAS A CUMPLIR Y RELACIÓN CON EL PROYECTO

Punto 9.1:

- Descripción: Desarrollar infraestructuras fiables, sostenibles, resilientes y de calidad, incluidas infraestructuras regionales y transfronterizas, para apoyar el desarrollo económico y el bienestar humano, haciendo especial hincapié en el acceso asequible y equitativo para todos
- Relación con el proyecto: Mejorar la conectividad con la red de carreteras de Cantabria de los vecinos de San Juan de la Cistierna y proporcionar, por ende, un mayor bienestar y seguridad a su población.

Punto 9.2:

- Descripción: Promover una industrialización inclusiva y sostenible y, de aquí a 2030, aumentar significativamente la contribución de la industria al empleo y al producto interno bruto, de acuerdo con las circunstancias nacionales, y duplicar esa contribución en los países menos adelantados.
- Relación con el proyecto: En Soba alrededor del 10% de la población activa se dedica a la industria, por lo que este proyecto no solo mejoraría la conectividad del municipio para transporte sino también el acceso de los vecinos del municipio de San Juan de la Cisterna al trabajo.

Punto 9.3:

- Descripción: Aumentar el acceso de las pequeñas industrias y otras empresas, particularmente en los países en desarrollo, a los servicios financieros, incluidos créditos asequibles, y su integración en las cadenas de valor y los mercados.
- Relación con el proyecto: La gran mayoría de la población de San Juan de la Cisterna se dedica a la ganadería, sector económico en declive y desventaja por la tradicionalidad y características rurales que presenta. Mejorar la carretera daría a los ganaderos un mejor acceso a otros núcleos de población, fomentar su producto e incluso exportarlo a mercados con mayor facilidad.

Punto 9.4:

- Descripción: De aquí a 2030, modernizar la infraestructura y reconvertir las industrias para que sean sostenibles, utilizando los recursos con mayor eficacia y promoviendo la adopción de tecnologías y procesos industriales limpios y ambientalmente racionales, y logrando que todos los países tomen medidas de acuerdo con sus capacidades respectivas.
- Relación con el proyecto: En el proyecto se llevarán a cabo prácticas medioambientalmente sostenibles y limpias, y también se modernizará la infraestructura de acceso a La Busta, objeto de este proyecto.

Punto 9.5:

- Descripción: Aumentar la investigación científica y mejorar la capacidad tecnológica de los sectores industriales de todos los países, en particular los países en desarrollo, entre otras cosas fomentando la innovación y aumentando considerablemente, de aquí a 2030, el número de personas que trabajan en investigación y desarrollo por millón de habitantes y los gastos de los sectores público y privado en investigación y desarrollo.
- Relación con el proyecto: No hay relación aparente.

Punto 9.a:

- Descripción: Facilitar el desarrollo de infraestructuras sostenibles y resilientes en los países en desarrollo mediante un mayor apoyo financiero, tecnológico y técnico a los países africanos, los países menos adelantados, los países en desarrollo sin litoral y los pequeños Estados insulares en desarrollo
- Relación con el proyecto: No hay relación aparente.

Punto 9.b:

- Descripción: Apoyar el desarrollo de tecnologías, la investigación y la innovación nacionales en los países en desarrollo, incluso garantizando un entorno normativo propicio a la diversificación industrial y la adición de valor a los productos básicos, entre otras cosas
- Relación con el proyecto: No hay relación aparente.

Punto 9.c:

- Descripción: Aumentar significativamente el acceso a la tecnología de la información y las comunicaciones y esforzarse por proporcionar acceso universal y asequible a Internet en los países menos adelantados de aquí a 2020.
- Relación con el proyecto: No hay relación aparente.

SUSTAINABLE DEVELOPMENT OBJECTIVES

OBJECTIVE 9: TO BUILD RESILIENT INFRASTRUCTURE, PROMOTE SUSTAINABLE INDUSTRIALIZATION AND PROMOTE INNOVATION.

DESCRIPTION OF THE OBJECTIVE

Goal 9 aims to build resilient infrastructure, promote sustainable industrialization, and foster innovation.

Economic growth, social development, and climate action depend heavily on infrastructure investments, sustainable industrial development, and technological progress. Given the rapidly evolving global economic landscape and rising inequalities, sustained growth must entail industrialization that, first, makes opportunities accessible to all people and, second, is supported by innovation and resilient infrastructure.

The global manufacturing industry, considered one of the engines of global economic growth, has been experiencing a steady decline due to tariffs and trade tensions, even before the onset of the COVID-19 pandemic. The decline in manufacturing caused by the pandemic has had serious repercussions on the global economy.

This is mainly due to high inflation, fluctuations in energy prices, continued disruptions in the supply of raw materials and intermediate products, and the slowdown in the global economy.

While least developed countries (LDCs) in Asia have made considerable progress, LDCs in Africa would need to change their current trajectory and significantly intensify their progress to achieve the target by 2030. However, medium-high- and high-tech industries showed solid growth rates.

GOALS TO ACHIEVE AND RELATION WITH THE PRESENT PROJECT

Point 9.1:

- Description: Develop reliable, sustainable, resilient and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.
- Relation with the project: To improve connectivity with the Cantabrian road network for the residents of San Juan de la Cistierna, thereby providing greater well-being and safety to its population.

Point 9.2:

- Description: Promote inclusive and sustainable industrialization and, by 2030, significantly increase the contribution of industry to employment and gross domestic product, in accordance with national circumstances, and double that contribution in least developed countries.
- Relation with the project: In Soba, approximately 10% of the working population is engaged in industry, so this project would not only improve the municipality's transportation connectivity but also improve access to work for residents of the municipality of San Juan de la Cistierna.

Point 9.3:

- Description: Increase access to financial services, including affordable credit, and their integration into value chains and markets for small-scale industries and other enterprises, particularly in developing countries.
- Relation with the project: The vast majority of San Juan de la Cisterna's population is dedicated to livestock farming, an economic sector in decline and disadvantaged by its traditional and rural nature. Improving the road would give ranchers better access to other population centers, promote their products, and even make it easier to export them to markets.

Point 9.4:

- Description: De aquí a 2030, modernizar la infraestructura y reconvertir las industrias para que sean sostenibles, utilizando los recursos con mayor eficacia y promoviendo la adopción de tecnologías y procesos industriales limpios y ambientalmente racionales, y logrando que todos los países tomen medidas de acuerdo con sus capacidades respectivas.
- Relation with the project: The project will implement environmentally sustainable and clean practices and will also modernize the access infrastructure to La Busta, the focus of this project.

Point 9.5:

- Description: Increase scientific research and enhance the technological capacity of industrial sectors in all countries, particularly developing countries, by, inter alia, fostering innovation and substantially increasing, by 2030, the number of people working in research and development per million inhabitants and public and private sector expenditure on research and development.
- Relation with the project:

Point 9.a:

- Description: Facilitate the development of sustainable and resilient infrastructure in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States.
- Relation with the project: There is no apparent relationship.

Point 9.b:

- Description: Support the development of domestic technologies, research, and innovation in developing countries, including by ensuring a regulatory environment conducive to industrial diversification and value addition to commodities, among other things.
- Relation with the project: There is no apparent relationship.

Point 9.c:

- Description: Significantly increase access to information and communications technology and strive to provide universal and affordable Internet access in the least developed countries by 2020.
- Relation with the project: There is no apparent relationship.

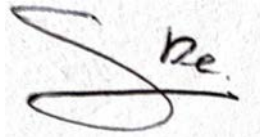


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ÁREA DE PROYECTOS DE INGENIERÍA		
		
UNIVERSIDAD DE CANTABRIA		
TIPO	PROYECTO	
TÍTULO	PROJECT FOR THE PLATFORM IMPROVEMENT OF ROAD CA-661, ACCESS TO “LA BUSTA”	
PROVINCIA	CANTABRIA	
TERMINO MUNICIPAL	SOBA	
TOMO	I (Y UNICO)	
DOCUMENTOS	DOC N°1: INTRODUCTION DOC N°2 : PRELIMINARY STUDIES DOC N°3: PROJECT DESIGN DOC N°4: TECHNICAL SPECIFICATIONS DOC N°5: BUDGET DOC N°6: EXECUTION PLAN DOC N°7: APPENDICES	
GRUPO	CARRETERAS	
AUTORES	SANTOS DIEGO CRUZ	
PRESUPUESTO P.B.L 835.505,63		FECHA SEPTIEMBRE 2025

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UNIVERSIDAD DE CANTABRIA			

FIRMAS DEL DOCUMENTO

FIRMA DEL ALUMNO AUTOR DEL PROYECTO:



PROJECT REPORT



INITIAL DOCUMENT: PROJECT REPORT

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1. INTRODUCTION

This project was developed as a final project for the Civil Engineering mayor at the School of Civil Engineering. The objective of the project is to improve the layout of the CA-661 highway, in order to improve connectivity and access to the town of San Juan de la Cistierna and its more remote neighborhood, La Busta.

The improvements planned for the project will include, among others, widening the roadway, installing a drainage system, renewing the pavement, and adapting the road to current regulations and requirements.

The need to improve the layout of this road is due to the poor condition of the pavement, the absence of hard shoulders, poor signage and drainage, and the danger posed by curved corners with no visibility and the lack of containment systems on the edge adjacent to embankments.

2. DESCRIPTION OF THE PROJECT

2.1. WORKPLACE DESCRIPTION

Regional framework:

The project is being developed entirely in the autonomous community of Cantabria, located 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 north of the autonomous community, is the capital and most populous city in Cantabria. It has a population of 584,507 (2021 data, INE), concentrated in the upper half of the territory.

Regional and municipal framework:

The planned highway will run through the municipality of Soba, a valley and municipality in Cantabria. The municipality includes the following towns:

Locality	Approximate Area / Location
Aja	Upper Asón valley
Asón	Source of the Asón River, central valley
Astrana	Western area, near La Gándara
Bustancillés	Middle Asón valley
Cañedo	Around Veguilla (municipal capital)
Fresnedo	Middle valley, near the Gándara River
Hazas	Near Alisas pass, northern part
Herada	Around Veguilla (capital)
Incedo	Central valley, near the Asón River
Lavín	Middle Asón valley
Pilas	Near Veguilla
El Prado	Close to Quintana and Veguilla
Quintana	Central valley, close to the capital
Regules	Lower Asón valley
Rehoyos	Asón River area, middle section
La Revilla	Near Rozas and Veguilla
Rozas	Central area, near Veguilla
San Juan	Close to Quintana



San Martín	Middle Asón valley
San Pedro	Gándara area
Sangas	Central valley, near Lavín
Santayana	Upper area, on the way to La Sía pass
Valcaba	Near Lunada pass
Valdició	High area, bordering Burgos
Veguilla (capital)	Municipal capital, administrative center
Villar	Close to Rozas
Villaverde	Eastern area, towards Burgos

According to the Regional Accounting conducted by the INE (National Institute of Statistics and Census) in 2022, the municipal per capita income was €13,859 per inhabitant, lower than the regional average of €13,888 and the national average of €13,960.

Regarding sectoral activity, the primary sector accounts for 59% of the municipality's population, construction accounts for 10.8%, industry accounts for 9%, and the service sector accounts for 22.1%.

Regarding the municipal historical heritage, the El Mortero, Las Escaleras, and El Tarreón caves are worth highlighting.

2.2. DESCRIPTION OF THE WORK

The work to be carried out, the improvement of the CA-661 roadbed, will consist of improving the surface, widening the road, correcting curves, and adapting the drainage, signage, and visibility to ensure proper vehicle traffic.

The CA-661 road, from its intersection with the CA-256 to the town of La Busta, is 5.000 m long. The improvement project will extend past the Santa María neighborhood, 2.100 m from the initial intersection. Therefore, the project will cover from PK 0+000 to PK 2+100.

This project, by improving the condition of the CA-661 highway, aims to facilitate access to the town of San Juan de la Cisterna and the surrounding neighborhoods via the CA-661 highway, as well as the connection between the CA-256 highway and the N-629 national highway via the junction of the CA-661 and CA-660 highways.

Drainage elements will be installed, both longitudinal (gutters and manholes for roadway and shoulder drainage) and transverse (cross drainage works for basin drainage). Horizontal and vertical signage and vehicle containment elements will also be installed. No lighting will be installed as the route is located outside the urban area.

The following actions will be carried out:

- Execution of the esplanade. The typical section has two 3-meter-wide lanes and 0.5-meter shoulders. Cut and fill sections will be built.
- Execution of the drainage. Transverse drainage is planned, consisting of pipe systems and bridge sections to drain water flowing from the basins to the roadway, and longitudinal drainage is planned to evacuate runoff from the platform and banks.
 - Transverse: Four transverse drainage structures are planned along the bypass, as well as four bridge sections.
 - Longitudinal: Type VA-75 ditches will be constructed.
- Road structure spreading Starting with tolerable soil and traffic category T42, 75 cm of selected soil, 25 cm of artificial gravel and the following layer of road surface will be laid to create an E2 surface:
 - Wear course: AC16 SURF 50/70 S OFITA, 5 cm.
- Signaling, beaconing and containment systems placing. Both vertical signage (signs with RA-2 retroreflection and RA-3 signs) and horizontal signage (road markings) are contemplated, in addition to vehicle containment barriers.
- Environmental Integration. Slope revegetation will be carried out using hydroseeding.

2.3. TOPOGRAPHY AND CARTOGRAPHY

The mapping used for the development of the project will be the basic topographic mapping from the Harmonized Topographic Base (BTA), scale 1/5,000, based on the 2007 flight plan, BTA 2007.



The sheets corresponding to the road layout are:

- Sheet 0060-2-6.
- Sheet 0060-2-7.

In addition to the cartographic sheets, the corresponding series of orthophotos will be used.

2.4. GEOLOGY AND ORIGIN OF MATERIALS

The study area is located on sheet 60 – Valmaseda, of the National Geological Map, scale 1:50,000.

2.5. SEISMIC EFFECTS

According to the specifications of the Earthquake-Resistant Construction Standard: General and Building Part, NCSE-02, seismic effects in the vicinity of the work will not be considered if the value of the basic horizontal seismic acceleration of the ground surface, a_b , is less than 0.04g.

As can be seen in the Seismic Hazard Map attached to the standard, the value of said coefficient a_b is less than 0.04g. With this in mind, it is not necessary to consider any seismic action or activity in the work area or in the Autonomous Community of Cantabria.

2.6. CLIMATOLOGY AND HYDROLOGY

The project area has a class Cfb oceanic climate, temperate with no dry season and a mild summer.

The area's climate is characterized based on data from the Santander Airport meteorological station. By compiling data on air temperatures and precipitation from 1997 to 2022, this allows the calculation of the average daily maximum and minimum temperatures recorded each month, as well as the average daily maximum and minimum precipitation.

The Community of Cantabria has two distinct climates: the temperate Atlantic climate and the Mediterranean climate. In the study area, the climate is temperate Atlantic, characterized by humid conditions influenced by the prevailing westerly winds, which bring humid air masses, whether tropical or polar.

In the valley and municipality of Soba, the climate is warm and temperate, with an average temperature of 12.6°C. In summer, temperatures are around 18.9°C, while in winter they drop to 4°C.

Regarding rainfall, the municipality of Soba has an annual average of 1,008 mm. The extreme rainfall levels occur in July, with 43 mm, and in December, with 125 mm. During the rest of the year, rainfall fluctuates between this threshold.

The CA-661, as far as river courses are concerned, is not crossed by any. However, the Gándara River, formerly the Soba River, flows near the road around the ravine known as La Cubilla.

2.7. URBAN PLANNING

The CA-661 highway, which connects the town of San Juan de la Cistierna with the CA-256 highway, is located, according to Cantabria Law 2/2001, on mostly rural land, with some small urban land.

2.8. TRAFFIC

Traffic data from coverage station 661-01, provided by the University of Cantabria, show that the daily traffic flow on this road in 2023 was 135 vehicles, 10% of which were heavy vehicles.

Cover Station	Road	Average IMD in 2023	% of heavy traffic
661-01	CA-661	135 veh/día	10

Considering the annual increase is 1.44% and taking 2026 as the year of commissioning, an $IMD_{P,2026}$ of 143 heavy vehicles per day and lane is obtained.

2.9. GEOTECHNICAL STUDIES

The route falls within Sheet 5 – Santander of the National Geotechnical Map at a scale of 1:200,000. The project is being carried out on soil composed primarily of massive limestone and marl, with high stability throughout the area, which will change beyond the project zone. This soil offers favorable conditions for construction, with no apparent specific problems.

Thus, the same cut and fill slopes will be used throughout the bypass. The slopes will be 0.5H:1V for both the fill and cut.



2.10. EARTHWORKS

Previously established slope designs will be used. The soil obtained from the clearing will be reused for the construction of the fills, covering them completely.

This is a summary of the project's earthworks:

VOLUMES (m3)	
Cut	28.612,86
Fill	13.376,94
From loan	0
Selected soil	11.000

Table 1. Earthworks summary.

2.11. DRAINAGE

The drainage calculation is carried out in accordance with Standard 5.2-IC "Surface Drainage." In the vicinity of the road, four main drainage basins are distinguished, discharging their water into the structure. The water collected by the ditches in the basins generated by the platform and its banks is also taken into account. No drainage element is designed for basin C2, as the water will be discharged back to the ground via a bridge section, taking advantage of the difference in altitude between the road and the ground.

The following drainage elements will be installed:

Transversal Drainage

- 4 transversal drainage works (ODT) with a circular section of 1.500 mm of diameter.
- 4 mouths for the ODTs.

Longitudinal Drainage

- Triangular VA-75 type excavation ditches, lined with concrete.

2.12. ROAD STRUCTURE

The pavement sections are sized according to the criteria defined in Standard 6.1-IC, "Pavement Sections." Based on the available traffic data, a value of 8 heavy vehicles per day per lane is found. The underlying soil is tolerable (0). This results in a T42 heavy traffic category.

The goal is to achieve a category E2 esplanade.

A 75 cm thick layer of selected soil (2) will be used to construct the crest.

CAPA		GROSOR
Road Structure Layer	Bituminous mixture- AC 16 surf 50/70 S ophite, with B 50/70 bitum	5 centimeters
	Primer Irrigation- Bituminous emulsion C60BF4 IMP	-
	Artificial Gravel	25 centimeters
Esplanade Layer	Esplanade- Selected soil	75 centimeters

Table 2. Road structure summary.

2.13. SOLUTIONS TO TRAFFIC DURING CONSTRUCTION

The proposed traffic solutions are defined according to the guidelines of Standard 8.3-IC, "Works Signaling," and the Manual of Examples of Fixed Works Signaling published by the General Directorate of Highways. A series of vertical signs, road markings, and beaconing elements will be used to regulate traffic.

2.14. SIGNALING, BEACONING AND CONTAINMENT SYSTEMS

Vertical signage will be installed in accordance with Standard 8.1-IC, "Vertical Signage." Vertical signage will consist of signs (RA-2 retroreflection).

Horizontal signage will be installed in accordance with Standard 8.2-IC, "Road Markings."

To contain vehicles, safety barriers N2-W2 (containment level N2 and working width W2) will be installed following the recommendations of Circular Order 35/2014 on Criteria for the Application of Vehicle Containment Systems.



2.15. ENIRONMENTAL INTEGRATION

Before earthworks begin for leveling, the topsoil cover will be removed and properly stored for later planting on the fill and cut slopes.

The slopes will be revegetated using hydroseeding to prevent erosion, improve stability, and mitigate the impact on the landscape.

2.16. JUSTIFICATION OF THE CHOSEN SOLUTION

There is only one possible solution for the project: improving the current state of the road and minimally changing the layout, especially in the curved sections that pose a problem with road safety.

2.17. ACCESIBILITY

The new roadway is designed to be accessible so that it can be used safely and effectively by the widest possible range of people, whether they have disabilities or not.

2.18. COORDINATION WITH OTHER SERVICES

The entities listed below are affected by the execution of the works:

Public entities:

- Soba City Council.
- Government of Cantabria.
- Northern Hydrographic Confederation.
- Ministry of Development, Territorial Planning, and the Environment of the Government of Cantabria.
- Environmental Hydraulics Institute.
- Health and Safety Institute.

Service providers:

- Electricity supply network.
- Telephone network.

- Transportation infrastructure network.
- Gas supply network.
- Water supply network.

2.19. EXPROIATIONS

The expropriation of land in the vicinity of the project is valued at €284,580.

2.20. AFFECTED SERVICES

The restoration of services in the area surrounding the construction site is valued at €20,000.

2.21. CONSTRUCTION SCHEDULE

The construction is estimated to take 10 months and one week to complete. A summary of the planned construction plan is attached:

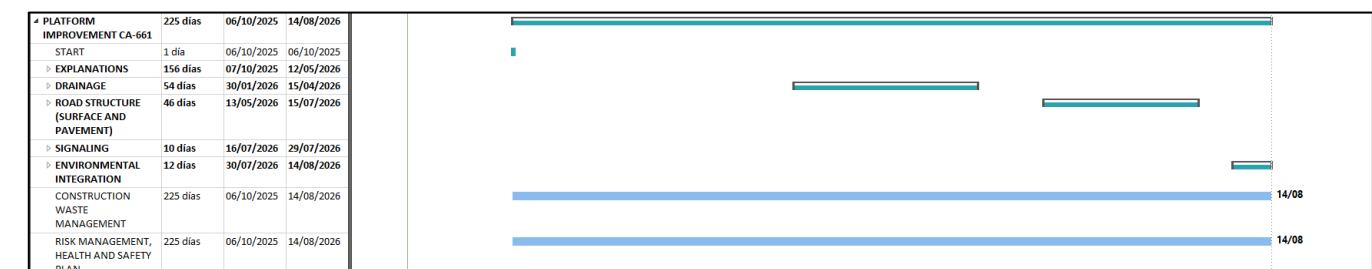


Figure 1: Construction schedule.

2.22. CONTRACTOR'S CLASSIFICATION

These classifications will be required of the Contractor:

Group		Subgroup		Category
G	Viales y pistas	4	Con firmes de mezcla bituminosa	3

Table 3. Contractor's classification.



2.23. PRICE JUSTIFICATION

Based on the amounts provided by the Cantabria Construction and Public Works Collective Agreement for 2024 and 2025, the following hourly labor costs are determined:

	COSTE DE LA MANO DE OBRA (C)	
	COSTE ANUAL	COSTE POR HORA
	€	€/h
CAPATAZ	46176,06	26,60
OFICIAL DE 1ª	45770,33	26,37
PEÓN ORDINARIO	37575,46	21,64

Table 4. Workforce cost.

An estimated 6% of indirect costs.

2.24. BUDGET FOR THE KNOWLEDGE OF THE ADMINISTRATION

The Budget for Knowledge of the Administration is calculated in the following table:

Concepto		Precio (€)	
		Parcial	Total
1	Presupuesto de Ejecución Material		580252,54
2	Gastos Generales, 13%	75432,83	
3	Beneficio Industrial, 6%	34815,15	
4	Presupuesto Base de Licitación sin IVA (1+2+3)		690500,52
5	IVA, 21%	145005,11	
6	Presupuesto Base de Licitación (4+5)		835505,63
7	Expropiaciones		284580
8	Servicios Afectados		20000
9	PRESUPUESTO PARA CONOCIMIENTO DE LA ADMINISTRACIÓN (6+7+8)		1140085,63

Table 5. Budget for the knowledge of the administration.

2.25. WASTE MANAGEMENT

Pursuant to the provisions of Royal Decree 105/2008 of February 1, which regulates the Production and Management of Construction and Demolition Waste, and Decree 72/2010 of October 28, which regulates the production and management of construction and demolition waste in the Autonomous Community of Cantabria, the construction waste generated during construction is determined and preventive measures are established. Overall, the cost of managing CDW is **€63,483.19**.

2.26. ENVIRONMENTAL IMPACT STUDY

In accordance with Annex II of Law 21/2013, the project is subject to a Simplified Environmental Assessment, which identifies the potential impacts the project will have on the environment and quantifies its degree of



impact, both during the construction and operational phases. The assessment was carried out using the semi-quantitative numerical method.

A series of preventive or corrective measures are established for impacts assessed as moderate, and the foundations for the implementation of an Environmental Monitoring Plan are laid out.

2.27. RISK MANAGEMENT, HEALTH AND SAFETY STUDY

It is drafted in compliance with Royal Decree 1627/1997, of October 24, which establishes the mandatory inclusion of a Health and Safety Study in public works projects.

This study describes the construction activities and methods to be followed on the project, identifying potential risks. It also determines the preventive measures that must be followed on site to avoid or reduce these risks.

In addition, it describes the hygiene and well-being facilities that will be available to workers on site.

The Documentation Sheet is also provided, detailing the planned Health and Safety elements.

Finally, a Health and Safety Budget is included, consisting of measurements, Price Schedule No. 1, a budget by chapter, and a budget summary. The Material Execution Budget for Health and Safety amounts to €55,077.62, an amount that is added to the Project Budget in its corresponding chapter.

2.28. PHOTOGRAPHICAL REPORT

The photographs from the project area's photo report will serve to highlight the poor condition of the road and raise awareness about the need to carry out this project.

3. TECHNICAL SPECIFICATIONS

The Specific Technical Specifications Document for this Project lists the laws and regulations applicable to the construction work described in this project. It describes the execution of the work, the construction units, the construction procedures, their measurement and payment, and the materials to be used.

4. BUDGET

The **Material Execution Budget** of the Project is **580.252,54 €**.

Applying General Expenses (13%), Industrial Profit (6%) and Value Added Tax (VAT, 21%), the **Base Tender Budget** amounts to **€835.505,63**.

Including the cost of expropriations and the restoration of affected services, the resulting **budget for the knowledge of the administration** amounts to **€1.140.085,63**.

5. STRUCTURE OF THE PROJECT

- **PART Nº1: INTRODUCTION**
 - **Document Nº1: Administrative Background**

- **PART Nº2: PRELIMINARY STUDIES**
 - **Document Nº1: Geotechnical Studies**
 - **Document Nº2: Traffic Studies**
 - **Document Nº3: Urban Planning**
 - **Document Nº4: Topographic Studies**
 - **Document Nº5: Geological Studies**
 - **Document Nº6: Seismological Studies**
 - **Document Nº7: Climatological and Hydrological Studies**
 - **Document Nº8: Environmental Impact Study**

- **PART Nº3: PROJECT DESIGN**
 - **Document Nº1: Road Alignment and Geometric Design**
 - **Document Nº2: Structural Design**
 - **Document Nº3: Drainage**
 - **Document Nº4: Earthworks**

- **PART Nº4: TECHNICAL SPECIFICATIONS**



- Document N°1: Technical Specifications

- PART N°5: BUDGET

- Document N°1: Budget
- Document N°2: Breakdown of Expenses
- Document N°3: Contractor's Classification
- Document N°4: Price Revision Formula
- Document N°5: Budget for the Knowledge of the Administration

- PART N°6: EXECUTION PLAN

- Document N°1: Construction Schedule
- Document N°1: Risk Management, Health and Safety Study

- PART N°7: APPENDICES

- Document N°1: Technical Drawings and Plans
- Document N°1: Additional Documentation
 - Document N°2.1: Workplace Description
 - Document N°2.2: Signaling, Beacons and Containment Systems
 - Document N°2.3: Road Lightning
 - Document N°2.4: Traffic Measures and Solutions During Construction
 - Document N°2.5: Accesibility
 - Document N°2.6: Expropriations and Affected Services
 - Document N°2.7: Construction Waste
 - Document N°2.8: Landscape Restoration
 - Document N°2.9: Environmental Responsibility
 - Document N°2.10: Photographical Information
 - Document N°2.11: Justification for the Chosen Procedure

6. CONCLUSION

Everything stated in this Report, as well as the Plans, Technical Specifications Document and Budget, constitute sufficient justification for this Construction Project "PROJECT TO IMPROVE THE PLATFORM OF THE CA-661 ROAD. SECTION: ACCESS TO LA BUSTA".

Santander, september 2025.

Signed by: Santos Diego Cruz.

PART №1 – INTRODUCTION



DOCUMENT N°1 – ADMINISTRATIVE BACKGROUND



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3. TECHNICAL SPECIFICATIONS.....	2



1. INTRODUCTION

The following project project, "Project for the platform improvement of road CA-661, access to La Busta", serves as the Final Degree Project for Santos Diego Cruz, a fourth-year student of Civil Engineering at the University of Cantabria in the Higher Technical School of Civil Engineers of Santander, 2024-2025 academic year.

2. SCOPE OF THE PROJECT

The CA-661 highway covers part of the Soba Valley, originating at one end as a split from the CA-256 highway. The section that provides access to the town of San Juan begins here, and its other end is in the town of Herada. The highway, along its entire length, is 7,7 kilometers long.

The project consists of improving the layout and surface of the CA-661 road in the section that provides access to the town of La Busta, part of San Juan de la Cistierna. This improvement will be carried out from the beginning of the road, where it splits from the CA-256 highway (PK 0+000) to past the neighborhood of Santa María, also part of San Juan de la Cistierna (PK 2+100).

The main objectives of this project are to improve the road's surface and layout, as well as its cross-section, in compliance with current traffic and construction regulations.

3. TECHNICAL SPECIFICATIONS

- Type of project: Construction project.
- Type of network: Autonomous Road from the local network.
- Location: Autonomous Community of Cantabria, Soba municipality.
- Works to be projected: Platform improvement and widening, as well as some layout changes.
- Project speed: 40 km/h.
- Cross section type: Single carriageway road with one lane in each direction.
- Section length: 2.100m.
- Carriageways: Two, one each direction. 3 meters wide.
- Shoulders: 0,5m.

PART №2 – PRELIMINARY STUDIES



DOCUMENT N°1 – GEOTECHNICAL STUDIES



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3. SLOPE CALCULATIONS	4
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3.3. DETAIL FROM THE WORKPLACE	5
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1. INTRODUCTION

This annex shows the geotechnical study conducted in the project area, which is necessary to identify the characteristics of the terrain on which the road will be located. With these characteristics defined, the slopes to be considered, both for embankments and cuts along the road's route, will be specified.

2. GEOTECHNICS

2.1. GEOTECHNICAL CHARACTERIZATION OF THE MATERIALS

The project area is characterized by a lithology based on detrital materials, predominantly clayey, with intercalations of limestone and clayey layers common. The variable relief features steep slopes with limestone and sandstone layers, with gentler slopes dominated by clay and sand. Overall, the project area is semipermeable, with impermeable areas on valley floors.

The area's lithology, predominantly clayey, also including sand and sandstone, gives rise to a set of gentle reliefs and heavy surface coverings of clayey soil, difficult drainage, and poor surface stability.

II₂	Materiales detríticos cretácicos. Predominio de arcillas con arenas, ocupan el centro de la Hoja. Potentes recubrimientos superficiales arcillosos.
-----------------------	--

Figure 1: Lithological characterization of the workplace.

Hydrologically speaking, the material in the project area, as mentioned, is semi-permeable. Surface drainage in the area is favored by the high runoff and slopes of the terrain, while deep drainage may be difficult in certain areas. Any aquifer levels that may exist in the area will generally be scarce and difficult to exploit.

The geotechnical study of the project area is possible thanks to the information included in the General Geotechnical Map, scale 1:200,000, of the Geological and Mining Institute of Spain (IGME).

The project area, located below Ramales de la Victoria, is in a zone known as II₂, which on the adjacent surface is identified by its borders with the Gándara and Calera rivers.

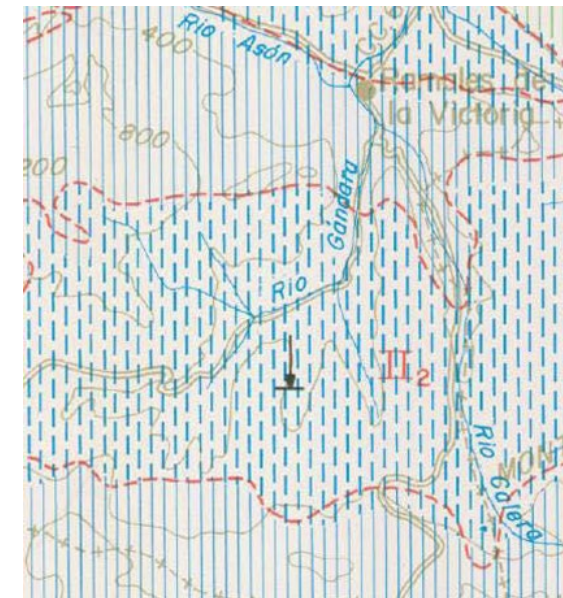


Figure 2.1: Detail of the workplace from the map.

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

Figure 2.2: Construction characteristics of the workplace.

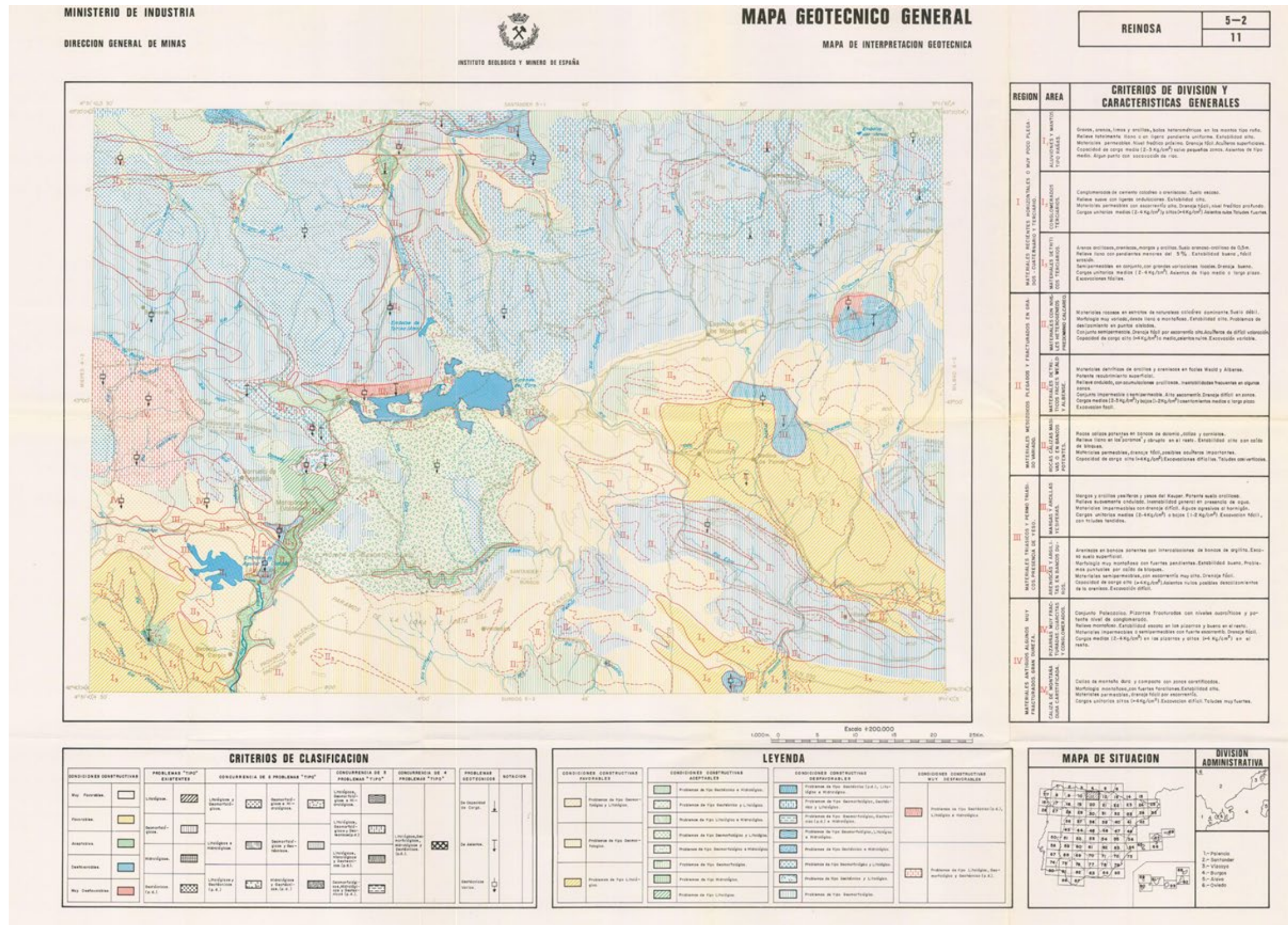
II₂ MATERIALES DETRÍTICOS FACIES WEALD Y ALBENSE.	Materiales detríticos de arcillas y areniscas en facies Weald y Albense. Potente recubrimiento superficial. Relieve ondulado, con acumulaciones arcillosas. Inestabilidades frecuentes en algunas zonas. Conjunto impermeable o semipermeable. Alta escorrentía. Drenaje difícil en zonas. Cargas medias (2-3 Kg/cm ²) y bajas (1-2 Kg/cm ²) asentamientos medios a largo plazo. Excavación fácil.
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Figure 2.3: Geotechnical characteristics of the materials in the workplace.

As can be seen, the construction conditions in the project area are unfavorable, due to geotechnical, geomorphological, and lithological problems. The materials in the area are precariously stable but easy to excavate, and water plays a significant role. The problems in this area stem from the clayey-sandy nature of the materials, which, combined with the rugged topography, will generate construction difficulties and unfavorable conditions.



2.2. NATIONAL GEOTECHNICAL MAP





3. SLOPE CALCULATIONS

Due to the lack of geotechnical data in the Project area, the definition of soil properties will be based solely on the geological characteristics detailed above.

3.1. EMBANKMENT/CUT SLOPE

Embankment, or cut, slopes Will be calculated with the following table:

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

Figure 3.1: Table with values of cut slope.

As can be seen in the table, for sandy and clayey materials a slope height of approximately 1.25:1 or 1.5:1 (H:V ratio) is recommended, which we will round up to 2:1 (H:V).

3.2. FILL SLOPE

Fill slopes Will be calculated with the following table:

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			

Figure 3.2: Table with values of fill slope.

To obtain a slope estimate for embankments, we must use one of the two available classifications: AASHTO or SUCS.

The AASHTO classification, defined in the table below, cannot be used with certainty in this case due to the lack of information, such as particle size analysis. Therefore, we must make an approximation based solely on the composition of the soil materials in the project area and their characteristics, defined above.

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 o 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

Figure 4.1: AASHTO soil classification.

As we can see, and considering that the predominant material is clayey sand, we can say that the soil in the project area is A-2, specifically A-2-6 or A-2-7. Again, lacking important information, such as particle size analysis or plasticity and liquid limit indices, the SUCS classification will most accurately determine the soil type we are dealing with.

According to the SUCS classification, we can say that the soil in the project area, which is composed of sand and clay, is of type SC, which is defined by soils of clayey sand and mixtures of sand and clay.



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	-

Figure 4.2: Soil characteristics, SUCS classification.

Principales divisiones	Letra	Nombre	Valor como terreno de apoyo	Valor como subbase	Valor como base	Acción potencial de la helada	Compresibilidad y expansión	Características de drenaje	Equipo de compactación	Peso unitario en seco en Tm/m³	CBR	Módulo k en Tm/m² y en lb/pulg²	
1	2	3	4	5	6	7	8	9	10	11	12	13	
Suelos de grano grueso	Gravas y suelos con grava	GW	Gravas bien graduadas, mezclas de grava y arena, poco o ningún fino	Excelente	Excelente	Bueno	Ninguna a muy ligera	Casi ninguna	Excelente	Tractor tipo oruga, rodillo de neumáticos, rodillo con ruedas de acero	2.00-2.24	40-80	5536-8304 200-300
		GP	Gravas pobremente graduadas,mezclas de grava y arena, poco o ningún fino	Bueno a excelente	Bueno	Regular a bueno	Ninguna a muy ligera	Casi ninguna	Excelente	Tractor tipo oruga, rodillo de neumáticos, rodillo con ruedas de acero	1,76-2.24	30-60	5536-8304 200-300
		GM	Gravas limosas, mezclas de grava, arena y limo	Bueno a excelente	Bueno	Regular a bueno	Ligera a media	Muy ligera	Pobre a mediano	Rodillo de neumáticos, rodillo de pata de cabra	2.00-2.32	40-60	5536-8304 200-300
				Bueno	Mediano	Pobre a no conveniente	Ligera a media	Ligera	Pobre a prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.84-2.16	20-30	2768-8304 100-300
		GC	Gravas arcillosas, mezclas de grava, arena y arcilla	Bueno	Mediano	Pobre a no conveniente	Ligera a media	Ligera	Pobre a prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	2.08-2.32	20-40	2768-5536 100-200
	Arenas y suelos arenosos	SW	Arenas bien graduadas, arenas con grava, poco o ningún fino	Bueno	Mediano a bueno	Pobre	Ninguna a muy ligera	Casi ninguna	Excelente	Tractor tipo oruga, rodillo de neumáticos	1.76-2.08	20-40	5536-8304 200-300
		SP	Arenas pobremente graduadas, arenas con grava, poco o ningún fino	Mediano a bueno	Mediano	Pobre a no conveniente	Ninguna a muy ligera	Casi ninguna	Excelente	Tractor tipo oruga, rodillo de neumáticos	1.68-2.16	10-40	5536-8304 200-300
		SM	Arenas limosas, mezclas de arena y limo	Mediano a bueno	Mediano a bueno	Pobre	Ligera a alta	Muy ligera	Pobre a mediano	Rodillo de neumáticos, rodillo de pata de cabra	1.92-2.16	15-40	5536-8304 200-300
				Mediano	Pobre a mediano	No conveniente	Ligera a alta	Ligera a media	Pobre a prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.60-2.08	10-30	2768-5536 100-200
		SC	Arenas arcillosas, mezcla de arena y arcilla	Pobre a mediano	Pobre	No conveniente	Ligera a alta	Ligera a media	Pobre a prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.60-2.16	5-20	2768-8304 100-300
Suelos de grano fino	Limos y arcillas	ML	Limos inorgánicos	Pobre a mediano	No conveniente	No conveniente	Media a muy alta	Ligera a media	Pobre a mediano	Rodillo de neumáticos, rodillo de pata de cabra	1.44-2.08	15 o menos	2768-5536 100-200
		CL	Arcillas inorgánicas de baja a media compresibilidad,arcillas con gravas, arcillas arenosas, arcillas limosas	Pobre a mediano	No conveniente	No conveniente	Media a alta	Media	Prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.44-2.08	15 o menos	1384-5536 50-200
		OL	Limos orgánicos y arcillas limosas orgánicas de baja compresibilidad	Pobre	No conveniente	No conveniente	Media a alta	Media a alta	Pobre	Rodillo de neumáticos, rodillo de pata de cabra	1.44-1.68	5 o menos	1384-2768 50-100
		MH	Limos inorgánicos de alta compresibilidad	Pobre	No conveniente	No conveniente	Media a muy alta	Alta	Pobre a mediano	Rodillo de neumáticos, rodillo de pata de cabra	1.28-1.68	10 o menos	1384-2768 50-100
	Limos y arcillas	CH	Arcillas inorgánicas de alta compresibilidad	Pobre a mediano	No conveniente	No conveniente	Media	Alta	Prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.44-1.84	15 o menos	1384-5536 50-200
		OH	Arcillas y limos orgánicos de media a alta compresibilidad	Pobre a muy pobre	No conveniente	No conveniente	Media	Alta	Prácticamente impermeable	Rodillo de neumáticos, rodillo de pata de cabra	1.28-1.76	5 o menos	692-2768 25-100
		Pt	Turba y otros suelos altamente orgánicos	No conveniente	No conveniente	No conveniente	Ligera	Muy alta	Pobre a mediano	No se practica la compactación	—	—	—
Suelos altamente orgánicos													

Figure 4.3: SUCS soils values.

3.3. DETAIL FROM THE WORKPLACE

Although the geotechnical characteristics of the project area are rather unfavorable, the section through which the road passes do not exactly present sandy or clayey materials.

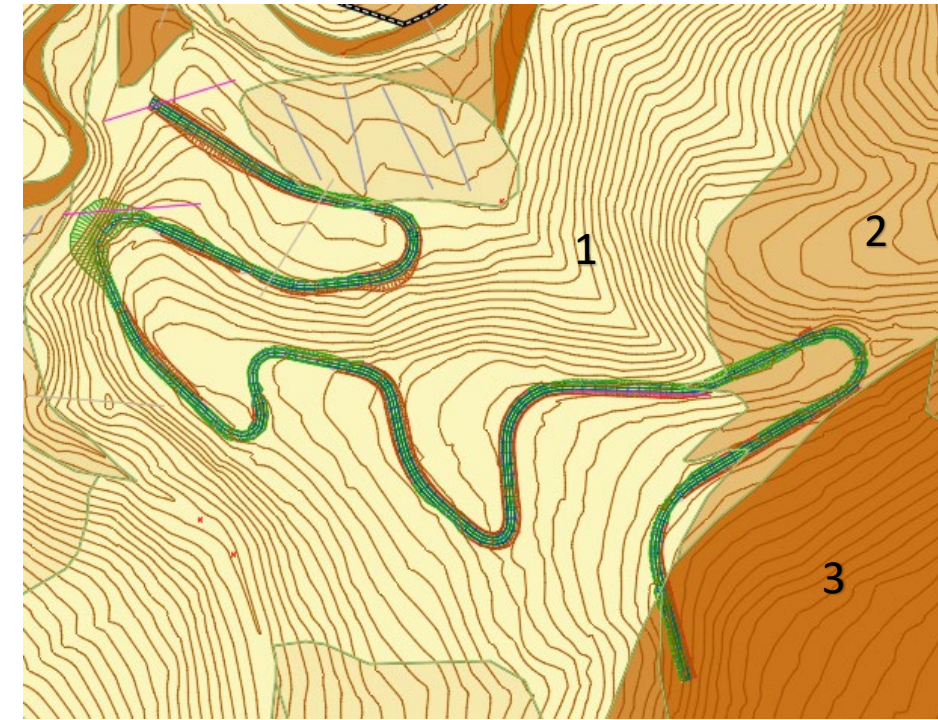


Figure 5: Geotechnics in the Project area.

As can be seen in the attached image, along the length of the CA-661 road, we can find three different types of material beneath it. These materials are as follows:

1. Rhythmic alternation of marly limestone and dark marl.
2. Bioturbated silty limestone.
3. Slump levels and muddy flow.

The first material, unlike the rest of the area, is resistant and does not require the demanding embankment and cut slopes discussed above. The second and third materials, however, do present greater challenges in terms of mechanical behavior and resistance, so it will likely be necessary to define different types of slopes according to the material found beneath the road.

Once the soil type has been assessed and confirmed to be classified as 'SC', we will define a slope gradient of 2:1 (H:V) for it, since flooding is not expected in embankment slope areas.



3.4. CONCLUSIONS

Based on the results obtained, and considering that despite the influence of water, the project area is not a floodable area, the slopes for both fill and cut for the project road will be as follows:

Slopes of 0.5:1 (H:V) in the area with marly limestone and dark marl. Since this is a resistant material, more vertical slopes can be permitted, which in turn will imply less interference with land uses due to their reduced land use, whether livestock land or private residential properties. In other words, this slope will be used from PK 0+000 to PK 2+100 throughout the entire project.

Slopes of 2:1 (H:V) in the areas affected by less resistant materials, that is, where bioturbated silty limestone and mudstone flow are present. As recommended in the report attached to the National Geotechnical Map, the surfaces in areas of character II_2 are characterized by easy excavation, and the slopes to be adopted are recommended to be in the range 2:1 to 1:1 (H:V). Therefore, and in accordance with the study carried out, the slope gradients for fill and cut will be 2:1 (H:V) in these areas. In the area where the project will be carried out, it will not be necessary to consider the use of these slopes for two reasons:

1. The stratigraphy in the upper soil zone is rather rocky and resistant.
2. The problematic area with the most unfavorable terrain is present in a very small section of the project.

Therefore, since this situation will not cause problems due to the low traffic volume and the soil's surface resistance, a slope of 0.5:1 (H:V) will be used throughout the entire project. However, as the work continues beyond the 2+100 km mark, which is the extent of the current project, more demanding slopes or measures to treat the soil on which the road will be built will have to be considered.



DOCUMENT N°2 – TRAFFIC STUDIES



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1.	INTRODUCTION	2
2.	TRAFFIC FORECAST	2



1. INTRODUCTION

This annex will carry out a traffic study of the projected road and estimate the expected traffic intensity in the year of its entry into service after the layout improvement, in 2026. To carry out this study, data collected by the coverage station that covers the road, station 661-01, will be used. This information is included in the document 'Plan de Aforos de 2023, Dirección General de Obras Públicas, Servicio de Carreteras Autonómicas del Gobierno de Cantabria'.

COVERAGE STATION	ROAD	IMD 2023	% HEAVY VEH.
661-01	CA-661	135 veh. /day	10

2. TRAFFIC FORECAST

To calculate the traffic forecast for the commissioning year, we use the following formula:

$$IMD_T = IMD_{2022}(1 + r)^n$$

Donde:

- IMD_T Diary average intensity in commissioning year (2026)
- IMD_{2022} Diary average intensity in starting year (2022)
- r anual growth rate
- n number of years gone by.

To estimate the annual growth rate, we refer to Service Note 05/2014, which specifies the following values to be taken:

Incrementos de tráfico a utilizar en estudios	
Periodo	Incremento anual acumulativo
2013-2016	1,08%
2017 en adelante	1,44%

Figure 1: Traffic increments according to Orden FOM/3317/2010.

As we can see from the table, since the data collected by the coverage station corresponds to the year 2022, the value of r , the annual growth rate to be used in the studies, will be 1.44%.

Therefore, the calculations to be performed are as follows:

$$IMD_{2026} = 135 \times \left(1 + \frac{1,44}{100}\right)^4$$

The result obtained is that the IMD for the commissioning year is 143 veh. /day.

Since the percentage of heavy vehicles circulating on the project road is 10%:

$$143 \times 0,1 = 14,3 \sim 15 \text{ heavy veh./day}$$

$$IMD_{p_{carril}} = \frac{IMD_p}{N^{\circ} \text{ carriles}} = \frac{15}{2} = 8 \frac{\text{veh. pesados}}{\text{día carril}}$$

Following the instructions of Norma 6.1, "Secciones de firmes", de la Instrucción de Carreteras, we will define the road category as one of the 8 established according to the IMD of heavy vehicles per lane on the road in the year of commissioning, already calculated. The table provided by Norma 6.1 IC is as follows:

TABLA 1.A. CATEGORÍAS DE TRÁFICO PESADO T00 A T2

CATEGORÍA DE TRÁFICO PESADO	T00	T0	T1	T2
IMD _p (vehículos pesados/día)	≥ 4 000	< 4 000 ≥ 2 000	< 2 000 ≥ 800	< 800 ≥ 200

TABLA 1.B. CATEGORÍAS DE TRÁFICO PESADO T3 Y T4

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

Figure 2: Heavy Traffic Categories 6.1 IC.

As we can observe, the IMD_p estimated traffic volume per lane on the CA-661 in 2026 is 8 heavy vehicles per day per lane. The standard's category table shows that the projected road will be category T42, since it has a daily traffic volume of less than 25 heavy vehicles per lane.



DOCUMENT N.º3 – URBAN PLANNING



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1. INTRODUCTION

The following appendix presents the impact of the current Urban Development Plan on the land in the project area, in the municipality of Soba. The analysis will consider the degree of urbanization of the land, as well as the territorial planning that will be required to improve the CA-661 roadbed.

The information used will be obtained from the Government of Cantabria's Geographic Information Viewer (Mapas Cantabria), as well as from the laws and regulations governing land use in the area of influence of the road. These laws are as follows:

- Norma subsidiaria municipal de 1989.
- Ley 2/2001, de 25 de junio, de Ordenación Territorial y Régimen Urbanístico del Suelo de Cantabria (LOTRUSCA).
- Normativa general de carreteras: Planeamiento urbanístico, modificada por la nota de servicio 5/2017 el de octubre de 2017.
- Ley 5/2022, de 15 de Julio, de ordenación del Territorio y Urbanismo de Cantabria.

2. URBAN PLANNING

According to Law 5/2022, we distinguish three types of land. Depending on the type of land on which our project is located, the considerations and limitations will vary. These types of land are: urban land, developable land, and rural land.

Clasificación Urbanística del Suelo	
	Suelo Urbano Consolidado
	Suelo Urbano Núcleo Tradicional
	Suelo Rústico de Protección Ordinaria
	Suelo Rústico de Especial Protección
	Núcleo Rural

Figure 1: Land classification in the workplace.

The attached table indicates the different land categories found in the vicinity of the CA-661 highway, the project road. As can be seen in the map attached on the next page, the road route mostly crosses ordinary protected rural land, passing through some traditional urban areas and specially protected rural land.



Urban Planning Map, Project Area



julio 2, 2025

Clasificación Urbanística del Suelo

Suelo Urbano Consolidado

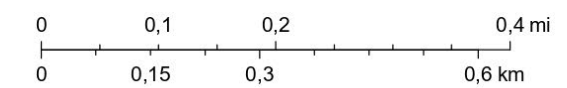
Suelo Urbano Núcleo Tradicional

Suelo Rústico de Protección Ordinaria

Suelo Rústico de Especial Protección

Núcleo Rural

1:8.000



Gobierno de Cantabria; Gobierno de Cantabria e IGN-
CNIG. Capa SPOT perteneciente a CNES 2009 Spot
IMAGE y obtenida a través del PNT.; Gobierno de
Cantabria-IGN, Sistema Cartográfico Nacional

Mapa realizado con el visualizador de información geográfica del
© Información perteneciente a la Administración o Administraciones productoras



DOCUMENT Nº4 –TOPOGRAPHIC STUDIES



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1. INTRODUCTION

The topographic maps and orthophotographs of the project area were obtained using the Geographic Information Map Viewer of the Government of Cantabria (<https://mapas.cantabria.es/>).

2. TOPOGRAPHY

The topographic cartography used in the project will be the BTA 2007 Cartography (Harmonized Topographic Base) on flight from 2007. The sheets used are 0060-2-6 and 0060-2-7.

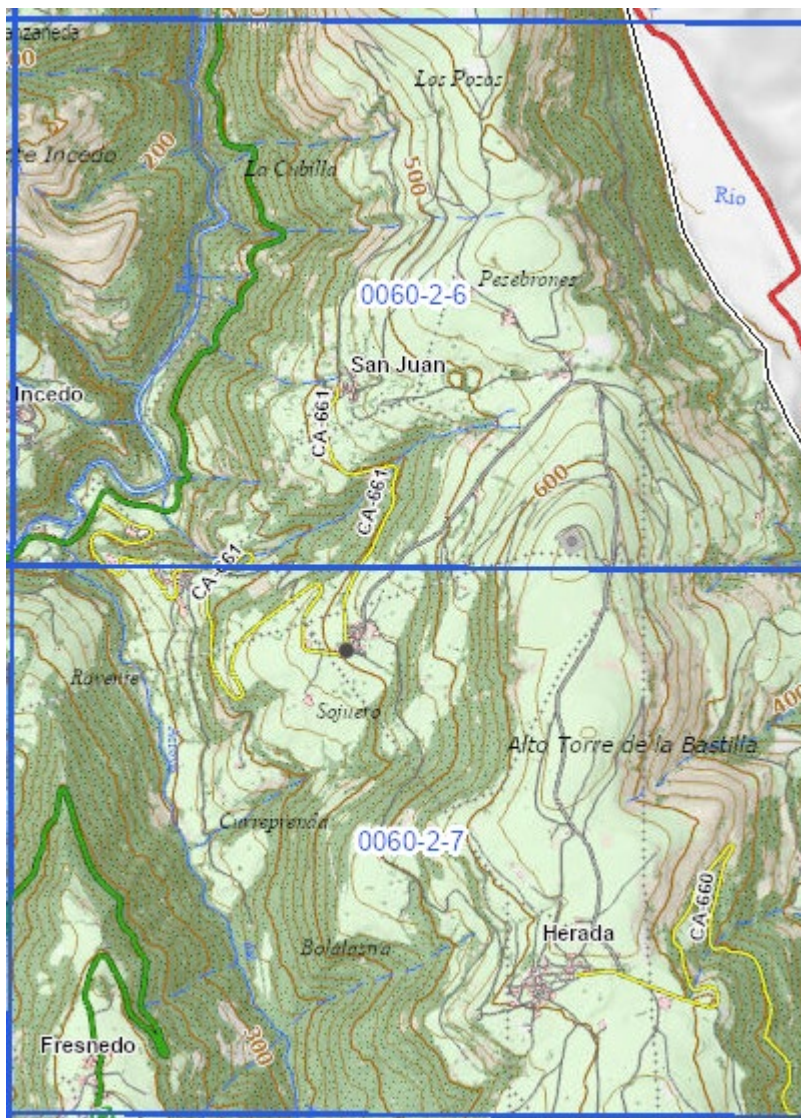


Figure 1: BTA 2007 Map over the workplace.

3. ORTHOPHOTOGRAPHY

Sheets 0060-0206 and 0060-0207 will be used, representative of the project area and corresponding to the series of Orthophotographs of Cantabria from the year 2007 PNOA 0.25 m.



Figure 1: Orthophotos over the workplace.



DOCUMENT Nº5 – GEOLOGICAL STUDIES



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1. INTRODUCTION

The following appendix presents the geological study carried out in the study area for the improvement of the CA-661 highway. The information presented below defines aspects such as the stratigraphy, tectonics, geomorphology, and hydrology of the site.

For the purposes of this study, information from the IGME (Geological and Mining Institute of Spain) was used, from which the following cartographic information sheets were obtained

- Spain's Geological Map. 1/50.000 scale. Page 60 (20-05).
- Spain's Geomorphological Map. 1/50.000 scale. Page 60-III (39-10).

2. GENERAL GEOLOGICAL FRAMEWORK

In Cantabria, we generally find three distinct geographical areas: La Marina, La Montaña, and Campoo, and the southern valleys belonging to the Ebro and Duero River basins. The predominant presence of mountains explains why the entire region has historically been known as La Montaña, since 50% of its territory is above 600 meters above sea level and 75% is above 200 meters.

The three áreas previously mentioned are characterized by the following:

- La Marina: A coastal strip of low, broad, gently rolling valleys about 10 km wide, rarely exceeding 500 m in altitude. It borders the sea, forming steep cliffs that are broken by the appearance of river mouths, creating estuaries and beaches.
- La Montaña: It is a long barrier of rugged mountains parallel to the sea that make up part of the Cantabrian Mountains. The highest elevation in Cantabria is located at the peak of Torre Blanca (2,619 meters).
- Campoo y los valles del sur: With a more continental climate, it presents optimal development of forest masses.

Regarding the geology of Cantabria, the autonomous community is located north of the Cantabrian Mountains, which are 480 kilometers long and 100 kilometers wide on average. They extend from east to west, parallel to the sea, and cross the regions of Galicia, Asturias, Castile and León, Cantabria, the Basque Country, Navarre, and La Rioja. The mountains of the range that cross Cantabria are composed of Mesozoic limestone and marl rocks.

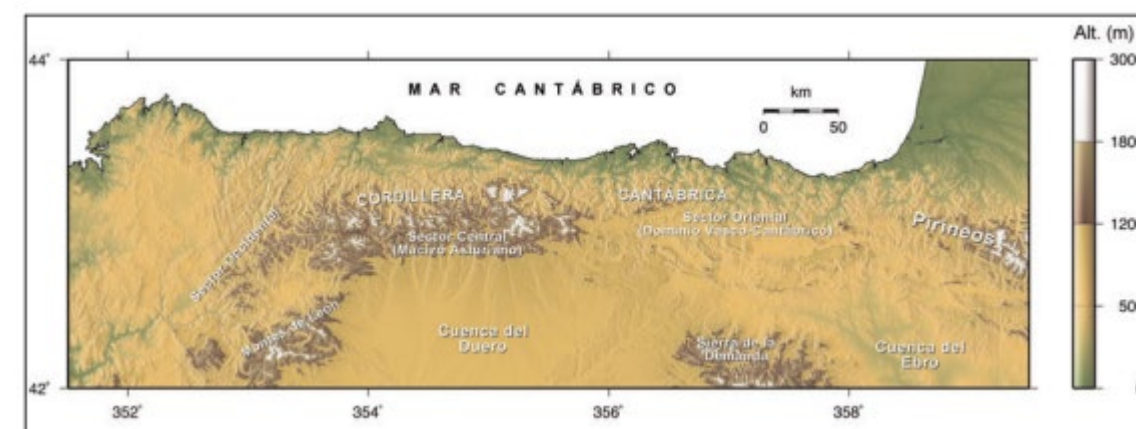


Figure 1: Montaneous relief of the Cantabrian Mountains.

The rocks that make up Cantabrian geology span a range from the Lower Paleozoic to the present day. 77.4% of the region's surface area is made up of land from the Mesozoic era. Of this, 55% corresponds to the Cretaceous period. 13.6% corresponds to the Paleozoic era. 9.0% to the Cenozoic era. Of this, 1.2% to the Tertiary and 7.8% to the Quaternary.

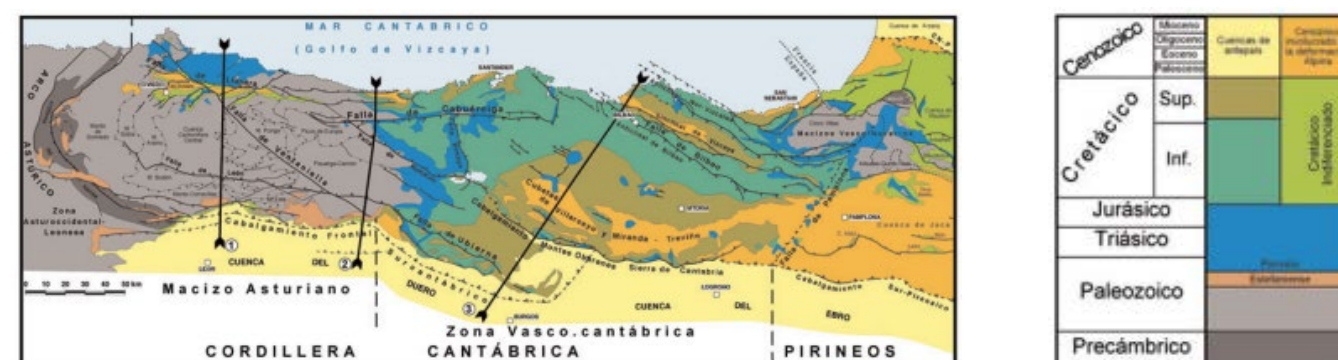


Figure 2: Geological Structures of the Cantabrian Mountains.



3. GEOLOGICAL FRAMEWORK OF THE SURROUNDINGS

The study area is located on the Valmaseda sheet (Sheet 60 (20-05)) on the cartography of the Geological and Mining Institute of Spain. It is in the southwestern corner of Cantabria, also including regions of Biscay and Burgos.

Morphologically speaking, the limestone elevations around Ramales de la Victoria and Trucios stand out in this area, as well as the alignment of the Ordunte Mountains to the southwest. The elevations range from 20 to 1,018 m. The most notable hydrographic network is the Asón (part of its course runs embedded in a large fault near Ramales), Gándara, Carranza, Agüera, and Ordunte rivers, which flow into the Cantabrian Sea. The most important population centers are Valmaseda, Ramales de la Victoria, and Trucios. Geologically, the Sheet belongs to the Cantabrian Basin, located near its central zone, which is characterized by strong subsidence and consequently the great thickness reached by the series belonging to the Cretaceous.

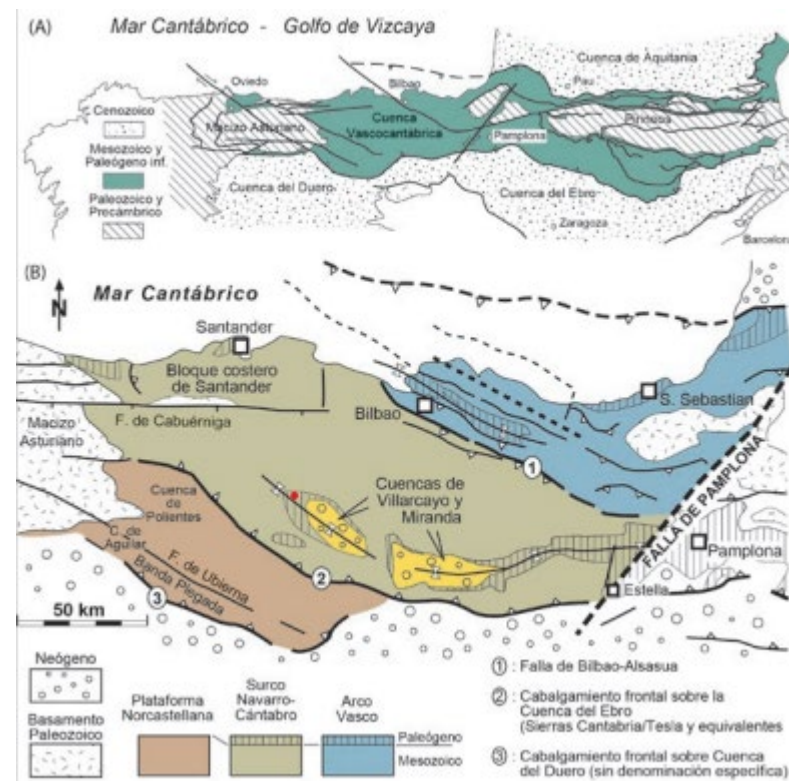


Figure 3.1: Geology of the Basque-Cantabric basin.

The section of the Cantabrian basin through which the CA-661 road runs, in the Valmaseda area, is in an area where the most abundant materials are clayey limestone, sandstone lenses (C_{153-15}^{1-3}) and limestone with rudist and orbitoline rocks, with sandstone at the base (C_{15-16}^{0-2}).

CUATER.	HOLOCENO		Q ₂ Al	Q ₂ C	Q ₂ C	Códigos de discriminación	
	PLEISTOCENO		Q ₂ Al	Q ₂ C	Q ₂ C		
CRETACICO	SUPERIOR	CENOMANIENSE	SUPERIOR	C ₂₁ ²⁻³		Q ₂ T	Terrazas
			MEDIO	C ₂₁ ¹		Q ₂ 2-3	Margas y calizas arcillosas
			INFERIOR	C ₂₁ ⁰		Q ₂ 1	Areniscas y arcillas con Orbitolinas
	INFERIOR	ALBIENSE	SUPERIOR	C ₁₆ ²⁻³		C ₂ 2-0	Calizas arcillosas con espículas
			MEDIO	C ₁₆ ¹		C ₁₆ 3-1	Areniscas y arcillas arenosas
			INFERIOR	C ₁₆ ⁰		C ₁₆ 1-2	Areniscas
	INFERIOR	CLANSAYEN.	SUPERIOR	C ₁₆ ²⁻³		C ₁₆ 1-2	Calizas y margas
			MEDIO	C ₁₆ ¹		C ₁₆ 1-2	Arcillas hojosas y areniscas
			INFERIOR	C ₁₆ ⁰		C ₁₆ 1	Calizas
		GARGASIEN.	SUPERIOR	C ₁₆ ²⁻³		C ₁₆ 1	Areniscas
			MEDIO	C ₁₆ ¹		C ₁₆ 1	Margas hojosas y calizas arcillosas
			INFERIOR	C ₁₆ ⁰		C ₁₆ 1	Intercálaciones de areniscas
	INFERIOR	BEDOULIENSE	SUP.	C ₁₆ ²⁻³		C ₁₆ 3-2	Margas calizas arcillosas y arcillas con pequeños biohermos calizos
			MED.	C ₁₆ ¹		C ₁₆ 1-3	Calizas arcillosas, lentejones de areniscas
			INF.	C ₁₆ ⁰		C ₁₆ 1-3	Calcarentas
	INFERIOR	BARREMIENSE	SUP.	C ₁₆ ²⁻³		C ₁₆ 0-2	Calizas con Rudistas y Orbitolinas
			MED.	C ₁₆ ¹		C ₁₆ 0-2	Areniscas en la base
INF.			C ₁₆ ⁰		C ₁₆ 1-1	Areniscas y calizas con Orbitolinas	
INFERIOR	BARREMIENSE	SUP.	C ₁₆ ²⁻³		C ₁₆ 1-1	Margas arenosas y areniscas en el E.	
		MED.	C ₁₆ ¹				
		INF.	C ₁₆ ⁰				

Figure 3.2: Legend of Page 60, Magna 50 Map.

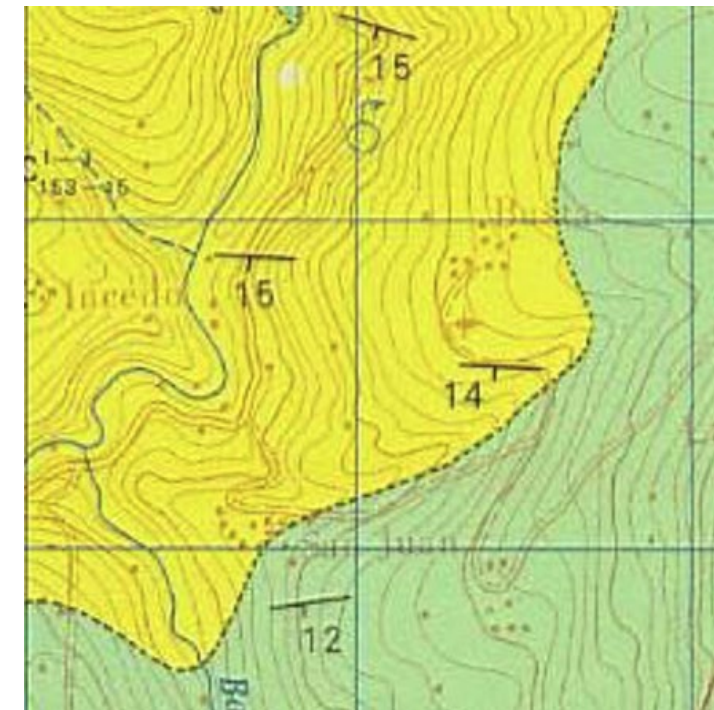


Figure 3.3: Detail of the workplace in the Magna 50 Map.



Therefore, we can expect that, during the earthmoving phase, these rocks, belonging to the Aptian Early Cretaceous, will be the most abundant material extracted.

3.1 STRATIGRAPHY

The materials that emerge in the project area belong to the Triassic, Jurassic, Cretaceous and Quaternary periods.

3.1.1 TRIASIC

From the Triassic, only the Keuper facies appear, always from zones of weakness and presenting a highly overlain layer. Data provided by existing oil drilling in the region reveals the existence of Triassic Bunt facies materials in deep areas.

3.1.1.1 KEUPER FACIES

They outcrop exclusively in the Rmales Thrust Belt, injected into fracture zones around Gibaja. They consist of gypsum-rich variolated clays with hyacinths. Oil drilling has intersected 62 meters of variegated clays with anhydrite interbeds and 370 meters of sandstones with dolomitic clay interbeds at the top, the latter possibly corresponding to the Buntsandstein facies. Since the carbonate, limestone, and dolomite facies of the Muschelkalk are absent regionally, it is partially included in the Keuper facies notation.

3.1.2 JURASSIC

The Jurassic includes marine sediments from the Lias and Dogger basins, with the Malm basin represented by Purbeck facies materials, which cannot be separated from the Lower Cretaceous sediments of these facies. They outcrop exclusively in the northwestern part of the work area, around Rmales, Gibaja, and Rasines, in the Rmales Thrust Belt, as well as in the Carranza River valley and the tectonized zone of the Gándara River.

3.1.2.1 LOWER-MIDDLE SINEMURIENSE

Tectonized outcrops, with series consisting of dolomites and limestone formations in layers ranging from 30 to 70 centimeters thick. In some places, limestone-dolomitic breccias interspersed with the dolomitic section. This area has a thickness of approximately 200 meters.

3.1.2.2 SUPERIOR SINEMURIENSE

Outcrops flanked by faults, consisting of alternating gray clayey limestone and gray leafy marl. The section is approximately 600 meters thick.

3.1.2.3 DOGGER

Present in the Rmales de la Victoria stratigraphic column. Clayey calcilutites and black calcareous clays with pyrite alternate, at intervals of 30 to 50 centimeters. The column is approximately 85 meters thick, although surveys estimate that approximately 130 meters of dogger have been cut.

3.1.3 CRETACIC

Sediments from the Aptian to the Cenomanian outcrop. They occur in Urgonian facies (Aptian-Albian), lagoonal facies (Albian and Early Cenomanian), and outer-shelf neritic facies (Middle and Upper Cenomanian).

The main outcropping sediments are:

3.1.3.1 LOWER-MIDDLE BEDOULIENSE

It outcrops, forming a narrow band between the Weald facies materials and the Urgonian limestones. It has been differentiated on maps in areas where it reaches sufficient thickness to be represented. In the Rmales column, it is made up of two sections, which are from wall to roof:

- 40 meters of yellowish-brown to reddish sandstones, with soft pebbles at the base, alternating with siltstone clays.
- 80 meters of dark gray limestones, ranging from microcrystalline to bioclastic, with clayey joints.

In the Alén area, to the east of the study area, a thick complex almost 400 meters thick appears, consisting of medium- to coarse-grained sandstones alternating with siltstone clays at the base. Sandy marls and sandy-clayey limestones outcrop in the upper part of the area.

3.1.3.2 MIDDLE APTIENSE-ALBIENSE (URGONIAN LIMESTONES)

The Middle Aptian-Albian, defined by a dense series of gray limestones, outcrops in the vicinity of Rmales de la Victoria and in the Trucios Massif, where they give rise to steep, rugged relief. In areas where it is not



differentiated from the Early-Middle Bedoulian, it begins by forming between 30 and 40 meters of well-bedded sandstones and argillaceous limestones.

3.1.4 QUATERNARY

Quaternary deposits cover Mesozoic materials in the form of small, irregularly distributed patches. These are Pleistocene and Holocene materials.

3.1.4.1 PLEISTOCENE

From the Pleistocene, fluvial terraces appear, consisting of boulders and rounded pebbles of limestone and quartzite sandstone embedded in a sandy matrix. In the Calera (Ramales) and Carranca (Gibaja) valleys, they are found 20 meters above the current level of the valley.

3.1.4.2 HOLOCENE

The following materials date back to Holocene:

- Alluvium consisting of deposits of gravel, sand, and silt. Notable among these are those from the Asón, Carranza, Calera, and Agüera rivers.
- Colluvium originating from hillside collapses. They are shaped like blocks, boulders, and pebbles of Urgonian limestone and are located in areas with steep slopes, generally around the town of Ramales de la Victoria.
- Decalcification basins. Developed on Urgonian limestone, they are prominent in areas where red decalcification clays are abundant.

3.2 TECTONICS

In the project area, on the Valmaseda sheet, there are N-S and NE-SW trending alignments, coexisting with the WNW-ESE alignments, which are the dominant ones in this area of the Cantabrian Basin. In the western part, the orientations tend to be E-W, a continuation of those existing in the adjacent Sheet 19-05 (Villacarriedo). These guidelines (N-S and E-W) are initially interpreted as reflecting base structures, and a certain tectonic detachment of the Mesozoic can be accepted at the Keuper level. The E-W trending faults (Ramales fault) are interpreted as an extension of the large tectonic feature known as the 'Cabuérniga Shield Thrust Strip', which forms a protrusion of the Asturian Massif to the east (Hoja de Cabezón de la Sal and Los Corrales de Buelna),

where Carboniferous and Permian-Triassic materials overlie Mesozoic sediments. There is also another large N-S trending zone of weakness, stretching from Ramales de la Victoria to the Asón Estuary, where Keuper injections are frequent.

3.3 GEOMORFOLOGY

The geomorphological characteristics that describe the study area are strongly characterized by karst processes and mountainous relief. This is mainly due to the mountainous areas, with altitudes of up to 1,000 meters, found in the Sierra de La Alcomba and Sierra de Hornijo, as well as the highly soluble Mesozoic limestone rocks, which favor the formation of a karst environment. In turn, the presence of rivers such as the Asón and Gándara rivers lead to the formation of valleys marked by the passage of river water. Another characteristic that defines the geomorphology of the area is the Alpine Orogeny, which, by affecting the sedimentary rocks in the area, causes the creation of faults and folds.

3.4 HIDROGEOLOGY

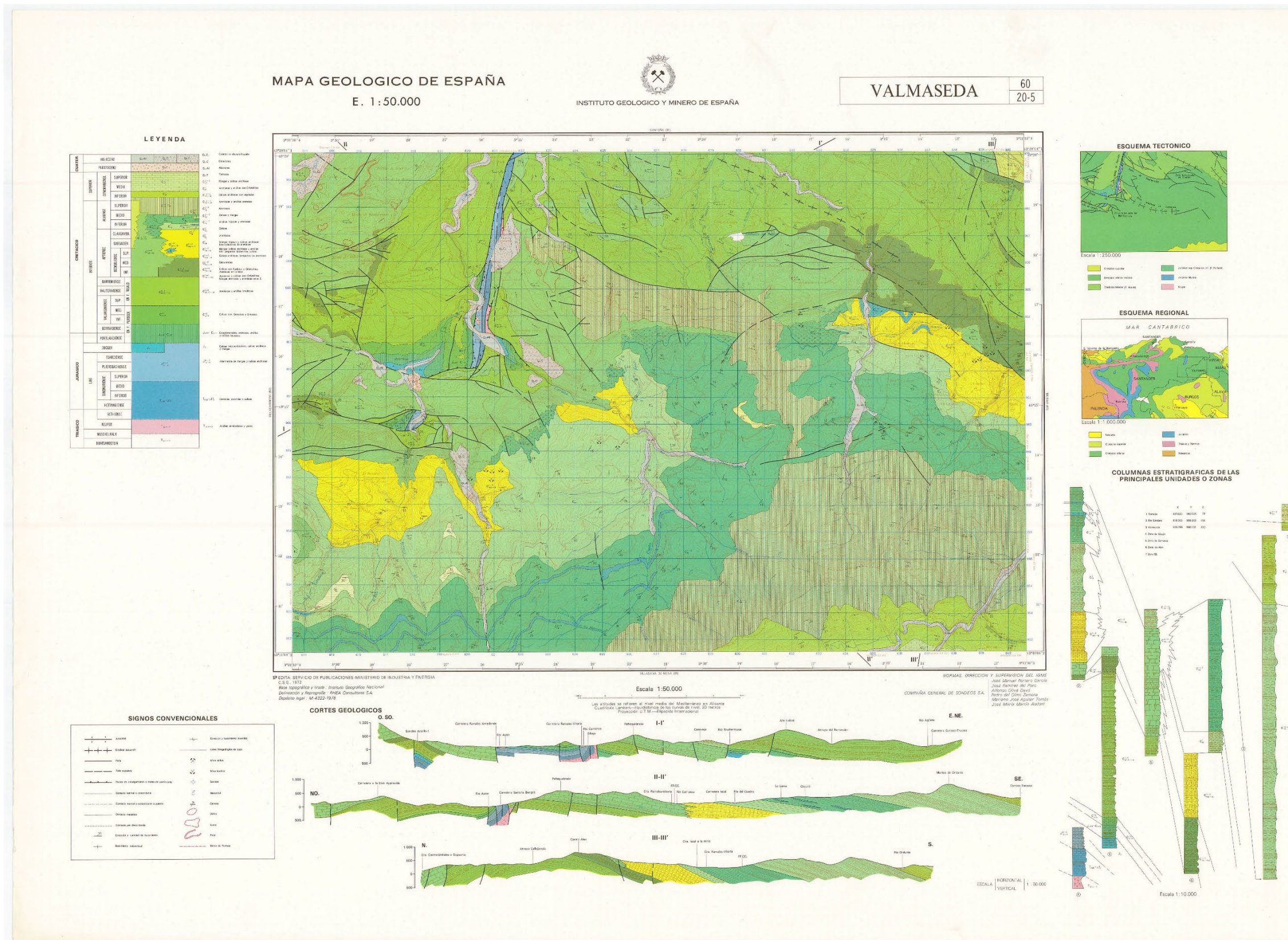
There are numerous springs due to the alternation of sandstones with restricted intergranular permeability and more or less sandy clays in the Weald facies and sediments of the Early Bedouliense and Early Albian-Early Cenomanian.

Another important formation is the Aptian-Middle Albian limestones. They contain a significant karst apparatus and given the region's high average rainfall and extensive outcrop, they should have sufficient recharge potential.

At the same time, no fully favorable structure has been observed in the area. The areas south of the Ruahermosa and Ramales faults, as well as the Carranza River valley in the areas near the lateral change from Urgonian to Paraurgonian limestone, have the greatest potential for capturing the aquifers contained in the limestones.



4. APENDIX I: SPAIN'S GEOLOGICAL MAP





DOCUMENT N°6 – SEISMOLOGICAL STUDIES



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1. INTRODUCTION

The following appendix will study the hazard and significance of seismic effects on the project to be implemented. This information will be necessary to determine the appropriateness of the roadway's structural strength and stability based on its location.

2. APPLICABLE STANDARD

The regulations in force considered in the project are the following:

- “Norma de Construcción Sismorresistente: Parte general y Edificación (NCSE-02)”, aprobada por Real Decreto 997/2002 de 27 de septiembre y publicada en el BOE de 11 de octubre de 2002.
- Norma de Construcción Sismorresistente: Puentes (NCSP-07), aprobada por RD 637/2007 de 18 de mayo y publicada en el BOE de 2 de junio de 2007.

3. SEISMIC CONSIDERATIONS IN THE PROJECT AREA

As specified in the Norma de Construcción Sismorresistente: Parte general y edificación (NCSE-02), seismic effects will be considered in the vicinity of the work when the basic seismic acceleration, characteristic value of the horizontal acceleration of the ground surface, is equal to or greater than $0.04g$, where g represents the acceleration of gravity.

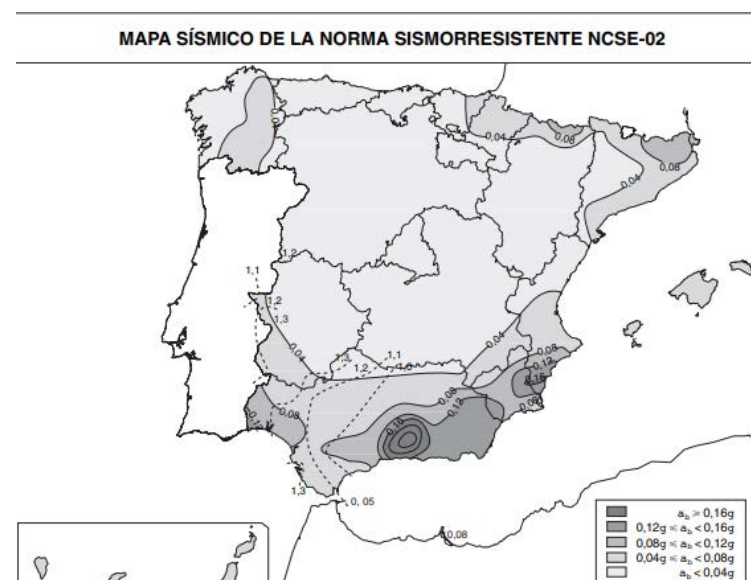


Figure 1: Seismic map from Norma sismorresistente NCSE-02.

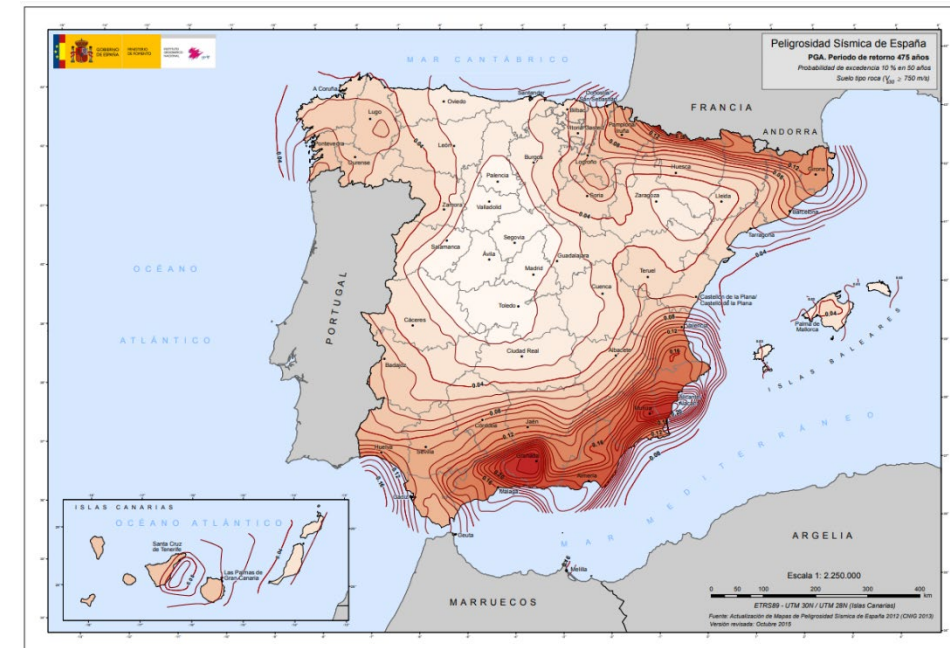


Figure 2: Earthquake resistance map of Spain.

4. CONCLUSIONS

As we can see in the attached maps, the entire territory of the autonomous community of Cantabria, where the CA-661 highway, the object of the project, is located, is in an area where the basic seismic acceleration value is less than $0.04g$. Therefore, it is not necessary to consider seismic actions in the study area.



DOCUMENT N.º7 – CLIMATOLOGICAL AND HYDROLOGICAL STUDIES



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1. INTRODUCTION

A This annex presents a climatological and hydrological study of the project area, necessary to characterize the work area and useful in the design and sizing of the road drainage. The data collected and analyzed, characteristic of the climatological and geographic environment of the region, will include information regarding the climate of the area as well as its respective temperatures and precipitation.

2. CLIMATOLOGY

2.1 CLIMATOLOGICAL CHARACTERIZATION OF THE AREA

Cantabria is located in a zone, or region, with an oceanic or Atlantic climate, classified as C_{fb} according to the Köppen-Geiger climate classification. This climate is a temperate mesothermal climate, characterized by a narrow temperature range, meaning that the difference between the extreme maximum and minimum temperatures recorded in the area does not vary greatly throughout the year. It is also characterized by the absence of a dry season and mild summers.

According to the Iberian Climate Atlas, available from the State Meteorological Agency (AEMET), the Cantabrian climate is a temperate climate, or type C, characterized, among other things, by monthly minimum temperatures between 0°C and 18°C. According to the Atlas, type C climates can be of different subtypes depending on whether or not there is a dry season throughout the year. The Cantabrian region, as we saw earlier, is classified as a type that does not have a dry season.

Cantabria's climate, classified as C_{fb} , is temperate with no dry season and mild summers. This climate is present not only in the Cantabrian region but also in the Iberian System, part of the northern plateau, and much of the Pyrenees, except for the highest areas.

Specifically, in the Soba region, the climate is humid and temperate, with mild temperatures in winter and cool temperatures in summer. Rainfall is frequent throughout the year, and the region's mountainous location can influence local climate variations.

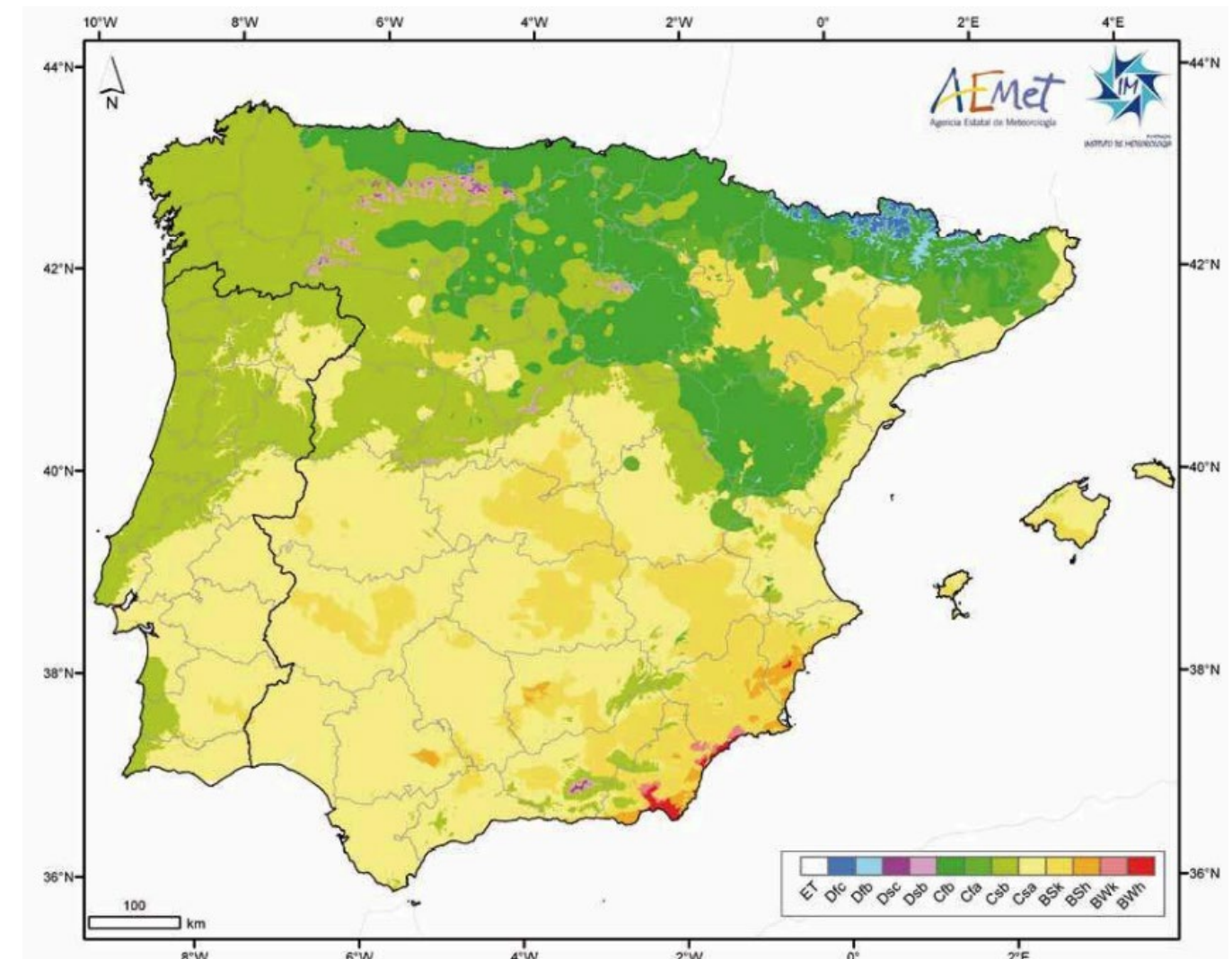


Figure 1: Köppen-Geiger climate classification in the Iberian Peninsula and Balearic Islands.

To study the area's climatology, information available from data collected by the Santander Airport station between 1981 and 2010 was also used. The station, located three meters above sea level, is in Seve Ballesteros.



Figure 2: Location of the station Santander Aeropuerto.



The climatological values obtained from the station are the following:

Mes	T	TM	Tm	R	H	DR	DN	DT	DF	DH	DD	I
Enero	9.7	13.6	5.8	106	72	12.3	0.4	0.8	0.8	2.1	2.9	85
Febrero	9.8	13.8	5.7	92	72	11.1	0.3	1.1	0.9	1.2	3.1	104
Marzo	11.3	15.7	7.0	88	71	9.9	0.1	0.9	1.2	0.4	2.9	135
Abril	12.4	16.6	8.3	102	72	11.9	0.0	1.3	0.7	0.0	2.4	149
Mayo	15.1	19.1	11.1	78	74	10.4	0.0	1.6	1.7	0.0	2.4	172
Junio	17.8	21.6	13.9	58	75	7.6	0.0	1.8	1.2	0.0	3.7	178
Julio	19.8	23.6	16.0	52	75	7.3	0.0	2.0	0.5	0.0	4.5	187
Agosto	20.3	24.2	16.4	73	76	7.6	0.0	1.4	0.8	0.0	3.8	180
Septiembre	18.6	22.8	14.4	83	76	8.9	0.0	1.5	1.9	0.0	4.6	160
Octubre	16.1	20.3	11.8	120	75	11.1	0.0	1.0	2.1	0.0	2.8	129
Noviembre	12.5	16.3	8.7	157	75	13.3	0.0	1.3	0.9	0.4	3.2	93
Diciembre	10.5	14.2	6.7	118	73	12.1	0.1	0.9	0.6	2.0	3.4	74
Año	14.5	18.5	10.5	1129	74	123.6	0.9	15.7	13.4	6.2	38.9	1649

Leyenda

- T Temperatura media mensual/anual (°C)
- TM Media mensual/anual de las temperaturas máximas diarias (°C)
- Tm Media mensual/anual de las temperaturas mínimas diarias (°C)
- R Precipitación mensual/anual media (mm)
- H Humedad relativa media (%)
- DR Número medio mensual/anual de días de precipitación superior o igual a 1 mm
- DN Número medio mensual/anual de días de nieve
- DT Número medio mensual/anual de días de tormenta
- DF Número medio mensual/anual de días de niebla
- DH Número medio mensual/anual de días de helada
- DD Número medio mensual/anual de días despejados
- I Número medio mensual/anual de horas de sol

Figure 3: Climatological values from station Santander Aeropuerto.

2.2 TEMPERATURE

The temperature in Cantabria is affected by the presence of the sea, which acts as a thermoregulator of the climate. As a result, the region's temperatures are generally mild.

With information provided by both the Iberian Climate Atlas and the Meteocantabria database, as well as data from the Santander Airport station, we can derive the following temperature values for the project area:

- Average annual temperature: Average minimum temperature of 9.7°C and average maximum temperature of 20.3°C, with an average annual temperature of 15.7°C based on average monthly temperatures.

- Average annual minimum temperature: Minimum monthly minimum temperature of 5.7°C and maximum monthly minimum temperature of 16.4°C, with an average annual minimum temperature of 11.36°C.
- Average annual maximum temperature: Minimum temperature among the monthly maximums of 13.6°C and maximum temperature among the monthly maximums of 24.2°C, with an average annual maximum temperature of 20.03°C.

Using information from Meteocantabria and the Santander Airport station, the following graph has been created illustrating the evolution of temperatures in Cantabria from 1997 to 2023:

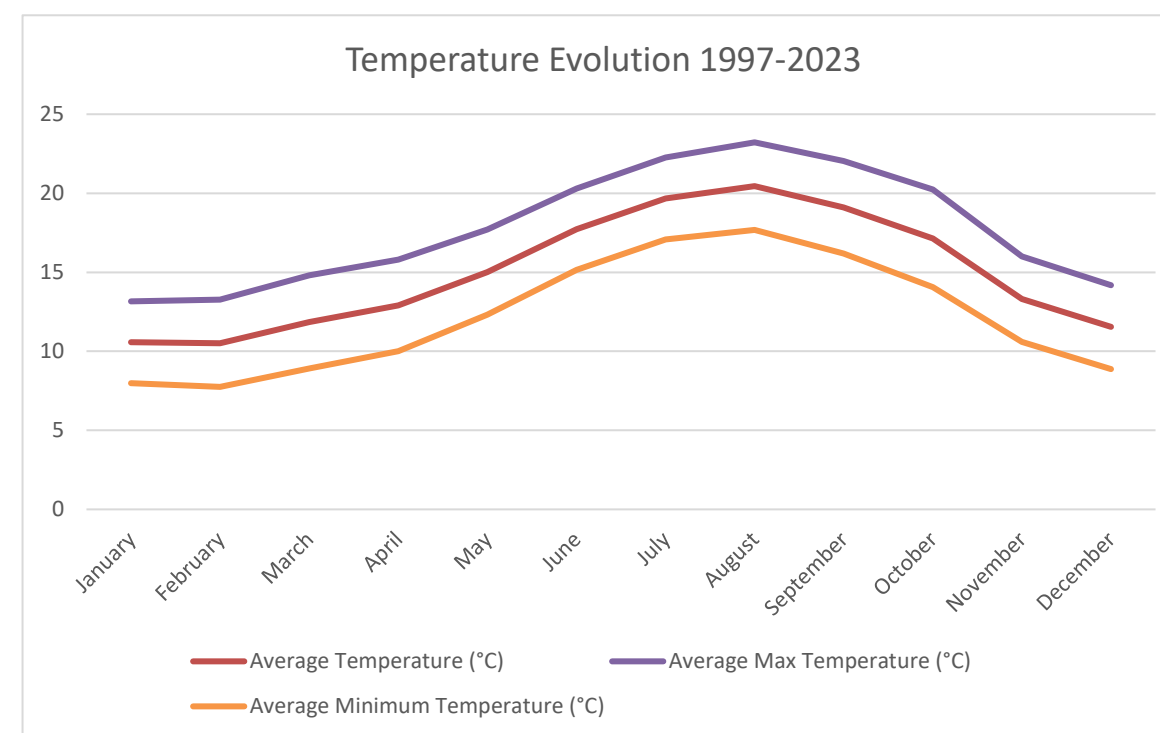


Figure 4: Average temperatures 1997-2023.

2.3 PRECIPITATION

The analysis of rainfall in Cantabria was conducted using data from the Santander Airport station, as shown in the table attached to the document. In addition, information from Meteocantabria was used to define the rainfall periods for each month of the year.

The following two graphs are the ones obtained:

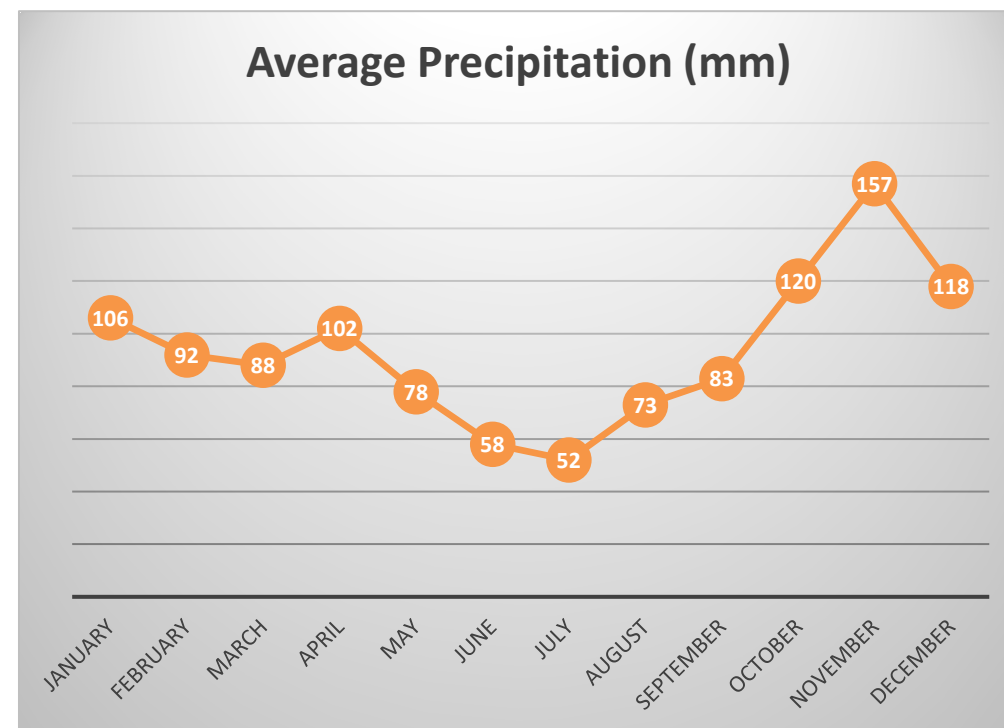


Figure 5.1: Monthly average precipitation in Cantabria (mm).

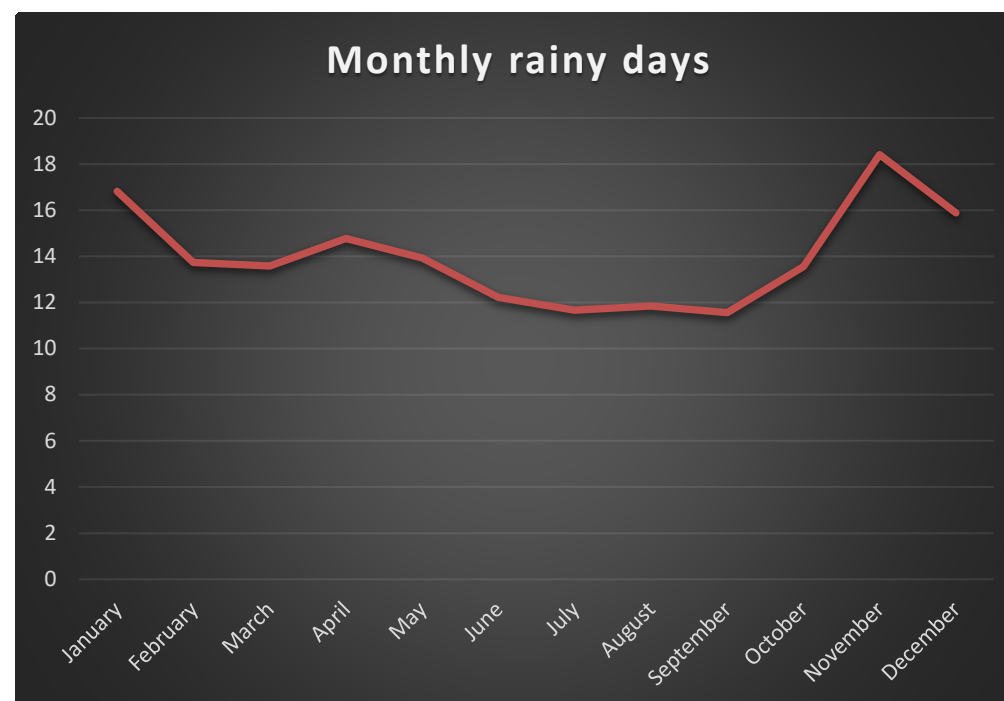


Figure 5.2: Monthly average of rainy days in Cantabria.

3. HYDROLOGY

3.1 SUPERFICIAL HIDROLOGY AND FLUVIAL COURSES

The municipality of Soba, and therefore the work area of our project, is in the Cantabrian Hydrographic Confederation, one of the many organizations responsible for managing and protecting the public water domain in the river basins that flow through the autonomous communities. This basin protects water resources that flow not only through Cantabria, but also through the Principality of Asturias, the Basque Country, Galicia, Castile and León, and the Autonomous Community of Navarre. All the water resources it encompasses and protects comprise almost 24,000 kilometers of riverbeds, where 332 surface water bodies and 34 groundwater bodies have been defined.

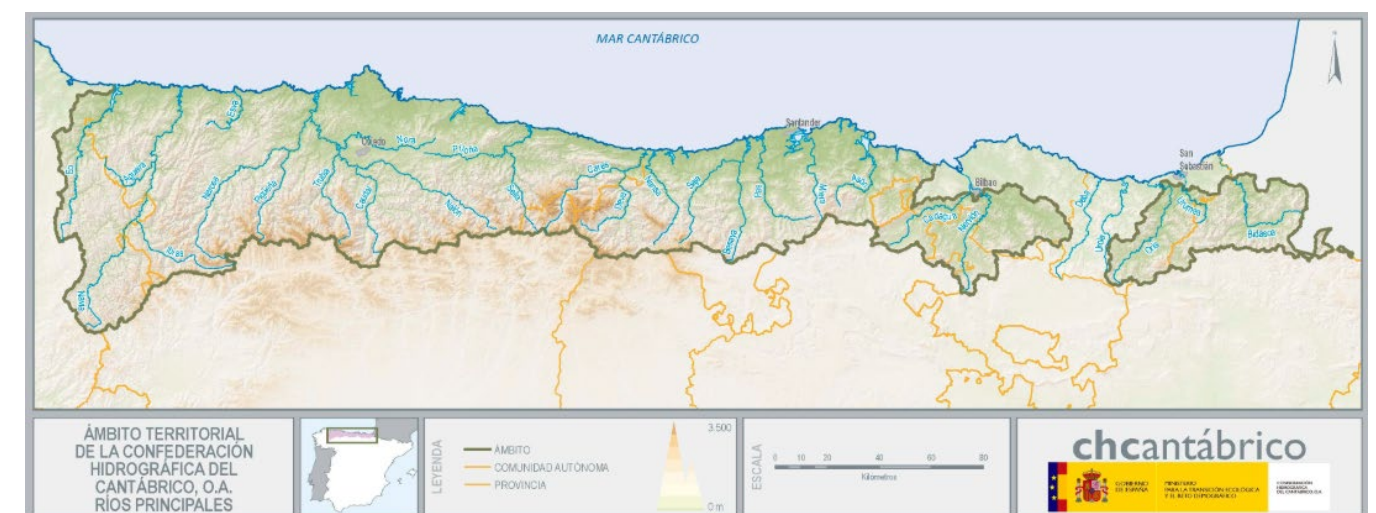


Figure 6: Mapa of the Cantabrian Hydrographic Confederation.

Within the municipality of Soba itself, the main rivers are the Asón River and the Gándara River. The Asón River rises in Portillo de Asón and flows into the Limpias Estuary, traveling 50.3 kilometers and carrying an average annual flow of almost 22 cubic meters per second. The other river that runs through the municipality, the Gándara River, rises in Puertos de Soba and flows into the Asón River as a tributary, traveling 19.3 kilometers.



3.2 HYDROGRAPHIC BASIN OF THE WORKPLACE

The project area, the CA-661 highway and its access to La Busta, is located in the Asón river basin. This basin covers an area of 562 square kilometers, stretching between Cantabria and the Basque Country. Despite this, the Cantabrian region occupies the largest proportion of the basin, with almost 75% of its surface area. The basin borders the Agüera and Miera river basins to the east and west, respectively; as well as the Picón del Fraile to the south and the Cantabrian Sea to the north. Its mouth to the sea is through the Colindres estuary.

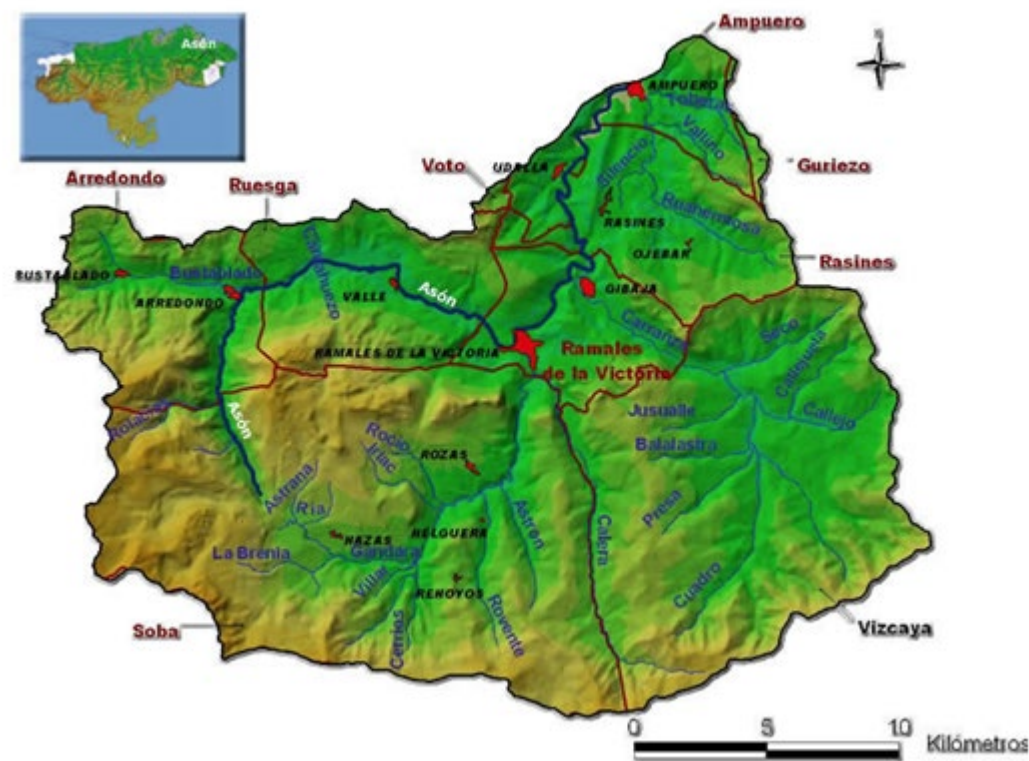


Figure 7: Physical map of the Asón Hydrographic Basin.

Near the CA-661 highway, more specifically within the basin, lies the Gándara River crossing mentioned above, although there is no road crossing over it. The closest body of water to the road is the Astrón Ravine, one of the river's tributaries, which stretches for 5 kilometers.

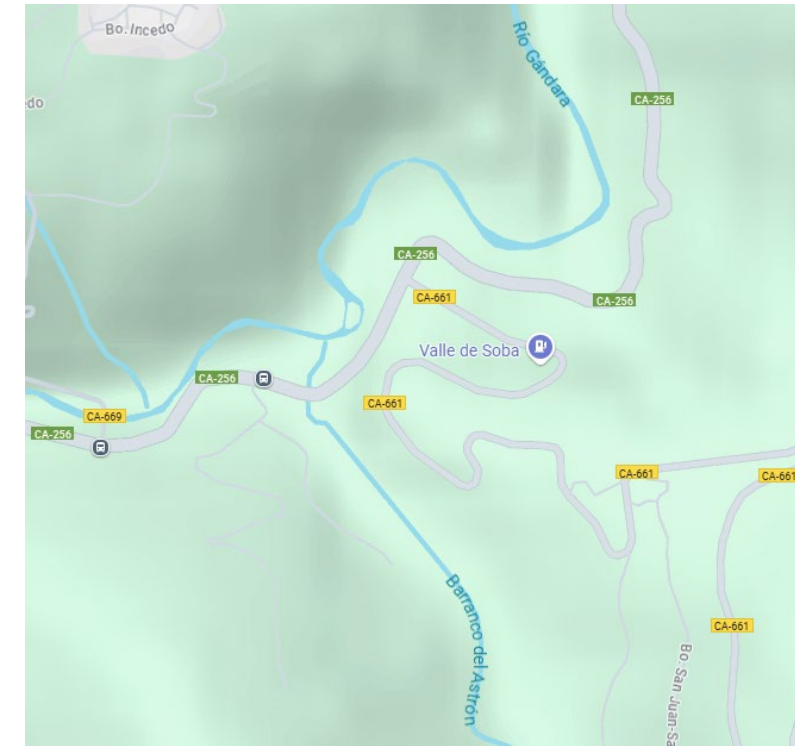


Figure 8: Hydrography of the workplace..

3.3 MAIN BASINS IN THE WORKPLACE

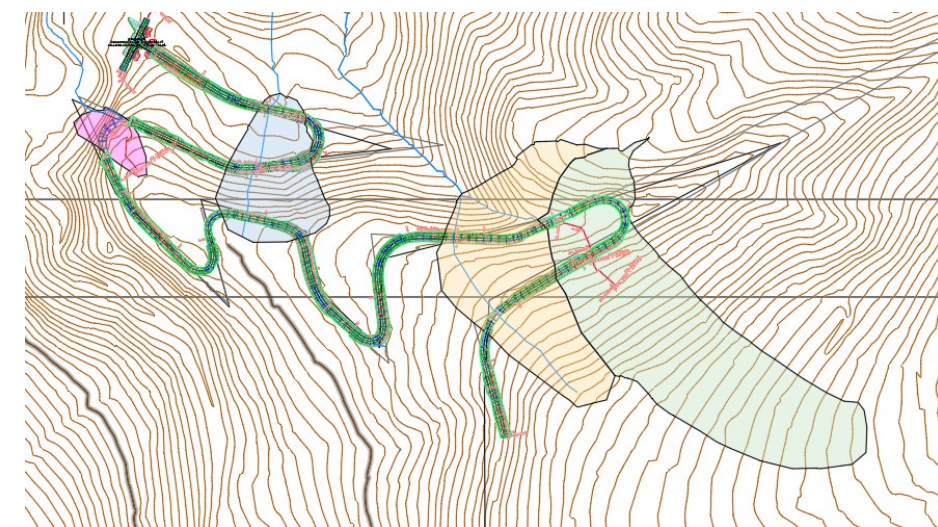


Figure 9: Basins of the workplace.

Four main basins are identified in the study of the road, which refer to the natural or topographic basins of the terrain and are called, in ascending order of the road, C1 to C4.



3.4 FLOODING RISK IN THE WORKPLACE

The CA-661 highway, as well as the town of San Juan de la Cistierna and the La Busta neighborhood, are exempt from possible river flooding, as can be seen in the figure below:

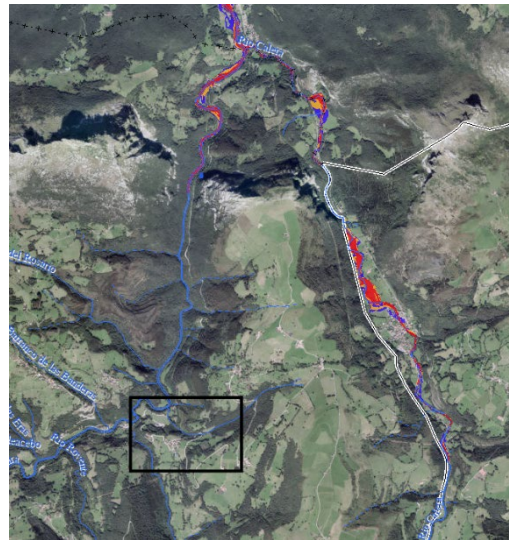


Figure 10: Flood risk in the work area.

As can be seen, the project area, marked with a black rectangle, would not be affected by flooding due to fluvial causes, the most significant in the project area. These potential floods would affect the towns of Ranales de la Victoria and Lanestosa due to the passage of the Calera River.

If we analyze the probabilities of fluvial flooding for return periods of 100 and 500 years, the results obtained are as follows:

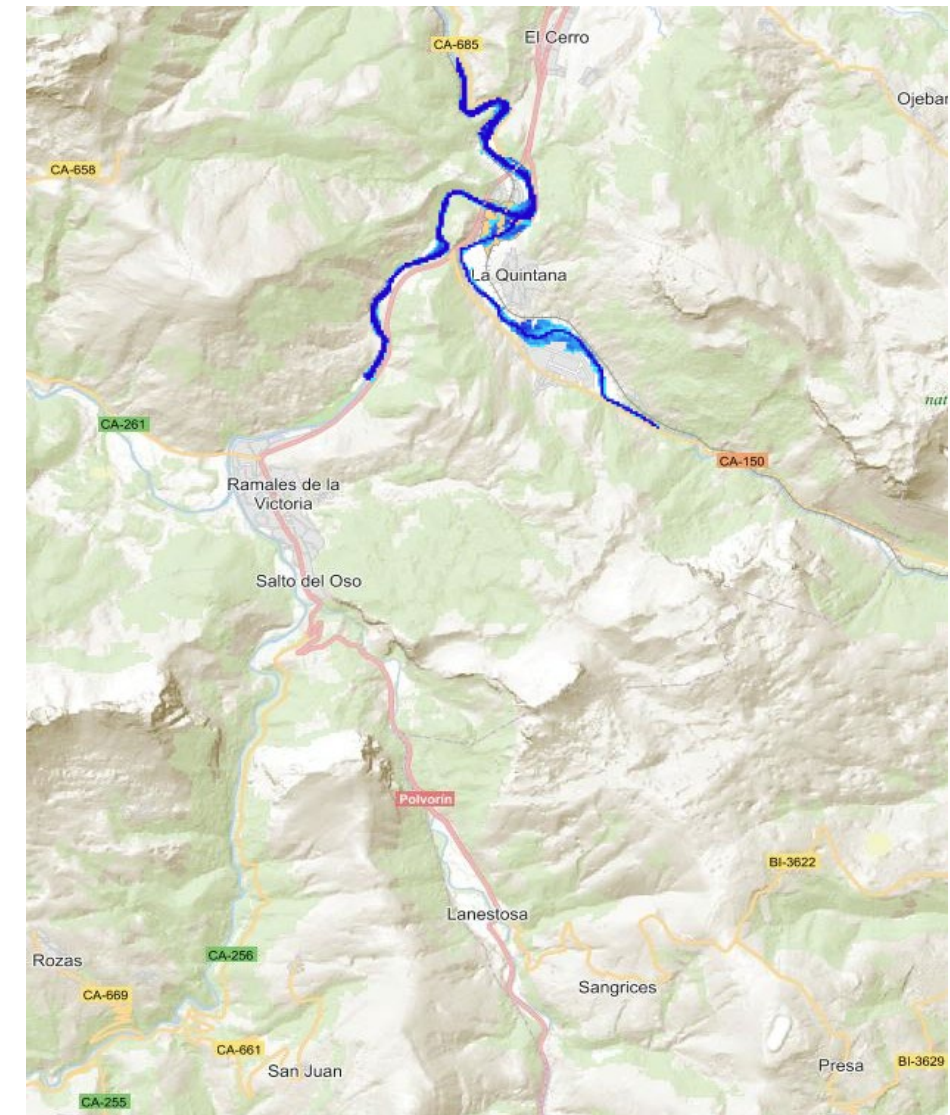


Figure 11.1: Fluvial flood Hazard map. T=100 años.

As can be seen in this case, flooding would not affect the project area and would be concentrated mainly in the towns of Riancho and Gibaja, where the Carranza River passes through them.



Figure 11.2: Fluvial flood Hazard map. $T=500$ años.



DOCUMENT N°8 – ENVIRONMENTAL IMPACT STUDY

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1. INTRODUCTION

This annex will conduct an environmental assessment study for the project. It begins by citing the relevant legislation and the content of the study. The environmental assessment will then be conducted through a description of the project, an analysis of the environment, identification of potential impacts, and an assessment of these. Finally, it will conclude with a series of preventive and corrective measures for each phase of the project, as well as a proposal for an Environmental Monitoring Program to serve as a monitoring and control system.

2. BACKGROUND

2.1. ENVIRONMENTAL IMPACT STUDY'S IMPACT

The objectives of the environmental impact study are to identify, describe, and assess the effects that the construction of the project will have on the various environmental aspects of the project area. These aspects may be affected directly or indirectly, over various time periods, from short to long; they may be temporary or permanent in nature, and they may even determine whether they can be resolved, that is, whether they are remediable or irreversible.

2.2. LEGISLATION

The current legislation on this matter is as follows:

- Law 9/2018, of December 5, amending Law 21/2013, of December 9, on environmental assessment (Official State Gazette, December 11, 2013).

Regarding the Autonomous Community of Cantabria, the following should be considered:

- Law 17/2006, of December 11, on integrated environmental control.
- Decree 19/2010, of March 18, approving the regulations of Law 17/2006, on Integrated Environmental Control.

According to Article 8 of Cantabria Law 5/1996 of December 17:

- Studies and projects for new roads and significant population bypasses, in accordance with the level and purpose of each, must include the corresponding Environmental Impact Assessment and must be

reported by the competent environmental authority in the manner established in the corresponding applicable legal regulations.

- In no case will the following be considered new roads: layout improvements or improvements, platform widening, road surface improvements, and, in general, any other actions that do not entail a substantial modification to the functionality of the pre-existing road. In this case, there will be no need for such an assessment or any corresponding environmental procedure.

According to Annex I of Law 21/2013, the following road projects must undergo Ordinary Environmental Assessment:

- Construction of motorways and dual carriageways.
- Construction of a new road with four or more lanes, or realignment and/or widening of an existing road with two or fewer lanes to create four or more lanes, when such new road or the realigned and/or widened road section reaches or exceeds 10 km in continuous length.

Although the project is not listed as requiring an environmental impact study under regional or state legislation, it will nevertheless be conducted due to the importance of the natural environment surrounding the project area and its respective municipality in general.

3. ENVIRONMENTAL EVALUATION

3.1. PROJECT'S LOCATION

The project, as previously mentioned, will be built entirely in the municipality of Soba. This municipality is the third largest in the Autonomous Community of Cantabria, with an area of 214.16 square kilometers.



The stretch of road serving as the project's focus is located east of the municipality, below the town of Ramales de la Victoria and close to the border with the Basque Country. The terrain in the project area is rugged, with frequent slopes where water flows down to the two river features that surround the road at its beginning: the Gándara River and the Astrón Ravine.



Figure 1: Location of Soba in the Region of Cantabria.

3.2. PROJECT'S DESCRIPTION

The purpose of the project is to improve the road surface and slightly widen the section of the CA-661 highway, accessing La Busta, from the beginning of the highway, where it separates from the CA-256 at PK 0+000, to PK 2+100, past the town of Santa María.

The main technical characteristics are as follows:

- **Project type:** Construction Project.
- **Typical section:** Single-carriageway highway with one lane in each direction.
- **Project speed:** 40 km/h.
- **Length:** 2.100 km.
- **Roadway width:** 6 meters. Two lanes, 3 meters wide.
- **Shoulders:** 0.5 meters.

3.2.1. ACTIONS THAT PRODUCE AN IMPACT

Based on the Guide for the Preparation of Environmental Studies for Projects with an Impact on the Natural Environment, "Guide 1: Land-Based Communication and Transportation Infrastructure," and specifically on the

description of the project actions likely to cause an impact, a list is drawn up with the existing actions in the project at each phase of its life cycle that may cause some impact, positive or negative, on the environment.

During construction phase:

- Clearing and earthworks.
- Land requirements.
- Creation of additional tracks and access points.
- Transport of materials.
- Movement of heavy machinery.
- Paving of surfaces.
- Storage of materials.
- Fencing and vehicle circulation.
- Creation of structures associated with the project.

During exploitation phase:

- Increased road traffic.
- Use of maintenance machinery.
- Use of salts, herbicides, and additives for infrastructure preservation.
- Road maintenance (cleaning, painting road lines, paving some sections, etc.).
- Glare from vehicles.
- Creation of waste dumps in the vicinity of the road, as a result of the increased accessibility of the area.
- Increased atmospheric emissions (CO₂, CO, VOCs, NO_x, SO_x, heavy metals, free radicals) capable of affecting natural environmental factors present in the project's host area.

Abandon phase:

- This phase is not contemplated for the type of infrastructure that is the subject of this Study.



3.3. DESCRIPTION OF THE MEDIUM

In the following section, a study of the project site and the environmental characteristics present prior to the project's implementation will be conducted. This will define the status of each of these characteristics and the environmental factors that may be affected, in one way or another, by the project. An individual analysis of the study factors will be conducted, which will allow the territory to be classified according to its capacity to withstand and accept the changes or effects that the project entails. To conduct this individual analysis, the physical, biological, social, and perceptual environments will be studied separately.

3.3.1. PHYSICAL MEDIUM

The physical environment surrounding the project area will be described below. The aspects to consider within the physical environment of the area surrounding the project include climatology, hydrology, and pollution (both noise and light and air pollution).

3.3.1.1. CLIMATOLOGY

As specified in the Climatology and Hydrology document attached to the project, and following the Köppen-Geiger climate classification, the project area is located in a temperate mesothermal climate area.

The Cantabrian climate, temperate or type C, is characterized by monthly minimum temperatures between 0°C and 18°C. Furthermore, type C climates, according to the Atlas, can be classified according to subtypes. The Cantabrian climate falls into subtype Cfb, which is characterized by a temperate climate without a dry season, as well as mild summers. Specifically, in the Soba region, the municipality where the project is being carried out, the climate is not only temperate but also humid, with cool temperatures in summer and mild winter. Precipitation, on the other hand, is frequent throughout the year. Regarding the project area temperatures, this shows an average annual temperature based on average monthly temperatures of 15.7°C, with minimum values of 9.7°C and maximum values of 20.3°C.

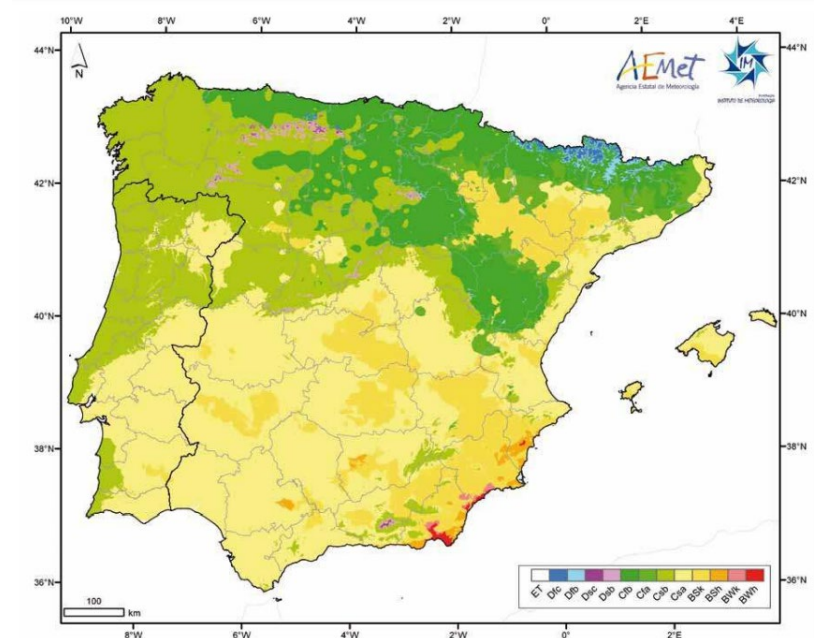


Figure 2: Spain's Climatic Map.

3.3.1.2. HYDROLOGY

The municipality of Soba is located in the Cantabrian River Basin. Within the municipality, the main rivers are the Asón River and the Gándara River, the latter flowing near the project area.

Alongside the road, there are two river features worth considering: the aforementioned Gándara River and the Astrón Ravine.



Figure 3: Asón's hydrological basin, project zone.



3.3.1.3. AIR POLLUTION

Being a rural area dedicated mainly to livestock farming and with very little industrialization, the air quality is good. The low vehicle traffic density on the projected road does not affect air quality.

3.3.1.4. ACOUSTIC POLLUTION

Noise pollution in the project area is low as there are no industrial zones or heavy vehicle traffic that generates loud noise.

3.3.1.5. LIGHT POLLUTION

The project area is not illuminated, so light pollution in the area is practically zero.

3.3.2. BIOLOGICAL MEDIUM

This section will indicate the main characteristics of the flora and fauna present in the project area:

3.3.2.1. VEGETATION

The following figures represent the main tree, herbaceous and scrub formations in the autonomous community of Cantabria:



Figure 4: Main tree formations in Cantabria.

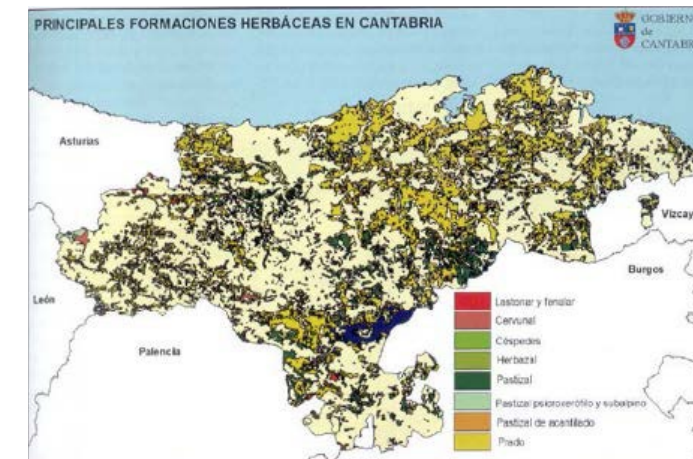


Figure 5: Main herbaceous formations in Cantabria.

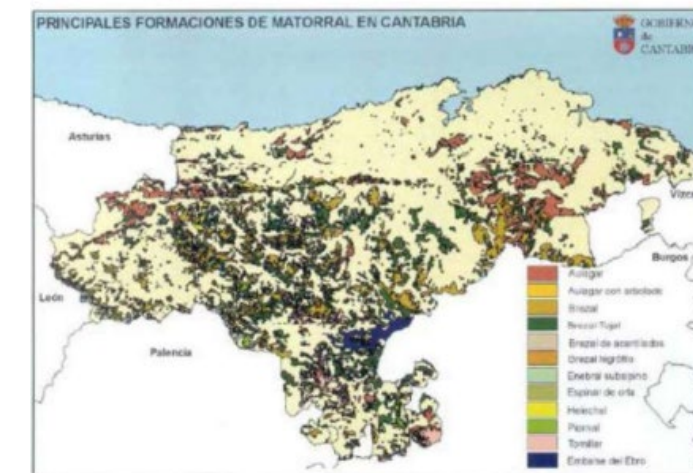


Figure 6: Main scrub/bush formations in Cantabria.

The flora of Soba is characterized by the presence of large forests of Cantabrian oaks and holm oaks. In fact, two species of Cantabrian trees present in the area are classified as unique: the Cagigal de La Gándara and the Cagigal del Monte San Pedro. Furthermore, the Collados del Asón Natural Park is located within the municipality. The park includes the sources of the Gándara and Asón rivers and the limestone massif, with valleys of glacial origin, where they emerge, and is home to a rich flora and fauna. Furthermore, the municipality has proposed the basins of the Miera and Gándara rivers as Sites of Community Importance.

The following table shows the different types of flora that can be found in the municipality where the project is being developed and the approximate hectares occupied by each type:



Type of vegetation	Surface (ha)
Matorral	6,924.98
Agrícola y prados artificiales	4,520.53
Hayedos (Bosque)	3,997.34
Encinares (Bosque)	2,310.62
Monte sin vegetación superior	1,785.89
Prado con sebes	1,575.74
Robledal de <i>Quercus robur</i> y <i>Quercus petraea</i> (Bosque)	1,178.15
Bosques mixtos de frondosas en región biogeográfica atlántica (Bosque)	1,173.65
Herbazal	922.71
Pinares de pino albar (Bosque Plantación)	867.09
Bosques ribereños (A.F.M. - Riberas)	266.55
Pinares de pino radiata (Mosaico arbolado sobre cultivo)	121.64
Pinares de pino radiata (Bosque Plantación)	119.18
T.D. (Talas)	101.05
Artificial	94.65
Eucaliptales (Bosque Plantación)	85.25
Mezcla de coníferas con frondosas, autóctonas con alóctonas (Bosque Plantación)	78.86
Acebedas (Bosque)	78.63

Melojares (Bosque)	66.83
Castañares (Bosque)	62.20
Prado	50.55
Hayedos (Mosaico arbolado sobre cultivo)	48.72
Mezclas de coníferas y frondosas autóctonas (Bosque)	46.17
Arbolado disperso de coníferas y frondosas (Bosque)	44.84
Pinares de pino radiata (A.F.M. - Bosquetes)	35.82
Complementos del bosque	33.54
Pastizal Matorral	23.35
Otras especies de producción en mezcla (Bosque Plantación)	22.21
Madroñales (Bosque)	9.54
Avellanedas (Bosque)	5.61
Fresnedas (Bosque)	4.35
Agua	2.81
Pinares de pino salgareño (Bosque Plantación)	0.30



3.3.2.2. WILDLIFE

Regarding the local fauna, the following is a list of animals that may appear in the project area:

Amphibians:

COMMON NAME	SCIENTIFIC NAME
RANA BERMEJA	<i>Rana temporaria</i>
SALAMANDRA COMÚN	<i>Salamandra salamandra</i>
SAPO PARTERO COMÚN	<i>Alytes obstetricans</i>
TRITÓN ALPINO	<i>Mesotriton alpestris</i>
TRITÓN PALMEADO	<i>Lissotriton helveticus</i>

Birds:

COMMON NAME	SCIENTIFIC NAME
ACENTOR COMÚN	<i>Prunella modularis</i>
AGATEADOR COMÚN	<i>Certhia brachydactyla</i>
ÁGUILA CULEBRERA	<i>Circaetus gallicus</i>
ÁGUILA REAL (CAUDAL)	<i>Aquila chrysaetos</i>
ALCAUDÓN DORSIRROJO	<i>Lanius collurio</i>
ALCOTÁN EUROPEO	<i>Falco subbuteo</i>
ALIMOCHÉ COMÚN (ABANTO)	<i>Neophron percnopterus</i>
ALONDRA COMÚN	<i>Alauda arvensis</i>
ARREDAJO	<i>Garrulus glandarius</i>

AVIÓN COMÚN	<i>Delichon urbicum</i>
AVIÓN ROQUERO	<i>Ptyonoprogne rupestris</i>
BISBITA ARBÓREO	<i>Anthus trivialis</i>
BISBITA RIBEREÑO ALPINO	<i>Anthus spinoletta</i>
BUSARDO RATONERO	<i>Buteo buteo</i>
CAMACHUELO COMÚN	<i>Pyrrhula pyrrhula</i>
CÁRABO COMÚN	<i>Strix aluco</i>
CARBONERO COMÚN	<i>Parus major</i>
CARBONERO GARRAPINOS	<i>Parus ater</i>
CARBONERO PALUSTRE	<i>Parus palustris</i>
CERNÍCALO VULGAR	<i>Falco tinnunculus</i>
CHOCHÍN	<i>Troglodytes troglodytes</i>
CHOTACABRAS GRIS	<i>Caprimulgus europaeus</i>
CHOVA PIQUIGUALDA	<i>Pyrrhocorax graculus</i>
CHOVA PIQUIRROJA	<i>Pyrrhocorax pyrrhocorax</i>
COLIRROJO TIZÓN	<i>Phoenicurus ochruros</i>
CORNEJA NEGRA	<i>Corvus corone</i>
CUCO COMÚN	<i>Cuculus canorus</i>
CUERVO	<i>Corvus corax</i>



CURRUCA CAPIROTADA	<i>Sylvia atricapilla</i>
ESCRIBANO CERILLO	<i>Emberiza citrinella</i>
ESCRIBANO MONTESINO	<i>Emberiza cia</i>
GAVILÁN COMÚN	<i>Accipiter nisus</i>
GOLONDRINA COMÚN	<i>Hirundo rustica</i>
GORRIÓN COMÚN	<i>Passer domesticus</i>
HALCÓN PEREGRINO	<i>Falco peregrinus</i>
HERRERILLO CAPUCHINO	<i>Parus cristatus</i>
HERRERILLO COMÚN	<i>Parus caeruleus</i>
JILGUERO	<i>Carduelis carduelis</i>
LAVANDERA BLANCA (AGUZANIEVES)	<i>Motacilla alba</i>
LAVANDERA CASCADEÑA	<i>Motacilla cinerea</i>
LECHUZA COMÚN	<i>Tyto alba</i>
BUITRE LEONADO	<i>Gyps fulvus</i>
MARTÍN PESCADOR COMÚN	<i>Alcedo atthis</i>
MILANO NEGRO	<i>Milvus migrans</i>
MIRLO ACUÁTICO	<i>Cinclus cinclus</i>
MIRLO COMÚN	<i>Turdus merula</i>
MITO	<i>Aegithalos caudatus</i>

MOSQUITERO IBÉRICO	<i>Phylloscopus ibericus</i>
PALOMA TORCAZ	<i>Columba palumbus</i>
PARDILLO COMÚN	<i>Carduelis cannabina</i>
PETIRROJO EUROPEO	<i>Erithacus rubecula</i>
PICO PICAPINOS	<i>Dendrocopos major</i>
PINZÓN VULGAR	<i>Fringilla coelebs</i>
PITO REAL	<i>Picus viridis</i>
REYEZUELO LISTADO	<i>Regulus ignicapilla</i>
RUISEÑOR BASTARDO	<i>Cettia cetti</i>
TARABILLA COMÚN	<i>Saxicola torquatus</i>
TREPADOR AZUL	<i>Sitta europaea</i>
URRACA	<i>Pica pica</i>
VENCEJO COMÚN	<i>Apus apus</i>
VERDECILLO	<i>Serinus serinus</i>
VERDERÓN EUROPEO (COMÚN)	<i>Carduelis chloris</i>
ZORZAL CHARLO	<i>Turdus viscivorus</i>
ZORZAL COMÚN	<i>Turdus philomelos</i>

**Reptiles:**

COMMON NAME	SCIENTIFIC NAME
CULEBRA DE COLLAR	<i>Natrix natrix</i>
LAGARTIJA DE TURBERA	<i>Lacerta vivipara</i>
LAGARTIJA IBÉRICA	<i>Podarcis hispanica</i>
LAGARTIJA ROQUERA	<i>Podarcis muralis</i>
LAGARTIJA VIVÍPARA	<i>Zootoca vivipara</i>

Mammals:

COMMON NAME	SCIENTIFIC NAME
ARDILLA COMÚN	<i>Sciurus vulgaris</i>
LIEBRE	<i>Lepus europaeus</i>
CORZO	<i>Capreolus capreolus</i>
DESMÁN DE LOS PIRINEOS	<i>Galemys pyrenaicus</i>
ZORRO	<i>Vulpes vulpes</i>
JABALÍ	<i>Sus scrofa</i>
LOBO	<i>Canis lupus</i>
MURCIÉLAGO BIGOTUDO	<i>Myotis mystacinus</i>
MURCIÉLAGO COMÚN	<i>Pipistrellus pipistrellus</i>
MURCIÉLAGO DE CABRERA	<i>Pipistrellus pygmaeus</i>
MURCIÉLAGO DE CUEVA	<i>Miniopterus schreibersii</i>

MURCIÉLAGO HERRADURA GRANDE	<i>Rhinolophus ferrumequinum</i>
MURCIÉLAGO HERRADURA MEDIO	<i>Rhinolophus euryale</i>
MURCIÉLAGO HERRADURA PEQUEÑO	<i>Rhinolophus hipposideros</i>
MURCIÉLAGO RATONERO FORESTAL	<i>Myotis bechsteinii</i>
MURCIÉLAGO RATONERO GRANDE	<i>Myotis myotis</i>
MURCIÉLAGO RATONERO GRIS	<i>Myotis nattereri</i>
MURCIÉLAGO RATONERO PARDO	<i>Myotis emarginatus</i>
MURCIÉLAGO RIBEREÑO	<i>Myotis daubentonii</i>
NÓCTULO COMÚN	<i>Nyctalus noctula</i>
NÓCTULO PEQUEÑO	<i>Nyctalus leisleri</i>
RATA TOPERA	<i>Arvicola terrestris</i>
RATÓN CASERO	<i>Mus musculus</i>
RATÓN DE CAMPO	<i>Apodemus sylvaticus</i>
RATÓN LEONADO	<i>Apodemus flavicollis</i>
TEJÓN COMÚN	<i>Meles meles</i>
TOPILLO NIVAL	<i>Chionomys nivalis</i>
TOPILLO ROJO	<i>Myodes glareolus</i>

**Invertebrates:**

COMMON NAME	SCIENTIFIC NAME
CARACOL (ENDÉMICO)	<i>Cochlostoma oscitans</i>
CARACOL DE QUIMPER	<i>Elona quimperiana</i>
CANGREJO DE RÍO EUROPEO	<i>Austropotamobius italicus</i>

3.3.3. SOCIAL MEDIUM

The population of Soba has gradually declined over time due to the rural exodus phenomenon in the Community of Cantabria, as well as the low birth rate. Furthermore, the vast majority of the municipality's population is middle-aged.

The area's economy is primarily driven by livestock farming, as around 60% of Soba's inhabitants make their living from it. The area's other two major economic strengths are the service sector, primarily driven by rural and nature tourism, and construction.

3.3.4. PERCEPTUAL MEDIUM

The project area corresponds to a rural area in the interior of Cantabria. This area relies on livestock farming and small, scattered urban centers. The traditional emphasis of primary sector activities has shaped the traditional housing and population center. The rural area of Soba preserves a large number of heritage elements with popular construction typologies, both individual buildings and traditional building complexes. In addition to the main settlement found in the town center, there are scattered neighborhoods and housing.

3.3.5. SPECIAL PROTECTION AREAS

The route of the bypass does not affect any special environmental protection zone of any kind.

4. IMPACT IDENTIFICATION

The various impact factors and potential impacts arising from the project's various actions and activities, whether in the construction or operating phase, will be outlined below:

4.1. POTENTIAL ENVIRONMENTAL IMPACTS**4.1.1. ATMOSPHERIC IMPACT**

- Noise pollution.
- Light pollution.
- Emissions of dust, particles, and gaseous pollutants.

4.1.2. HYDROLOGICAL IMPACT

- Washing away of stockpiled or leveled materials.
- Accidental spills of lubricants, fuels, paints, concrete, bitumen, and other hazardous or polluting substances or products.
- Erosion of embankment slopes and natural terrain due to freefall water following cross-drainage works.

4.1.3. VEGETATION IMPACT

- Removal of native vegetation for the construction project.
- Risk of invasive plant species spreading through the corridor.
- Failure to restore herbaceous and/or tree cover.
- Risk of accidental fires.

4.1.4. WILDLIFE IMPACT

- Increased disturbance from noise emissions and vibrations from vehicles.
- Alteration and destruction of existing vegetation cover and other foraging, nesting, or shelter areas.
- Impact on wildlife permeability or mobility.
- Increased mortality due to the risk of vehicle accidents.

4.1.5. GEOTECHNICAL IMPACT

- Loss of nutrient properties of topsoil.
- Soil loss due to erosion.
- Washing away of soil on slopes.
- Temporary and permanent occupation.
- Soil compaction in occupied areas.

**4.1.6. LANDSCAPE IMPACT**

- Alteration of landscape forms and local morphology.
- Lack of restoration of the natural landscape on slopes and other disturbed areas.

4.1.7. PATRIMONIAL IMPACT

- Risk of impact on potential sites or elements of archaeological or heritage interest.

4.1.8. SOCIOECONOMICAL IMPACT

- Inconvenience to citizens resulting from the construction work.
- Failure to restore affected services and uses.
- Job creation

4.1.9. WASTE IMPACT

- Inadequate management of CDW, especially those that pose a risk to environmental and human health.

5. CHARACTERIZATION AND EVALUATION OF THE IMPACTS

Impact characterization and assessment are developed using the semi-quantitative numerical method proposed in the Criteria for Impact Characterization RD 1131/88. The concepts that characterize each impact and their respective assessment are presented below. These effects can have a negative sign, if they are harmful, or a positive sign, if they are beneficial.

- **(I) Intensity:** It refers to the degree of alteration that the impact introduces.
- **(E) Extent:** Referring to the area of influence of the impact, since it may affect specific areas within the study area or even exceed the area delimited as the area affected by the action.
- **(M) Moment:** Time it takes for a certain impact to affect any of the environmental factors.
- **(P) Persistence:** It refers to the altered factors that remain after the action is completed.
- **(R) Reversibility:** This criterion refers to the possibility of recovering the environmental quality of the factor once the impact has occurred.

The following table is used to obtain the values of each component of the model:

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

Figure 7: Impact evaluation table.

Once the impacts have been characterized and assessed, their significance is calculated. The following expression is used for this purpose:

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

And the results obtained are normalized with this other expression:

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

Based on the normalized value obtained for each expression, and for each impact, a rating corresponding to the impact of each factor is assigned. The different impact rating classifications are as follows:



Impact	Description	Ir
COMPATIBLE	Immediate recovery after the cessation of the activity that caused the impact.	0,0-2,5
	No corrective measures required.	
MODERATE	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
	Noticeable environmental loss.	
CRITIC	Magnitude exceeds the acceptable threshold.	7,5-10,0
	Permanent loss of environmental quality.	
	No recovery possible, even with corrective measures.	

Once the impacts to be considered and the assessment criteria have been defined, the classification of each factor is identified individually using the table attached in the following sheet:



DESCRIPCIÓN		VALORACIONES AMBIENTALES						IMPORTANCIA		IMPACTO
Factores	Impactos ambientales potenciales	Signo	I	E	M	P	R	I	Ir	
ATMÓSFERA	Contaminación acústica.	-	2	1	4	2	4	18	1,042	COMPATIBLE
	Contaminación lumínica.	-	1	2	4	4	4	19	1,146	COMPATIBLE
	Emisiones de polvo, partículas gaseosos.	-	2	2	4	4	4	22	1,458	COMPATIBLE
HIDROLOGÍA	Arrastres de materiales	-	2	4	4	4	4	26	1,875	COMPATIBLE
	Vertidos accidentales	-	8	4	4	2	4	42	3,542	MODERADO
FLORA	Retirada de la vegetación autóctona	-	2	1	4	4	2	18	1,042	COMPATIBLE
	Riesgo de propagación de especies.	-	1	1	4	4	1	14	0,625	COMPATIBLE
	Restitución de la cubierta vegetal.	-	2	2	4	4	2	20	1,250	COMPATIBLE
	Riesgo de incendios accidentales.	-	2	4	4	8	4	30	2,292	COMPATIBLE
FAUNA	Emisiones acústicas y vibraciones.	-	2	2	4	4	4	22	1,458	COMPATIBLE
	Alteración de la cobertura vegetal.	-	1	2	4	4	4	19	1,146	COMPATIBLE
	Afecciones a la movilidad de la fauna.	-	1	4	4	4	4	23	1,563	COMPATIBLE
	Aumento de la mortalidad por accidentes.	-	2	2	1	2	4	17	0,938	COMPATIBLE
SUELO	Pérdida de propiedades de la tierra.	-	4	2	4	4	4	28	2,083	COMPATIBLE
	Pérdidas de suelo por erosión.	-	4	2	4	4	4	28	2,083	COMPATIBLE
	Lavado de tierras en taludes.	-	4	2	4	4	4	28	2,083	COMPATIBLE
	Ocupación temporal y permanente.	-	8	2	4	8	8	48	4,167	MODERADO
	Compactación de los suelos.	-	4	2	4	8	4	32	2,500	MODERADO
PAISAJE	Alteración de las formas del paisaje.	-	2	4	4	8	4	30	2,292	COMPATIBLE
	Ausencia de restitución del paisaje natural.	-	2	4	4	4	4	26	1,875	COMPATIBLE
PATRIMONIO	Afección a posibles yacimientos.	-	2	1	2	2	2	14	0,625	COMPATIBLE
SOCIO ECONÓMICO	Molestias a los ciudadanos por las obras.	-	4	4	4	4	2	30	2,292	COMPATIBLE
	Reposición de los servicios afectados.	-	8	2	4	2	2	36	2,917	MODERADO
	Generación de puestos de trabajo.	+	4	2	4	2	1	23	1,563	COMPATIBLE
RESIDUOS	Inadecuada gestión de RCDs.	-	8	4	8	4	2	46	3,958	MODERADO



6. PREVENTIVE AND CORRECTIVE MEASURES

All impacts rated as COMPATIBLE do not require preventive or corrective measures. However, those classified as MODERATE do, even if the measures are not very intense.

Below are a series of preventive and corrective measures to ensure environmental and surrounding conservation, reducing the impact of these factors as much as possible.

6.1. SET OF PREVENTIVE AND CORRECTIVE MEASURES

6.1.1. ATMOSPHERIC FACTOR

- Comply with current emissions legislation.
- Maintain machinery in good condition and use CE-approved equipment.
- Moisten materials during earthmoving and control discharge heights.
- Control dust-emitting activities: apply periodic wetting and cleaning irrigation, transport materials using a tarp, and clean machinery wheels.
- Reduce the speed of machinery and vehicles near sensitive areas.

6.1.2. HYDROLOGICAL FACTOR

- Handle hazardous substances under appropriate environmental safety conditions to reduce the risk of spills.
- Have an Environmental Emergency Plan that will define the protocol in the event of an accident with significant environmental repercussions, especially spills.
- Place machinery parking areas in areas with low permeability.
- Appropriate authorizations must be obtained to obtain water for wetting operations.
- Washing ponds for the gutters of concrete tanks will be installed, and they will be adequately waterproofed.
- Sediment retention barriers will be installed near watercourses.
- Proper stockpile location and management must be ensured to prevent leachate.
- Place downpipes on the slopes of cross drainage works to prevent soil erosion due to the effect of free-falling water.

6.1.3. GEOTECHNICAL FACTOR

- Delimit the strictly occupied area of the construction site.
- Recover the top layer of fertile soil for later use in landscape restoration.
- Stockpile topsoil in piles no more than 1.5 meters high. If necessary, irrigate and fertilize to preserve its properties.
- In the event of spillage of polluting products, remove the affected soil and treat it as hazardous waste.
- Use absorbent materials to clean up spilled fluids from machinery, which will subsequently be treated as hazardous waste.
- Dismantle the facilities once the work is completed and clean the entire construction site.

6.1.4. WILDLIFE FACTOR

- Minimize noise and vibration generation.
- Avoid creating conditions that attract wildlife to the roadway area.
- Clear the land from the road centerline outward to allow wildlife to escape.
- Use reflectors to prevent vehicles from entering.

6.1.5. VEGETATION FACTOR

- Do not place nails, pegs, ropes, or cables in trees or shrubs.
- Do not stack or lean materials against tree trunks.
- Delimit the area around clearing operations.
- Carry out work that poses a fire risk away from highly flammable areas.
- Take extreme care in cleaning drains and waterways to avoid the unnecessary removal of natural vegetation.
- Restore all areas that have suffered significant vegetation disturbance.
- Protect vegetation from impacts and compaction of the root extension area, as well as from potential animals that could damage it.
- Properly manage invasive plant specimens.
- Implement the "Program for the Control of Invasive Plants in Cantabria" of the General Directorate of Forestry and Nature Conservation.
- Establish an appropriate schedule to allow for partial restorations.
- Carry out clearing, sowing, and planting operations at the appropriate time.



- If injuries occur on trees near the work site, make clean, smooth cuts on the damaged branches and paint them with a healing agent.

6.1.6. LANDSCAPE FACTOR

- Completely restore the area.
- Move unused soil removed from excavated excavations to a designated storage area.
- Ensure cleanliness and order in the work areas.
- If established revegetation measures are insufficient, adopt more intensive corrective measures.

6.1.7. SOCIOECONOMICAL FACTOR

- Ensure the functionality and continuity of affected services during construction.
- Make construction schedules compatible with those of the activities being carried out.

6.1.8. RESIDUAL FACTOR

- Comply with current legislation.
- Ensure proper segregation, storage on-site, and delivery to the authorized manager.

7. ENVIRONMENTAL VIGILANCE PROGRAM

In order to monitor and control the effective implementation of the proposed preventive and corrective measures, an Environmental Monitoring Program must be implemented in the project area while the works are carried out.

This program must include the following points:

- Control of dust emissions from the passage of vehicles and construction machinery.
- Control of noise levels during the execution of the works.
- Control to detect impacts.
- Control of the management of waste generated during the works.
- Control of the adequacy of drainage works in accordance with the requirements approved by the involved agencies.
- Control and monitoring of waterways against actions that could affect the free flow of water.

- Drafting of a simple and systematic method for environmental monitoring.

That is, the Environmental Monitoring Program must:

- Define the impacts to be controlled with the corresponding environmental improvement measures to be applied.
- Monitor and verify the effectiveness of protective and corrective measures, and provide solutions when these prove unsatisfactory.
- Define impact detection measures.
- Present a simple and systematic method for environmental monitoring.

PART №3 – PROJECT DESIGN



DOCUMENT N.º1 – ROAD ALIGNMENT AND GEOMETRIC DESIGN



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1. INTRODUCTION

This appendix describes and justifies the route designed for the improvement of the CA-661 Access Road to La Busta. The section studied in this project corresponds to the first part of the road, from PK 0+000 of the CA-661 to PK 2+100.

The following sections first define the geometric design criteria considered in the project, the main characteristics of the route designed, and the existing constraints that influenced the choice of route. The layout report, necessary for projecting the plans on the ground, is also included.

The effects of the route on the surrounding area will be considered when designing, based on current and planned land use, as well as the environmental impact. Likewise, a homogeneity of geometric characteristics must be achieved that encourages drivers to travel comfortably and safely without excessive speed fluctuations. To achieve this, points where geometric characteristics require a sudden decrease in speed will be avoided, and the perception of necessary speed variations will be facilitated through progressive changes in geometric parameters with the help of signage.

2. ROAD LAYOUT

The route was designed in accordance with Norma 3.1-IC "Trazado", published in 2016 by the Ministry of Public Works, for a design speed of 40 km/h. The layout reports are presented in plan and elevation views.

2.1. PLAN ROAD LAYOUT

To avoid problems related to fatigue, glare, or excessive speed, straight alignments must conform to a series of maximum and minimum length values based on the road's design speed, according to the standard. In the case of this project, these values are as follows:

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

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

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

Where:

- $L_{min,s}$ minimum length (m) for layouts in "S".
- $L_{min,o}$ minimum length (m) for other cases.
- L_{max} maximum length (m).
- V_p Project speed (km/h)

In the project layout, no straight alignments with a length greater than the established maximum have been projected and, given that the road layout adopts the shape of an "S", all straight lines also comply with the minimum length.

Vp=40 km/h	Longitud (m)
Lmin,s	56
Lmin,o	111
Lmax	668

Figura 1: Longitudes mínimas y máximas en alineación recta.

Once a certain design speed has been set, the minimum radius to be adopted for circular curves will be determined based on:

- The maximum superelevation and maximum mobilized transverse friction.
- Visibility at the stop along its entire length.
- The coordination of the layout in plan and elevation, to avoid loss of layout, orientation, and dynamics.



Therefore, the layout criteria considered in its design are as follows:

- Design speed: 40 km/h.
- Minimum radius: 30 m. This should be 50 m, but due to the conditions of the existing road, this is impossible.
- Maximum banking: It should be 7%, but due to this being a mountain road with steep slopes, we will limit it to 13%.

Finally, regarding curves, the instructions indicate their shape and characteristics. Clothoids will be used that meet a series of conditions regarding their parameter and length. There are limitations in several aspects, such as the variation of centrifugal acceleration in the horizontal plane, banking transition, and visual perception conditions.

2.2. PLAN LAYOUT REPORT

Below are the values for each alignment of the layout obtained in Civil 3D:

Tangent Data

Length:	108.890	Course:	S 57° 48' 40.9298" E
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.350
Radius:	150.000	S Tan:	11.682
Theta:	06° 41' 04.2274"	P:	0.340
X:	34.952	K:	17.492
Y:	1.360	A:	72.457

Chord:	34.979	Course:	S 60° 02' 21.4143" E
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Circular Curve Data

Delta:	07° 07' 27.6165"	Type:	LEFT
Radius:	150.000		
Length:	18.651	Tangent:	9.338
Mid-Ord:	0.290	External:	0.290
Chord:	18.639	Course:	S 68° 03' 28.9654" E

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.350
Radius:	150.000	S Tan:	11.682
Theta:	06° 41' 04.2274"	P:	0.340
X:	34.952	K:	17.492
Y:	1.360	A:	72.457
Chord:	34.979	Course:	S 76° 04' 36.5165" E

Tangent Data

Length:	43.194	Course:	S 78° 18' 17.0011" E
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Spiral Curve Data: clothoid

Length:	7.500	L Tan:	5.004
Radius:	30.000	S Tan:	2.504
Theta:	07° 09' 43.1008"	P:	0.078
X:	7.488	K:	3.748
Y:	0.312	A:	15.000
Chord:	7.495	Course:	S 75° 55' 03.7714" E

Circular Curve Data

Delta:	111° 03' 45.4523"	Type:	RIGHT
Radius:	30.000		
Length:	58.152	Tangent:	43.701
Mid-Ord:	13.021	External:	23.008
Chord:	49.466	Course:	S 15° 36' 41.1742" E

Spiral Curve Data: clothoid

Length:	45.370	L Tan:	31.205
Radius:	30.000	S Tan:	15.999

Theta:	43° 19' 31.8442"	P:	2.801
X:	42.844	K:	22.260
Y:	10.977	A:	36.893
Chord:	44.228	Course:	S 68° 52' 27.9817" W

Tangent Data

Length:	24.349	Course:	S 83° 14' 43.3962" W
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.400
Radius:	75.000	S Tan:	11.728
Theta:	13° 22' 08.4548"	P:	0.679
X:	34.810	K:	17.468
Y:	2.712	A:	51.235
Chord:	34.915	Course:	S 87° 41' 58.8105" W

Circular Curve Data

Delta:	05° 03' 32.7207"	Type:	RIGHT
Radius:	75.000		



Length:	6.622	Tangent:	3.313	X:	42.271	K:	22.162
Mid-Ord:	0.073	External:	0.073	Y:	12.080	A:	35.000
Chord:	6.620	Course:	N 80° 51' 21.7886" W	Chord:	43.963	Course:	N 80° 54' 23.0989" W

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.400
Radius:	75.000	S Tan:	11.728
Theta:	13° 22' 08.4548"	P:	0.679
X:	34.810	K:	17.468
Y:	2.712	A:	51.235
Chord:	34.915	Course:	N 69° 24' 42.3877" W

Tangent Data

Length:	90.776	Course:	N 64° 57' 26.9734" W
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Spiral Curve Data: clothoid

Length:	45.370	L Tan:	31.447
Radius:	27.000	S Tan:	16.220
Theta:	48° 08' 22.0491"	P:	3.098

Circular Curve Data

Delta:	53° 06' 57.6390"	Type:	LEFT
Radius:	27.000		
Length:	25.030	Tangent:	13.496
Mid-Ord:	2.849	External:	3.185
Chord:	24.144	Course:	S 40° 20' 42.1579" W

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.868
Radius:	27.000	S Tan:	12.155
Theta:	37° 08' 10.1522"	P:	1.862
X:	33.558	K:	17.258
Y:	7.338	A:	30.741
Chord:	34.351	Course:	S 11° 00' 53.5429" E

Tangent Data

Length: 26.765 Course: S 23° 20' 56.8138" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 23.359
Radius: 120.000 S Tan: 11.690
Theta: 08° 21' 20.2842" P: 0.425
X: 34.926 K: 17.488
Y: 1.699 A: 64.807
Chord: 34.967 Course: S 26° 08' 01.7691" E

Circular Curve Data

Delta: 06° 59' 36.3309" Type: LEFT
Radius: 120.000
Length: 14.647 Tangent: 7.333
Mid-Ord: 0.223 External: 0.224
Chord: 14.638 Course: S 35° 12' 05.2635" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 23.359

Radius: 120.000 S Tan: 11.690

Theta: 08° 21' 20.2842" P: 0.425

X: 34.926 K: 17.488

Y: 1.699 A: 64.807

Chord: 34.967 Course: S 44° 16' 08.7580" E

Tangent Data

Length: 56.979 Course: S 47° 03' 13.7132" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 25.248

Radius: 15.000 S Tan: 13.425

Theta: 66° 50' 42.2740" P: 3.242

X: 30.527 K: 16.735

Y: 12.344 A: 22.913

Chord: 32.928 Course: S 69° 04' 12.0724" E

Circular Curve Data



Delta:	15° 47' 52.2363"	Type:	LEFT	Radius:	20.000	S Tan:	6.830
Radius:	15.000			Theta:	28° 38' 52.4031"	P:	0.826
Length:	4.136	Tangent:	2.081	X:	19.506	K:	9.917
Mid-Ord:	0.142	External:	0.144	Y:	3.274	A:	20.000
Chord:	4.123	Course:	N 58° 12' 07.8946" E	Chord:	19.779	Course:	N 07° 00' 46.2297" W

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	25.248
Radius:	15.000	S Tan:	13.425
Theta:	66° 50' 42.2740"	P:	3.242
X:	30.527	K:	16.735
Y:	12.344	A:	22.913
Chord:	32.928	Course:	N 05° 28' 27.8618" E

Tangent Data

Length:	5.124	Course:	N 16° 32' 30.4974" W
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Spiral Curve Data: clothoid

Length:	20.000	L Tan:	13.512
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Circular Curve Data

Delta:	61° 01' 28.3844"	Type:	RIGHT
Radius:	20.000		
Length:	21.302	Tangent:	11.787
Mid-Ord:	2.770	External:	3.215
Chord:	20.309	Course:	N 42° 37' 06.0979" E

Spiral Curve Data: clothoid

Length:	20.000	L Tan:	13.512
Radius:	20.000	S Tan:	6.830
Theta:	28° 38' 52.4031"	P:	0.826
X:	19.506	K:	9.917



Y: 3.274 A: 20.000
Chord: 19.779 Course: S 87° 45' 01.5745" E

Tangent Data

Length: 54.386 Course: S 78° 13' 17.3067" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 23.763
Radius: 30.000 S Tan: 12.058
Theta: 33° 25' 21.1370" P: 1.681

X: 33.828 K: 17.303

Y: 6.642 A: 32.404

Chord: 34.474 Course: S 67° 06' 46.7562" E

Circular Curve Data

Delta: 14° 05' 58.0578" Type: RIGHT

Radius: 30.000

Length: 7.382 Tangent: 3.710

Mid-Ord: 0.227 External: 0.229

Chord: 7.364 Course: S 37° 44' 57.1409" E

Spiral Curve Data: clothoid

Length: 20.000 L Tan: 13.412

Radius: 30.000 S Tan: 6.738

Theta: 19° 05' 54.9354" P: 0.553

X: 19.779 K: 9.963

Y: 2.205 A: 24.495

Chord: 19.901 Course: S 17° 57' 39.8727" E

Tangent Data

Length: 12.801 Course: S 11° 36' 03.1766" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 23.371

Radius: 100.000 S Tan: 11.701

Theta: 10° 01' 36.3411" P: 0.510

X: 34.893 K: 17.482

Y: 2.037 A: 59.161



Chord: 34.952 Course: S 14° 56' 32.1685" E

Circular Curve Data

Delta: 17° 34' 31.6853" Type: LEFT
Radius: 100.000
Length: 30.675 Tangent: 15.459
Mid-Ord: 1.174 External: 1.188
Chord: 30.555 Course: S 30° 24' 55.3603" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 23.371
Radius: 100.000 S Tan: 11.701
Theta: 10° 01' 36.3411" P: 0.510
X: 34.893 K: 17.482
Y: 2.037 A: 59.161
Chord: 34.952 Course: S 45° 53' 18.5521" E

Tangent Data

Length: 15.159 Course: S 49° 13' 47.5441" E

Spiral Curve Data: clothoid

Length: 35.000 L Tan: 25.248
Radius: 15.000 S Tan: 13.425
Theta: 66° 50' 42.2740" P: 3.242
X: 30.527 K: 16.735
Y: 12.344 A: 22.913
Chord: 32.928 Course: S 71° 14' 45.9033" E

Circular Curve Data

Delta: 23° 50' 31.1662" Type: LEFT
Radius: 15.000
Length: 6.242 Tangent: 3.167
Mid-Ord: 0.323 External: 0.331
Chord: 6.197 Course: N 52° 00' 14.5989" E

Spiral Curve Data: clothoid

Length: 25.000 L Tan: 17.316
Radius: 15.000 S Tan: 8.927



Theta:	47° 44' 47.3385"	P:	1.694
X:	23.319	K:	12.216
Y:	6.607	A:	19.365
Chord:	24.237	Course:	N 08° 09' 24.8606" E

Tangent Data

Length:	36.432	Course:	N 07° 39' 48.3228" W
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.485
Radius:	50.000	S Tan:	11.805
Theta:	20° 03' 12.6822"	P:	1.016
X:	34.574	K:	17.429
Y:	4.048	A:	41.833
Chord:	34.810	Course:	N 00° 59' 09.1252" W

Circular Curve Data

Delta:	59° 39' 14.5482"	Type:	RIGHT
Radius:	50.000		

Length:	52.058	Tangent:	28.667
Mid-Ord:	6.623	External:	7.635
Chord:	49.738	Course:	N 42° 13' 01.6335" E

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.485
Radius:	50.000	S Tan:	11.805
Theta:	20° 03' 12.6822"	P:	1.016
X:	34.574	K:	17.429
Y:	4.048	A:	41.833
Chord:	34.810	Course:	N 85° 25' 12.3922" E

Tangent Data

Length:	82.127	Course:	S 87° 54' 08.4102" E
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.438
Radius:	60.000	S Tan:	11.762
Theta:	16° 42' 40.5685"	P:	0.848



X:	34.703	K:	17.450
Y:	3.382	A:	45.826
Chord:	34.868	Course:	N 86° 31' 52.5387" E

Circular Curve Data

Delta:	01° 07' 49.7752"	Type:	LEFT
Radius:	60.000		
Length:	1.184	Tangent:	0.592
Mid-Ord:	0.003	External:	0.003
Chord:	1.184	Course:	N 74° 49' 16.1338" E

Spiral Curve Data: clothoid

Length:	20.000	L Tan:	13.353
Radius:	60.000	S Tan:	6.684
Theta:	09° 32' 57.4677"	P:	0.278
X:	19.945	K:	9.991
Y:	1.109	A:	34.641
Chord:	19.975	Course:	N 67° 53' 20.2378" E

Tangent Data

Length:	77.046	Course:	N 64° 42' 23.7784" E
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.868
Radius:	27.000	S Tan:	12.155
Theta:	37° 08' 10.1522"	P:	1.862
X:	33.558	K:	17.258
Y:	7.338	A:	30.741
Chord:	34.351	Course:	N 77° 02' 27.0493" E

Circular Curve Data

Delta:	100° 54' 20.1799"	Type:	RIGHT
Radius:	27.000		
Length:	47.551	Tangent:	32.699
Mid-Ord:	9.809	External:	15.405
Chord:	41.639	Course:	S 27° 42' 15.9794" E

Spiral Curve Data: clothoid



Length:	35.000	L Tan:	23.868
Radius:	27.000	S Tan:	12.155
Theta:	37° 08' 10.1522"	P:	1.862
X:	33.558	K:	17.258
Y:	7.338	A:	30.741
Chord:	34.351	Course:	S 47° 33' 00.9918" W

Tangent Data

Length:	49.235	Course:	S 59° 53' 04.2627" W
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Tangent Data

Length:	78.516	Course:	S 59° 22' 45.0031" W
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Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.400
Radius:	75.000	S Tan:	11.728
Theta:	13° 22' 08.4548"	P:	0.679
X:	34.810	K:	17.468
Y:	2.712	A:	51.235

Chord:	34.915	Course:	S 54° 55' 29.5889" W
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Circular Curve Data

Delta:	47° 46' 03.5252"	Type:	LEFT
Radius:	75.000		
Length:	62.528	Tangent:	33.210
Mid-Ord:	6.422	External:	7.024
Chord:	60.733	Course:	S 22° 07' 34.7858" W

Spiral Curve Data: clothoid

Length:	35.000	L Tan:	23.400
Radius:	75.000	S Tan:	11.728
Theta:	13° 22' 08.4548"	P:	0.679
X:	34.810	K:	17.468
Y:	2.712	A:	51.235
Chord:	34.915	Course:	S 10° 40' 20.0173" E

Tangent Data

Length:	34.250	Course:	S 15° 07' 35.4316" E
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Tangent Data

Length: 48.614 Course: S 15° 07' 35.4316" E

1. Alignment: ALINEACION-Derecha-3.000

2. Description:

Tangent Data

Length: 24.625 Course: S 57° 48' 40.9298" E

3. Alignment: ALINEACION-Izquierda-3.000

4. Description:

Tangent Data

Length: 24.625 Course: S 57° 48' 40.9298" E

5. Alignment: CA-256

6. Description:

Tangent Data

Length: 4.884 Course: S 44° 01' 44.3210" W

Circular Curve Data

Delta: 08° 29' 28.6809" Type: LEFT

Radius: 5.913

Length: 0.876 Tangent: 0.439

Mid-Ord: 0.016 External: 0.016

Chord: 0.876 Course: S 39° 46' 59.9806" W

Tangent Data

Length: 0.395 Course: S 35° 32' 15.6401" W

Circular Curve Data

Delta: 05° 28' 08.7419" Type: LEFT

Radius: 5.515

Length: 0.526 Tangent: 0.263

Mid-Ord: 0.006 External: 0.006



Chord: 0.526 Course: S 32° 48' 11.2693" W

Tangent Data

Length: 7.971 Course: S 30° 04' 06.8981" W

Circular Curve Data

Delta: 03° 30' 12.7139" Type: LEFT
Radius: 5.515
Length: 0.337 Tangent: 0.169
Mid-Ord: 0.003 External: 0.003
Chord: 0.337 Course: S 28° 19' 00.5413" W

Tangent Data

Length: 5.196 Course: S 26° 33' 54.1842" W

Circular Curve Data

Delta: 01° 09' 26.3990" Type: LEFT
Radius: 5.515
Length: 0.111 Tangent: 0.056

Mid-Ord: 0.000 External: 0.000

Chord: 0.111 Course: S 25° 59' 10.9850" W

Tangent Data

Length: 5.538 Course: S 25° 24' 27.7852" W

Circular Curve Data

Delta: 01° 09' 26.3990" Type: RIGHT
Radius: 5.515
Length: 0.111 Tangent: 0.056
Mid-Ord: 0.000 External: 0.000
Chord: 0.111 Course: S 25° 59' 10.9849" W

Tangent Data

Length: 7.587 Course: S 26° 33' 54.1842" W

Circular Curve Data

Delta: 01° 15' 07.8026" Type: LEFT
Radius: 5.515



Length:	0.121	Tangent:	0.060
Mid-Ord:	0.000	External:	0.000
Chord:	0.121	Course:	S 25° 56' 20.2826" W

Tangent Data

Length:	10.378	Course:	S 25° 18' 46.3817" W
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Circular Curve Data

Delta:	00° 06' 50.3653"	Type:	RIGHT
Radius:	5.515		
Length:	0.011	Tangent:	0.005
Mid-Ord:	0.000	External:	0.000
Chord:	0.011	Course:	S 25° 22' 11.5660" W

Tangent Data

Length:	8.601	Course:	S 25° 25' 36.7470" W
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Circular Curve Data

Delta:	00° 13' 38.9375"	Type:	RIGHT
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Radius:	5.515		
Length:	0.022	Tangent:	0.011
Mid-Ord:	0.000	External:	0.000
Chord:	0.022	Course:	S 25° 32' 26.2170" W

Tangent Data

Length:	19.689	Course:	S 25° 39' 15.6845" W
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Circular Curve Data

Delta:	00° 54' 38.4997"	Type:	RIGHT
Radius:	5.515		
Length:	0.088	Tangent:	0.044
Mid-Ord:	0.000	External:	0.000
Chord:	0.088	Course:	S 26° 06' 34.9346" W

Tangent Data

Length:	0.798	Course:	S 26° 33' 54.1842" W
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Circular Curve Data



Delta:	00° 17' 54.2861"	Type:	LEFT
Radius:	5.515		
Length:	0.029	Tangent:	0.014
Mid-Ord:	0.000	External:	0.000
Chord:	0.029	Course:	S 26° 24' 57.0417" W

Tangent Data

Length:	10.896	Course:	S 26° 15' 59.8981" W
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Circular Curve Data

Delta:	00° 55' 13.6647"	Type:	LEFT
Radius:	5.515		
Length:	0.089	Tangent:	0.044
Mid-Ord:	0.000	External:	0.000
Chord:	0.089	Course:	S 25° 48' 23.0656" W

Tangent Data

Length:	10.664	Course:	S 25° 20' 46.2334" W
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Delta:	00° 25' 03.7265"	Type:	LEFT
Radius:	5.515		
Length:	0.040	Tangent:	0.020
Mid-Ord:	0.000	External:	0.000
Chord:	0.040	Course:	S 25° 08' 14.3689" W

Tangent Data

Length:	9.897	Course:	S 24° 55' 42.5069" W
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Circular Curve Data

Delta:	20° 04' 17.4934"	Type:	RIGHT
Radius:	0.408		
Length:	0.143	Tangent:	0.072
Mid-Ord:	0.006	External:	0.006
Chord:	0.142	Course:	S 34° 57' 51.2531" W

Tangent Data

Length:	0.108	Course:	S 45° 00' 00.0001" W
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7. Alignment: CA-256-Derecha-3.000

8. Description:

Tangent Data

Length: 4.071 Course: S 26° 33' 54.1842" W

Circular Curve Data

Delta: 01° 15' 07.7996" Type: LEFT

Radius: 8.515

Length: 0.186 Tangent: 0.093

Mid-Ord: 0.001 External: 0.001

Chord: 0.186 Course: S 25° 56' 20.2829" W

Tangent Data

Length: 10.378 Course: S 25° 18' 46.3817" W

Circular Curve Data

Delta: 00° 06' 50.4045" Type: RIGHT

Radius: 2.514

Length: 0.005 Tangent: 0.003

Mid-Ord: 0.000 External: 0.000

Chord: 0.005 Course: S 25° 22' 11.5616" W

Tangent Data

Length: 8.601 Course: S 25° 25' 36.7470" W

Circular Curve Data

Delta: 00° 13' 38.9535" Type: RIGHT

Radius: 2.515

Length: 0.010 Tangent: 0.005

Mid-Ord: 0.000 External: 0.000

Chord: 0.010 Course: S 25° 32' 26.2160" W

Tangent Data

Length: 19.689 Course: S 25° 39' 15.6845" W

Circular Curve Data



Delta:	00° 54' 38.5042"	Type:	RIGHT
Radius:	2.515		
Length:	0.040	Tangent:	0.020
Mid-Ord:	0.000	External:	0.000
Chord:	0.040	Course:	S 26° 06' 34.9338" W

Tangent Data

Length:	0.798	Course:	S 26° 33' 54.1843" W
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Circular Curve Data

Delta:	00° 17' 54.2803"	Type:	LEFT
Radius:	8.515		
Length:	0.044	Tangent:	0.022
Mid-Ord:	0.000	External:	0.000
Chord:	0.044	Course:	S 26° 24' 57.0414" W

Tangent Data

Length:	3.523	Course:	S 26° 15' 59.8981" W
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9. Alignment: CA-256-Izquierda-3.000**10. Description:**Tangent Data

Length:	4.071	Course:	S 26° 33' 54.1842" W
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Circular Curve Data

Delta:	01° 15' 07.7981"	Type:	LEFT
Radius:	2.515		
Length:	0.055	Tangent:	0.027
Mid-Ord:	0.000	External:	0.000
Chord:	0.055	Course:	S 25° 56' 20.2829" W

Tangent Data

Length:	10.378	Course:	S 25° 18' 46.3817" W
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Circular Curve Data

Delta:	00° 06' 50.3733"	Type:	RIGHT
Radius:	8.514		



Length:	0.017	Tangent:	0.008
Mid-Ord:	0.000	External:	0.000
Chord:	0.017	Course:	S 25° 22' 11.5622" W

Tangent Data

Length:	8.601	Course:	S 25° 25' 36.7470" W
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Circular Curve Data

Delta:	00° 13' 38.9358"	Type:	RIGHT
Radius:	8.515		
Length:	0.034	Tangent:	0.017
Mid-Ord:	0.000	External:	0.000
Chord:	0.034	Course:	S 25° 32' 26.2169" W

Tangent Data

Length:	19.689	Course:	S 25° 39' 15.6845" W
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Circular Curve Data

Delta:	00° 54' 38.4981"	Type:	RIGHT
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Radius:	8.515		
Length:	0.135	Tangent:	0.068
Mid-Ord:	0.000	External:	0.000
Chord:	0.135	Course:	S 26° 06' 34.9343" W

Tangent Data

Length:	0.798	Course:	S 26° 33' 54.1842" W
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Circular Curve Data

Delta:	00° 17' 54.3094"	Type:	LEFT
Radius:	2.515		
Length:	0.013	Tangent:	0.007
Mid-Ord:	0.000	External:	0.000
Chord:	0.013	Course:	S 26° 24' 57.0427" W

Tangent Data

Length:	3.523	Course:	S 26° 15' 59.8981" W
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11. Alignment: Gota Cuenca 1

**12. Description:**Tangent Data

Length: 39.516 Course: N 11° 23' 34.6118" E

Circular Curve Data

Delta: 02° 59' 17.5640" Type: LEFT

Radius: 26.395

Length: 1.377 Tangent: 0.688

Mid-Ord: 0.009 External: 0.009

Chord: 1.376 Course: N 09° 53' 55.8298" E

Tangent Data

Length: 1.033 Course: N 08° 24' 17.0478" E

Tangent Data

Length: 2.780 Course: N 08° 24' 17.0478" E

Tangent Data

Length: 1.911 Course: N 01° 44' 08.5365" E

Tangent Data

Length: 4.146 Course: N 12° 15' 53.1854" W

Tangent Data

Length: 2.608 Course: N 12° 15' 53.1854" W

Tangent Data

Length: 5.507 Course: N 01° 44' 08.5365" E

Tangent Data

Length: 1.594 Course: N 04° 28' 04.3009" E

Tangent Data

Length: 1.927 Course: N 04° 28' 04.3009" E

Tangent Data

Length: 6.957 Course: N 17° 00' 07.2716" E

Tangent Data

Length: 5.007 Course: N 17° 00' 07.2716" E

Tangent Data

Length: 3.169 Course: N 08° 52' 19.6788" E

Tangent Data

Length: 3.944 Course: N 08° 52' 19.6788" E

Tangent Data

Length: 2.974 Course: N 20° 04' 01.5135" E

Tangent Data

Length: 6.006 Course: N 00° 50' 35.7130" E

Tangent Data

Length: 0.143 Course: N 00° 25' 19.6731" E

Tangent Data

Length: 0.042 Course: N 00° 25' 19.6729" E

Tangent Data

Length: 1.662 Course: N 41° 56' 54.2692" E

Tangent Data

Length: 6.939 Course: S 89° 34' 40.3270" E

Tangent Data

Length: 0.432 Course: N 23° 53' 42.5811" E

Tangent Data

Length: 0.365 Course: N 00° 47' 05.3685" E

Tangent Data

Length: 9.790 Course: N 15° 28' 56.0580" E

Tangent Data

Length: 5.406 Course: N 09° 38' 08.9914" E

Tangent Data



Length: 23.647 Course: N 09° 38' 08.9914" E

Tangent Data

Length: 5.490 Course: N 01° 53' 44.3701" E

Tangent Data

Length: 0.428 Course: N 01° 53' 44.3701" E

Tangent Data

Length: 12.541 Course: N 13° 00' 06.3310" E

Tangent Data

Length: 22.357 Course: N 09° 45' 18.2834" E

Tangent Data

Length: 0.980 Course: N 09° 45' 18.2833" E

13. Alignment: Gota Cuenca 2

14. Description:

Tangent Data

Length: 5.434 Course: N 35° 08' 11.8435" W

Tangent Data

Length: 3.736 Course: N 35° 08' 11.8435" W

Tangent Data

Length: 12.919 Course: N 44° 18' 27.1678" W

Tangent Data

Length: 2.214 Course: N 44° 18' 27.1678" W

Tangent Data

Length: 18.141 Course: N 03° 03' 07.8117" E

Tangent Data

Length: 0.548 Course: N 24° 12' 51.1271" E

Tangent Data



Length: 0.172 Course: N 64° 09' 20.2045" E

Tangent Data

Length: 0.640 Course: N 00° 26' 51.4110" E

Tangent Data

Length: 0.688 Course: N 14° 44' 36.8263" E

Tangent Data

Length: 0.778 Course: N 26° 43' 46.8976" E

Tangent Data

Length: 2.699 Course: N 56° 52' 09.5837" E

Tangent Data

Length: 0.889 Course: N 35° 23' 16.3868" E

Tangent Data

Length: 0.736 Course: N 31° 05' 50.3264" E

Tangent Data

Length: 1.891 Course: N 61° 24' 05.8793" E

Tangent Data

Length: 0.149 Course: N 19° 39' 13.7665" W

Tangent Data

Length: 1.622 Course: N 66° 45' 18.0582" E

Tangent Data

Length: 6.334 Course: N 03° 00' 59.2271" W

Tangent Data

Length: 7.912 Course: N 26° 06' 30.1709" W

Tangent Data

Length: 7.123 Course: N 26° 06' 30.1709" W

Tangent Data

Length: 2.080 Course: N 48° 51' 20.2812" W



15. Alignment: Gota Cuenca 3

16. Description:

Tangent Data

Length: 13.522 Course: N 55° 12' 56.6625" W

Circular Curve Data

Delta: 11° 22' 10.5906" Type: RIGHT

Radius: 12.290

Length: 2.439 Tangent: 1.223

Mid-Ord: 0.060 External: 0.061

Chord: 2.435 Course: N 49° 31' 51.3672" W

Tangent Data

Length: 1.835 Course: N 43° 50' 46.0718" W

Tangent Data

Length: 1.679 Course: N 43° 50' 46.0718" W

Tangent Data

Length: 7.828 Course: N 40° 04' 42.0157" W

Tangent Data

Length: 0.744 Course: N 41° 58' 19.4265" W

Tangent Data

Length: 0.190 Course: N 43° 31' 52.3178" W

Tangent Data

Length: 0.065 Course: N 43° 31' 52.3173" W

Tangent Data

Length: 11.084 Course: N 39° 12' 18.3941" W

Tangent Data

Length: 10.662 Course: N 39° 12' 18.3941" W

Tangent Data



Length: 2.589 Course: N 38° 57' 03.9863" W

Tangent Data

Length: 2.134 Course: N 38° 57' 03.9863" W

Tangent Data

Length: 13.825 Course: N 35° 07' 14.6751" W

Tangent Data

Length: 6.054 Course: N 35° 07' 14.6751" W

Tangent Data

Length: 22.525 Course: N 56° 34' 46.1166" W

Tangent Data

Length: 7.410 Course: N 45° 45' 44.6365" W

Tangent Data

Length: 11.259 Course: N 45° 30' 27.8426" W

Tangent Data

Length: 11.137 Course: N 51° 28' 01.4039" W

Tangent Data

Length: 15.425 Course: N 47° 47' 14.5171" W

Tangent Data

Length: 14.471 Course: N 43° 47' 57.8131" W

Tangent Data

Length: 7.923 Course: N 37° 12' 07.8349" W

Tangent Data

Length: 11.455 Course: N 38° 50' 51.2471" W

Tangent Data

Length: 14.520 Course: N 40° 09' 11.7911" W

Tangent Data

Length: 13.642 Course: N 33° 57' 37.6799" W



Tangent Data

Length: 13.653 Course: N 31° 35' 06.3156" W

Tangent Data

Length: 14.958 Course: N 31° 18' 24.2913" W

Tangent Data

Length: 15.684 Course: N 31° 51' 57.5197" W

Tangent Data

Length: 15.447 Course: N 04° 53' 20.9871" W

Tangent Data

Length: 2.995 Course: N 04° 53' 20.9871" W

Tangent Data

Length: 4.128 Course: N 00° 32' 25.8367" W

17. Alignment: Gota Cuenca 4**18. Description:**

Tangent Data

Length: 14.159 Course: N 48° 52' 45.6753" W

Tangent Data

Length: 7.120 Course: N 48° 52' 45.6753" W

Tangent Data

Length: 0.563 Course: N 60° 04' 06.5573" W

Tangent Data

Length: 5.519 Course: N 43° 07' 56.3562" W

Tangent Data

Length: 0.989 Course: N 30° 59' 26.7953" W

Tangent Data

Length: 0.409 Course: N 66° 44' 15.4149" W

Tangent Data

Length: 0.490 Course: S 66° 20' 00.6922" W

Tangent Data

Length: 0.530 Course: N 45° 45' 50.0345" W

Tangent Data

Length: 0.351 Course: N 04° 53' 56.7327" W

Tangent Data

Length: 2.405 Course: S 71° 27' 07.3508" W

Tangent Data

Length: 6.209 Course: N 32° 22' 25.8337" W

Tangent Data

Length: 2.600 Course: N 24° 08' 43.9510" W

Tangent Data

Length: 4.224 Course: N 09° 38' 26.3120" W

Tangent Data

Length: 1.896 Course: N 09° 38' 26.3120" W

Tangent Data

Length: 8.067 Course: N 10° 40' 21.0207" W

Tangent Data

Length: 1.967 Course: N 10° 40' 21.0207" W

Tangent Data

Length: 7.543 Course: N 16° 11' 58.8712" W

Tangent Data

Length: 5.423 Course: N 16° 11' 58.8712" W

Tangent Data

Length: 7.877 Course: N 23° 21' 11.1942" W

Tangent Data



Length: 9.963 Course: N 23° 21' 11.1942" W

Tangent Data

Length: 6.207 Course: N 35° 43' 27.8908" W

Tangent Data

Length: 24.066 Course: N 74° 38' 47.2879" W

Tangent Data

Length: 0.280 Course: N 74° 38' 47.2882" W

Tangent Data

Length: 1.000 Course: N 30° 38' 54.7332" W

Tangent Data

Length: 1.070 Course: N 03° 04' 18.9228" W

Tangent Data

Length: 4.115 Course: N 15° 10' 49.3623" W

Tangent Data

Length: 1.094 Course: N 49° 14' 03.9006" W

Tangent Data

Length: 1.644 Course: N 83° 23' 34.3201" W

19. Alignment: Intersección_-_NE_-_Cuadrante

20. Description:

Tangent Data

Length: 10.000 Course: N 57° 48' 40.9298" W

Tangent Data

Length: 14.958 Course: N 16° 13' 05.0893" W

Tangent Data

Length: 5.856 Course: N 25° 18' 46.3817" E

Circular Curve Data



Delta: 01° 15' 07.7949" Type: RIGHT

Radius: 2.515

Length: 0.055 Tangent: 0.027

Mid-Ord: 0.000 External: 0.000

Chord: 0.055 Course: N 25° 56' 20.2829" E

Tangent Data

Length: 4.023 Course: N 26° 33' 54.1842" E

21. Alignment: Intersección_-SE_-Cuadrante

22. Description:

Tangent Data

Length: 3.475 Course: N 26° 15' 59.8981" E

Circular Curve Data

Delta: 00° 17' 54.3423" Type: RIGHT

Radius: 2.515

Length: 0.013 Tangent: 0.007

Mid-Ord: 0.000 External: 0.000

Chord: 0.013 Course: N 26° 24' 57.0427" E

Tangent Data

Length: 0.798 Course: N 26° 33' 54.1842" E

Circular Curve Data

Delta: 00° 54' 38.4968" Type: LEFT

Radius: 8.515

Length: 0.135 Tangent: 0.068

Mid-Ord: 0.000 External: 0.000

Chord: 0.135 Course: N 26° 06' 34.9343" E

Tangent Data

Length: 5.611 Course: N 25° 39' 15.6845" E

Circular Curve Data

Delta: 96° 32' 03.3857" Type: RIGHT



Radius: 10.000

Length: 16.848

Mid-Ord: 3.343

Chord: 14.925

Tangent: 11.211

External: 5.023

Course: N 73° 55' 17.3774" E

Tangent Data

Length: 10.000

Course: S 57° 48' 40.9298" E

23. Alignment: ODT PK 0+200

24. Description:

Tangent Data

Length: 11.281

Course: N 10° 03' 27.5291" E

25. Alignment: ODT PK 0+380

26. Description:

Tangent Data

Length: 23.020

Course: N 00° 19' 46.4069" E

27. Alignment: ODT PK 1+460

28. Description:

Tangent Data

Length: 14.641

Course: S 04° 31' 43.3775" W

29. Alignment: ODT PK 1+780

30. Description:

Tangent Data

Length: 14.240

Course: N 12° 47' 02.6465" W



2.3. ELEVATION LAYOUT

The elevation layout will be defined by combining a straight line with a uniformly inclined gradient and parabolas as a vertical curve. This layout will be referenced to an axis determined by a point in each cross section, which will be the center of the roadway for single-carriageway, two-way traffic.

The standard establishes a series of parameters to be considered when defining the elevation layout, such as the gradient of the gradient, the value of which is limited based on the design speed for conventional roads, as shown in the following table.

Project Speed	Maximum Inclination (%)	Exceptional Maximum Inclination (%)
40 km/h	7	14

2.4. ELEVATION LAYOUT REPORT

Below are the values for each alignment of the elevation layout obtained in Civil 3D.

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	164.980	-13.690 %	0.000
2	0+01.058	164.835	7.177 %	0.000
3	0+74.965	170.139	0.275 %	0.000
4	2+15.922	170.527	8.945 %	129.813
5	3+51.752	182.677	8.452 %	78.978

6	5+27.884	197.564	5.595 %	150.000
7	6+93.736	206.844	7.436 %	150.000
8	10+37.084	232.376	3.638 %	150.000
9	11+76.813	237.459	10.668 %	122.985
10	13+01.503	250.762	0.659 %	124.906
11	14+69.672	251.870	7.266 %	150.000
12	16+46.228	264.699	7.956 %	150.000
13	18+23.296	278.786	4.541 %	150.000
14	19+05.713	282.529	2.134 %	14.094
15	20+00.858	284.560	11.754 %	150.000
16	21+04.046	296.689		

Horizontal Alignment Information

Name: ALINEACION-Derecha-3.000

Station Range: 0+00.000 to 0+24.625

**31. Vertical Alignment: ALINEACION - Derecha - -2.00%**

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	164.779	-13.690 %	0.000
2	0+00.025	164.775	7.177 %	0.000
3	0+24.625	166.541		

Horizontal Alignment Information

Name: ALINEACION-Izquierda-3.000

Station Range: 0+00.000 to 0+24.625

32. Vertical Alignment: ALINEACION - Izquierda - -2.00%

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	164.779	-13.690 %	0.000
2	0+00.025	164.775	7.177 %	0.000
3	0+24.625	166.541		

Horizontal Alignment Information

Name: CA-256-Derecha-3.000

Station Range: 0+00.000 to 0+47.344

33. Vertical Alignment: CA-256 - Derecha - -2.00%

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	166.223	-7.606 %	0.000
2	0+02.694	166.018	-2.231 %	0.000
3	0+03.454	166.001	-5.845 %	0.000
4	0+04.071	165.965	-3.626 %	0.000
5	0+04.257	165.958	-5.353 %	0.000
6	0+04.362	165.952	-12.341 %	0.000
7	0+10.516	165.193	2.423 %	0.000
8	0+10.537	165.193	-6.520 %	0.000
9	0+14.078	164.963	-3.219 %	0.000
10	0+14.434	164.951	-3.233 %	0.000



11	0+14.540	164.948	-9.634 %	0.000
12	0+14.620	164.940	-0.293 %	0.000
13	0+14.635	164.940	-0.634 %	0.000
14	0+14.640	164.940	-0.289 %	0.000
15	0+16.171	164.935	-0.198 %	0.000
16	0+18.442	164.931	-0.327 %	0.000
17	0+18.685	164.930	-0.267 %	0.000
18	0+19.432	164.928	-4.586 %	0.000
19	0+23.240	164.754	-10.116 %	0.000
20	0+23.250	164.753	-4.639 %	0.000
21	0+26.666	164.594	-4.250 %	0.000
22	0+37.796	164.121	4.270 %	0.000
23	0+39.415	164.190	1.989 %	0.000
24	0+42.240	164.246	-0.694 %	0.000

25	0+42.593	164.244	-1.677 %	0.000
26	0+42.939	164.238	-3.929 %	0.000
27	0+42.979	164.237	-1.905 %	0.000
28	0+43.777	164.221	-1.209 %	0.000
29	0+43.821	164.221	-1.830 %	0.000
30	0+44.864	164.202	-3.723 %	0.000
31	0+47.344	164.109		

Horizontal Alignment Information

Name: CA-256-Izquierda-3.000

Station Range: 0+00.000 to 0+47.312

34. Vertical Alignment: CA-256 - Izquierda - -2.00%

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	166.223	-7.606 %	0.000
2	0+02.694	166.018	-2.231 %	0.000



3	0+03.454	166.001	-5.843 %	0.000
4	0+04.071	165.965	-12.279 %	0.000
5	0+04.126	165.958	-5.365 %	0.000
6	0+04.231	165.952	-12.341 %	0.000
7	0+10.385	165.193	2.423 %	0.000
8	0+10.406	165.193	-6.520 %	0.000
9	0+13.947	164.963	-3.219 %	0.000
10	0+14.303	164.951	-3.233 %	0.000
11	0+14.408	164.948	-9.635 %	0.000
12	0+14.489	164.940	-0.289 %	0.000
13	0+14.503	164.940	-0.187 %	0.000
14	0+14.520	164.940	-0.289 %	0.000
15	0+16.051	164.935	-0.198 %	0.000
16	0+18.323	164.931	-0.327 %	0.000

17	0+18.566	164.930	-0.267 %	0.000
18	0+19.313	164.928	-4.586 %	0.000
19	0+23.121	164.754	-2.988 %	0.000
20	0+23.155	164.753	-4.639 %	0.000
21	0+26.571	164.594	-4.250 %	0.000
22	0+37.701	164.121	4.270 %	0.000
23	0+39.320	164.190	1.989 %	0.000
24	0+42.145	164.246	-0.694 %	0.000
25	0+42.497	164.244	-1.679 %	0.000
26	0+42.844	164.238	-1.160 %	0.000
27	0+42.979	164.237	-1.904 %	0.000
28	0+43.777	164.221	-4.095 %	0.000
29	0+43.790	164.221	-1.830 %	0.000
30	0+44.833	164.202	-3.723 %	0.000



31	0+47.312	164.109		
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9	0+34.892	166.219		
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Horizontal Alignment Information

Name: Intersección_-_NE_-_Cuadrante

Station Range: 0+00.000 to 0+34.892

35. Vertical Alignment: Intersección - NE - Cuadrante - Perfil

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	166.402	-7.177 %	0.000
2	0+10.000	165.684	-2.952 %	0.000
3	0+24.958	165.243	12.341 %	0.000
4	0+30.708	165.952	5.365 %	0.000
5	0+30.814	165.958	12.279 %	0.000
6	0+30.869	165.965	5.843 %	0.000
7	0+31.485	166.001	2.231 %	0.000
8	0+32.246	166.018	7.606 %	0.000

Horizontal Alignment Information

Name: Intersección_-_SE_-_Cuadrante

Station Range: 0+00.000 to 0+36.880

36. Vertical Alignment: Intersección - SE - Cuadrante - Perfil

PVI	Station	Elevation (m)	Grade Out (%)	Curve Length (m)
1	0+00.000	164.111	3.723 %	0.000
2	0+02.433	164.202	1.830 %	0.000
3	0+03.475	164.221	4.095 %	0.000
4	0+03.488	164.221	1.904 %	0.000
5	0+04.286	164.237	1.160 %	0.000
6	0+04.421	164.238	1.679 %	0.000
7	0+04.768	164.244	0.694 %	0.000
8	0+05.120	164.246	-1.989 %	0.000



9	0+07.946	164.190	-4.270 %	0.000
10	0+09.564	164.121	4.250 %	0.000
11	0+10.032	164.141	9.974 %	0.000
12	0+26.880	165.821	7.177 %	0.000
13	0+36.880	166.539		

3. REPLANNING /LAYOUT REPORT

P.K.	Girado.Derecha	Distancia	Coordenada.N	Coordenada.E
0+000.00	164.5516 (d)	25.634m	4,784,331.8774m	461,435.3617m
0+020.00	164.5516 (d)	5.634m	4,784,321.2232m	461,452.2877m
0+040.00	344.5516 (d)	14.366m	4,784,310.5691m	461,469.2137m
0+060.00	344.5516 (d)	34.366m	4,784,299.9149m	461,486.1397m
0+080.00	344.5516 (d)	54.366m	4,784,289.2607m	461,503.0656m
0+100.00	344.5516 (d)	74.366m	4,784,278.6066m	461,519.9916m
0+120.00	344.5251 (d)	94.366m	4,784,267.9893m	461,536.9407m
0+140.00	344.0729 (d)	114.344m	4,784,258.1207m	461,554.3301m
0+160.00	342.8044 (d)	134.140m	4,784,250.2589m	461,572.7041m
0+180.00	340.9460 (d)	153.581m	4,784,244.7437m	461,591.9190m
0+200.00	339.0744 (d)	172.859m	4,784,240.5221m	461,611.4676m
0+220.00	337.5299 (d)	192.246m	4,784,236.4680m	461,631.0524m
0+240.00	336.2690 (d)	211.747m	4,784,232.4139m	461,650.6372m
0+260.00	336.2257 (d)	231.472m	4,784,224.5804m	461,668.7408m
0+280.00	338.9338 (d)	247.517m	4,784,207.5066m	461,678.4304m



0+300.00	343.1462 (d)	254.254m	4,784,188.0968m	461,675.4875m
0+320.00	347.5102 (d)	249.829m	4,784,174.4008m	461,661.3342m
0+340.00	351.3156 (d)	238.249m	4,784,168.4399m	461,642.3336m
0+360.00	355.0002 (d)	224.892m	4,784,165.8902m	461,622.4988m
0+380.00	359.0986 (d)	212.415m	4,784,163.5416m	461,602.6372m
0+400.00	3.5451 (d)	200.443m	4,784,162.0482m	461,582.7027m
0+420.00	7.8858 (d)	186.915m	4,784,164.1387m	461,562.8637m
0+440.00	11.8621 (d)	171.266m	4,784,170.6553m	461,543.9819m
0+460.00	16.0810 (d)	155.271m	4,784,179.0020m	461,525.8077m
0+480.00	21.1949 (d)	140.215m	4,784,187.4678m	461,507.6878m
0+500.00	27.4743 (d)	126.537m	4,784,195.9336m	461,489.5680m
0+520.00	35.1563 (d)	114.729m	4,784,204.3994m	461,471.4481m
0+540.00	44.3891 (d)	105.423m	4,784,212.8652m	461,453.3282m
0+560.00	55.1330 (d)	99.924m	4,784,220.7698m	461,434.9685m
0+580.00	66.1417 (d)	103.530m	4,784,223.4807m	461,415.3116m
0+600.00	72.2649 (d)	119.099m	4,784,214.9779m	461,397.6828m
0+620.00	71.1789 (d)	138.504m	4,784,196.8682m	461,390.2968m

0+640.00	66.3966 (d)	154.186m	4,784,177.4032m	461,394.2597m
0+660.00	61.4135 (d)	168.455m	4,784,158.9931m	461,402.0713m
0+680.00	57.2031 (d)	183.718m	4,784,140.6322m	461,410.0009m
0+700.00	53.5231 (d)	199.488m	4,784,122.5063m	461,418.4443m
0+720.00	49.9044 (d)	214.604m	4,784,105.4748m	461,428.8901m
0+740.00	46.1702 (d)	228.430m	4,784,090.2964m	461,441.8875m
0+760.00	42.5427 (d)	241.793m	4,784,076.4299m	461,456.2970m
0+780.00	39.2521 (d)	255.795m	4,784,062.8036m	461,470.9369m
0+800.00	36.3116 (d)	270.552m	4,784,049.1774m	461,485.5768m
0+820.00	33.6805 (d)	285.943m	4,784,035.5558m	461,500.2209m
0+840.00	30.8200 (d)	299.310m	4,784,024.9658m	461,516.9480m
0+860.00	27.2194 (d)	298.205m	4,784,030.3728m	461,534.9581m
0+880.00	25.5143 (d)	280.774m	4,784,049.5005m	461,538.4361m
0+900.00	25.3830 (d)	260.795m	4,784,068.7955m	461,533.2175m
0+920.00	24.1271 (d)	241.966m	4,784,088.4088m	461,532.7735m
0+940.00	19.7756 (d)	235.722m	4,784,100.5813m	461,547.5944m
0+960.00	15.6650 (d)	245.547m	4,784,098.8537m	461,567.3764m



0+980.00	12.1920 (d)	258.465m	4,784,094.7711m	461,586.9553m
1+000.00	9.0599 (d)	272.241m	4,784,090.6885m	461,606.5341m
1+020.00	6.2481 (d)	286.801m	4,784,086.5336m	461,626.0973m
1+040.00	4.2251 (d)	303.757m	4,784,079.3087m	461,644.6425m
1+060.00	4.1430 (d)	323.412m	4,784,064.1365m	461,657.1444m
1+080.00	5.5120 (d)	341.736m	4,784,044.7650m	461,662.0067m
1+100.00	6.8564 (d)	359.964m	4,784,025.1932m	461,666.1211m
1+120.00	7.8636 (d)	378.867m	4,784,005.9857m	461,671.6446m
1+140.00	8.2893 (d)	398.624m	4,783,988.0348m	461,680.3874m
1+160.00	8.1317 (d)	418.560m	4,783,972.1678m	461,692.5100m
1+180.00	7.5862 (d)	438.131m	4,783,958.3500m	461,706.9566m
1+200.00	6.9641 (d)	457.531m	4,783,945.2704m	461,722.0867m
1+220.00	6.2197 (d)	476.522m	4,783,933.4089m	461,738.1106m
1+240.00	4.4052 (d)	488.058m	4,783,933.4052m	461,757.2505m
1+260.00	2.3927 (d)	479.292m	4,783,950.9027m	461,764.9479m
1+280.00	1.0301 (d)	462.735m	4,783,970.7613m	461,762.6605m
1+300.00	359.6062 (d)	446.227m	4,783,990.5826m	461,759.9934m

1+320.00	358.0461 (d)	430.179m	4,784,010.4349m	461,757.5894m
1+340.00	356.0517 (d)	416.752m	4,784,030.3543m	461,758.4103m
1+360.00	353.4579 (d)	410.081m	4,784,048.6721m	461,766.1014m
1+380.00	350.7039 (d)	412.150m	4,784,062.5489m	461,780.3186m
1+400.00	348.3735 (d)	422.489m	4,784,069.8259m	461,798.8105m
1+420.00	346.7032 (d)	438.023m	4,784,071.1309m	461,818.7318m
1+440.00	345.3544 (d)	455.038m	4,784,070.4475m	461,838.7199m
1+460.00	344.1085 (d)	472.312m	4,784,069.7155m	461,858.7065m
1+480.00	342.9511 (d)	489.794m	4,784,068.9834m	461,878.6931m
1+500.00	341.8739 (d)	507.462m	4,784,068.2513m	461,898.6797m
1+520.00	340.8621 (d)	525.262m	4,784,067.5958m	461,918.6686m
1+540.00	339.7362 (d)	542.256m	4,784,068.9009m	461,938.5956m
1+560.00	338.2673 (d)	556.378m	4,784,075.1569m	461,957.5316m
1+580.00	336.7003 (d)	569.151m	4,784,083.6704m	461,975.6290m
1+600.00	335.2008 (d)	582.305m	4,784,092.2155m	461,993.7116m
1+620.00	333.7685 (d)	595.839m	4,784,100.7605m	462,011.7942m
1+640.00	332.4006 (d)	609.730m	4,784,109.3056m	462,029.8769m



1+660.00	331.1503 (d)	624.491m	4,784,117.1006m	462,048.2744m
1+680.00	330.5041 (d)	642.886m	4,784,118.0531m	462,067.9852m
1+700.00	331.0392 (d)	661.459m	4,784,106.4094m	462,083.6844m
1+720.00	332.4887 (d)	671.350m	4,784,087.2224m	462,087.4124m
1+740.00	334.1489 (d)	668.246m	4,784,070.2090m	462,077.5733m
1+760.00	335.5993 (d)	657.447m	4,784,058.8424m	462,061.1742m
1+780.00	337.0233 (d)	645.709m	4,784,048.8074m	462,043.8739m
1+800.00	338.4991 (d)	634.384m	4,784,038.7725m	462,026.5736m
1+820.00	340.0317 (d)	623.569m	4,784,028.6625m	462,009.3173m
1+840.00	341.6214 (d)	613.292m	4,784,018.4755m	461,992.1061m
1+860.00	343.2640 (d)	603.504m	4,784,008.2884m	461,974.8950m
1+880.00	344.9593 (d)	594.227m	4,783,998.1013m	461,957.6839m
1+900.00	346.7106 (d)	585.572m	4,783,987.8347m	461,940.5206m
1+920.00	348.5717 (d)	579.145m	4,783,976.1042m	461,924.3496m
1+940.00	350.5423 (d)	577.768m	4,783,961.0894m	461,911.2269m
1+960.00	352.4596 (d)	582.340m	4,783,943.1488m	461,902.5221m
1+980.00	354.1385 (d)	592.412m	4,783,923.5486m	461,898.8526m

2+000.00	355.4479 (d)	606.917m	4,783,903.6478m	461,900.3125m
2+020.00	356.4621 (d)	623.684m	4,783,884.1983m	461,904.9454m
2+040.00	357.3770 (d)	640.950m	4,783,864.8913m	461,910.1644m
2+060.00	358.2436 (d)	658.370m	4,783,845.5842m	461,915.3834m
2+080.00	359.0653 (d)	675.933m	4,783,826.2772m	461,920.6024m
2+100.00	359.8453 (d)	693.628m	4,783,806.9702m	461,925.8214m
2+104.05	359.9982 (d)	697.223m	4,783,803.0646m	461,926.8772m



DOCUMENT N.º2 – STRUCTURAL DESIGN



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1. INTRODUCTION

This annex will be used to determine the dimensions of the pavements and grades that will make up the projected roadway, a necessary objective for improving the layout of the CA-661. The following current regulations have been used to define the corresponding standard sections:

- Order FOM /3460/2003 - Approval of Standard 6.1 IC, Pavement Sections.
- Circular Order OC1/2023 - Update of layer thicknesses and types of hot and semi-hot bituminous mixes in Standard 6.1 IC "Pavement Sections".

2. SIZING FACTORS

2.1.1. HEAVY TRAFFIC CATEGORY

The first factor to consider when sizing the road will be the heavy traffic category, already calculated in the traffic annex. In this annex, we found that the projected road fell into category **T42**.

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

Figure 1: Heavy Traffic Categories 6.1 IC.

2.1.2. ESPLANADE CATEGORY

With the heavy traffic category obtained, we must identify the category of the esplanade to be defined. This esplanade can be in one of three categories: E1, E2, or E3. The three categories are defined by the compressibility modulus in the second loading cycle (E_{v2}) according to NLT-357 "Slab Load Test."

CATEGORÍA DE EXPLANADA	E1	E2	E3
E_{v2} (MPa)	≥ 60	≥ 120	≥ 300

Figure 2: Compressibility modulus in the second loading cycle(6.1 IC).

Due to the materials found in the soil beneath the project area, and assuming, based on the heavy traffic category, that the volume of vehicles passing through the project road will be low, we will consider the esplanade category to be **E2**. Therefore, the esplanade corresponds to an $E_{v2} \geq 120$ (MPa).

2.1.3. SOIL CATEGORY

We must also identify the soil category, which is necessary to determine the type of esplanade to be installed. According to the geological and geotechnical study carried out, the soil used will be **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.

Figure 3: Materials for the formation of esplanades(6.1 IC).

3. SIZING

3.1.1. ESPLANADE SIZING

Based on the established sizing factors, we have obtained both the esplanade category and the soil type. With this information, we will use the esplanade formation table from Standard 6.1 IC to establish the esplanade design.

With the esplanade category E2 and tolerable soil (0), we will choose, from among the four possible options, the one consisting of a 75-centimeter layer of selected soil.



		TIPOS DE SUELOS DE LA EXPLANACIÓN (DESMONTES) O DE LA OBRA DE TIERRA SUBYACENTE (TERRAPLENES, PEDRAPLENES O RELLENOS TODO-UNO)				
		SUELOS INADECUADOS Y MARGINALES (IN)	SUELOS TOLERABLES (0)	SUELOS ADECUADOS (1)	SUELOS SELECCIONADOS (2) y (3)	ROCA (R)
CATEGORÍA DE EXPLANADA	E1 $E_{vd} \geq 60 \text{ MPa}$					
	E2 $E_{vd} \geq 120 \text{ MPa}$					
	E3 $E_{vd} \geq 300 \text{ MPa}$					

IN Suelo inadecuado o marginal (Art. 330 del PG-3) 0 Suelo tolerable (Art. 330 del PG-3) 1 Suelo adecuado (Art. 330 del PG-3) 2 Suelo seleccionado (Art. 330 del PG-3) 3 Suelo seleccionado (Art. 330 del PG-3)

S-EST 1 Suelo estabilizado in situ (Art. 512 del PG-3) S-EST 2 Suelo estabilizado in situ (Art. 512 del PG-3) S-EST 3 Suelo estabilizado in situ (Art. 512 del PG-3) HM-20 Hormigón (Art. 610 del PG-3)

tipo de material
espesor mínimo en cm
suelo de explanación o de la obra de tierra subyacente

Figure 4: Table Formation of the Esplanade(Norma 6.1 IC).

3.1.2. ROAD SURFACE SIZING

Given the heavy traffic category (T42) and the esplanade category (E2), we will now define the materials and thicknesses of the layers that will make up the road surface of the project. To do so, we will use the table in Standard 6.1 IC on pavement sections for heavy traffic categories based on the esplanade category.

		CATEGORÍA DE TRÁFICO PESADO											
		T31			T32			T41			T42		
CATEGORÍA DE EXPLANADA	E1												
	E2												
	E3												

MB Mezclas bituminosas HF Hormigón de firme SC Suelocemento ZA Zahrora artificial

Espesores mínimos en cm

Figure 5: Road sections (Standard 6.1 IC).

The combination selected to form the road surface will be solution 4221, composed of 5 centimeters of bituminous mix and 25 centimeters of artificial gravel.

3.1.3. BITUMINOUS LAYER SIZING

When sizing the bituminous layer, we will consider the heavy traffic category. This bituminous layer, as previously defined, will have a thickness of 5 centimeters; however, we will now determine the sublayers, and the bituminous mixtures present in each layer. To do this, we use the table of hot-mix bituminous layer thicknesses in Standard 6.1 IC. It is also advisable to consult Circular Order OC1/2023, which updates certain nomenclatures to be considered.

The bituminous layer on the project road will consist of a 5-centimeter-thick wearing course of hot-mix bituminous mixture (D and S): AC 16 surf 50/70 S ophite, with B 50/70 bitumen.



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 ^{l***}		
Base	S y G	7-15		
	MAM	7-13		

Figure 6: Thicknesses of hot mix bituminous layers (Standard 6.1 IC).

4. CONCLUSIONS

Finally, the complete solution of the layers that will make up the road surface are the following:

LAYER	THICKNESS
Road Surface Layer	Bituminous mixture (D and S): AC 16 surf 50/70 S Ophite, with B 50/70 bitumen 5 centimeters
	Primer Irrigation - Bituminous Emulsion C60BF4 IMP -
	Artificial gravel 25 centimeters
Esplanade Layer	Esplanade- Selected Soil 75 centimeters



DOCUMENT Nº3 – DRAINAGE

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1. INTRODUCTION

This annex determines the flow rates and dimensions of the longitudinal and transverse drainage elements of the platform, considering what is described in Service Note 8/2014 Recommendations for the Drafting of Road Layout Projects.

To carry out the flow calculations, Standard 5.2-IC “Surface Drainage” approved by Order FOM/298/2016, of February 15, and Standard 5.1. - I.C: “Drainage” of the M.O.P.U., which in practice is replaced by Circular Order 17/2003, of December 23, on Recommendations for the design and construction of underground drainage in road works, are taken as reference, so this one is also of great relevance.

2. FLOW CALCULATIONS

Standard 5.2-IC proposes a rational method for calculating the maximum annual flow, Q_T , corresponding to a given return period, T , for basins with an area less than 50 km^2 . The method uses the following general calculation formula:

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

Where:

- $Q_T (\text{m}^3/\text{s})$: Maximum annual flow corresponding to the return period T , at the drainage point of the basin.
- $I(T, tc)$ (mm/h): Precipitation intensity corresponding to the return period considered T , for a duration of the downpour equal to the concentration time tc , of the basin.
- C (dimensionless): Average runoff coefficient.
- $A (\text{km}^2)$: Area of the basin or surface considered
- Kt (dimensionless): Coefficient of uniformity in the temporal distribution of precipitation.

2.1 PRECIPITATION INTENSITY

The precipitation intensity (I) as a function of the return period and the concentration time is found with the following formula

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

Where:

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

2.1.1 RETURN PERIOD

The return period to be included in the flow calculation is 100 years for transverse drainage works and 25 years for platform and bank drainage (longitudinal drainage), as dictated by regulations

2.1.2 CORRECTED DAILY AVERAGE INTENSITY

The corrected daily average intensity corresponding to the period T I_d is obtained from the following formula:

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

Where:

- P_d Maximum daily precipitation corresponding to period T .
- K_A Precipitation reduction factor by basin area.

2.1.3 MAXIMUM DAILY PRECIPITATION

The maximum daily rainfall is obtained from the document “Maximum daily rainfall in mainland Spain”, which defines:

$$Pd = \bar{P} * K_T$$

Where:

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

The average value of the maximum annual precipitation is obtained from “Sheet 3-1. Bilbao” of the isoline map of the maximum rainfall document.

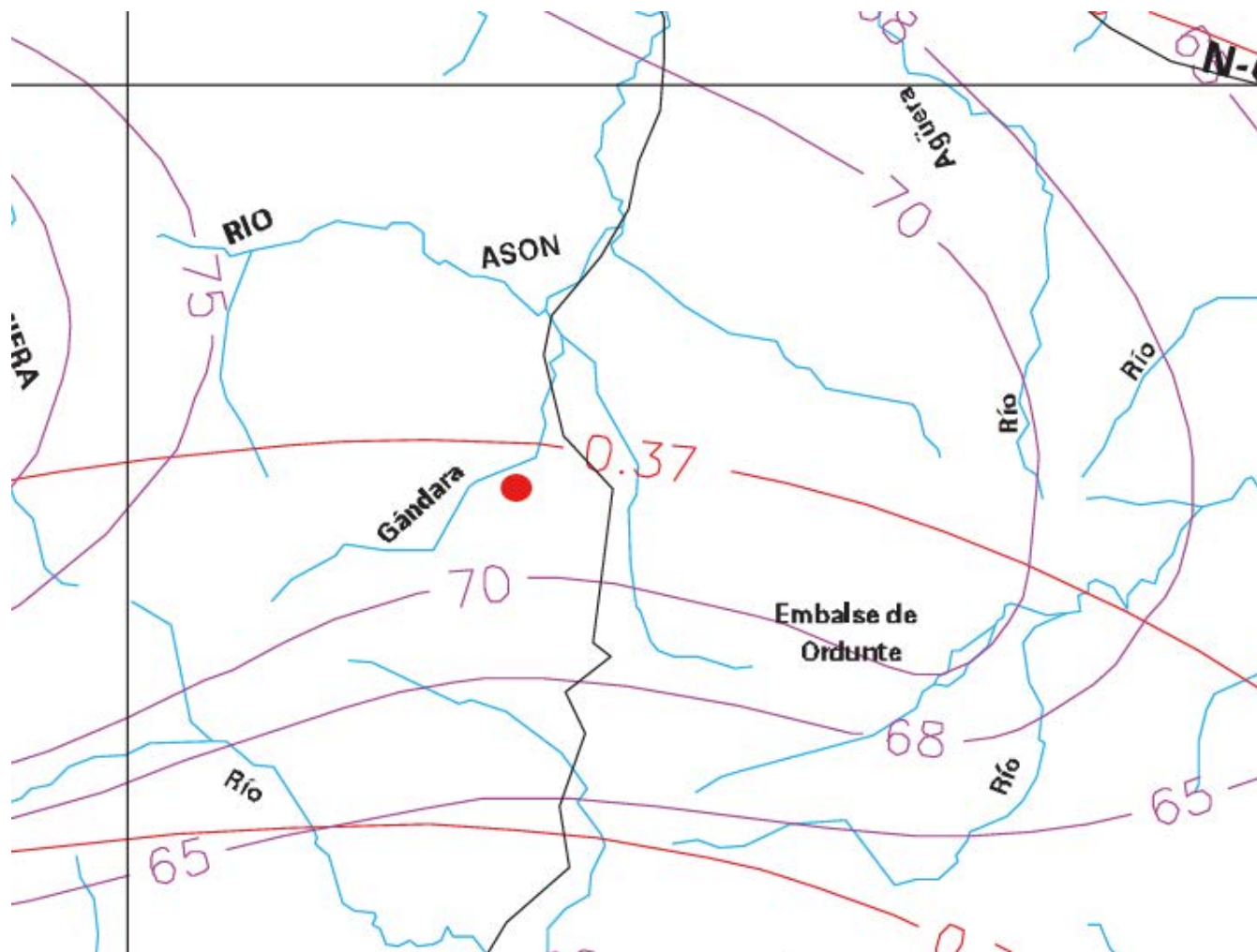


Figure 1: Maximum daily precipitation Map. Page 3-1. Bilbao.

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

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

C_V	PERIODO DE RETORNO EN AÑOS (T)							
	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

Table 1: C_V values en according to the return period.

2.1.4 PRECIPITATION REDUCTION FACTOR BY BASIN AREA

The precipitation reduction factor per basin area is calculated by:

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

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

2.1.5 INTENSITY FACTOR

The intensity factor is obtained by the following formula:

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

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.

Since data from a nearby rain gauge is not available, it will be taken directly:



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

Where:

- $\frac{I_1}{I_d}$ Torrentiality index expresses the relationship between hourly precipitation intensity and corrected daily average.
- t duration of the downpour.

The torrentiality index is obtained from the following map:

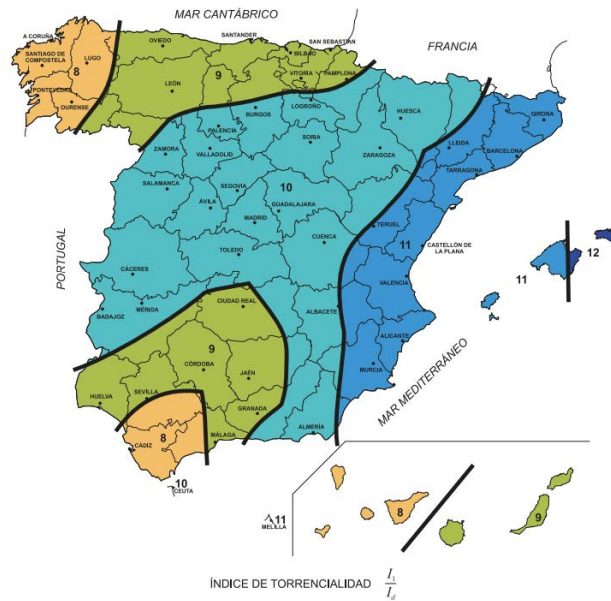


Figure 2: Torrentiality Index Map.

In this case, it is determined that $\frac{I_1}{I_d}$ is 9 for all basins.

2.1.6 CONCENTRATION TIME

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

The time of concentration (t_c) is the time that elapses between the start of the downpour and the moment when the entire surface of the basin is contributing runoff to the drainage point. Its calculation differs in primary and secondary basins. In the first case, 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 main basins where the diffuse flow travel time over the ground is significant relative to the total travel time, the above formula will not apply; instead, the following guidelines for secondary basins should be applied. This circumstance is considered to occur when the time of concentration calculated using the above formula is less than zero point twenty-five 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} Channel length in diffuse flow.
- J_{dif} Average slope of the channel.
- n_{dif} Diffuse flow coefficient, which is determined by the following table:

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

Table 2: Diffuse Flow coefficient Table.

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: Determination of t_c under diffuse flow conditions.



With the values from the tables, we obtain:

- n_{dif} : 0,320.

2.2 RUNOFF COEFFICIENT

The runoff coefficient will be defined by:

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

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

2.2.1 RUNOFF THRESHOLD

Intensity factor is obtained from the following formula:

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

Where:

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

The initial runoff threshold value is obtained from "Table 2.3" of IC 5.2.

This value depends on the soil's hydrological group, which varies from A to D, from more to less favorable drainage. In the project area, according to the following map, the soil is considered group C.

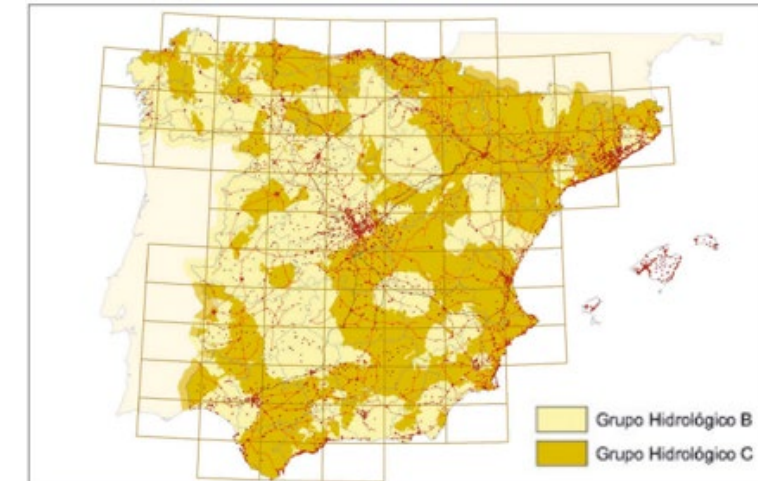


Figure 3: Map of soil hydrological groups. IC Standard 5.2 "Surface Drainage".

The P_0^i values according to land use provided by the regulations are the following:

CÓDIGO	USO DE SUELO	PENDIENTE	P_0^i
11100	Tejido urbano continuo		1
11200	Tejido urbano discontinuo		8
23100	Prados y praderas	≥ 3	18
23100	Prados y praderas	< 3	22
23100	Prados arbolados	≥ 3	18
23100	Prados arbolados	< 3	22

Table 4: Initial value of the runoff threshold.

Therefore, the initial value of the runoff coefficient that we will use will be 18.

2.2.2 RUNOFF THRESHOLD CORRECTION COEFFICIENT

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

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

For cross drainage, the formula is:

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

Where:

- β^{PM} Runoff threshold correction coefficient for platform and bank drainage.



- β^{DT} Runoff threshold correction coefficient for cross-drainage of the road.
- β_m Average value of the runoff threshold correction coefficient in the region.
- F_T Factor function of the return period.
- Δ_{50} Deviation from the mean value with a 50% confidence interval.

The value of these elements is obtained from the Standard and depends on each region into which the Spanish territory is divided for the purposes of calculating the coefficient β .



Figure 4: Regions considered for the characterization of the runoff threshold correction coefficient.

As can be seen, the road is in region 13. Based on this region, the coefficients described in the following table of 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
22	1,50	0,15	0,20	0,35	0,74	0,90	1,12	1,27	1,37

Table 5: Value of the runoff threshold correction coefficient.

2.3 UNIFORMITY COEFFICIENT

Is obtained with the following formula:

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

Where:

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



3. TRANSVERSAL DRAINAGE

3.1. FLOW CALCULATIONS

Below is the calculation of the flow rates of the main basins, carried out as detailed in this annex:

DATOS DE PARTIDA					INTENSIDAD DE PRECIPITACIÓN															COEFICIENTE DE ESCORRENTÍA							C. UNIF	CAUDAL	
					MÁXIMAS LLUVIAS			si A<1 km2				RÉGIMEN DIFUSO para tc<=0,25 h																	
Índice de cuenca	Área	Longitud cauce principal	Diferencia de cota del cauce principal	Pendiente media	Coeficiente de variación	Valor medio de la máxima precipitación anual	Factor de amplificación	Precipitación diaria para T	Factor reductor de la precipitación por área de cuenca	Intensidad media diaria de precipitación	Tiempo de concentración	Coeficiente flujo difuso	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	Valor medio de la región del coeficiente corrector del u. e.	Desviación respecto al valor medio	Factor función del periodo de retorno	Coeficiente corrector del umbral de escorrentía para drenaje transversal	Umbral de escorrentía	Coeficiente de escorrentía	Coeficiente de uniformidad	Caudal máximo anual para T en el punto de desagüe de la cuenca	
C	A	Lc	Dif. Cota	Jc	Cv	P	Kt	Pd	Ka	Id	tc	ndif	tdif	tc	t	l1/lđ	Fa	Fint	l(T,tc)	P0i	βm	Δ50	Ft	βdt	P0	C	Kt	Q	
Uđ	Km2	Km	m	m/m	-	mm	-	mm	-	mm/h	horas	-	min	min	horas	horas	-	-	-	mm/h	mm	-	-	-	-	mm	-	-	m3/s
1	0,020	0,18068	57,670	0,3192	0,37	70	2,281	159,7	1	6,653	0,102	0,32	14,829	14,829	0,247	0,247	9	18,578	18,578	123,601	18	0,6	0,2	1,34	0,603	10,854	0,782	1,004	0,547
2	0,005	0,07671	21,272	0,2773	0,37	70	2,281	159,7	1,0000	6,653	0,054	0,32	10,767	10,767	0,179	0,179	9	21,633	21,633	143,923	18	0,6	0,2	1,34	0,603	10,854	0,782	1,002	0,151
3	0,042	0,27128	78,497	0,2894	0,37	70	2,281	159,7	1	6,653	0,141	0,32	17,866	17,866	0,298	0,298	9	16,965	16,965	112,865	18	0,6	0,2	1,34	0,603	10,854	0,782	1,006	1,041
4	0,072	0,12778	40,434	0,3164	0,37	70	2,281	159,7	1	6,653	0,078	0,32	12,898	12,898	0,215	0,215	9	19,865	19,865	132,159	18	0,6	0,2	1,34	0,603	10,854	0,782	1,003	2,079



3.2 TRANSVERSAL DRAINAGE WORKS

A cross-drainage system is being designed, with a 100-year lifespan, to maintain natural water drainage and allow the passage of water from the basins or from the platform and banks.

In the case of the four main basins, the ODTs will be complemented with bridge sections to allow water to pass through them. The design of these structures is not the subject of this project. Drainage of the main basins, however, will be provided using precast concrete pipes.

The pipe used to drain the basins must have a minimum diameter of 1.5 meters, complying with the recommendation of Standard 5.1-IC "Surface Drainage" regarding the minimum diameter of an ODT based on its length. However, to facilitate construction work, smaller diameter pipes will be constructed, which will be sufficient for the drainage of water flows.

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 6. Minimum recommended size of an ODT. IC Standard 5.2 "Surface Drainage".

The calculation of the flow rate and admissible velocity of each pipe is carried out using the Manning method, with the following equations:

$$\text{Flow rate} \rightarrow Q_{CH} = \frac{R_H^{\frac{2}{3}} * J^{\frac{1}{2}} * S_H}{n} \geq Q_p$$

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

Where:

- Q_{CH} Flow rate allowed by the ODT.
- Q_P Design Flow rate.

- R_H Hydraulic radius.
- J ODT slope.
- Q_{CH} Flow rate allowed by the ODT.
- S_H Wet section of the ODT.
- n Manning coefficient.
- V_P Circulation speed through the ODT.
- V_{MAX} Maximum speed allowed by the ODT.

Both the Manning roughness coefficient and the maximum 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 enchados	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 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 7: Maximum wáter speed.

For concrete pipes, the roughness coefficient used will be 0.015, and the maximum velocity must be less than 6 meters per second. The allowable flow must be less than the previously calculated project flow, originating from the main basins and any secondary basins created during the construction of the project.



The following table shows the verification of the capacity of each pipe according to the Manning method, considering the flow of the main channels and those produced by the cuttings and the platform.

DATOS DE PARTIDA					DIMENSIONES ODT					RESULTADOS			
Caño	Cuencas de aportación	Punto kilométrico ODT	Caudal de diseño	Coefficiente de Manning	Longitud ODT	Diámetro ODT	Pendiente ODT	Sección mojada ODT	Radio hidráulico	Caudal admisible por la ODT	Velocidad de circulación por la ODT	Comprobación para el caudal de diseño	Comprobación para la velocidad
		P.K.	Q	n	L	D	J	Sh	Rh	Qch	Vp		
			m3/s	s/m3^-1	m	m	%	m2	m	m3/s	m/s		
ODT PK 0+200	C1	0+200	0,547	0,015	11,3	1,5	2,50	1,77	0,38	9,687	0,310	CUMPLE	CUMPLE
ODT PK 0+380	C1	0+380	0,547	0,015	12,7	1,5	2,50	1,77	0,38	9,687	0,310	CUMPLE	CUMPLE
ODT PK 1+460	C3	1+460	1,041	0,015	14,6	1,5	2,50	1,77	0,38	9,687	0,589	CUMPLE	CUMPLE
ODT PK 1+780	C4	1+780	2,079	0,015	14,4	1,5	2,50	1,77	0,38	9,687	1,176	CUMPLE	CUMPLE



4. LONGITUDINAL DRAINAGE

Longitudinal drainage (platform and margins) is solved by using ditches, manholes, collectors, drainpipes and downpipes.

4.1. FLOW CALCULATIONS

The calculation of the flows contributed by the platform and its margins is shown below.

DATOS DE PARTIDA					INTENSIDAD DE PRECIPITACIÓN											COEFICIENTE DE ESCORRENTÍA								C. UNIF	CAUDAL	
					MÁXIMAS LLUVIAS				si A<1 km2		RÉGIMEN DIFUSO para tc<=0,25 h															
Obra de drenaje transversal	Índice de cuenca	Área	Longitud cauce principal	Pendiente media	Coefficiente de variación	Valor medio de la máxima precipitación anual	Factor de amplificación	Precipitación diaria para T	Factor reductor de la precipitación por área de cuenca	Intensidad media diaria de precipitación	Coefficiente flujo difuso	Tiempo de recorrido en flujo difuso sobre el terreno	Tiempo de concentración en flujo difuso	Factor de intensidad	Intensidad de precipitación para T y tc	Valor inicial del umbral de escorrentía	Valor del coeficiente corrector	Desviación respecto al valor medio	Factor función del periodo de retorno	Coefficiente corrector para drenaje transversal	Umbral de escorrentía	Coefficiente de escorrentía	Coefficiente de uniformidad	Caudal máximo anual para T en el punto de desagüe de la cuenca	Caudal total a desaguar por cada ODT	
ODT	C	A	Lc	Jc	Cv	P	Kt	Pd	Ka	Id	ndif	tdif	tc	Fint	I(T,tc)	P0i	βm	Δ50	Ft	βdt	P0	C	Kt	Q	Q	
	Ud	Km2	Km	m/m	-	mm	-	mm	-	mm/h	-	min	min	horas	-	mm/h	mm	-	-	-	-	mm	-	-	m3/s	m3/s
	Mayor Desmonte	0,0004541	0,00521	0,49	0,38	70	1,793	159,67	1	6,65	0,12	2,348	5,000	0,083	30,560	203,314	8	0,6	0,15	1,15	0,5175	4,14	0,941	1	0,024	0,054
	Plataforma	0,0005247		0,02	0,38	70	1,793	159,67	1	6,65	0,015	0,000	5,000	0,083	30,560	203,314	1	0,6	0,15	1,15	0,5175	0,5175	0,999	1	0,030	



4.2. CUTTING FOOT DITCHES

Model VA-75 ditches (asymmetrical triangular concrete lined) will be built, with a depth of 15 centimeters, a width of 75 centimeters, and slopes of 1:4 and 1:1, with the typical section shown below:

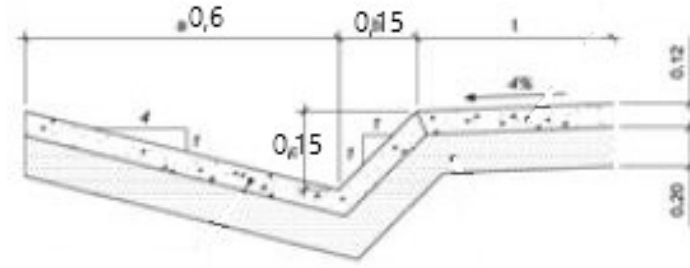


Figure 5: VA-75 ditch section. Measures in meters.

In general, ditches will be constructed in 60-meter segments to ensure that the design flow volume is always less than the ditch capacity, while maintaining a safety margin.

In cases where the ditch is insufficient, collectors will be installed.

If there is a downpipe from a catchment area to a manhole, the length of the ditch segments can be reduced to ensure that the manholes are aligned with the main channels of the water collection areas.

The design flow for a given distance between manholes based on the total section considered is calculated using the following formula:

$$Q_d = Q_t * \frac{D}{L_t}$$

Where:

- Q_d Design Flow.
- Q_t Total flow of the entire section.
- D Distance between manholes.
- L_t Length of complete section.

Below is a table with the calculation for the sizing of the gutters:

Cuneta	Cuencas de aportación	CAUDAL DE DISEÑO				CAPACIDAD HIDRÁULICA DE LA CUNETA						RESULTADO
		Distancia entre arquetas	Longitud total del tramo	Caudal total del tramo	Caudal de diseño	Área	Radio hidráulico	Pendiente cuneta	Coefficiente de Manning	Capacidad	Velocidad	
		D	Lt	Qt	Qd	A	Rh	J	n	Q	Vp	
		m	m	m3/s	m3/s	m2	m	%	s/m3^-1	m3/s	m/s	
1.1	PC1+D1+PR1	50	175	0,054	0,015	0,0563	0,068	0,67	0,015	0,051	0,907	CUMPLE

it is observed that the design flow rate is lower than the hydraulic capacity of both ditches, and that the velocity at full section is less than 6 meters per second

4.3. DOWNSPOUTS

Precast concrete downpipes will be installed to channel the water discharged by the ODTs down the embankment slopes to the natural ground. Due to the steep slopes at the water outlet after the cross drainage works, downpipes will be installed to prevent soil erosion.

4.4. MANHOLES

The manholes will be placed at the junction points between gutters, collectors, and downpipes when necessary. In addition to serving as a link between different drainage elements, the manholes facilitate maintenance operations on underground elements.

Generally, the manholes will be placed every 50 meters, although the distance may vary for various reasons.

4.5. COLLECTORS

Collectors will be installed under the ditches between downstream manholes, always projecting the first manhole not at the beginning of the section, but 50 meters downstream if possible. They are installed to collect water coming from the platform and bank drainage.



4.6. DRAIN

110 mm diameter PVC drainpipes will be installed alongside the collector section, at a level higher than the collector to collect water that seeps through the road surface and transport it to the downstream manhole.



DOCUMENT Nº4 – EARTHWORKS



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1. INTRODUCTION

This annex defines the earthworks resulting from the execution of the project. It presents the earthworks report, which includes data at 20-meter intervals, the mass diagram, and determines the appropriate disposal of the surplus earth.

2. EARTHWORKS

Along this stretch, the road runs primarily on embankments. Part of the material extracted from the excavation will be reused to complete the embankments, except for the crest, where a 75 cm thickness of selected soil will be used.

2.1. SLOPES

Based on the soil composition and its bearing capacity, the slopes used, as defined in the corridor's geotechnical study document, are as follows:

- Embankment slopes 0.5H:1V for the entire section.
- Cut slopes 0.5H:1V for the entire section.

2.2. EARTHWORKS REPORT

This report includes the volumes of earth that must be excavated and placed to form the platform on which the pavements are built, i.e. the excavated volumes of cut and the constructed volumes of embankment required:

P.K.	Área de desmonte (metros cuadrado s)	Volumen de desmonte (metros cúbicos)	Volumen reutilizabl e (metros cúbicos)	Área de terraplén (metros cuadrado s)	Volumen de terraplé n (metros cúbicos)	Vol. desmont e acumul. (metros cúbicos)	Vol. reutilizabl e acumul. (metros cúbicos)	Vol. terraplé n acumul. (metros cúbicos)	Vol. neto acumul. (pies cúbicos)

0+020.00 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0+040.00 0	43.97	439.73	439.73	0.00	0.00	439.73	439.73	0.00	439.73
0+060.00 0	56.05	1000.26	1000.26	0.00	0.00	1440.00	1440.00	0.00	1440.00
0+080.00 0	40.10	961.52	961.52	0.00	0.00	2401.51	2401.51	0.00	2401.51
0+100.00 0	30.98	710.84	710.84	0.00	0.00	3112.35	3112.35	0.00	3112.35
0+120.00 0	11.91	428.90	428.90	0.00	0.00	3541.25	3541.25	0.00	3541.25
0+140.00 0	26.06	380.97	380.97	0.00	0.00	3922.22	3922.22	0.00	3922.22
0+160.00 0	18.93	452.04	452.04	0.00	0.00	4374.26	4374.26	0.00	4374.26
0+180.00 0	7.27	263.48	263.48	0.00	0.04	4637.74	4637.74	0.04	4637.70
0+200.00 0	0.58	78.74	78.74	5.56	55.47	4716.47	4716.47	55.51	4660.97



0+220.00 0	0.00	5.78	5.78	16.60	221.58	4722.25	4722.25	277.08	4445.17
0+240.00 0	2.68	26.85	26.85	6.00	225.97	4749.10	4749.10	503.05	4246.05
0+260.00 0	8.85	108.01	108.01	0.08	65.22	4857.12	4857.12	568.28	4288.84
0+280.00 0	11.55	196.60	196.60	0.00	0.94	5053.71	5053.71	569.21	4484.50
0+300.00 0	27.21	390.31	390.31	0.00	0.00	5444.02	5444.02	569.21	4874.81
0+320.00 0	106.89	1420.37	1420.37	0.00	0.00	6864.39	6864.39	569.21	6295.17
0+340.00 0	66.60	1799.94	1799.94	0.00	0.00	8664.32	8664.32	569.21	8095.11
0+360.00 0	8.26	753.09	753.09	0.49	4.84	9417.41	9417.41	574.05	8843.36
0+380.00 0	3.08	113.42	113.42	4.17	46.62	9530.83	9530.83	620.67	8910.16
0+400.00 0	15.81	192.14	192.14	0.27	43.84	9722.97	9722.97	664.51	9058.46

0+420.00 0	6.95	236.40	236.40	2.28	24.55	9959.37	9959.37	689.06	9270.31
0+440.00 0	0.71	79.01	79.01	7.85	99.27	10038.38	10038.38	788.33	9250.04
0+460.00 0	8.09	88.46	88.46	0.77	85.92	10126.84	10126.84	874.25	9252.58
0+480.00 0	8.00	160.91	160.91	0.39	11.59	10287.75	10287.75	885.84	9401.91
0+500.00 0	10.71	187.12	187.12	0.00	3.89	10474.87	10474.87	889.73	9585.13
0+520.00 0	22.49	332.01	332.01	0.00	0.01	10806.88	10806.88	889.75	9917.14
0+540.00 0	7.00	294.89	294.89	0.35	3.47	11101.78	11101.78	893.22	10208.56
0+560.00 0	0.00	68.90	68.90	31.27	317.86	11170.68	11170.68	1211.08	9959.60
0+580.00 0	0.00	0.00	0.00	0.00	318.88	11170.68	11170.68	1529.96	9640.72
0+600.00 0	0.00	0.00	0.00	0.00	0.00	11170.68	11170.68	1529.96	9640.72



0+620.00 0	0.00	0.00	0.00	0.00	0.00	11170.68	11170.68	1529.96	9640.72
0+640.00 0	8.58	89.48	89.48	14.42	134.35	11260.16	11260.16	1664.32	9595.85
0+660.00 0	0.00	86.15	86.15	21.62	359.90	11346.32	11346.32	2024.21	9322.11
0+680.00 0	0.00	0.00	0.00	2.50	241.27	11346.32	11346.32	2265.48	9080.84
0+700.00 0	9.63	95.29	95.29	0.93	34.57	11441.60	11441.60	2300.05	9141.55
0+720.00 0	9.49	186.40	186.40	1.19	21.74	11628.00	11628.00	2321.79	9306.21
0+740.00 0	12.53	213.80	213.80	1.78	30.33	11841.81	11841.81	2352.12	9489.68
0+760.00 0	11.67	239.11	239.11	8.55	103.87	12080.91	12080.91	2455.99	9624.92
0+780.00 0	5.46	171.26	171.26	1.97	105.16	12252.18	12252.18	2561.15	9691.03
0+800.00 0	0.49	59.46	59.46	9.45	114.21	12311.64	12311.64	2675.35	9636.28

0+820.00 0	0.00	4.87	4.87	25.48	349.31	12316.51	12316.51	3024.66	9291.85
0+840.00 0	0.00	0.00	0.00	14.67	411.16	12316.51	12316.51	3435.83	8880.69
0+860.00 0	0.63	4.83	4.83	1.54	167.31	12321.34	12321.34	3603.14	8718.20
0+880.00 0	4.79	52.08	52.08	0.00	16.54	12373.43	12373.43	3619.67	8753.75
0+900.00 0	0.00	47.77	47.77	4.86	48.55	12421.20	12421.20	3668.23	8752.97
0+920.00 0	0.00	0.00	0.00	7.90	130.96	12421.20	12421.20	3799.19	8622.01
0+940.00 0	0.00	0.00	0.00	14.15	233.54	12421.20	12421.20	4032.72	8388.47
0+960.00 0	0.00	0.00	0.00	12.56	276.43	12421.20	12421.20	4309.15	8112.04
0+980.00 0	0.07	0.72	0.72	25.12	376.83	12421.91	12421.91	4685.98	7735.93
1+000.00 0	0.00	0.72	0.72	17.61	427.24	12422.63	12422.63	5113.23	7309.40



1+020.00 0	9.71	96.83	96.83	0.03	176.89	12519.46	12519.46	5290.12	7229.35
1+040.00 0	30.49	399.53	399.53	0.00	0.30	12919.00	12919.00	5290.42	7628.57
1+060.00 0	36.35	669.06	669.06	0.00	0.00	13588.06	13588.06	5290.42	8297.64
1+080.00 0	71.58	1084.07	1084.07	0.00	0.00	14672.13	14672.13	5290.42	9381.71
1+100.00 0	64.61	1360.73	1360.73	0.00	0.00	16032.86	16032.86	5290.42	10742.4 4
1+120.00 0	41.54	1056.31	1056.31	0.00	0.00	17089.17	17089.17	5290.42	11798.7 5
1+140.00 0	26.40	672.83	672.83	0.00	0.00	17762.00	17762.00	5290.42	12471.5 8
1+160.00 0	11.81	376.47	376.47	0.00	0.00	18138.47	18138.47	5290.42	12848.0 4
1+180.00 0	2.84	144.71	144.71	2.91	29.51	18283.18	18283.18	5319.93	12963.2 5
1+200.00 0	9.43	122.69	122.69	0.00	29.11	18405.87	18405.87	5349.05	13056.8 2

1+220.00 0	14.93	238.97	238.97	0.00	0.01	18644.84	18644.84	5349.05	13295.7 8
1+240.00 0	39.27	543.67	543.67	0.00	0.00	19188.51	19188.51	5349.05	13839.4 5
1+260.00 0	38.35	801.37	801.37	0.00	0.00	19989.88	19989.88	5349.05	14640.8 2
1+280.00 0	33.39	720.18	720.18	0.00	0.00	20710.05	20710.05	5349.05	15361.0 0
1+300.00 0	23.72	571.18	571.18	0.00	0.00	21281.23	21281.23	5349.05	15932.1 8
1+320.00 0	16.66	402.80	402.80	0.00	0.00	21684.03	21684.03	5349.05	16334.9 8
1+340.00 0	18.16	344.21	344.21	0.00	0.00	22028.24	22028.24	5349.05	16679.1 9
1+360.00 0	16.35	339.96	339.96	0.00	0.00	22368.20	22368.20	5349.05	17019.1 4
1+380.00 0	14.34	300.95	300.95	0.00	0.00	22669.14	22669.14	5349.05	17320.0 9
1+400.00 0	3.72	174.96	174.96	0.98	10.38	22844.10	22844.10	5359.43	17484.6 7



1+420.00 0	2.59	60.87	60.87	9.89	111.76	22904.98	22904.98	5471.19	17433.7 8
1+440.00 0	3.79	63.58	63.58	11.85	218.04	22968.55	22968.55	5689.23	17279.3 2
1+460.00 0	3.84	76.25	76.25	16.47	283.29	23044.80	23044.80	5972.52	17072.2 8
1+480.00 0	9.96	137.99	137.99	10.57	270.40	23182.79	23182.79	6242.91	16939.8 7
1+500.00 0	9.28	192.45	192.45	10.64	212.01	23375.24	23375.24	6454.93	16920.3 2
1+520.00 0	13.29	226.56	226.56	1.66	122.49	23601.81	23601.81	6577.42	17024.3 9
1+540.00 0	7.39	212.67	212.67	2.24	37.71	23814.47	23814.47	6615.12	17199.3 5
1+560.00 0	0.00	76.95	76.95	20.94	226.49	23891.42	23891.42	6841.61	17049.8 1
1+580.00 0	0.00	0.00	0.00	62.97	839.15	23891.42	23891.42	7680.76	16210.6 6
1+600.00 0	0.00	0.00	0.00	58.60	1215.71	23891.42	23891.42	8896.47	14994.9 5

1+620.00 0	0.00	0.00	0.00	57.32	1159.18	23891.42	23891.42	10055.6	13835.7 7
1+640.00 0	0.27	2.72	2.72	9.01	663.24	23894.14	23894.14	10718.9	13175.2 5
1+660.00 0	7.67	82.09	82.09	0.01	88.74	23976.24	23976.24	10807.6	13168.6 0
1+680.00 0	0.00	86.60	86.60	14.32	142.57	24062.84	24062.84	10950.2	13112.6 3
1+700.00 0	0.00	0.00	0.00	29.55	437.12	24062.84	24062.84	11387.3	12675.5 1
1+720.00 0	0.00	0.00	0.00	20.85	498.17	24062.84	24062.84	11885.4	12177.3 4
1+740.00 0	8.29	93.31	93.31	5.85	257.47	24156.14	24156.14	12142.9	12013.1 8
1+760.00 0	9.83	189.21	189.21	5.95	113.93	24345.35	24345.35	12256.8	12088.4 6
1+780.00 0	6.42	162.51	162.51	6.71	126.63	24507.87	24507.87	12383.5	12124.3 5
1+800.00 0	26.42	328.47	328.47	0.00	67.12	24836.34	24836.34	12450.6	12385.7 0

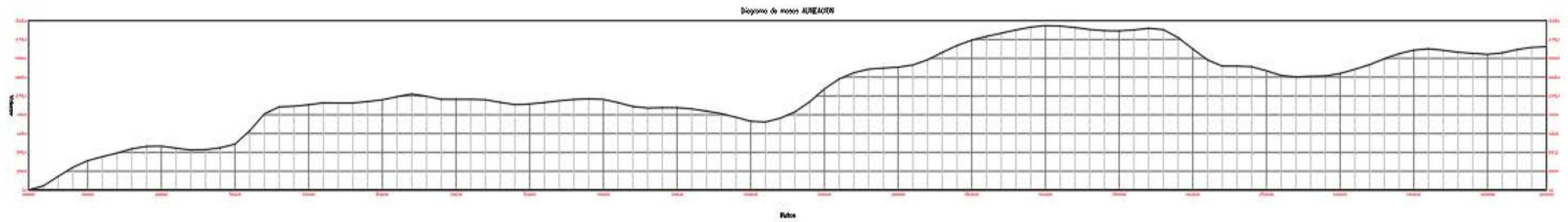


1+820.00 0	18.40	448.23	448.23	0.00	0.00	25284.57	25284.57	12450.6 4	12833.9 3
1+840.00 0	31.16	495.56	495.56	0.00	0.00	25780.13	25780.13	12450.6 4	13329.4 9
1+860.00 0	31.73	628.91	628.91	0.00	0.00	26409.04	26409.04	12450.6 4	13958.4 0
1+880.00 0	22.24	539.78	539.78	0.00	0.00	26948.82	26948.82	12450.6 4	14498.1 8
1+900.00 0	15.24	374.13	374.13	0.00	0.00	27322.95	27322.95	12450.6 4	14872.3 1
1+920.00 0	2.68	176.41	176.41	3.22	32.89	27499.36	27499.36	12483.5 2	15015.8 4
1+940.00 0	0.02	25.69	25.69	14.64	180.72	27525.06	27525.06	12664.2 4	14860.8 2
1+960.00 0	0.68	6.63	6.63	7.03	219.66	27531.68	27531.68	12883.9 0	14647.7 8
1+980.00 0	1.12	17.07	17.07	5.96	133.64	27548.75	27548.75	13017.5 5	14531.2 0
2+000.00 0	1.66	26.54	26.54	6.82	131.01	27575.29	27575.29	13148.5 5	14426.7 3

2+020.00 0	20.74	221.92	221.92	0.00	68.84	27797.21	27797.21	13217.3 9	14579.8 2
2+040.00 0	14.83	355.77	355.77	0.01	0.08	28152.98	28152.98	13217.4 7	14935.5 0
2+060.00 0	11.29	261.20	261.20	2.95	29.53	28414.18	28414.18	13247.0 1	15167.1 7
2+080.00 0	8.58	198.68	198.68	10.05	129.93	28612.86	28612.86	13376.9 4	15235.9 2



2.3. EARTHWORK/ MASS DIAGRAM



PART №4 – TECHNICAL SPECIFICATIONS



DOCUMENT N°1 – TECHNICAL SPECIFICATIONS

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1. INTRODUCTION AND GENERALITIES

1.1. TECHNICAL SPECIFICATIONS' PURPOSE

1.1.1. DEFINITION

This Technical Specifications Document constitutes the set of specifications, requirements, criteria, and standards that, together with those established in the General Technical Specifications Document for Road and Bridge Works PG-3 of the Directorate General of Roads and Rural Roads, approved by the Official Gazette of February 6, 1976, and those indicated in the Plans, define all the technical requirements for the works that are the subject of the construction project: "Improvement of the CA-661 roadbed, access to La Busta."

The publication of said General Technical Specifications Document, edited by the Publications Service of the Directorate General of Roads, is legal for all purposes by Official Gazette of July 2, 1976.

The two specifications also contain a general description of the works, the conditions that the materials must meet, instructions for the execution, measurement, and payment of the work units, and are the guiding standard that the Contractor and Project Manager must follow.

1.1.2. SCOPE OF APPLICATION

This Specific Technical Specifications document shall apply to the construction, control, management and inspection of the works corresponding to the construction project: "Improvement of the platform of the CA-661 road, access to La Busta."

1.1.3. CORRELATION WITH THE PG-3

The content of this document is broadly based on the requirements of PG-3. The sections indicate the corresponding PG-3 articles referenced.

1.2. GENERAL DISPOSITIONS

The specifications established in Article 101 - "General Provisions" of PG-3, completed or modified with those contained in this Article of this Document, as well as the rest of the provisions of PG-3, shall apply to this Article.

1.2.1. CONSTRUCTION MANAGEMENT

The Construction Manager is the person with appropriate and sufficient qualifications directly responsible for verifying and overseeing the proper execution of the contracted works.

The powers assigned to the Construction Manager in this Document and those assigned by current legislation may be delegated to his or her collaborating staff, in accordance with the established requirements. The Contractor may require that these delegated powers be explicitly issued in an order recorded in the corresponding "Order Book" for the project.

Any member of the Construction Manager's collaborating team, including the Construction Management body, may, in the event of an emergency, issue, at the discretion of the Construction Manager, any instructions they deem appropriate within their legal powers, which shall be binding on the Contractor.

The inclusion of the terms "Construction Manager" and "Construction Management" in these specifications are practically ambivalent, taking into account the foregoing, although it should be understood here that when referring to "Construction Management," the functions or tasks referred to in said term are presumably delegable.

The direction, supervision, and oversight of the works will be exercised by the Technical Services of the Government of Cantabria, through the person designated by them.

The Director's duties, in relation to the direction, control and supervision of the works, which fundamentally affect his relations with the Contractor, are those indicated in section 101.3 of PG-3.

1.2.2. CONTRACTOR'S PERSONNEL, RESOURCES AND RESPONSIBILITIES

The Contractor shall have at least the following technical personnel:

- Delegate: Civil Engineer or Public Works Technical Engineer with more than 10 years of experience in construction projects.
- Site Manager: Civil Engineer or Technical Public Works Engineer with full availability for construction work, resident in Cantabria, and with at least five years' experience in similar projects. This position may overlap with the previous position, if applicable.



- Topography Manager: Technical Engineer in Topography with full availability for construction, resident in Cantabria, and with a minimum of 5 years' experience in similar projects.
- The one established in Article C107/11.- “Preventive obligations of the contractor” of this Document regarding the Contractor’s Preventive Organization in the Work for the fulfillment of its obligations in that 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 when the use of the materials and 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 standards and current legislation.

1.2.3. ORDER OF THE DOCUMENTS

The documents that make up the project are the following::

- Document N°1: Introduction
- Document N°2: Preliminary Studies
- Document N°3: Project Design
- Document N°4: Technical Specifications
- Document N°5: Budget
- Document N°6: Execution Plan
- Document N°7: Appendices

1.3. WORK DESCRIPTION

The project is part of improving the platform, widening the roadway, and rerouting problematic areas of the CA-661 highway at its entrance to the town of La Busta, in the municipality of Soba.

The subject of this Construction Project is the section of the highway between PK 0+000 (where it connects with the CA-256) and 2+100 (past the town of San Juan de la Cistierna).

The route is designed with a design speed of 40 km/h. The roadway has two lanes, 3 meters wide, each for one direction of traffic. 0.5-meter-wide shoulders are planned.

Along the 2,100-meter length of the highway, there are four overpass structures located in areas where runoff water to be evacuated flows. These bridge sections are placed where there is a significant difference in elevation between the road and the ground. However, their construction is not the subject of this Project, and they will be considered already constructed. This Project will only consider the extension of the pavement layers and the signage on the structure.

Most of the route runs over cut, with sections of embankment that will be filled with the extracted material. Vegetation will be restored on the slopes formed by the embankment and cut through the roadway and shoulders.

Drainage elements will be installed, both longitudinal (gutters and manholes for roadway and verge drainage) and transverse (transverse drainage works for watershed drainage). Horizontal and vertical signage and vehicle containment elements will also be installed. No lighting will be installed as the route is located outside the urban area.

The following actions will be carried out:

- Construction of the leveling. The typical section has two 3-meter-wide lanes and 0.5-meter shoulders. Sections of cut and fill will be constructed.
- Construction of the drainage. Transverse drainage is planned to drain water flowing from the basins into the roadway, and longitudinal drainage is planned to evacuate runoff from the platform and shoulders.
 - Transverse: Four transverse drainage works are planned along the bypass.
 - Longitudinal: Type VA-75 ditches and manholes will be constructed in the cut section.
- Laying of the roadbed layers. Starting with tolerable soil and traffic category T42, 75 cm of selected soil, 25 cm of gravel, and the following layer of roadbed will be laid to achieve an E2 leveling:
 - Wear course: AC16 SURF 50/70 S OFITA, 5 cm.
- Installation of signage and containment systems. Both vertical signage (RA-2 retroreflective signs and RA-3 signs) and horizontal signage (road markings) are planned, as well as N2-W2 vehicle containment barriers.
- Environmental integration. Slope revegetation will be carried out using hydroseeding.

**1.3.1. DOCUMENTATION TO SUBMIT**

The documents, both of the project and other complementary documents that the Construction Management delivers to the Contractor, may have a contractual or merely informative value, as detailed in this Article..

Contractual Documents

The provisions of Articles 82, 128, and 129 of the General Regulations on State Procurement and Clause 7 of the General Administrative Clauses for the procurement of works (State Contracts) shall apply.

The work program shall be a contractual document when mandatory, in accordance with the provisions of Article 128 of the General Procurement Regulations or, failing that, when expressly provided for in the Specific Administrative Clauses.

The Environmental Impact Statement shall be a contractual document. This is the pronouncement of the competent environmental authority, in accordance with Article 4 of Royal Decree-Law 1302/1986, which determines, with respect to the foreseeable environmental effects, the appropriateness or inadvertent nature of carrying out the planned activity and, if so, the conditions that must be established to ensure adequate protection of the environment and natural resources.

In this case, the Deputy Ministry of the Environment is responsible for formulating this Declaration. The specific studies carried out to identify and assess the environmental impacts will be for informational purposes only. This is not the case with the Corrective Measures and Monitoring Plan included in the Construction Project.

If it is deemed necessary to classify any other project document as contractual, this shall be stated in the Specific Technical Specifications Document, and the rules governing contracting incidents with the other contractual documents shall be established below.

Notwithstanding the foregoing, the contractual nature of said document shall only be considered applicable if expressly mentioned in the Tender Documents in accordance with Article 81 of the Study Contracting Regulations.

Both the project's geotechnical information and data on the origin of materials, unless such origin is required in the corresponding article of the Specific Technical Specifications Document, tests, local conditions, earthwork diagrams, machinery studies, climatic conditions, price justification, and, in general, all those typically included

in the project report, are for informational purposes only and, consequently, should be accepted only as supplements to the information that the Contractor must acquire directly and with its own means. Therefore, the Contractor shall be liable for any errors that may arise from its failure or negligence in obtaining all data affecting the contract, the planning, and the execution of the works.

Documents Defining the Works and Order of Priority

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

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

Compliance with Current Ordinances and Regulations

The Contractor is obliged to comply with current legislation that, for any reason, is applicable during the development of the works, even if it is not expressly indicated in this Document or in any other contractual document.

1.3.2. PLANS

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

Complementary and New Works Plans

The Contractor must request, in writing, from the Construction Management, the necessary supplementary execution plans to define the works to be performed 30 days in advance of the scheduled date according to the work program. The plans requested under these conditions will be delivered to the Contractor within a period of no more than 15 days.

**Interpretation of the Plans**

Any questions regarding the interpretation of the plans must be communicated in writing to the Construction Manager, who will provide the necessary explanations within 15 days to clarify any details not perfectly defined in the Plans.

Confrontation of Plans and Measures

The Contractor must immediately compare all drawings provided upon receipt and must promptly inform the Project Manager of any anomalies or inconsistencies.

The dimensions on the drawings shall always prevail over scale measurements.

The Contractor must compare the different drawings and verify the dimensions before rigging the work and shall be responsible for any errors that could have been avoided had they done so.

Complementary Detail Plans

The Contractor shall be responsible for preparing any additional detailed plans necessary for the proper execution of the works. These plans shall be submitted to the Construction Management 15 working days in advance for approval and/or comments.

Archive of Documents Defining the Works

The Contractor shall have on-site a complete copy of the Specifications Document and the legal regulations reflected therein, a complete set of the Project Drawings, as well as copies of all supplementary drawings developed by the Contractor and accepted by the Construction Management, and of the revised drawings supplied by the Construction Management, along with any accompanying instructions and specifications.

On a monthly basis, as a result of this updated file, the Contractor is required to submit a collection of "As Built" drawings or drawings of the work actually executed, duly verified with the data obtained jointly with the Construction Management, and shall be responsible for any expenses incurred in this regard.

The Contractor shall be required to submit a monthly technical report to the Technical Services of the Provincial Council's Construction Management regarding the actions and any incidents with environmental impact that may have occurred. The degree of implementation of the corrective measures and their effectiveness shall also be indicated. If the results are negative, they shall be reviewed and a proposal for new corrective measures shall be submitted.

The Owner shall provide original plans for this work.

1.3.3. CONTRADICTIONS, OMISSIONS OR ERRORS IN THE DOCUMENTATION

Anything mentioned in the General and Specific Technical Specifications Documents and omitted from the plans, or vice versa, must be executed as if it were contained in all of these documents.

In the event of a contradiction between the Project Drawings and the Technical Specifications Documents, the provisions of the latter shall prevail.

Omissions in the Plans and Documents 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 Documents, or which by custom and usage must be carried out, not only do not relieve the Contractor from the obligation to execute these omitted or erroneously described details of the work, but, on the contrary, they must be executed as if they had been completely and correctly specified.

For the execution of the aforementioned details, the Contractor shall prepare sketches that will be provided to the Project Manager for approval and subsequent execution and payment.

In any case, any contradictions, omissions or errors noted in these documents by the Director or the Contractor must be duly reflected in the Order Book.

1.4. DEVELOPMENT AND CONTROL OF THE WORK**1.4.1. EQUIPMENT AND MACHINERY**

The Contractor must justify the equipment and machinery required for the execution of all work units in advance, in accordance with the volume of work to be performed and the works program, and submit them to the Construction Management for approval.



The Construction Management's verification refers exclusively to ensuring that the aforementioned equipment meets the conditions offered by the Contractor. The Contractor shall not be held solely responsible for the quality and timeliness of the works.

The equipment must always be maintained in satisfactory working condition and dedicated exclusively to the contracted works. It may not be removed without written authorization from the Construction Management, upon proof that the work units for which it was intended have been completed.

1.4.2. INSTALLATIONS, WORKS AND AUXILIAR MATERIAL

Project for Installations and Auxiliary Works

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

The Contractor 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 current regulations and the standards of the Supply Company.

The designs for the auxiliary works and facilities must be submitted to the Project Management for approval.

Location and Execution

The location of these works, their elevations, and even their appearance when the main work requires it, will be subject to the approval of the Construction Management. The provisions set forth in the section on temporary occupation of land will also apply.

The Contractor is required to submit a plan showing the exact location of the construction facilities, such as machinery parks, material, oil and fuel storage areas, etc., taking into account the protection and non-impact of the natural values of the area. This plan must be submitted to the Construction Management for approval.

Removal of Installations and Auxiliary Works

Upon completion of the works, or in advance, to the extent possible, the Contractor shall, at its own expense, remove all buildings, works, and auxiliary and/or temporary installations.

After their removal, the Contractor shall clean the areas occupied by them, leaving them clean and free of debris.

The Contractor shall properly treat the surfaces compacted by the installations and auxiliary works and their subsequent restoration in accordance with the technical and material requirements described in the Revegetation Project Specifications.

1.4.3. GUARANTEE AND QUALITY CONTROL OF THE WORKS

Definition

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

Quality assurance includes quality control, which encompasses actions that verify quality meets predetermined requirements. Quality control of a project encompasses the following aspects:

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

Contractor Quality Assurance Program

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

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

The quality assurance program will include, at a minimum, a description of the following items:

- Organization:

This section will include a functional and nominal organizational chart specific to the contract.



The organizational chart will include the specific quality assurance organization in line with the needs and requirements of the project. The resources, whether internal or external, will be adequately approved.

The Contractor's Quality Assurance Manager will be exclusively dedicated to his or her role.

- Procedures, instructions and plans:

All activities related to construction, inspection, and testing must be carried out in accordance with work instructions, procedures, drawings, or other similar documents that detail the specifications set forth in the Project's Technical Specifications and Plans.

The program will contain a list of such procedures, instructions, and drawings, which will subsequently be submitted to the Project Management for approval, sufficiently in advance of the commencement of work.

- Control over materials and acquired services

The Contractor will conduct a pre-assessment and selection of suppliers, which must be documented and submitted for approval by the Project Management.

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

- o Equipment drawing.
- o Detailed drawing.
- o Sufficient supporting documentation to provide the Project Manager with the precise information to determine the acceptance or rejection of the equipment.
- o Materials comprising each piece of equipment.
- o Standards according to which it was designed.
- o Construction procedure.
- o Standards to be used for acceptance tests, specifying which tests should be performed on the bench and which on-site.

It will also perform the receiving inspection to verify that the material complies with the Project requirements, issuing the corresponding inspection report.

- Handling, storage and transportation

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

- Special Processes

Special processes such as welding, testing, etc., will be performed and controlled by the Contractor's qualified personnel, using approved procedures in accordance with applicable codes, standards, and specifications. The program will define the means to ensure and document these requirements.

- Construction Inspection by the Contractor

The Contractor is responsible for performing the controls, tests, inspections, and trials required in these Terms of Reference. The program shall define the system to be developed by the Contractor to comply with this section.

- Documentation Management

Proper management of documentation related to the quality of the work will be ensured, ensuring final documented evidence of the quality of the elements and activities included in the quality assurance program.

The Contractor will define the means to ensure that all documentation related to construction quality is archived and controlled until it is delivered to the Construction Management.

Quality Control Plans and Inspection Point Programs

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

The Construction Management shall evaluate the quality control plan and notify the Contractor in writing of its approval or comments.

The activities or phases of the work for which a quality control plan shall be submitted shall include, among others, the following:



- Material reception and storage.
- Equipment reception and storage.
- Geometric inspection of earthworks.
- Backfilling and compaction.
- Masonry work.
- Concrete manufacturing and transportation. Placement and curing.
- Planting and rooting.
- Etc.

The quality control plan shall include, as a minimum, 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 trial procedures.
- Suppliers and subcontractors.
- Packaging, transportation, and storage.
- Market and identification.
- Documentation to be generated regarding construction, inspection, testing, and trials.

An inspection point schedule will be included as an attachment to the quality control plan. This document will consist of a sequential list of all construction, inspection, testing, and trial operations to be performed throughout the entire activity or phase of the work.

For each operation, the reference of the drawings and procedures to be used, as well as the participation of the Contractor's organizations in the inspections to be performed, will be indicated, whenever possible. A blank space will be left so that the Construction Management can mark its own inspection points.

Once the activity or phase of the work is completed, there will be evidence (through protocols or signatures in the inspection point schedule) that all inspections, tests, and trials scheduled by the various organizations involved have been performed.

Payment of the Costs of the Quality Assurance System

The costs incurred by the Contractor as a result of the obligations assumed in compliance with the Technical Specifications shall be borne by the Contractor and are deemed to be included in the Project prices.

In particular, all quality control tests and trials required to comply with this Technical Specifications, or the general regulations applicable to this Project, shall be borne by the Contractor, unless expressly specified otherwise.

Quality control level

The corresponding sections of this Document or the Plans specify the type and number of tests to be systematically performed during the execution of the works to control the quality of the works. It is understood that the set number of tests is a minimum, and if several criteria are indicated to determine their frequency, the one requiring the highest frequency will be chosen.

The Construction Manager may modify the frequency and type of these tests in order to achieve adequate control of the quality of the works, or request the Contractor to perform quality controls not provided for in the Project. Any additional tests incurred shall be borne by the Contractor, provided that their cost does not exceed 2% of the total net budget for the execution of the works, including any extensions.

Inspection and Quality Control by the Construction Management

The Construction Management, at its own expense, may maintain a team to inspect and control the quality of the works and perform approval and contradictory tests.

To carry out these tasks, using its own programs and procedures, the Construction Management will have access at all times to all work sites, supply sources, factories and production processes, laboratories, and quality control files of the Contractor or its subcontractor.

The Contractor shall supply, at its own expense, all materials to be tested and shall provide the necessary facilities for this purpose.

The cost of performing these contradictory tests shall be borne by the Administration if, as a result, the supply, material, or work unit meets the quality requirements.



The tests shall be borne by the Contractor in the following cases:

- a) If, as a result of the tests, the supply, material, or work unit is rejected.
- b) If these are additional tests proposed by the Contractor on supplies, materials, or work units that have previously been rejected in tests conducted by the Construction Management.

1.4.4. MATERIALS

All materials must be suitable for their intended purpose and, having been taken into account in the pricing and budgeting processes, are understood to be of the highest quality in their class among those available on the market.

Therefore, even if their particular characteristics or relative importance do not warrant a more explicit definition, their use will be subject to the approval of the Managing Engineer, who may determine the appropriate acceptance tests or trials.

In all cases, the materials will be of equal or better quality than that which could be inferred from their origin, evaluation, or characteristics, as stated in any Project document. They will be subject to official standards or good manufacturing criteria in the field, and the Managing Engineer may require their supply by a firm offering adequate guarantees.

The figures for weights or volumes of materials appearing in the composite units of Price Table No. 2 will only be used to determine the cost of these materials stockpiled on site, but will not be of any value in defining the proportions of the mixtures or the volume required in stockpiles to obtain the unit of this material, compacted on site.

1.4.5. EARTHWORKS

Before excavation, all topsoil necessary for revegetation must be removed, after clearing any trees, plants, stumps, weeds, fallen wood, debris, trash, or any other existing material that could affect the quality and conservation of the soil.

This soil is found in the surface horizons of the soil. Only those horizons explored by the roots should be removed, discarding layers close to excessively clayey rocks.

Compaction by machinery on the surface to be stripped must be avoided.

The soil must also be removed prior to any excavation of trenches, pits, opening of roads, etc.

No work should be done on the topsoil on rainy days or when the soil is excessively compacted.

If deemed necessary, the different layers of soil that are easily distinguishable by their color, abundance of roots, texture, etc., must be removed separately. Soils of different qualities must be managed separately to preserve the qualities of the best soils.

Stockpiling of topsoil involves stockpiling this soil in the quantity necessary for subsequent use in sowing and planting. Stockpiling will be carried out in the selected locations and in accordance with the Site Management, so as not to interfere with the normal progress of the works, respecting the surrounding environment and in accordance with the instructions described in the corresponding work unit. The provisions set forth in the section on temporary placement 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 specify the minimum operations required for the start-up and operation of the landfill. However, the Contractor may seek other landfills if deemed appropriate, under its sole responsibility, and will be responsible for the landfill fee.

A Surplus Disposal Plan will be drawn up, which the Contractor awarded the works will be required to comply with. This plan will specify the specific characteristics of the landfills, such as the shape of the tanks, their location, volume, etc.

No more surface area will be affected than that initially planned for the landfills. Trees adjacent to the landfill, whose continued existence is determined by the Revegetation Project and the Construction Management, must be protected by avoiding compaction in the area at their base corresponding to the canopy projection.

The surplus waste to be dumped will consist exclusively of inert materials from the construction site. The development and execution of the Surplus Waste Plan will be supervised by the Construction Management, which may establish modifications to it, provided they are not substantial. If substantial changes occur during the execution of the works, the Contractor is obligated to submit to the Construction Management an Environmental Impact Study whose methodology and content comply with the provisions of Law 21/2013, of December 9, on Environmental Assessment.



The Contractor will be responsible for seeking loans and their payment to the owners, as well as the operations necessary for their initiation and operation, which will be subject to the approval and supervision of the Construction Management. The Construction Management may determine that the materials from the excavation be dumped and spread on land owned by the Contractor, within a maximum radius of ten (10) kilometers from the excavation site, without this being a reason for revising the contracted price.

The Project Manager shall have one (1) month to select or reject the extraction and disposal sites proposed by the Contractor. This period shall begin from the moment the Contractor notifies the Contractor of the proposed waste dumps, borrow pits, and/or quarries. The Project Manager's acceptance of the extraction and disposal sites does not limit the Contractor's liability, both with respect to the quality of the materials and the exploitable volume of the deposit, as well as the obtaining of the corresponding licenses and permits.

The Contractor is obligated to remove, at its own expense, any materials of inferior quality to that required that appear during the exploitation of the previously authorized quarry, gravel pit, or deposit.

If, during the course of exploitation, the materials cease to meet the quality requirements, or if the volume or production proves insufficient due to an increase in the proportion of unusable material, the Contractor must seek another extraction site following the standards set forth in the preceding paragraphs, without the change in the natural deposit giving it the option to claim any compensation. The Contractor may use materials obtained from excavation in the works, provided they meet the conditions set forth in this Document.

The Construction Management may provide the bidders or Contractors with any information or preliminary studies it may have learned during the drafting of the Project, but this shall always be for informational purposes only and shall not invalidate or contradict the provisions of the first paragraph of this section.

The locations of the storage areas will be proposed by the Contractor for approval by the Construction Management. The provisions set forth in the section on temporary land occupation shall also apply.

1.4.7. ACCESS TO THE WORKPLACE

Construction of Access Roads

The temporary ramps and access roads to the various pits will be executed under the responsibility and expense of the Contractor. The Construction Management may request that all or part of them be constructed before the start of work.

The Contractor must submit a plan showing the access roads, taking into account minimal impact on the natural environment, and must submit it to the Construction Management for approval.

The Contractor will proceed with the appropriate treatment of the compacted surfaces and their subsequent restoration in accordance with the technical and material requirements described in the Revegetation Project.

The Contractor shall be obligated to reconstruct at its own expense all public or private service works, constructions, and facilities, such as cables, sidewalks, gutters, sewers, etc., that are affected by the construction of roads, access roads, and temporary works. The Contractor shall also place the necessary signage at intersections or detours with roads, streets, etc. All surplus construction materials and equipment shall also be removed from the site once the work is completed, leaving the area completely clean.

Roads or access roads shall be located, to the extent possible, outside the site of the permanent works. In the exceptional event that interferences must necessarily occur, any subsequent modifications required for the execution of the works shall be the responsibility of the Contractor.

Conservation and use

The Contractor shall maintain the temporary access roads and construction roads in suitable condition for use. If the roads are to be used by several Contractors, they shall agree among themselves on the distribution of construction and maintenance costs, which shall be proportional to the traffic generated by each Contractor. In the event of a dispute, the Construction Management shall arbitrate the distribution of these costs by crediting or deducting the resulting amounts, if necessary, from the payments due to each Contractor.

Temporary Occupation of Land for Access Roads

In the event that the construction of accesses affects third parties and involves any type of temporary occupation, the Contractor must have reached a prior agreement with those affected, with the costs being borne by the Contractor.

1.4.8. SECURITY AND HYGIENE

It covers the measures and precautions that the Contractor is obligated to implement and adopt during the execution of the works to prevent risks, accidents, and occupational diseases, as well as those arising from worker hygiene and well-being.



In accordance with Royal Decree 84/1990, an Occupational Health and Safety study must be included in this Works Execution Project, consistent with the contents of said Works Execution Project, in which the specific health and safety issues will be developed with minimum content and characteristics. This plan will not exceed the budget for the health and safety project corresponding to the Project, with the understanding that any excess will be included in the percentage of indirect costs that are part of the Project prices.

Payment of the budget corresponding to the health and safety project will be made in accordance with the corresponding price table included therein, or, where applicable, in the occupational health and safety plan, approved by the Administration, which is considered a contract document for these purposes.

1.4.9. NOISE AND VIBRATIONS 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 section.

In general, the Contractor shall comply with the provisions of the Current Standards, whether National ("Health and Safety Regulations") or Municipal. In cases of uncertainty, the most restrictive shall apply.

All machinery located outdoors shall be arranged to minimize noise generation. For compressors used outdoors, the noise level shall not exceed the specified values. If at 7 m they produce sound levels greater than 75 dB/B (A), they shall not be located less than 8 m from residential or similar facilities. If levels are greater than 70 dB/B (A), they shall not be located less than 4 m from residential or similar facilities.

Mobile compressors shall be operated and maintained in accordance with the manufacturer's instructions to minimize noise, and unnecessary operation shall be avoided.

Pneumatic tools shall be equipped, where possible, with silencers.

1.4.10. EMERGENCIES

The Contractor shall have the necessary organization to carry out urgent work outside of working hours, which, in the opinion of the Project Manager, is necessary to resolve emergencies related to the Contract works.

The Project Manager shall at all times maintain an up-to-date list of addresses and telephone numbers of the Contractor's personnel and those responsible for organizing such emergency work.

1.4.11. WORK MODIFICATIONS

If, during the execution of the works, causes arise that lead to modifications in the execution of the works with respect to the project or under different conditions, the Contractor shall notify the Construction Management of these facts so that it may 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 applicable, simultaneously with the delivery to the Construction Management by the Contractor of the plans or documents proposing 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 set forth in the section on conflicting prices shall apply.

1.4.12. PRESERVATION OF THE WORKS DURING THE WARRANTY PERIOD

The Contractor undertakes to maintain, at its own expense, all the works comprising the Project until they are provisionally accepted. Furthermore, it is obligated to maintain them for a one-year warranty period from the date of provisional acceptance. For this purpose, it will be reimbursed, upon justification, for the corresponding expenses, for which a line item is reserved in Document No. 4 - Budget.

For these purposes, works that have suffered deterioration due to negligence or other causes attributable to the Contractor, or due to any cause that can be considered avoidable, will not be counted. Likewise, the Contractor will be obligated to replace and collect from the responsible third party any accidents or damages caused by third parties during the operation of the works.

1.4.13. CLEARANCE AFTER THE WORK IS FINISHED

Upon completion of the works, all facilities, warehouses, and buildings temporarily constructed to service the project must be removed, and their locations restored to their original state.

Temporary roads, including access to borrow pits and quarries, must be treated similarly.

The work must be carried out in such a way that the affected areas are completely clean and in aesthetic condition, in keeping with the surrounding landscape. These works will be subject to payment in the form of a lump sum.



The technical specifications of the Works Management will not be subject to payment, as in the case of landfills whose disposal is provided by the Administration. The obligations indicated by the Management for their final disposal must also be fulfilled.

1.5. CONTRACTOR'S RESPONSIBILITIES

1.5.1. PERMITS AND LICENSES

The Contractor shall obtain, at its own expense, the necessary permits or licenses 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 shall take out comprehensive insurance to cover any damage or compensation that may occur as a result of the performance of the work.

1.5.3. THIRD PARTY CLAIMS

All claims for damages received by the Contractor shall be notified in writing without delay to the Construction Manager. A similar exchange of information shall be made regarding complaints received in writing.

The Contractor shall notify the Construction Manager, in writing and without delay, of any accident or damage that occurs during the execution of the works.

The Contractor shall take the necessary precautions to avoid any type of damage to third parties and shall promptly address any claims from affected owners that are accepted by the Construction Manager.

In the event of damage to third parties, the Contractor shall inform the Construction Manager and those affected.

The Contractor shall restore the property to its original condition as quickly as possible, especially if it involves an essential public service or if there are significant risks.

1.6. MEASUREMENTS AND PAYMENTS

1.6.1. PAYMENTS

Unless otherwise indicated in the Tender Documents and/or the Award Contract, contracted works will be paid for as "Work at Unit Prices," applying the unit prices to the resulting work units.

Likewise, they may be settled in whole or in part through lump sums.

In all cases of settlement by applying unit prices, the amounts to be taken into account will be established based on the volumetric measurements derived 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 affairs and will be carried out by the Construction Management, who will submit them to the Contractor.

The Contractor is obliged to request (in due time) the presence of the Construction Management, for the taking of contradictory measurements in the works, services and supplies that are not susceptible to subsequent checks or verifications, in the absence of which, except for contrary evidence that 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 Tender Documents and/or the Contract Award, all payments will be made against monthly certifications of completed works.

At the end of each month, the Construction Management will prepare a provisional valuation of the work performed in the preceding month and at the original date to be used to prepare the corresponding certification, proceeding as specified in the General Administrative Clauses for State contracts.

The contract prices or any contradictory prices approved by the Construction Management will apply.

Contract prices are fixed and subject to revision, regardless of the work execution period.



Payment of the amount of a certification will always be made in full and pending the final certification, reducing the amount established as a guarantee, and taking into account any additional credits and deductions that may result from the clauses of the Contract Award.

Upon completion of the works, a general and definitive certification will be established.

Payment of the amount due to the Contractor, after the final certification has been issued and accepted, after deducting any partial payments already made, will be made less the security deposit withholding and any other amounts resulting from the application of the clauses in the Contract Award and/or Tender Documents.

The monthly provisional certifications and the final certifications will be established so that the amount for the work settled by administration and the total amount for the other work appear separately, cumulative from the original date.

In all cases, payments will be made in the manner specified in the Contract Award, Tender Documents, and/or the formula agreed upon with the Contractor during the award process.

Applicable prices

The unit, basic, and fixed-price prices for material execution to be used will be those resulting from applying the reduction made by the Contractor in its bid to all corresponding project prices, except for those units explicitly specified in the corresponding articles of the "Work Units" chapter of these Technical Specifications, in which a reduction is considered due to the substitution of borrowed, quarry, or other external material for material obtained from the work performed on the project itself.

All unit or fixed-price prices for "material execution" include, without exception or reservation, all expenses and charges incurred by the execution of the work corresponding to each of them, including those resulting from the obligations imposed on the Contractor by the various contract documents and, in particular, by these Technical Specifications.

These prices will include all expenses necessary for the execution of the corresponding works until their complete completion and commissioning, so that they serve the purpose for which they were designed, and in particular the following:

- Expenses for labor, consumables, and miscellaneous supplies, including necessary finishes and finishing, even if not expressly described in the unit price justification.
- Planning, coordination, and quality control expenses.
- Expenses for calculations, plans, or construction sketches.
- Storage, transportation, and tooling expenses.
- Expenses for transportation, operation, maintenance, and repair of auxiliary construction equipment, as well as its depreciation or amortization expenses.
- Expenses for the maintenance of auxiliary access roads for other temporary works.
- Electricity costs for motive power and lighting, unless expressly indicated otherwise.
- Insurance of all kinds.
- Financing costs.
- The "contracted execution" prices obtained according to the criteria of the Tender Documents or Award Contract, also include:
 - o General expenses and industrial profit.
 - o Taxes and fees of all kinds.

The prices also cover:

- a) Non-recoverable expenses related to the study and installation of all auxiliary facilities, unless expressly stated that they will be paid separately.
 - b) Non-recoverable expenses related to the dismantling and removal of all auxiliary facilities, including the restoration of the corresponding land, unless expressly stated that they will be paid separately.
- a Those units not specifically listed in this Technical Specifications Document will be paid for fully completed under the conditions at the prices set forth in Price Schedule No. 1, which include all expenses necessary for their execution. It is understood that "fully completed" includes materials, auxiliary equipment, paint, testing, commissioning, and all other elements or operations required for the use of the units in question.



Except in the cases provided for in this Technical Specifications Document, the Contractor may not, under any pretext, request a modification of the award prices.

Lump Sum Items

These are items in the budget corresponding to the execution of a project, or one of its parts, in any of the following cases:

- For a fixed price defined prior to the execution of the works and without breakdown into unit prices (lump item for full credit).
- Justification of the invoicing by the Contractor is provided by applying existing basic or lump sum unit prices to actual measurements whose definition proves imprecise during the design phase (lump item to be justified).

In the first case, the item will be fully paid after the completion of the work defined therein and under the specified conditions, while in the second case, only the amount resulting from the actual measurement will be certified. The availability or partial use of these items will be at the discretion of the Construction Management, without the Contractor having the right to claim for this concept.

Lump sum items will be treated in the same way regarding their classification (material execution and contracted) as indicated for unit and basic prices.

Unauthorized Work and Defective Work

As a general rule, no credit will be paid for work not contemplated in the Project and carried out without the authorization of the Construction Management. However, any defective work will not be demolished and restored to the quality standards required by the Project.

However, if any work unit has not been executed exactly in accordance with the conditions stipulated in the Documents, and is nevertheless admissible in the judgment of the Construction Management, it may be accepted provisionally and definitively, if applicable. However, the Contractor will be obliged to accept, without any right to claim, the determined financial reduction, except in the case in which the Contractor prefers to demolish the work 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 circumstances, it is necessary to value incomplete works, the prices in Price Schedule No. 2 shall apply. No valuation of each unit of work may be claimed other than that in said schedule, nor shall the Contractor be entitled to any claim for insufficiency or omission of the cost of any element that constitutes the price. The items that make up the price breakdown shall be credited when all the material, including accessories, has been collected or the work or operations determining the definition of the item have been fully carried out, since the criterion to be followed must be that only phases with completed execution are considered payable, the Contractor losing all rights if they are left incomplete.

Excess Construction

Any excess work not authorized in writing by the Project Manager will not be credited.

In this case, the Project Manager may decide to make the necessary restitution to bring the work into compliance with the Project definition, in which case all costs incurred will be borne by the Contractor.

Payment of Stockpiled Materials

The Construction Management reserves the right to make, at the Contractor's request, credits on the price of certain materials stockpiled on site, acquired in full ownership and actually paid for by the Contractor.

Credits will be calculated by applying the basic prices listed in the price schedules.

If the price schedules do not specify the necessary basic prices, credits may be calculated based on the invoices submitted by the Contractor.

Stockpiled materials for which credits have been made may not be removed from the site without the authorization of the Construction Management and without prior reimbursement of the credits.

Credits 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.

Credits for materials issued may not be invoked by the Contractor to mitigate its responsibility for the proper preservation of all stockpiles in storage until their use. The Contractor is responsible in any situation for the stockpiles created on the site for its work, regardless of their origin.



Advance payments for stockpiles do not obligate the Construction Management to accept basic prices for materials; they merely represent amounts on account.

Price Revision

Depending on the items included in the construction budget, the following price revision formula is established:

$$K_t = 0,01A_t / A_0 + 0,05B_t / B_0 + 0,09C_t / C_0 + 0,11E_t / E_0 + 0,01M_t / M_0 + 0,01O_t / O_0 + 0,02P_t / P_0 + 0,01Q_t / Q_0 + 0,12R_t / R_0 + 0,17S_t / S_0 + 0,01U_t / U_0 + 0,39$$

Where the meaning of each of the terms is as follows:

- K_t : Theoretical revision coefficient for execution time t .
- A_t : Aluminum cost index at execution time t .
- A_0 : Aluminum cost index on the tender date.
- B_t : Bituminous materials cost index at execution time t .
- B_0 : Bituminous materials cost index on the tender date.
- C_t : Cement cost index at execution time t .
- C_0 : Cement cost index on the tender date.
- E_t : Energy cost index at execution time t .
- E_0 : Energy cost index on the tender date.
- M_t : Timber cost index at execution time t .
- M_0 : Timber cost index on the tender date.
- O_t : Plant cost index at execution time t .
- O_0 : cost index of the plants on the tender date.
- P_t : cost index for plastic products at execution time t .
- P_0 : cost index for plastic products on the bidding date.
- Q_t : cost index for chemical products at execution time t .
- Q_0 : cost index for chemical products on the bidding date.
- R_t : cost index for aggregates and rocks at execution time t .
- R_0 : cost index for aggregates and rocks on the bidding date.

- S_t : cost index for steelmaking materials at execution time t .
- S_0 : cost index for steelmaking materials on the bidding date.
- U_t : cost index for copper at execution time t .
- U_0 : cost index for copper on the bidding date.

1.6.2. CONFLICTING PRICES

If the development of the works requires the execution of units for which prices are not included in the price schedules of this Project, the corresponding unit prices will be jointly formulated by the Construction Management and the Contractor.

The auxiliary prices (materials, machinery, and labor) and average yields to be used in the development of the new prices will be those included in the basic price schedule and in the price breakdown of this Project, to the extent applicable.

The price will always be set before the new unit is executed. The applicable price will be set by the Administration, based on the Construction Manager's proposal and the Contractor's observations.

In the absence of mutual agreement and pending the resolution of the discrepancy, the Contractor will be provisionally paid based on prices estimated by the Construction Management.

1.6.3. EXPENSES BORNE BY THE CONTRACTOR

In general, these are those specified as such in the chapters of this Technical Specifications Document and which are understood to be passed on by the Contractor in the different unit, basic and/or fixed prices, as indicated in the second section of this Article.

1.7. WORK OFFICE

As a complement to Clause 7 of the General Administrative Clauses for the Contracting of State Works, Decree 3954/1970 of December 31, the Contractor is required to make available to the Managing Engineer sufficient premises (within the area of his construction office) for the facilities he may require for the control and supervision of the works. At least one office shall be provided on-site for the exclusive use of the technical services of the Construction Management. The usable area of said offices shall be at least 50 m².



These facilities shall be constructed and equipped with water, electricity, and telephone services so that they are available for occupancy and use thirty days after the commencement date of work.

The Contractor shall provide heating, electricity, and cleaning services until the completion of the works.

The telephone in these offices shall be completely independent, ensuring complete privacy.

The corresponding cost will be borne by the Contractor and will be included in the corresponding unit prices.

1.8. SURROUNDING'S PROTECTION

1.8.1. PREPAIRING THE SURROUNDINGS

Site preparation consists of removing from the designated construction site areas any existing trees, plants, stumps, weeds, fallen wood, debris, trash, or any other material that is in the way, incompatible with the Construction Project, or not trees to be protected.

These clearing operations will be carried out with due safety precautions to avoid damage to existing buildings, adjacent properties, roads, or public services, and accidents of any kind. When the trees being felled could cause damage to other trees that must be preserved or to adjacent buildings, they will be cut from the top to the base, or they will fall toward the center of the clearing area.

Before carrying out backfilling on natural terrain, the terrain will be cleared, removing stumps and roots so that none remain within the backfill foundation or less than 15 cm below the natural ground surface. Any remaining beneath the embankments will also be eliminated. The voids left by the removal of stumps and roots will be filled with soil from the same soil, compacting the soil to the same level as the existing soil.

When there are pits or holes in the ground, their treatment will be determined by the Construction Manager on a case-by-case basis.

All materials that can be destroyed by fire will be burned or removed to a landfill in accordance with the Construction Manager's instructions and the regulations applicable in each locality.

1.8.2. DITCH CLEANING

When the accumulation of stones and other materials impedes the function of the ditches, they will be cleaned mechanically or manually.

Care will also be taken to ensure that the size and shape of the initial ditch are not altered in any work that may be carried out on them.

1.8.3. USED OILS TREATMENT

The treatment of used oils will comply with the provisions of Law 7/2022, of April 8, on waste and contaminated soil for a circular economy.

Used oil is understood to be all industrial or lubricating oils, of mineral, natural, or synthetic origin, that are no longer suitable for their originally intended 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 finding the final destination for used oils that guarantees the protection of human health, environmental conservation, and the preservation of natural resources. It includes collection, storage, treatment, recovery, regeneration, and combustion operations.

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 any natural person who, either on their own initiative 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 authorized to carry out any of the used oil management activities, whether or not they are the producer of the oil.

The Contractor is obligated to properly manage used oil, avoiding the transfer of contamination to the various receiving environments.

The following are prohibited:

- Any discharge of used oil into surface water, inland water, groundwater, any territorial sea area, or into sewage or wastewater disposal systems.



- Any deposit or discharge of used oil with harmful effects on the soil, as well as any uncontrolled discharge of waste derived from the treatment of used oil.
- Any treatment of used oil that causes atmospheric pollution above the level established by legislation on the protection of the atmospheric environment.

The Contractor must comply with the prohibitions set forth in the previous section by delivering the aforementioned oil to an authorized manager. To comply with the provisions of the previous section, the producer must:

- Store used oils in satisfactory conditions, avoiding mixing them with water or other non-oil-bearing waste.
- Have facilities that allow for the conservation of used oils until they are collected and managed, and that are accessible to the vehicles responsible for said collection.
- Deliver used oils to authorized collection personnel, or, with due authorization, transport them to the authorized management site.

The Contractor must submit to the Construction Management the control and monitoring document, which must be signed by the producer and recipient. The Contractor must retain a copy of the document corresponding to each transfer for one year. The manager must submit to the competent body copies of the documents relating to each transfer, as established in the Order.

1.8.4. ENVIRONMENTAL INTEGRATION

The Construction Management may require a rounded finish on the edges of the grading surface and the natural terrain or on the edges between grading planes, both horizontal and inclined. The Contractor must in all cases avoid the appearance of sharp-angled geometric shapes, except where indicated in the plans and the Project.

The grading slopes must be shaped, throughout their entire length, in accordance with the Director's specifications and must be maintained in perfect condition until the final acceptance of the works, both in terms of functional and aesthetic aspects.

Slope profiling carried out to harmonize with the surrounding landscape must be gradual, paying special attention to the transitions between slopes of different inclinations. At the intersections of cut and fill, the

slopes must be curved to blend with each other and with the natural terrain surface, without creating a visible discontinuity.

The finish of the slopes will be smooth, uniform, and fully consistent with the surface of the site and the project, without major contrasts, and in accordance with the Plans. Taking care to avoid damage to existing trees or patinated rocks, the necessary adjustments must be made.

On slopes to be covered with vegetation, the surface must not be smoothed or compacted, without compromising safety. It will not undergo any final treatment, and it is even desirable to preserve traces of machinery. The outcome of a seeding operation is directly linked to the condition of the slope surface: even if it is in stable equilibrium, it will remain rough and uneven, such that the seeds and products of hydroseeding or the topsoil to be spread will find spaces where they can resist washing away or sliding.

The costs of this conditioning will be borne by the Contractor.

1.9. ENVIRONMENTAL IMPACT STUDY

An Environmental Impact Assessment will be conducted in the event of substantial project changes during the execution of the works (access and work roads, surplus plan, and other unforeseen modifications).

According to Law 21/2013, of December 9, on Environmental Assessment, any plan, program, or project that may have significant effects on the environment must undergo an appropriate environmental assessment before its adoption, approval, or authorization. Its methodology and content must comply with the provisions of said Law and Law 9/2018, of December 5, which modifies Law 21/2013, of December 9, on environmental assessment, Law 21/2015, of July 20, which modifies Law 43/2003, of November 21, on Forests and Law 1/2005, of March 9, which regulates the greenhouse gas emission rights trading system.

1.10. RECEIPT AND SETTLEMENT

1.10.1. SETTLEMENT PROJECT

The Contractor shall submit to the Construction Management for approval all sketches and drawings of the actual work that involve modifications to the Project or that permit and have been used to establish certification editions.



With all this documentation duly approved, or with the contradictory plans and measurements from the Construction Management, as applicable, the Settlement Project shall be drawn up. Based on this, the final settlement of the works shall be carried out in a single final certification, as indicated in the section on certifications.

1.10.2. PROVISIONAL WORK RECEPTION

Upon completion of the works covered by this Document, it will be verified that they have been completed in accordance with the prescribed conditions. In this case, provisional acceptance will be carried out in accordance with the provisions of the General Administrative Clauses Document (Chapter VI, Section 1) and the General Regulations for State Contracting (Chapter VI, Section 2).

The provisional acceptance report will record any deficiencies that, in the opinion of the Construction Management, must be remedied by the Contractor. It will also stipulate the maximum period of two (2) months within which they must be executed, as well as the manner in which said work must be carried out.

1.10.3. GUARANTEE PERIOD. CONTRACTOR'S OBLIGATION

The warranty period, starting from the provisional acceptance of the works, will be one (1) year. During this period, the Contractor will be responsible for their routine maintenance, regardless of the nature of the work to be performed, provided that it is not due to force majeure. It must also remedy any issues noted in the provisional acceptance certificate. The Contractor will be responsible for any costs corresponding to general testing to be performed during the warranty period, provided that this has been indicated in the provisional acceptance certificate.

The warranty period for the actions related to sowing and planting, described in the Revegetation Project and as established in the Specifications Document, will be two (2) years. During this warranty period, maintenance and upkeep of the plants, sowing, and related works will be established for a period of two (2) years, as specified in the Specific Specifications Document for the Revegetation Project.

Maintenance encompasses all work that must be performed periodically, daily, or seasonally, on planted areas to allow them to evolve and develop as designed in the project, thus achieving the functional and botanical characteristics that define and distinguish them, as well as to increase the ornamental value for which they are often planted. For maintenance and conservation, the Revegetation Project establishes a section for the

maintenance and upkeep of plantations throughout the warranty period. The Construction Management will conduct as many inspections as it deems necessary to ensure the proper maintenance of plants, plantings, and structures. Regarding the Contractor's responsibility, the Construction Management is responsible for determining the true cause of any deterioration or deficiencies and deciding who is responsible for the costs of repairs.

1.10.4. DEFINITIVE WORK RECEPTION

Once the guarantee period has expired, the amounts retained as a guarantee will be definitively accepted, if applicable. The final acceptance of the works does not exempt the Contractor from any liability that may apply, in accordance with current legislation, regarding possible defects due to hidden flaws that may arise during the project's useful life. Upon final acceptance, the Contractor shall be required to verify any work or deficiencies that, for various 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 a mixture in appropriate proportions of cement, coarse aggregate, fine aggregate and water, with or without the addition of additives or additions, which develops its properties by hardening the cement paste (cement and water).

2.1.2. GENERAL CONDITIONS

Materials corresponding to this type must meet the characteristics specified by the Structural Code.

2.1.3. MATERIALS

The materials used in the manufacture of concrete, whose characteristics are determined in their corresponding articles of PG-3, will be as follows:

- Article 202, "Cements"
- Article 280, "Water to be used in mortars and concretes"
- Article 281, "Additives to be used in mortars and concretes"
- Article 283, "Additions to be used in concretes"

2.1.4. TYPES OF CONCRETE

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 scheduled so that its implementation is carried out continuously. The time between deliveries may not exceed thirty minutes (30 min) under any circumstances when the concrete belongs to the same structural element or phase of a structural element.

2.1.6. EXECUTION

Pouring

Free pouring of concrete from heights greater than two meters (2 m) is not permitted. Pouring it with shovels from great distances, distributing it with rakes, or advancing it more than one meter (1 m) inside the formwork is prohibited. Always ensure that the concrete is distributed vertically, avoiding projecting the pouring jet onto reinforcement or formwork. When pouring the concrete, it will be vibrated to ensure the reinforcement is perfectly enclosed, paying special attention to areas with a large amount of reinforcement.

Compaction

Vibrators will always be applied so that their effect extends to the entire mass, without causing local segregation or significant grout leakage through the formwork joints. Compaction will be more careful and intense along the walls and corners of the formwork and in areas with a high density of reinforcement, until the paste flows back to the surface. If surface vibrators are used, they should be applied slowly, ensuring the concrete surface is completely moistened.

If vibrators attached to the formwork are used, special care should be taken to ensure the rigidity of the formwork and the devices that anchor the vibrators to it.

If internal vibrators are used, they should be immersed vertically into the layer, so that their tip penetrates the adjacent, already vibrated layer, and withdrawn at an angle. The needle should be inserted and withdrawn slowly and at a constant speed; it is recommended not to exceed ten centimeters per second (10 cm/s). The distance between immersion points should be adequate to give the entire surface of the vibrated mass a shiny appearance; as a general rule, vibrating many points for a short time is preferable to vibrating a few points for a prolonged period.

Curing

During the setting and initial hardening period, the concrete must be maintained in a moist state. To achieve this, it must be cured using procedures that do not cause any damage to the surface, if it is to remain exposed, nor involve the introduction of substances harmful to the concrete.



Curing procedures may include direct irrigation with water (to prevent the concrete from washing out), the use of burlap, straw mats, or other similar fabrics with high moisture retention capacity, plastic sheeting, and film-forming curing products, so that the evaporation rate does not exceed half a liter per square meter per hour (0.50 l/m²/h).

When concreting is carried out at temperatures above 40 degrees Celsius (40°C), the concrete must be wet-cured. The curing process must continue uninterrupted for at least 10 days (10 d).

2.1.7. MEASUREMENT AND PAYMENT

Concrete will be paid for by cubic meters (m³) measured according to the project plans for the work units actually executed. Cement, aggregates, water, admixtures, and additions, as well as the manufacturing, transportation, and pouring of the concrete, are included in the unit price of the concrete, as are its compaction, jointing, curing, and finishing.

Operations required to repair defects will not be paid for.

2.2. MORTAR

2.2.1. DEFINITION

Cement mortar is defined as a mixture consisting of fine aggregate, cement, and water. It may occasionally contain additives to improve some of its properties, the use of which must have prior approval from the Project Manager.

2.2.2. MATERIALS

The materials used in the manufacture of mortar, whose characteristics are determined in their corresponding articles of PG-3, will be as follows:

- Article 202, "Cements"
- Article 280, "Water to be used in mortars and concretes"
- Articles 281 to 284, Additives
- Article 610.2.3, Fine aggregate

2.2.3. TYPES OF MORTAR

M-250 type mortar will be used.

2.2.4. FABRICATION

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 color is obtained. The strictly necessary amount of water will then be added so that, once mixed, the mixture has the appropriate consistency for application on site.

Only the mortar required for immediate use will be manufactured, rejecting any mortar that has begun to set and any that has not been used within forty-five minutes (45 min) of mixing.

2.2.5. MEASUREMENT AND PAYMENT

Mortar will not be directly charged, 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 meters (m³) actually used.

2.3. CORRUGATED STEEL BARS

2.3.1. DEFINITION

Corrugated bars for structural concrete are substantially cylindrical steel products with raised or grooved surfaces to improve their adhesion to the concrete.

2.3.2. GENERAL CONDITIONS

Materials corresponding to this type must meet the characteristics specified by the Structural Code.

2.3.3. TYPES 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 delivery location in the stipulated conditions.

2.3.5. RECEIPT AND CONTROL

Before ordering the batch, the scheduled tasks must be planned to facilitate unloading and storage operations.

Inspections

Each delivery of an assembly batch must be accompanied by a delivery sheet, which must be available at all times to the construction manager/contract manager. It must include, at a minimum, the following information:

- Name of the company supplying the batch.
- Serial number of the delivery sheet.
- Delivery date.
- Name of the requester and the person responsible for receiving.
- Technical specifications of the delivered material.
- Quantity and arrangement of the material comprising the load, expressed in kg of material.
- Identification of the delivery truck (or transport equipment) and the person performing the unloading.

2.3.6. QUALITY CONTROL

Mechanical test results may be requested randomly.

Penalty

In the event of non-compliance with specifications affecting the strength characteristics of the supplied steel, and provided that, in the opinion of the project manager/contract manager, these defects do not entail a significant loss of the functionality and safety of the project or part of it and cannot be corrected subsequently, the batch may be accepted, and penalties will be applied in the form of a deduction from the valued ratio, according to the following formula.:

$$P1 = 0,1 \cdot P$$

Where:

- P1: unit deduction for penalty, €/kg.
- P: steel price, €/kg.

2.3.7. MEASURE

The measurement and payment of the steel will be carried out in accordance with the Specific Technical Specifications for the work unit of which it forms part.

2.4. ASPHALT BITUMS**2.4.1. DEFINITION**

According to the UNE-EN 12597 standard, asphalt bitumens are defined as practically non-volatile hydrocarbon binders obtained from crude oil or present in natural asphalts, which are completely or almost completely soluble in toluene and have 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 are without prejudice to the provisions of Regulation 305/2011 of 9 March 2011 of the European Parliament and of the Council establishing harmonized conditions for the marketing of construction products. For products bearing the CE marking, the manufacturer shall assume responsibility for their conformity with the declared performance, in accordance with Article 11 of the Regulation.

Asphalt bitumens must bear the CE marking, in accordance with the provisions of the previous UNE-EN standards.



Furthermore, the provisions of current legislation on environmental matters, health and safety, production, storage, management, and transport of construction products, construction and demolition waste, and contaminated soil shall apply in all cases. The use of asphalt bitumens containing tar or other substances derived from the distillation of carbonaceous products (coal or others), or oxidized bitumen 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 operating temperature.

The designation of conventional and hard asphalt bitumens will consist of two numbers, representing their minimum and maximum penetration, determined according to standard UNE-EN 1426, separated by a slash (/).

For both the wearing course and the intermediate and base courses, the bituminous binder to be used will be conventional asphalt bitumen type 50/70.

2.4.3. TRANSPORT AND STORAGE

Asphalt bitumen will be transported in heat-insulated tanks. The tanks will have a suitable sampling facility, will be equipped with thermometers located at clearly visible points, and must be equipped to heat the asphalt bitumen when, due to any anomaly, the temperature drops and may impede its transfer.

The Contractor will inform the Construction Manager 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 prior cleaning must be carried out if they previously contained any other product.

The Construction Manager may authorize, only for very short transports and in exceptional cases, the use of ordinary tanks without insulation or a heating system, including those commonly used for the transport of other liquids, provided that it can be verified that the tank has been used completely clean.

Asphalt bitumen shall be stored in one or more tanks, adequately insulated from each other, equipped with vents to prevent pressure buildup, and equipped with the necessary measuring and safety equipment in easily accessible locations.

The tanks must be heat-insulated and equipped with thermometers located at clearly visible points and equipped with their own heating system, capable of preventing the temperature from deviating more than ten degrees Celsius (10°C) from the storage temperature in the event of any anomaly. They shall also have a suitable valve for taking samples.

When storage tanks do not have their own loading facilities, the tankers used for transporting asphalt bitumen shall be equipped with pneumatic or mechanical means for rapid transfer of their contents. When transfer pumps are used, rotary pumps are preferable to centrifugal pumps.

All pipes and pumps used for transferring asphalt bitumen, from the transport tank to the storage tank and from there to the application equipment, must be heated, thermally insulated, and arranged so that they can be easily and thoroughly cleaned after each application and/or workday. Transfer from the transport tanks to the storage tanks will always be carried out through direct piping.

The Project Manager will check, as frequently as he deems necessary, the transport and transfer systems and storage conditions for any issues that could affect the quality of the material. If they are not in compliance, he will suspend the operation until the necessary measures are taken to ensure that it is carried out in accordance with his requirements.

2.4.4. RECEPTION AND IDENTIFICATION

Each tanker shall be accompanied by a delivery note and information regarding the CE labeling and 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 supplier company, the date of manufacture and delivery, the vehicle transporting it, the quantity and type of asphalt bitumen supplied, the purchaser and destination, and the order reference.

The CE labeling 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 first installation, the reference number of the Declaration of Performance, the reference to the corresponding European standard, the product description, and information on the essential characteristics included in the corresponding standard.



The data sheet shall contain, at a minimum, the tanker's delivery note reference, the commercial name, if applicable, and the type of bitumen supplied, as well as the penetration values according to the NLT-124 penetration index, the NLT-181 Fraass brittle point, and 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 necessary to ensure uniformity and maintenance of product properties during the manufacturing and installation process.

The supplier must provide a certificate, provided by the manufacturer, confirming 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 reception control, documentary verification will be carried out to ensure that the values declared in the information accompanying the CE marking meet the specifications established in this document.

Regardless of the acceptance of the veracity of the properties referred to in the CE marking, if any anomaly is detected during transport, storage, or handling, the Works Manager may request at any time that inspections and tests be carried out on the materials supplied to the project.

From each bitumen tanker arriving at the project, two (2) samples of at least one kilogram (1 kg) will be taken (UNE-EN 58 standard) at the time the material is transferred from the tanker to the storage tank.

One of the samples will be used to determine penetration (UNE-EN 1426 standard), and the other will be used for contrast testing if necessary.

Mixer entrance control

A batch of three hundred tons (300 t) of asphalt bitumen will be considered a batch, which will be accepted or rejected as a block, in accordance with the provisions of section 211.7 of this article. In any case, the Specific Technical Specifications Document or the Works Director may specify another batch size.

From each batch, two (2) samples of at least one kilogram (1 kg) will be taken (UNE-EN 58 standard), at a point between the storage tank outlet and the mixer inlet.

The penetration (UNE-EN 1426 standard) and softening point (UNE-EN 1427 standard) will be determined on one of the samples, 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 Works, in the exercise of his powers, may require the performance of the tests necessary to verify the characteristics specified in the following table, with a recommended frequency of once (1) each 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 Document, or failing that, the Works Director, will indicate the measures to be adopted in the event that the asphalt bitumen does not meet any of the characteristics established in the table above.

2.4.7. MEASURE

The measurement and application of asphalt bitumen will be carried out as indicated in the Specific Technical Specifications for the work unit of which it forms part, in tons (t).



2.5. BITUMINOUS EMULSION

2.5.1. DEFINITION

Bituminous emulsions are defined as dispersions of small particles of a hydrocarbon binder and, if appropriate, a polymer in a solution of water and an emulsifying agent.

For the purposes of applying this specification, cationic bituminous emulsions, in which the hydrocarbon binder particles have a positive polarity, are considered for use on the State's road network.

2.5.2. GENERAL CONDITION

The provisions of this article are without prejudice to the provisions of Regulation 305/2011 of the European Parliament and of the Council on harmonized conditions for the marketing of construction products. For products bearing the CE marking, the manufacturer shall assume responsibility for their compliance with the declared performance. These must be accompanied by the Declaration of Performance, and the product's instructions and safety information.

The Contractor must verify that the values declared in the documents accompanying the CE marking allow for inferring compliance with the specifications contemplated in the Project or, failing that, in these Documents. In the event that there are indications of non-compliance with the declared specifications, the Contractor must adopt all measures it deems appropriate to ensure the suitability of the product supplied for the project.

Cationic bituminous emulsions must bear the CE marking, in accordance with the provisions of standard UNE-EN 13808.

Furthermore, current legislation on environmental matters, health and safety, production, storage, management, and transportation of construction products, construction and demolition waste, and contaminated soil will be complied with in all cases. The use of asphalt bitumens containing tar or other substances derived from the distillation of carbonaceous products (coal or others), or oxidized bitumens, is prohibited.

2.5.3. TECHNICAL CHARACTERISTICS

The designation of modified or unmodified cationic bituminous emulsions will follow the following scheme, in accordance with the UNE-EN 13808 standard:

C	% ligante	B	P	F	C. rotura	aplicación
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Where:

- C: Cationic emulsion.
- Binder %: Nominal binder content (UNE-EN 1428 standard).
- B: Indication that the hydrocarbon binder is an asphalt bitumen.
- P: To be added if the emulsion incorporates polymers.
- F: To be included if a fluidizer content greater than 3% is incorporated. Indicating the type may be optional (Fm: Mineral fluidizer, Fv: Vegetable fluidizer).
- C. Break: Indicates the break behavior class (UNE-EN 13075-1 standard), from 2 to 10.
- Application: Type of emulsion application (ADH: Bonding coating, TER: Thermo-adhesive bonding coating, CUR: Curing coating, IMP: Primer coating, MIC: Cold micro-agglomeration, REC: Cold recycling).

The material used must meet all the general specifications set forth in the corresponding chapter of PG-3.

- Curing coat: C60B4 CUR bituminous emulsion, with a binder content of at least 300 g/m² of residual binder.
- Primer coat: C60BF5 IMP bituminous emulsion, with a binder content of at least 500 g/m² of residual binder.

2.5.4. TRANSPORT AND STORAGE

The bituminous emulsion will be transported in tanks and stored in one or more tanks, adequately insulated from each other. These tanks must be equipped with vents to prevent pressure buildup and must be equipped with the necessary measuring and safety devices, located at easily accessible points. They must also have a suitable valve for sampling.

When the storage tanks do not have their own loading facilities, the tanks used for transporting bituminous emulsion must be equipped with pneumatic or mechanical means for rapid transfer.



All direct piping and pumps, preferably rotary, used for transferring the bituminous emulsion from the transport tank to the storage tank and from there to the on-site application equipment or mixer must be arranged so that they can be easily and thoroughly cleaned after each application or workday.

The Project Manager will check, as frequently as he deems necessary, the transport and transfer systems and storage conditions for any issues that could affect the quality of the material. If they are not in compliance, he will suspend the use of the contents of the corresponding tank or cistern until the specifications he deems appropriate have been verified.

2.5.5. RECEPTION AND IDENTIFICATION

Each tanker of cationic bituminous emulsion arriving at the construction site must be accompanied by a delivery note and information regarding the labeling and CE marking according to standard UNE-EN 13808.

The delivery note must contain the identifying information of the supplier; the vehicle transporting it; the quantity, commercial name and order reference; the name and address of the purchaser and the destination.

The labeling and CE marking must include their identification and characteristics.

The supplier must provide a certificate, if applicable, provided by the manufacturer, stating that the emulsion does not contain tar or other substances derived from the distillation of carbonaceous products, nor oxidized bitumen.

2.5.6. QUALITY CONTROL

Reception control

For reception control purposes, 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 this document.

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 Works Manager may, at any time, order inspections and tests to be carried out on the materials supplied to the project.

From each bituminous emulsion tanker arriving at the project, two (2) samples of at least two kilograms (2 kg) will be taken, in accordance with the UNE-EN 58 standard, at the time the material is transferred from the

tanker to the storage tank. The appropriate tests will be performed on one of the samples, and the other will be kept for at least fifteen days (15 days) for verification tests, if necessary. In any case, the Director of Works may establish additional criteria for the control of the reception of the tanks.

Control at the momento of use

A batch, which will be accepted or rejected as a block, will be considered to be thirty tons (30 t) or the daily fraction of bituminous emulsion, except in the case of emulsions used in adhesion coatings, priming, and curing, in which case the weekly fraction will be considered the batch. In any case, the Specific Technical Specifications Document or the Works Director may specify another batch size.

Two (2) samples will be taken from each batch, and the same tests performed as those performed for acceptance control will be performed.

Additional control

In order to prevent potential anomalies that may have occurred during the transportation and/or storage of the materials, the Project Manager may require the necessary tests to verify their characteristics, with a recommended frequency of once (1) per month and at least three (3) times during the execution of the works, for each type and composition of bituminous emulsion.

If the bituminous emulsion has been stored for more than fifteen days (>15 d) before use, at least two (2) samples shall be taken, one from the top and one from the bottom of the storage tank, for the sieve test (UNE-EN 1429) and the binder content test (UNE-EN 1428). If it does not comply with the requirements for this characteristic, it shall be homogenized and new tests performed, or it shall be removed. In unfavorable atmospheric conditions or in abnormal construction situations, the Works Director may reduce the storage period in order to verify storage conditions.

2.5.7. ACCEPTANCE OR REJECTION CRITERIA

The Specific Technical Specifications Document, or failing that, the Works Director, will indicate the measures to be taken in the event that the bituminous emulsion does not meet any of the established specifications.

**2.5.8. MEASURE**

a The measurement and application of 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 applied based on the tons (t) actually stored.

2.6. THERMOPLASTIC MATERIALS FOR ROAD MARKS**2.6.1. DEFINITION AND CLASSIFICATION**

This section defines thermoplastic marking materials that, once melted, are hot-applied to mark road markings on bituminous pavements, drying instantly.

This mixture consists of coarse-grained mineral substances (up to 700 microns), a resin, and a plasticizer, both in solid granular or flake form. They also contain premixed glass microspheres, a special mineral oil that helps control application viscosity and plasticize the material, and a pigment that gives it its color.

Thermoplastic materials are solvent-free, and heat fluidizes the product to allow for application. They solidify immediately after application.

These materials can be applied either by extrusion or by spray gun, allowing the addition of glass microspheres immediately after application.

2.6.2. AGGREGATES

They are essentially composed of natural white mineral substances with a suitable granulometry to achieve maximum compaction, such as silica sand, quartz, calcite, etc.

2.6.3. PIGMENT

It is made from titanium dioxide, which gives the product its white color, and may eventually incorporate a suitable extender that has a hardness and particle size that makes it, at the same time, resistant to wear and slipping.

2.6.4. BINDER OR PLASTICIZER VEHICLE

aConsisting of one or more thermoplastic resins of various types, natural or synthetic, intended to bind the aggregates and pigments together and provide adhesion to the pavement.

Said vehicle must be properly plasticized, generally with special oils, and stabilized against ultraviolet rays.

The proportion of the constituents in the mixture may be freely decided by the manufacturer, provided it meets the conditions imposed as characteristics of the material before and after application.

2.6.5. GENERAL CHARACTERISTICS**2.6.5.1. GENERAL CHARACTERISTICS**

Their color shall be white, meaning that corresponding to reference B-118 of Standard UNE 48.103, and they shall always be reflective.

The material shall be solid at room temperature and of paste-like consistency at forty degrees Celsius (40 °C).

Its specific gravity shall be between one and nine-tenths and two and one-tenths kilograms per cubic decimeter (1.9-2.1 kg/dm³).

The applied material shall not deteriorate due to contact with sodium calcium chloride and other chemical agents commonly used to prevent the formation of ice on the roadway, nor due to fuels or lubricants that may be deposited by traffic.

In their plastic state, the materials shall not emit fumes that are toxic or in any way hazardous to people or property.

The viscosity/temperature ratio of the plastic material shall remain constant for at least four (4) reheatings.

To ensure the best adhesion, the specified compound shall be melted and held at a minimum temperature of one hundred ninety degrees (190°C) without discoloration after four (4) hours at this temperature.

When heated to two hundred degrees Celsius (200°C) and dispersed with paddles, it shall not exhibit clots, hard deposits, or color separation, and shall be free of skin, dirt, foreign particles, or other ingredients that could cause bleeding, staining, or discoloration.



The flash point shall not be less than two hundred thirty-five degrees Celsius (235°C) when used in the Cleveland Open Cup.

The material will contain approximately twenty percent (20%) of glass microspheres by weight, and forty percent (40%) of the total weight must be supplied separately (Combinex method). Therefore, the machinery must be adapted to this type of application. This process ensures their permanence in the road marking throughout its useful life, making thermoplastics one of the best alternatives for long-lasting retroreflection, as the natural wear of the road marking will gradually cause them to appear. Initial performance depends on the application of post-mix microspheres, but these have a very short useful life (1 to 6 months), at which point the pre-mixed spheres appear.

The vehicle for the pigmented organic binder will consist of a mixture of thermoplastic synthetic resins and plasticizers, at least one of which will 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 material dries instantly, allowing a reasonable time of thirty (30) seconds, without sticking, discoloring, or shifting under the influence of traffic.

These materials achieve the highest levels of nighttime visibility throughout their useful life, reaching more than 400 mcd.m².lx⁻¹ after withstanding four million wheel passes in the durability test.

2.6.5.2. DRY FILM CHARACTERISTICS

Directional lightning reflectance

The directional luminous reflectance (MELC-12.97) for the white color, daytime visibility of the applied line, will not be less than seventy-five (75) when the measurement is made with standardized light under an angle of forty-five degrees (45 °C).

Retroreflection

The retroreflection or night visibility shall be greater than one hundred and fifty millicandelas per lux and square meter (150 mcd/lux/m²) measured with a retroreflectometer operating at an angle of incidence of eighty-six degrees thirty minutes (86° 30') and an angle of divergence of one degree thirty minutes (1° 30').

Softening Point

The softening point shall not be less than ninety-five degrees Celsius (95°C), measured by the ball and ring method (ASTM B-28-58-T), using truncated cone rings.

Heat stability

The manufacturer shall indicate the safety temperature, i.e., the temperature at which the material can be maintained for a minimum of six (6) hours in a closed kettle or application machine without deterioration. This temperature shall not be lower than the softening temperature, measured according to the test indicated in the previous point, minus fifty degrees Celsius (50 °C).

The decrease in luminance, using an EEL reflectance spectrophotometer with 601, 605, and 609 filters, shall not exceed five (5) units.

Light stability

The decrease in light reflectance when a test piece of the material is subjected to the action of ultraviolet rays for sixteen hours (16 h) will not exceed five (5) units.

Flux resistance

The decrease in height of a thermoplastic cone of twelve centimeters (12 cm) in diameter and one hundred plus/minus five millimeters (100 ± 5 mm) in height during forty-eight (48) hours, at forty degrees Celsius (40 °C), will not be greater than twenty percent (20%).

Impact resistance

The impact of a steel ball falling from two meters (2 m) height 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) thick must not cause deterioration in at least six of the samples.

Abrasion resistance

Abrasion resistance will be measured by means of a Taber Abraser apparatus, using H-22 calibrated wheels, for which the material will be applied to a Monel plate one-eighth of an inch thick and the test piece will be



subjected to water-lubricated abrasion. The weight loss after one hundred (100) revolutions will not exceed half a gram (0.5 gr).

Slip resistance

All materials used in road markings shall offer a coefficient of sliding friction 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 Skide apparatus of the Road Research Laboratory.

2.6.6. RECEPTION CONTROL

The Project Manager will require the corresponding official certificates to be presented prior to the start of stockpiling.

An initial random sampling will be performed, removing one can from every forty (40). One can, chosen at random, will be sent to an Approved Official Laboratory to verify compliance with all the specifications indicated in this Document. The remaining cans will be reserved until the results arrive, in order to perform cross-check tests in case of doubt.

At any time, the Project Manager may require any of the aforementioned tests to be performed, as well as choose the sample on which said tests will be performed, which may be taken from the reserved cans or from the stockpiles.

2.6.7. MEASUREMENT AND PAYMENT

The measurement and payment of these materials will be carried out in accordance with the specifications for the work unit of which they form part.



3. EXPLANATIONS

3.1. LAND CLEARANCE AND BRUSHING

3.1.1. DEFINITION AND SCOPE

The specifications for this work unit are based on those defined in Article 300 - "Land Clearing" of PG-3.

This consists of removing and clearing from the designated areas all trees, stumps, plants, weeds, brush, fallen wood, debris, trash, or any other undesirable material, as determined by the Project Manager. This includes the removal of stakes, foundations, and other fencing elements from rural plots, as well as the removal of trees not included in the work unit and the elimination of unpaved roads. This operation includes the following:

- Removal of the materials to be cleared.
- Removal and spreading of these materials in their final location.

Top soil must always be removed, except when it is to be maintained as directed by the Project Manager.

3.1.2. WORK EXECUTION

Removal of materials to be cleared:

In all cases, the provisions of current legislation regarding the environment, health and safety, and the storage and transportation of construction products shall be observed.

Topsoil must be removed from ground surfaces affected by excavations or embankments to a depth of 30 cm or the depth verified or defined during the work.

Removal operations shall be carried out with the necessary precautions to achieve sufficient safety conditions and avoid damage to existing nearby structures.

The Contractor shall provide appropriate protective measures to prevent damage to vegetation, objects, and services considered permanent. When these elements are damaged by the Contractor, they must be replaced, with the approval of the Project Manager, at no cost to the Owner.

All stumps or roots larger than ten centimeters (10 cm) in diameter shall be removed to a depth of not less than fifty centimeters (50 cm) below the grade line. Outside the grade line, vegetation stumps that the Project Manager deems necessary may be left cut to ground level.

All voids caused by the removal of stumps and roots shall be filled with material similar to the soil exposed by clearing and compacted as specified in this Document until the surface conforms to that of the existing ground. All pits and holes within the grade line shall be filled in accordance with the Project Manager's instructions.

Removal and disposal of materials subject to clearing:

All forest products or by-products not suitable for use will be disposed of in accordance with the Project's provisions or orders issued by the Project Manager. In principle, these items will be burned when this operation is permitted and accepted by the Project Manager. The Contractor must have specialized personnel available to prevent damage to both vegetation and nearby property. At the end of each phase, the fire must be completely extinguished.

Topsoil from clearing must be disposed of in its final location as quickly as possible. If used directly, it must be stored in piles no higher than two meters (2 m). It must be protected from vehicle traffic or overloading, and its transfer must be minimized.

If dumping is carried out outside the designated area, the Contractor must secure suitable sites not visible from the roadway. These sites must be approved by the Project Manager, who must be provided with copies of the contracts with the affected landowners.

3.1.3. MEASUREMENT AND PAYMENT

This work unit includes obtaining permits for the disposal of cleared material.

Vegetation protection measures and permanent assets and services will not be subject to separate payment. Clearing of borrow areas will not be paid for either.

The unit will be measured and paid for according to the Project price tables for the square meters (m²) measured on the Plan, i.e., the area to which the unit applies, excluding land that does not require clearing and clearing, such as paved roads.



3.2. TREE CUTTING

3.2.1. DEFINITION

The specifications for this work unit are based on those defined in Article 306 - "Tree Felling with Stump Removal" of PG-3.

This is defined as the set of operations required to cut, uproot, 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:

- Tree felling.
- Stump removal.
- Loading and transporting the extracted materials to the landfill or site of use.
- Filling and compacting the cavities caused by the removal of stumps and roots with artificial gravel.

For the purposes of this unit, trees between 5.00 and 7.00 meters in height are considered.

3.2.2. WORK EXECUTION

The execution of this work unit must have the prior approval of the Construction Manager. In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transportation of construction products will be observed.

The trees will be cut using a power saw, and the necessary precautions must be taken to ensure sufficient safety conditions and prevent harm to third parties, personnel, and construction equipment.

Trees suitable for harvesting will be pruned and cut into lengths of no less than three (3) meters and must be stored in the location designated by the Construction Manager.

All voids in the ground caused by the removal of stumps and roots will be filled with tolerable soil and compacted to 98% Modified Proctor until the surface conforms to that of the existing ground.

Stumps, roots, and other unusable material will be removed by transport to a landfill or site of use.

The surrounding buildings and facilities will be protected.

The services affected by the construction of this unit will be temporarily maintained or replaced, and will subsequently be restored to their previous condition.

3.2.3. MEASUREMENT AND PAYMENT

This unit will be measured and paid for, according to the Project price tables, by the units (units) of tree actually felled and stumped.

The price includes tree felling, stump removal, loading and transport of the extracted materials to the landfill or site of use as ordered by the Project Manager, filling and compacting the cavity caused by the stump and root removal with artificial gravel, and all other operations and costs necessary for the complete execution of the unit.

The removal of trees shorter than 5.00 m, as well as shrubs, plants, weeds, and other similar elements, will be measured and paid for as specified in the "Land Clearing and Clearing" section of this Specific Technical Specifications.

3.3. EXCAVATIONS

The specifications of this work unit are based on those defined in Article 320 - "Excavation of grading and borrowing" of PG-3.

3.3.1. DEFINITION

This consists of the set of operations to excavate and level the areas where the road will be laid, including the platform, slopes, and ditches, as well as planned or authorized borrow areas, and the subsequent transportation of the removed products to the warehouse or site of use.

This unit includes the widening of trenches, the improvement of slopes in cuts, and additional excavation on unsuitable soils, as ordered by the Project Manager.



3.3.2. EXCAVATION'S CLASSIFICATION

Excavation is considered to be in soft ground throughout the entire clearing area, carried out by mechanical means.

3.3.3. SLOPES

The cut slope will be **0.5H/1V**.

3.3.4. WORK EXECUTION

Generalities

Once the land clearing operations are completed, excavation work will begin, adhering to the alignments, slopes, dimensions, and other information contained in the Project, and to any other relevant instructions from the Project Manager. The Contractor must notify the Project Manager of the commencement of any excavation and the planned execution system in advance to obtain approval.

To this end, excavation systems other than those included in the Specific Technical Specifications Document must not be used, especially if the intended variation could cause excessive damage to the land.

During the execution of the works, appropriate precautions will be taken in all cases to avoid diminishing the strength or stability of the unexcavated ground. In particular, the tectonic-structural characteristics of the surrounding area and alterations to its drainage will be taken into account, and the necessary measures will be adopted to avoid the following phenomena: instability of rock slopes or blocks of rock due to inadequate blasting, landslides caused by the unseating of the excavation base, waterlogging due to inadequate drainage of the works, excessive temporary slopes, etc.

In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transportation of construction products will be observed.

Tolerancia Geométrica de Terminación de las Obras

The following tolerances are established:

- Slopes up to 3 m: + 15 cm
- Slopes over 3 m: + 25 cm

The defined tolerances may be modified by the Project Manager.

The maximum allowable tolerance for slopes, ditch bottoms, and drains will depend on the slope defined in the Project for each work unit.

- Ditches and drains with a slope between 3‰ and 5‰ = ± 1‰.
- Ditches and drains with a slope between 5‰ and 10‰ = ± 2‰.
- Ditches and drains with a slope greater than 10‰ = ± 4‰.

The maximum deviation in plan for ditches and drains with respect to the slope defined in the Project will be 10 cm.

3.3.5. MEASUREMENT AND PAYMENT

The excavation of the earthworks will be paid for by cubic meters (m³), in all types of terrain, measured on cross-sectional plans.

The price includes transportation of the removed materials to the landfill or place of use, but not refining, which is defined in a separate unit. Also included are the training processes for potential excavators, the payment of occupation fees, and all necessary operations and associated costs for the complete execution of the unit.

3.4. EMBANKMENTS

3.4.1. DEFINITION AND SCOPE

The specifications for this work unit are based on those defined in Article 330 - "Embankments" of PG-3.

This unit consists of the spreading and compaction, in layers, of materials in areas of such dimensions that they systematically allow the use of heavy machinery to create a platform on which the road surface rests. It includes the completion and refining of the esplanade.

Its execution includes the following operations:

- Preparation of the support surface for the embankment-type fill.
- Spreading one layer.
- Wetting or drying one layer.



- Compaction of one layer.

The last three operations will be repeated as many times as necessary.

3.4.2. MATERIAL'S CLASSIFICATION

The materials used to form the embankments will be classified into the following types:

- Selected soils (75 cm thick at the crest).
- Tolerable soils.

3.4.3. SLOPES

The embankments will be laid out with a **0.5H/1V slope**.

3.4.4. WORK EXECUTION

Compaction Control

Compaction control will be intended to verify, on the one hand, that each layer meets the dry density and moisture content requirements established by the Project Manager, and, on the other hand, that the deformability characteristics are adequate to ensure acceptable fill performance.

To this end, control will be carried out using the "Finished Product Control" method, through in-situ determinations on the compacted fill, comparing the results obtained with the corresponding reference values. In special circumstances, the Project Manager may also prescribe additional testing to characterize the geotechnical properties of the fill (shear strength, expansiveness, collapse, etc.).

Compaction control will be performed using a plate load test according to NLT-357, on the crest (grade). The vertical deformation modulus in the second load cycle of the plate load test (Ev2) will correspond to the grade E31.

Completion and Refining of the Esplanade

The completion and refining of the esplanade will be carried out in accordance with Article 340, "Completion and Refining of the Esplanade" of PG-3.

3.4.5. MEASUREMENT AND PAYMENT

Fills for embankment-type excavations will be paid for by cubic meters (m3), measured on the cross-sectional plans.

Fills that are necessary to restore the leveling to the projected elevations due to excessive excavation or any other case of incorrect execution attributable to the Contractor, nor for increases not provided for in these Documents, in the Project, or previously authorized by the Works Manager, will not be credited. The Contractor is obligated to correct such defects at its own expense without any additional payment.

Two categories are distinguished in relation to their unit price:

- Embankment of selected soil.
- Embankment of soil from excavation.

3.5. SLOPE FINISHING

3.5.1. DEFINITION AND SCOPE

The specifications for this work unit are based on those defined in Article 341 - "Slope Refinement" of PG-3.

This unit consists of the operations required to achieve the geometric finish of the embankment slopes and the crest layer of the causeway.

3.5.2. WORK EXECUTION

Slope refinement works shall be carried out after the construction of drains and masonry works that impede or hinder their implementation. They shall also be carried out after leveling.

In the event of a landslide or instability on a fill slope, the material affected by the landslide must be removed and replaced, and the damage to the structure must be repaired. The contact surface between the replaced material and the remaining material on the slope must be contoured to prevent the development of instabilities in favor of the slope. The slope surface must then be contoured according to the criteria defined in this article.

At the intersections between cut and fill, the slopes will be curved to blend with each other and with the natural ground surface, without creating a visible discontinuity.



The slope finish will be smooth, uniform, and fully in line with the ground and road surface, without major contrasts, and in accordance with the Project. Efforts will be made to avoid damage to existing trees or patinated rocks, for which the necessary adjustments must be made.

In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transportation of construction products will be observed.

3.5.3. MEASUREMENT AND PAYMENT

Slope refinement will be paid for by square meters (m2) measured on the floor plans.



4. DRAINAGE

4.1. CONCRETE DITCHES

4.1.1. DEFINITION

The specifications for this work unit are based on those defined in Article 400 - "Concrete ditch executed on site" of PG-3.

The concrete ditch executed on site is a longitudinal trench dug in the ground next to the platform to receive and channel rainwater. It is lined "in situ" with concrete, placed on a properly prepared bed.

The shape, dimensions, and other characteristics correspond to those of a type VA-75 ditch.

4.1.2. MATERIALS

In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products shall apply.

The provisions of this article shall be without prejudice to the provisions of Royal Decree 1630/1992 (amended by Royal Decree 1328/1995), which establishes provisions for the free movement of construction products, in application of Directive 89/106 EEC. In particular, with regard to special recognition procedures, the provisions of Article 9 of the aforementioned Royal Decree shall apply.

Concrete

The concrete used in the coating, and its components, shall generally comply with the requirements of the following current:

- Structural Code.
- Instructions for the Reception of Cement.
- Articles 610 "Concrete" and 630 "Mass or Reinforced Concrete Works" of PG-3.

The characteristic compressive strength of the concrete shall not be less than twenty megapascals (20 MPa), at twenty-eight days (28 d).

Others

The remaining materials to be used in this work unit, such as fillers, joints, etc., will comply with the specifications in the Project.

The sealing materials to be used in the joints, subject to approval by the Project Manager, may be bituminous products, synthetic elastomeric products, or elastic profiles, with filler and protective materials when necessary, depending on the type of joint involved.

4.1.3. EXECUTION

In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transportation of construction products shall be observed.

Preparation of the Sediment Bed

Starting from the natural surface of the ground or from the leveling, the excavation of the required ditch bed shall be carried out, along with the leveling, refining, and preparation of the sediment bed.

The excavation shall be carried out, whenever possible, from downstream to upstream and, in any case, shall be leveled and sloped to prevent water retention or ponding.

During the construction of the ditches, appropriate measures shall be taken to prevent erosion and changes in the characteristics of the sediment bed. For these purposes, the time that the bed may remain unlined shall be limited to that which is essential for the concrete to be laid, and in no case shall it exceed eight days (8d).

Concreting

Concrete installation will be carried out in accordance with the Structural Code, Article 630 "Mass or Reinforced Concrete Works" of PG-3, and the conditions required by the Project.

Care will be taken to ensure the surface finish, with irregularities greater than fifteen millimeters (15 mm) measured with a static three-meter (3 m) ruler according to NLT-334.

Defects in the thickness of the concrete coating provided for in the Project plans will not exceed ten millimeters (10 mm) or one-quarter (1/4) of the nominal thickness.



Sections that do not meet these conditions will be raised and rebuilt, and filling with cement mortar will not be permitted.

Joints

Joints will be arranged as shown on the plans or in the Project.

Contraction joints will generally be constructed at a distance of two meters (2 m), with a thickness of three millimeters (3 mm) for unsealed joints and at least five millimeters (5 mm) for sealed joints.

Expansion joints will be constructed at the junctions with the masonry. Their thickness will be between fifteen and twenty millimeters (15 and 20 mm).

After the concrete has cured, the joints must be cleaned, and the filling, sealing, and protective materials specified in the project must be installed.

4.1.4. MEASUREMENT AND PAYMENT

The ditch is measured in linear meters (lm) executed, measured on floor plans. The payment includes the concrete used and its placement until the entire construction unit is completed.

4.2. MANHOLES

4.2.1. DEFINITION

The specifications for this work unit are based on those defined in Article 410 - "Manholes and Manholes" of PG-3.

The manhole is a prismatic container for collecting water from gutters or drainage pipes and subsequently delivering it to a drain.

The constituent material may be concrete, ceramic materials, prefabricated pieces, or any other material provided for in the Project or approved by the Project Manager. It will normally be covered by a lid or grate.

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 accessible, with a minimum interior dimension of one meter (1 m) and a minimum cover or grate dimension of sixty centimeters (60 cm).

The covers or grates will be aligned with the structure and will be positioned so that their exterior face is level with the adjacent surfaces. They will be designed to withstand traffic, and precautions will be taken to prevent theft or displacement.

The manholes must be easily cleanable; non-accessible manholes are prohibited.

The depth must be adapted to the hydraulic requirements and, where applicable, accessibility requirements. The continuity of the water flow must be ensured. Sand pits will be provided where necessary, and if they do not exist, it must be ensured that the water carries away the sediment.

4.2.3. MATERIALS

In general, all materials used in the construction of manholes and inspection shafts must comply with the specifications specified in the applicable instructions and regulations, as well as in the corresponding articles of this document. In all cases, the provisions of current legislation on the environment, health and safety, and the storage and transport of construction products must be observed.

The provisions of this article are without prejudice to the provisions of Royal Decree 1630/1992 (amended by Royal Decree 1328/1995), which establishes provisions for the free movement of construction products, in application of Directive 89/106 EEC. In particular, with regard to special recognition procedures, the provisions of Article 9 of the aforementioned Royal Decree must be observed.

The following specific requirements must also be met:

Concrete

- Structural Code.



- Instruction for the Reception of Cement (RC-16).
- Articles 610 "Concrete" and 630 "Mass or Reinforced Concrete Works" of PG-3.
- Cleaning and filling concrete must have a minimum characteristic compressive strength of twelve and a half megapascals (12.5 MPa) at twenty-eight days (28 d).

Casting for Caps and Fences

- UNE EN 1561 and UNE EN 1563.

4.2.4. EXECUTION

Tolerances on the dimensions of the manholes and manholes shall not exceed ten millimeters (10 mm) from those specified in the Project plans.

Pipe and gutter connections shall be made at the elevations 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 structure shall be arranged to prevent leakage from the surrounding soil onto or into it.

Covers or grates shall be fitted to the structure and placed so that their exterior face is level with the adjacent surfaces. They shall be designed to withstand traffic, and precautions shall be taken to prevent theft or displacement.

If the Project deems it necessary, a leak test shall be performed.

The backfill of the masonry will generally be carried out with material from the excavation, in accordance with Article 332, "Localized Fills," of PG-3.

In all cases, the provisions of current legislation on environmental matters, health and safety, and the storage and transportation of construction products will be observed.

4.2.5. MEASUREMENT AND PAYMENT

Manholes will be paid for by units actually executed.

The price will include the complete and finished work unit, including excavation, backfilling, and additional elements (cover, frame, slabs, etc.).

4.3. PIPES

4.3.1. DEFINITION

This group of units includes circular pipes used as conduits in transverse and longitudinal drainage projects.

It includes the following activities:

- Supply of prefabricated pipes.
- Preparation and placement of the pipe bed concrete.
- Placement of 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 installed.

They will be Class 135 according to the classification of the UNE-127-010-EX standard, as defined in the Project.

The pipes will be prefabricated from reinforced concrete. They will be supplied in modules with a maximum length of 1.7 m.

The concrete base of the pipe will have a compressive strength of 20 N/mm² for the ODTs, and 15 N/mm² for the collectors.

The concrete and reinforcement used will comply with the requirements defined in their corresponding articles.

The minimum reinforcement for the pipes will be as specified in the UNE-127-010-EX standard.

The joints will be tongue-and-groove, with a compression rubber gasket. They will comply with the requirements of the UNE-53-571 standard.

4.3.3. EXECUTION

The pipes will be installed in sections, in a trench, on an embankment, or in a filled trench, with the minimum dimensions indicated in the plans, on a concrete slab with a characteristic strength of 20 N/mm².



The pipes will then be backfilled to the required level in accordance with the provisions of Article 332 "Localized Backfills" of PG-3. Care will be taken to ensure that the joints are properly sealed to ensure their watertightness.

4.3.4. MEASUREMENT AND PAYMENT

The construction of ODT pipes in embankments is divided into the following activities:

- **Excavation in a compact trench.** By mechanical means, including loading, unloading, and transporting products to the landfill. Measured in cubic meters (m3) according to the ODT Plans.
- **Reinforced concrete pipe.** Diameter 1,800 mm. Including concrete foundation, granular material fill, proportional joints, fully placed. Measured in linear meters (ml) on the floor plan.
- **Finned nozzle.** For 1,800 mm diameter pipes, fully completed. Measured by units (Ud) placed.
- **Backfill with unselected material.** Backfill to complete the embankment core level. Including extension and compaction. Measured in cubic meters (m3) according to the ODT Plans.

In the case of ODTs in embankments, the backfill of the embankment will be executed as established in the corresponding article.

As for the collectors, these will be paid per linear meter (mL) measured on floor plans. Payment includes trench excavation, as well as joints and concrete lining.

5. ROAD STRUCTURE

5.1. ARTIFICIAL GRAVEL

5.1.1. DEFINITION

Gravel is defined as granular material, with a continuous grain size, consisting of fully or partially crushed particles, in the minimum proportion specified in each case, and used as a road surface layer. The execution of road surface layers with gravel includes the following operations:

- Study of the material and obtaining the working formula.
- Preparation of the existing surface.

- Preparation of the material, if applicable, and transportation to the site of use.

- Spreading, moistening, if applicable, and compaction.

This unit includes leveling the resulting leveling at least three (3) points per cross section, leaving stakes at each point. The points will be on the centerline and both ends of the leveling. Profiles will be leveled every twenty (20) meters.

5.1.2. MATERIALS

General Conditions

The materials will come from the crushing and grinding of quarried stone or natural gravel, in which case the fraction retained by the UNE 5 sieve must retain a minimum of seventy-five percent (75%) by weight of crushed elements that present two (2) or more fracture faces. The aggregate will be composed of clean, solid, and resistant elements of reasonable uniformity, free of dust, dirt, clay, or other foreign matter.

The aggregate to be used with aggregates from crushed stone will conform to the uses provided for in PG-3 and specifically ZA (40).

The Project Manager may adopt, at the Contractor's proposal, any other use of the aforementioned PG-3.

Granulometric composition

The fraction sifted through the 0.080 UNE sieve will be less than two-thirds (2/3) of that sifted through the 0.40 UNE sieve, by weight.

The maximum size will not exceed half (1/2) of the thickness of the compacted layer.

The particle size distribution of the materials will fall within one of the zones specified in PG-3, and the Project Manager will determine the appropriate use at the time.

Quality

The wear coefficient measured by the Los Angeles test, according to Standard NLT-149/72, will be less than thirty-five (35). The test will be performed with the type B granulometry indicated in the aforementioned Standard.

**Plasticity**

The material will be "non-plastic," according to Standards NLT-105/72 and 106/72.

The sand equivalent will be greater than thirty (30), according to Standard NLT-113/72.

5.1.3. EXECUTION**Preparing the Seat Surface**

The artificial gravel shall not be laid until it has been verified that the surface on which it is to be laid meets the expected quality and shape conditions, within the established tolerances. To this end, in addition to any eventual repetition of acceptance tests on said surface, the Project Manager may order the passage of a loaded truck to observe its effect.

If there are defects or irregularities on the aforementioned surface that exceed those tolerable, they shall be corrected before the start of the artificial gravel application, in accordance with the requirements of the corresponding Article of the Specific Technical Specifications.

The preparation of the artificial gravel shall be carried out at a plant and not on-site. The addition of compaction water shall also be carried out at the plant, unless the Project Manager authorizes on-site wetting.

The optimum compaction moisture content, derived from the "Modified Proctor" test according to Standard NLT-109/72, may be adjusted to the composition and mode of operation of the compaction equipment, according to the tests performed on the test section.

The materials will be spread once the base layer has been approved, taking the necessary precautions to avoid segregation and contamination, in layers with thicknesses ranging from ten to thirty (10 to 30 cm).

Any water additions will occur before compaction. Afterwards, the only permissible wetting will be to achieve the surface moisture necessary for the next layer. The water will be dosed appropriately, ensuring that in no case will excess water wash out the material.

Compaction of the batch

Once the most suitable moisture content has been achieved, which should not exceed the optimum by more than one (1) percentage point, the layer will be compacted and continued until a density equal to at least that defined in the Quality Control section of this work unit is reached.

Areas that, due to their small size, slope, or proximity to drainage works, walls, or structures, do not allow the use of the equipment normally used, will be compacted using the appropriate means for each case, so that the densities achieved meet the specifications required for the artificial gravel in the rest of the layer.

When the artificial gravel is composed of materials of different characteristics or origins and in-situ mixing has been authorized, each material shall be spread in a layer of uniform thickness, with the coarsest material occupying the lower layer and the finest the upper. The thickness of each of these layers shall be such that, when mixed together, a granulometry that meets the required conditions is obtained. These layers shall be mixed using levelers, harrows, disc harrows, rotary mixers, or other machinery approved by the Project Manager, so as not to disturb the underlying material. Mixing shall continue until a uniform material is obtained, which shall be compacted as described above.

Execution limitations

The artificial gravel layers will be installed when the ambient temperature in the shade is above two degrees Celsius (2°C), and work must be suspended when the temperature drops below this limit.

All traffic will be prohibited on the layers being built until compaction is complete. If this is not feasible, traffic that must pass over them will be distributed so that track marks do not accumulate on the surface.

The Contractor will be responsible for any damage caused by this cause and must repair it in accordance with the instructions of the Project Manager.

When, due to construction requirements, the roadbed cannot be built to its full width in one go, one meter (1 m) of the sidewall of this layer, initially laid as a semi-roadway, must be over-excavated to ensure a proper bond between the two layers.

**5.1.4. QUALITY CONTROL**

Each workday, a pre-intake inspection (1) of the material to be used will be carried out, obtaining at least a dry density corresponding to one hundred percent (100%) of the maximum obtained in the Modified Proctor test according to Standard NLT-108/72.

Uniform material entering two hundred fifty meters (250 m) of roadway or shoulder, or alternatively, three thousand square meters (3,000 m²) of layer, or the fraction constructed daily, if less, will be considered a "batch," which will be accepted or rejected as a block.

The number of inspections per batch, using Natural Humidity tests according to Standard NLT-102/72 and "in situ" Density tests according to Standard NLT-109/72, will be six (6) for each batch.

For moisture and density testing, rapid non-destructive methods such as radioactive isotopes, calcium carbide, air pycnometer, etc., may be used, provided that prior testing has established a reasonable correspondence between these methods and Standards NLT-102/72 and 109/72.

Moisture determination tests are indicative in nature and do not constitute a basis for acceptance or rejection.

The dry densities obtained in the compacted layer constituting the batch shall not be lower than those obtained in the Modified Proctor test performed according to Standard NLT-108/72. No more than two (2) results may be up to two (2) percentage points below the required density.

For each batch, a plate load test (1) shall be performed according to Standard NLT-357/86, consisting of two loading-unloading cycles. The deformation modulus "E" shall be obtained for each cycle, with the second cycle, "E2," exceeding one thousand six hundred kilograms per square centimeter ($E2 > 1,600 \text{ kg/cm}^2$). The ratio between E2 and E1 shall be less than 2.2.

If the required results are not achieved, the batch shall be recompacted until the specified densities and modulus are reached.

Finished Surface Tolerances

With refining stakes leveled to the nearest millimeter (mm) according to the Drawings, arranged along the centerlines and edges of cross-sections, with a distance not exceeding twenty meters (20 m), the finished surface shall be compared with the theoretical surface passing through the heads of said stakes.

The finished surface shall not exceed the theoretical surface at any point, nor differ from it by more than one-fifth (1/5) of the thickness provided in the Plans for the artificial gravel layer.

The finished surface shall not vary by more than ten millimeters (10 mm) when checked with a three-meter (3 m) straightedge, applied both parallel and normal to the roadway centerline. Irregularities exceeding the aforementioned tolerances shall be corrected by the Contractor, in accordance with the Project Manager's instructions.

5.1.5. MEASUREMENT AND PAYMENT

The preparation of the base surface is considered included in the price of the immediately lower layer.

The artificial gravel will be measured in cubic meters (m³), obtained from the standard sections indicated in the Plans.

The credit will be obtained by applying the resulting measurement to the corresponding price in Price Schedule No. 1.

The over-excavation of one meter (1 m) to be carried out on the side of this layer, initially extended as a semi-roadway, when the full width of the platform is extended in two stages, is included within the price of this work unit and, therefore, will not be considered credit.

Any overfill generated in the upper layers that does not reach the project level, despite being within the tolerances, will not result in the measurement and credit of said excess.

5.2. PRIMER IRRIGATION

The specifications of this work unit are based on those defined in Article 530 - "Priming irrigation" of PG-3.

5.2.1. DEFINITION

Primer coating is defined as the application of a hydrocarbon binder to an unstabilized granular layer prior to the placement of a bituminous layer or treatment, in order to create an impermeable surface free of loose mineral particles.

Its execution includes the following operations:



- Preparation of the existing surface.
- Application of the bituminous binder.
- Possible spread of a cover aggregate.

5.2.2. MATERIALS

A **C60BF4 IMP** emulsion will be used.

The dosage will be 1 kg/m².

5.2.3. EXECUTION

Preparation of the Existing Surface

The surface to be primed must be checked to ensure that it meets the conditions specified for the corresponding work unit and is not softened by excessive moisture. If this is the case, it must be corrected in accordance with this Document for the work unit in question or the instructions of the Project Manager.

Immediately before applying the hydrocarbon binder, the surface to be primed must be cleaned of dust, dirt, mud, and loose or harmful materials. Mechanical sweepers or compressed air machines must be used for this purpose; hand-held brooms may be used in areas inaccessible to these devices. Special care must be taken to clean the edges of the area to be primed. Once the surface is clean, it must be lightly watered, without saturating it.

Application of Bituminous Emulsion

When the surface to be primed still retains a certain amount of moisture, the hydrocarbon binder will be applied at the rate and temperature approved by the Project Manager. The Project Manager may divide the total amount into two (2) applications if required for proper irrigation.

The hydrocarbon binder will be spread evenly, avoiding duplication in the transverse joints. To this end, strips of paper or other material will be placed under the diffusers in the areas where irrigation begins or stops. Where strip irrigation is required, a slight overlap of irrigation will be ensured where two adjacent strips meet.

The binder application temperature must be such that its viscosity is between 20 and 100 Saybolt Furol seconds (20 to 100 sSF), according to NLT-138, if a fluidized bitumen is used for primer coatings, or between 5 and 20 Saybolt Furol seconds (5 to 20 sSF), according to NLT-138, if a bituminous emulsion is used.

Any elements—such as curbs, fences, signs, beacons, trees, etc.—exposed to this material must be protected to avoid staining with the binder.

Extent of Cover Aggregate

Any spreading of the cover aggregate will be carried out, by order of the Project Manager, when it is necessary to drive vehicles over the primer or where it is observed that part of it has not been absorbed twenty-four hours (24 h) after the binder has been spread.

The cover aggregate will be spread mechanically in a uniform manner and with the equipment approved by the Project Manager. At the time of spreading, the aggregate must not contain more than two percent (2%) of free water; this limit may be increased to four percent (4%) if bituminous emulsion is used.

Contact of the paver wheels with uncovered binder must be avoided. If aggregate must be spread over a primed strip without the adjacent strip having been primed, an area approximately twenty centimeters (20 cm) wide must be left uncovered, next to the surface that has not yet been treated.

5.2.4. EXECUTION LIMITATIONS

The primer coat may be applied only when the ambient temperature is above ten degrees Celsius (10°C), and there is no reasonable fear of atmospheric precipitation. This limit may be lowered by the Project Manager to five degrees Celsius (5°C) if the ambient temperature tends to rise.

The application of the primer coat shall be coordinated with the application of the overlying bituminous layer so that the hydrocarbon binder has not lost its effectiveness as a bonding element. When the Project Manager deems it necessary, another primer coat shall be applied, which shall not be fertilized if the loss of effectiveness of the previous coat is attributable to the Contractor.

All traffic over the primer coat shall be prohibited until all the binder has been absorbed or, if cover aggregate has been spread, for four hours (4 h) following the spread of said aggregate.

**5.2.5. QUALITY CONTROL**

The hydrocarbon binder must meet the specifications established in the Materials section of this Document, according to the type of hydrocarbon binder to be used.

The quality control of the cover aggregate will be determined by the Project Manager.

Execution Control

The smallest batch size resulting from the application of the following three (3) criteria will be considered as a batch, which will be accepted or rejected as a block:

- 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 Project Manager may determine another batch size.

The amounts of hydrocarbon binder and, if applicable, aggregate will 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 spreading of the aggregate, at no less than five (5) points. For each of these trays, sheets, or plates, the residual binder content will be determined according to UNE-EN 12697-3. The Project Manager may authorize verification of the average hydrocarbon binder and aggregate content by other means.

The ambient temperature, the temperature of the surface to be primed, and the hydrocarbon binder temperature will be checked using thermometers placed away from any heating elements.

5.2.6. ACCEPTANCE OR REJECTION CRITERIA

The average content of both the residual binder and, where applicable, the aggregates, must not differ from the expected content by more than fifteen percent (15%). No more than one (1) individual in the tested sample may present results that exceed the established limits.

The Project Manager will determine the measures to be taken with batches 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 work unit corresponding to the construction of the underlying layer, and therefore will not be charged separately.

The bituminous emulsion used in primer irrigation will be paid in tons (t) calculated as the irrigated area multiplied by the supply. This payment will include the application of the emulsion.

This payment includes any cover aggregate required to allow traffic and its paving.

This work unit will be paid according to the corresponding prices in Price Schedule No. 1.

5.3. AC TYPE HOT BITUMINOUS MIXTURES**5.3.1. DEFINITION**

A hot-mix bituminous concrete-type asphalt mixture is defined as a combination of a hydrocarbon binder, aggregates (including mineral powder) with a continuous grading pattern, and, if necessary, additives, such that all aggregate particles are coated with a homogeneous binder film. Its manufacturing process involves heating the binder and aggregates (except, if necessary, the mineral powder), and its application must be carried out at a temperature well above ambient.

The execution of any type of hot-mix bituminous concrete mixture defined above includes the following operations:

- Analysis of the mix and obtaining the working formula.
- Manufacturing the mix according to the working formula.
- Transporting the mix to the site of use.
- Preparing the surface to receive the mix.
- Spreading and compacting the mix.

5.3.2. ROAD SURFACE LAYERS

The bituminous mixture will be applied to the following layers of road surface:



Capa	Mezcla bituminosa	Espesor (cm)
Rodadura	AC16 SURF 50/70 S OFITA	5

5.3.3. MATERIALS

Hydrocarbon Binder

The binder to be used will be 50/70 penetration bitumen in all layers (wearing, intermediate, and base).

During the winter, the asphalt bitumen in the wearing course will be improved by adding a 0.2% polyamine-based activator (Haffmitel or similar) to improve the adhesion of the fine aggregate. This cost is included in the price of the binder.

The dosage and homogeneous dispersion of the additive must be approved by the Project Manager.

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 at the manufacturing plant, the sand equivalent (SE4) (Annex A of standard UNE-EN 933-8), for the 0/4mm fraction of the combined aggregate (including mineral powder), in accordance with the proportions set out 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 standard UNE-EN 933-9) for the 0/0.125mm fraction of the combined aggregate must be less than seven grams per kilogram ($MBF < 7 \text{ g/kg}$) and, simultaneously, the sand equivalent (Annex A of standard UNE-EN 933-8) 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 shall be obtained by crushing quarry stone or natural gravel. The reject from the UNE 5 mm sieve shall contain a minimum proportion of particles with two (2) or more fracture faces, according to Standard NLT-358/87, not less than 100 in the tread and intermediate layers.

Cleaning

The coarse aggregate must be free of all foreign matter that could affect the durability of the layer. The fine content (UNE-EN 933-1 standard), determined as the percentage passing a 0.063 mm sieve, must be less than five per thousand ($<5\%$) by mass.

If the established requirements for cleaning the coarse aggregate are not met, the Project Manager may require washing, vacuuming, or other previously approved methods, as well as a new inspection.

Quality

The maximum Los Angeles wear coefficient for coarse aggregate must not exceed 25 in wearing and intermediate courses.

The minimum accelerated polishing coefficient for coarse aggregate to be used in wearing courses must be at least 50.

Shape

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 through the 2 mm sieve and retained by the 0.063 mm sieve (UNE-EN 933-2 standard).

General conditions

The fine aggregate will be 50% crushed and ground from ophitic quarry stone for the tread layer and 50% from limestone quarry stone for the intermediate layer.



Cleanliness

Fine aggregate must be free of clay lumps, plant matter, lean matter, or other foreign matter.

Quality

The material crushed to obtain fine aggregate must meet the requirements for coarse aggregate regarding the Los Angeles wear coefficient, and the resulting fine aggregate must have a sand equivalent greater than 50.

Adhesiveness

Adhesiveness will be considered sufficient if, in open mixes, the adhesiveness index, according to Standard NLT-355/74, is greater than four (4); or if, in other types of mixes, the loss of strength in the immersion-compression test, according to Standard NLT-162/84, does not exceed twenty-five percent (25%).

Adhesiveness between the aggregate and the hydrocarbon binder may be improved by using activators or any other product approved by experience. The Director of Works will establish the specifications that these additives and the resulting mixtures must meet.

Mineral dust (filler)

Definition

Mineral dust is defined as aggregate whose majority passes through a 0.063 mm sieve (UNE-EN 933-2 standard).

General Conditions

Mineral dust will be added at 50% for the wearing and intermediate layers, and will be of cement type III-1/35/MRSR. These will be the minimum amounts, unless it is verified that the mineral dust from the aggregates meets the requirements for mineral dust addition and the Works Manager reduces or even cancels these minimum proportions.

The mineral dust that inevitably remains attached to the aggregates after passing through the dryer may under no circumstances exceed two percent (2%) of the mass of the mixture.

Fineness and Activity

The apparent density of the mineral powder (Annex A of standard UNE-EN 1097-3) must be between five and eight tenths of a gram per cubic centimeter (0.5 to 0.8 g/cm³).

The emulsifiability coefficient, according to Standard NLT-180/74, must be less than six tenths (0.6).

5.3.4. NECESSARY EQUIPMENT

Manufacturing Plant

The hot-mix asphalt will be manufactured in an area off-site, with its supply being subcontracted.

The plant's minimum hourly production will be specified, based on the project's characteristics and minimum consumption needs.

Transportation

These will consist of trucks with smooth, watertight bodies, perfectly clean, and treated to prevent the bituminous mix from adhering to them with a product whose composition and supply must be approved by the Project Manager.

The shape and height of the body 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-mix asphalt during transport.

Paving Equipment

The pavers will be self-propelled and equipped with the necessary equipment to spread the hot mix asphalt with the desired geometry and production, and with a minimum pre-compaction requirement, which will be determined by the Project Manager. Hopper capacity and power will be appropriate for the type of work to be performed.

The paver must be equipped with an automatic leveling device and a heating element for the longitudinal joint.



Where applicable, the adjustments of the screed and master screed shall be verified to comply with the mechanical tolerances specified by the manufacturer and that these adjustments have not been affected by wear or other causes.

Compaction Equipment

Metal, static or vibratory, pneumatic or mixed roller compactors may be used. The minimum equipment shall be one (1) vibratory metal or mixed roller compactor and one (1) pneumatic roller compactor.

All types of compactors must be self-propelled, have smooth-action reversers, and be equipped with devices to clean their rims or tires during compaction and to keep them moist if necessary.

Metal-rim compactors must be free of grooves or irregularities. Vibratory compactors must have automatic devices to eliminate vibration when reversing their direction of travel. Pneumatic-rim compactors must have smooth wheels, of such number, size, and configuration as to allow the front and rear treads to overlap, and canvas skirts to protect the tires from cooling.

The contact pressures, static or dynamic, of the various types of compactors will be approved by the Project Manager and will be those necessary to achieve adequate and homogeneous compaction of the mix throughout its entire thickness, without causing breakage of the aggregate or rolling of the mix at the compaction temperature.

In locations inaccessible to standard compaction equipment, other equipment of appropriate size and design for the intended work shall be used and must always be authorized by the Works Director.

5.3.5. EXECUTION

The manufacture and implementation of the mix will not begin until the corresponding working formula has been approved by the Works Manager, studied in the laboratory, and verified at the manufacturing plant.

Surface Preparation

The layers of bituminous mix will be applied over bond coats or primers, which are not included in this work unit as they constitute independent units.

It will be verified that, after the bond coat binder has broken through, no water remains on the surface. Likewise, if a significant amount of time has passed since its application, it will be verified that its bonding capacity with the bituminous mix has not been detrimentally diminished. Otherwise, the Works Manager may order the application of an additional bond coat.

Transport and Reception of the Mix

The hot bituminous mix will be transported by truck from the manufacturing plant to the paver.

To prevent surface cooling, it must be protected during transport with tarps or other suitable covers. At the time of unloading it into the paver or transfer equipment, its temperature may not be lower than that specified in the work formula.

Mixture extension

Unless the Project Manager justifies otherwise, the spreading will begin at the lower edge and will be carried out in longitudinal strips. The width of these strips will be determined to ensure the fewest joints possible and the greatest continuity of the spreading, taking into account the width of the section, the potential for traffic flow, the characteristics of the paver, and the plant's production capacity.

After a strip has been spread and compacted, the next strip will be spread while the edge of the first is still warm and ready for compaction; otherwise, a longitudinal joint will be made.

The paver will be adjusted so that the surface of the spread layer is smooth and uniform, without segregations or drag, and with a thickness such that, once compacted, it conforms to the grade and cross-section indicated in the Project Drawings, within the established tolerances.

The paver shall be spread as continuously as possible, adjusting the speed of the paver to the production output of the manufacturing plant so that the paver does not stop. In the event of a stoppage, it shall be ensured that the temperature of the unspread mix, in the paver hopper and below it, does not fall below that prescribed in the work formula for the start of compaction; otherwise, a transverse joint shall be made.

Where, in the judgment of the Project Manager, the use of paving machines is impossible, the hot bituminous mix may be applied to the site by other procedures approved by the Project Manager. To this end, it shall be unloaded outside the area where it is to be spread and distributed in a uniform layer of such thickness that,



once compacted, it conforms to the grade and cross-section indicated in the Project Drawings, within the established tolerances.

Longitudinal and transversal joints

Whenever unavoidable, joints between overlapping layers shall be kept at a minimum separation of five meters (5 m) for transverse layers and fifteen centimeters (15 cm) for longitudinal layers.

When spreading adjacent longitudinal strips, if the temperature of the first layer does not exceed the minimum temperature established in the work formula for completing compaction, the edge of this strip shall be cut vertically, exposing a flat, vertical surface throughout its entire thickness. A uniform, light layer of adhesion primer shall be applied, allowing the emulsion to break sufficiently. The joint shall then be heated, and the next strip shall be spread against it.

Transverse joints in wearing courses shall be compacted transversely, providing the necessary supports for the compaction elements.

5.3.6. EXECUTION LIMITATIONS

Except with the express authorization of the Project Manager, the application of hot bituminous mixes will not be permitted:

- When the ambient temperature in the shade is below five degrees Celsius (5 °C), 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 °C). In strong winds, after frost, or on structural decks, the Project Manager may increase these limits, based on the compaction results obtained.
- When atmospheric precipitation occurs.

Once compaction is complete, the completed layer may be opened to traffic as soon as it reaches ambient temperature throughout its entire thickness, or, with the express authorization of the Project Manager, when it reaches a temperature of sixty degrees Celsius (60 °C), avoiding stops and changes of direction on the newly spread mix until it reaches ambient temperature.

5.3.7. QUALITY CONTROL

Only the construction work will be taken into account, as the mixing will be subcontracted.

Extent

Before pouring the mix from the conveyor into the paver hopper or transfer equipment, its appearance will be checked, its temperature will be measured, and the ambient temperature will be measured to take into account the limitations.

At least once a day, and at least once per batch, samples will be taken and test pieces will be prepared according to UNE-EN 12697-30, applying seventy-five (75) impacts per face if the maximum aggregate size is less than or equal to twenty-two millimeters (22 mm), or according to UNE-EN 12697-32 for a maximum aggregate size greater than this value. The void content of these test pieces will be determined according to UNE-EN 12697-8, and the apparent density according to UNE-EN 12697-6 using the test method indicated in Annex B of UNE-EN 13108-20.

For each of the batches, the reference density for compaction will be determined, defined by the average value of the last four (4) apparent density values obtained in the test pieces mentioned above.

At the discretion of the Works Manager, tests may be carried out on some of these samples to verify the binder dosage, in accordance with UNE-EN 12697-1, and the particle size of the extracted aggregates, in accordance with UNE-EN 12697-2.

The spread thickness will be checked using a graduated punch as frequently as established by the Works Manager.

Compaction

The composition and mode of operation of the compaction equipment will be checked, verifying:

- That the number and type of compactors are approved.
- The operation of the wetting, cleaning, and protection devices.
- The ballast, total weight, and, where applicable, inflation pressure of the compactors.
- The frequency and amplitude of the vibratory compactors.
- The number of passes of each compactor.

Upon completion of compaction, the temperature of the surface of the layer will be measured.

**Reception Control of the Finished Unit**

The lowest batch resulting from applying the following three (3) criteria to a single (1) layer of hot-mix bituminous mix will be considered a batch, which will be accepted or rejected as a block:

- Five hundred meters (500 m) of roadway.
- Three thousand five hundred square meters (3,500 m²) of roadway.
- The fraction constructed daily.

Core samples will be taken at randomly located points, in a number of no less than five (5), and their density and thickness will be determined according to UNE-EN 12697-6, considering the test conditions listed in Annex B of UNE-EN 13108-20.

The surface regularity of the lot shall be checked twenty-four hours (24 h) after its execution and always before the next layer is laid by determining the International Regularity Index (IRI) according to NLT-330. A single IRI value shall be calculated for each hectometer of the auscultated profile, which shall be assigned to that hectometer, and so on until the measured section is completed, which must comply with the specifications in section 542.7.3. The surface regularity check for the entire length of the work, on wearing courses, shall also be carried out before the final acceptance of the works.

On wearing courses, the following tests shall be performed, which must comply with the provisions of Table 542.17:

- Measurement of surface macrotexture, according to UNE-EN 13036-1, before the layer is put into service, at five (5) randomly selected points in the batch so that there is at least one per hectometer (1/hm).
- Determination of slip resistance, according to NLT-336, two (2) months after the layer is put into service, along the entire length of the batch.

5.3.8. MEASUREMENT AND PAYMENT

The preparation of the existing surface is not subject to payment, nor is it included in this work unit. Bonding irrigation is also not included; it will be paid as prescribed in these specifications for this work unit.

The manufacture and implementation of hot-mix bituminous concrete-type asphalt mixtures will be paid by tonnes (t), according to their type, measured by multiplying the widths indicated for each layer in the Project Plans by the thickness and density. This payment will include aggregates and milling from bituminous mixtures. Lateral growth and thickness increases due to correction of losses in underlying layers will not be paid.

The payment includes the hydrocarbon binder used (bitumen) and the mineral powder filler.

6. SIGNALING, BEACONING AND CONTAINMENT SYSTEMS**6.1. ROAD MARKS**

The specifications for this work unit are based on those defined in Article 700 - "Road Markings" of PG-3. Standards 8.2-IC - "Road Markings" and 8.3-IC - "Construction Signs" are also taken into account.

6.1.1. DEFINITION

Road markings, whether reflective or not, are defined as optical guides placed on the road surface, forming lines or signs, for informational and traffic regulation purposes.

6.1.2. TYPES

Road markings will be classified according to:

- Their use: permanent (white) or temporary (yellow).
- Their most relevant characteristics: type 1 (conventional road markings) or type 2 (road markings, with or without raised surfaces, specifically designed to maintain their properties in rainy or humid conditions).

During the execution of the works, temporary road markings, painted or prefabricated, will be used, yellow or orange, at the discretion of the D.O. and depending on the circumstances of the work.

Once the work is completed, permanent road markings will be applied as established in Standard 8.2-IC - "Road Markings."

Temporary and permanent road markings will be type 2.

**6.1.3. MATERIALS**

When permanent road markings are used, two applications will be made:

- First application with paint.
- Second application using hot-applied thermoplastics or cold-applied plastics.

The material characteristics must be those specified in UNE 135 200(2) for paints, hot-applied thermoplastics, and cold-applied plastics, and in UNE-EN-1790 for prefabricated road markings.

Likewise, the post-mixed glass microspheres used in reflective road markings must comply with the characteristics specified in UNE-EN-1423.

The quality guarantee for the materials used in the application of road markings must be required under all circumstances by the Contractor awarded the works.

6.1.4. EXECUTION

Before proceeding with the application of road markings, the pavement will be inspected to check its surface condition and any existing defects. When necessary, the surface will be cleaned to remove dirt or other contaminants that could negatively affect the quality and durability of the road markings to be applied.

Prior to the application of the materials that make up the road markings, a careful layout of the works will be carried out to ensure proper completion. To this end, when no suitable reference exists, a reference line will be created, either continuously or using as many points as deemed necessary, separated by a distance of no more than fifty centimeters (50 cm).

Once the road surface has been completed, the final horizontal markings will be applied. For this purpose, permanent type 2 road markings will be used, consisting of two applications.

Paint will be used for the initial application.

Between eight and ten months after receipt of the project, and still within the warranty period, a second application will be made using hot-melt thermoplastics or cold-melt plastics.

6.1.5. MACHINERY TO USE

The machinery and equipment used for applying the materials used in road markings must be capable of automatically applying and controlling the required dosages and ensuring uniformity of the road markings, ensuring their properties throughout their entire length.

The characteristics of the machinery used in applying road markings must comply with the specifications of UNE 135 277(1).

6.1.6. SECURITY AND WORK SIGNALING

Before beginning the application of road markings, the Contractor shall submit to the Project Manager for approval the signage systems for the protection of traffic, personnel, materials, and machinery during the execution period, as well as the newly painted markings until they are completely dry.

The safety and signage measures established in Standard 8.3-IC and other applicable legislation shall be complied with.

6.1.7. MEASUREMENT AND PAYMENT

When road markings are of constant width, they will be paid per meter (m) applied, measured along their centerline on floor plans.

Otherwise, road markings will be paid per square meter (m²), measured on floor plans. The price includes glass spheres.

Road markings installed as construction signage are not included in the payment for this work unit; they will be paid as a lump sum.

6.2. VERTICAL SIGNALS AND PANELS

The specifications for this project are based on those defined in Article 701 - "Retroreflective Vertical Traffic Signs and Posters" of PG-3. Standards 8.1-IC - "Vertical Signage" and 8.3-IC - "Construction Signage" also apply, as do the monographs "Mobile Construction Signage" and "Manual of Examples of Fixed Construction Signage" of the General Directorate of Roads, adapted to the requirements of this Project.

**6.2.1. DEFINITION**

Retroreflective traffic signs and posters are defined as a set of elements intended to inform, organize, or regulate road traffic flow and on which legends and/or pictograms are inscribed. Once installed, they must offer maximum visibility in both daytime and nighttime conditions; to achieve this, they must be able to reflect most of the incident light (generally from vehicle headlights) in the same direction as the road, but in the opposite direction.

- Signs: Their dimensions are fixed and depend on the type of road.
- Signs: Their dimensions are derived from the size of the characters, pictograms, and borders used, and the spacing between lines, borders, and edges. In the case of signs consisting of slats, their dimensions must be adjusted to a multiple of these.

6.2.2. MATERIALS

The material to be used as the substrate is that defined in the Project. When aluminum signs, posters, or complementary panels are used, the support and anchoring elements will be made of this same material.

Generally, all signs will have class RA-2 retroreflection, except for temporary signs, which may be class RA-1; posters will have RA-3 retroreflection.

If it is deemed necessary to signal a higher level of danger in specific areas, permanent signs and posters will be covered with a level 3 retroreflective, lemon yellow fluorescent sheeting consisting of wide-angle prismatic lenses.

The retroreflective sheeting attached to the various signs and posters will bear the following information:

- CI X mark, where X is the number indicating the retroreflection class, in accordance with standard UNE 135 334.
- Quality N mark.
- Manufacturer's logo.
- Manufacturing batch number of the sheeting.

6.2.3. FINISHED UNIT SPECIFICATIONS**Photometric Characteristics**

The minimum values for the retroreflection coefficient of the retroreflective traffic signs and vertical signs covered by this Project, for the warranty period, are those indicated in PG3.

Supporting Elements

The shape and dimensions of the foundation and the sign posts, side signs, and directional panels are as defined in the Project.

6.2.4. SECURITY AND WORK SIGNALING

The safety and signage measures established in Standard 8.3-IC and other current legislation on the matter will be complied with.

6.2.5. MEASUREMENT AND PAYMENT

Retroreflective vertical traffic signs, including their support elements, anchors, and foundations, will be paid exclusively for units actually installed on site.

Retroreflective vertical traffic signs will be paid for by square meter (m²) according to the dimensions specified in the Detail Plans. Support elements, anchors, and foundations are included.

Vertical construction signage will be paid for separately in its lump sum.

6.3. CONTAINMENT SYSTEMS

The specifications for this project are based on those defined in Article 704 - "Safety Barriers" of PG-3. Circular Order 321/95 T and P "Recommendations on Vehicle Restraint Systems," amended by O.C. 6/01, also applies, adapted to the requirements of this Project.

6.3.1. DEFINITION

Safety barriers are defined as vehicle restraint systems installed on the sides of roads, the purpose of which is to provide a certain level of restraint to an out-of-control vehicle.

The type, dimensions, and restraint level of the safety barriers to be used are defined in the Project.

**6.3.2. MATERIALS**

Metal safety barriers must meet the requirements established in Standard UNE 135121 - "Metal safety barriers for vehicle containment. Double-wave profile fence. Materials, geometry, dimensions, and tests", and specifically, those related to "Identification":

- The manufacturer must mark all fences manufactured according to the specifications of the aforementioned Standard.
- This mark must include the manufacturer's identification, as well as a code for product traceability. If the forming and/or galvanizing processes are subcontracted, the fences must also include the identification of the companies that perform these processes.
- The marking must be legible to the naked eye and indelible. All fences must be marked in a single, specific location, ensuring that the markings cannot be hidden once the barrier has been assembled.

To paint metal safety barriers, if applicable, two coats of polyurethane paint will be used. They are suitable for the weather conditions and are resistant to moisture and abrasion. The paint color used will be RAL 6014 or the one established by the D.O. (Official Document), always with a matte finish.

In the case of a galvanized and painted metal safety barrier, in addition to the barrier itself, the shock absorbers, posts, bolts, and anchor plate, if applicable, must be painted. All of these elements, including the barrier, must be supplied to the site already painted.

Both the primers and paints, as well as the substrate on which they are applied, must meet the conditions established in the NTE-RPP Technological Standard and the UNE standards referenced therein. When the material arrives at the site with a Certificate of Industrial Origin certifying compliance with these conditions, standards, and provisions, its reception will be carried out by checking only its apparent characteristics.

6.3.3. EXECUTION

Approved road studs will be placed every 4 m on metal safety barriers.

In the case of galvanized and painted metal safety barriers, a coat of polyurethane primer will be applied to the galvanized barrier before applying the first coat of paint.

6.3.4. SECURITY AND WORK SIGNALING

The safety and signage measures established in Standard 8.3-IC and other current legislation on the matter will be complied with.

6.3.5. MEASUREMENT AND PAYMENT

This unit will be measured and paid for according to the Project price tables, based on the linear meters (lm) of barriers installed, as measured on floor plans. The price includes the concrete foundation in the case of a concrete barrier; the slab and anchoring elements in the case of a barrier installed using an anchor slab; the paint, regardless of the color used, in the case of a metal safety barrier painted on its back; and the reflectors.



7. ENVIRONMENTAL INTEGRATION

7.1. VEGETABLE SOIL

7.1.1. DEFINITION

It is defined as soil from the surface of a land with a high content of organic matter placed in the formation of flowerbeds and restoration of slopes.

7.1.2. EXECUTION

If supplied in bulk, the topsoil will be transported by truck to the site where it is to be spread.

Once the soil has been transported to the site where it will be used, it will be spread to the thickness defined in the Project, and the clods will be broken up and subsequently raked to comply with the specifications set forth in these Terms and Conditions.

7.1.3. MEASUREMENT AND PAYMENT

This unit will be measured and paid for, according to the Project's price tables, by the cubic meters (m3) of topsoil actually installed. The price includes topsoil, raking and breaking up of clods, as well as all operations and costs necessary for the proper execution of the unit.

7.2. HYDROSEEDING

7.2.1. DEFINITION

This consists of spraying a mixture of seeds and water, and generally fertilizer and other elements, under pressure, onto the surface to be turfed.

This work unit includes:

- The procurement, loading, transportation, and unloading or stacking of the material at the temporary storage site, and from there, if applicable, or directly if not, to the place where the materials comprising the unit will be used.
- If applicable, the extension of a covering.

- Any work, machinery, materials, or auxiliary elements necessary for the correct and rapid execution of this work unit.

Neither the prior smoothing of slopes nor subsequent care such as irrigation or fertilization is included.

Nor are woody seeds, additives, or improvers not expressly included in the price breakdown included.

7.2.2. MATERIALS

Hydroseeding materials will be:

- Water.
- Meadow seeds: 20 g.
- Shrub seeds: 5 g.
- Mulch (short or long fiber, straw, cotton, chopped hay, peat): 40 g.
- Stabilizer.
- Fertilizers: 20 g.

7.2.3. EXECUTION

The chronological process will be as follows:

Water will be poured into the hydroseeder tank until it covers half of the agitator blades; then, the mulch will be added, avoiding the formation of blocks or lumps on the surface of the water. Water will be added until it reaches three-quarters of the tank's total capacity, keeping the agitator blades moving. Simultaneously, the seeds, fertilizers, and any additives will be added.

The agitator will be running for at least 10 more minutes before sowing begins, to promote the dissolution of the fertilizers and stimulate seed germination. Meanwhile, the tank will continue to be filled with water until approximately 10 cm is missing, and then the soil stabilizer will be added.

The sowing process will not begin until a homogeneous mixture of all its components has been achieved.

One or two minutes before starting, the agitator paddles will be accelerated to achieve better homogenization of the mixture.



Seeding will be done through the nozzle of the hydroseeder, if access to the planting point is possible, or otherwise, through one or more hoses connected to the nozzle. The mixture will be expelled in such a way that the jet does not directly hit the surface to be seeded, to avoid movement of fine particles on the slope during the operation. The mixture will be expelled in a circular or zigzag pattern to prevent the sprayed mixture from running down the slope. The distance between the nozzle (or hose) and the surface to be treated depends on the pump's ejection power and ranges from 20 to 70 meters.

When weather conditions, excessive humidity, strong winds, and other factors make it difficult to carry out the work and obtain satisfactory results, the work will be suspended and will only be resumed when conditions are deemed to be favorable again, or when approved alternative or corrective measures and procedures have been adopted.

The hydroseeder's nozzle must be tilted above the horizontal to achieve good distribution; that is, spraying should be from bottom to top.

In the case of embankments with inaccessible bases, hoses should be installed so that another operator can direct the spray from below. This same precaution must be taken when there are strong winds or any other circumstance that makes imperfect distribution likely due to the spray being launched from the top of the hydroseeder.

If hydroseeding is covered, it should be performed after the previous operation without interruption. The mechanical process is identical to that described for seeding.

The immediacy of the seeding and covering phases is of great importance; therefore, when it is anticipated that available time will not allow both phases to be performed on the same day, both operations should be postponed for the following day.

7.2.4. MEASUREMENT AND PAYMENT

If, within a maximum period of two months following hydroseeding, the treated area has not germinated, it will be at the discretion of the Project Manager to require a repeat hydroseeding operation; such repetition, if carried out, will be the responsibility of the Contractor.

Measurements will be made in square meters (m²) measured on floor plans.

The unit price will include the provision of all necessary materials described in these specifications and the construction of the entire unit. Payment will be made by applying the measurement to the unit prices for the previously specified units, as shown in Price Schedule No. 1.

Santander, september 2025

Signed by: Santos Diego Cruz.

PART №5 – BUDGET



BUDGET



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1. MEDICIONES

CÓDIGO	RESUMEN	UDS	LONGITUD	ANCHURA	ALTURA	CANTIDAD
01	EXPLANACIONES					
08	TRABAJOS PREVIOS					
09	DESPEJE Y DESBROCE DEL TERRENO					
D38AN015	M2 DESPEJE Y DESBROCE DEL TERRENO M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.					
						16.800,00
10	FRESADO DE LA CARRETERA					
D38GJ010	M2 M2xCM FRESADO DE PAVIMENTO M2 por cm. de espesor en fresado de pavimento, incluso barrido y transporte de productos a vertedero.					
						73.500,00
11	EXCAVACIONES					
D38AP020	M3 EXCAV/TTE.DTE.TRANSITO.M/MECA. M3. Excavación en desmonte en terreno de tránsito por medios mecánicos, incluso transporte de productos a vertedero o lugar de empleo.					
						28.612,00
13	RELLENOS					
01.03.01	RELLENOS PROCEDENTES DE EXCAVACIÓN					
D38AR015	M3 TERRAPLEN PROCEDENTE EXCAVACION M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.					
						13.376,90
01.03	SUELO SELECCIONADO					
D38AR014	M3 TERRAPLEN SUELO SELECCIONADO M3. Suelo seleccionado para formación de explanada en coronación de terraplén y en fondo de desmonte.					

14	TERMINACIÓN					11.000,00
01.04	ACABADO Y REFINO DE TALUDES					
D38AR031	M2 ACABADO Y REFINO DE TALUDES					
						42.000,00
02	DRENAJE					
02.01	CUNETAS					
D38CA015	ML CUNETA TRIANGULAR REVESTIDA HM-15 ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 6/1-4/1 y profundidad 0.15 m.					
						1.900,00
12	ARQUETAS					
D38CE030	UD ARQUETA O.F. CAÑO 100 CM UD. Arqueta tipo en entrada de O.F. para caño D= 1.00 m totalmente terminada.					
						42,00
15	TUBO DE DREN					
D38CV010	ML TUBO DREN PVC 110 MM. MAT FILTRO ML. Tubería drenaje PVC D=110 mm de diámetro incluso colocación y material filtro.					
						1.900,00
02.02	BAJANTES					
D38CC015	ML BAJANTE PREFABRICADA DE HORMIGON ML. Bajante prefabricada de aguas pluviales, en hormigón HM-12,5/P/40/IIA, i/colocación.					
						20,00
02.03	TUBOS DE HORMIGÓN					
D38CM315	ML TUBO D=150CM H.A.RECU.M/GRANULAR ML. Tubo D= 150 cm de hormigón armado i/relleno de material granular y parte proporcional de juntas totalmente colocado.					
						53,00

**02.04 BOQUILLAS PARA SALIDAS DE TUBO**

D38CR070 UD BOQUILLA ALETAS O.F. 150 CM
UD. Boquilla con aletas en O.F. para caño D=1.50 m
totalmente terminada.

4,00

03 FIRMES Y PAVIMENTOS
03.01 ZAHORRAS, SUELOS ESTABILIZADOS Y GRAVAS TRATADAS

D38GA115 M3 ZAHORRA ARTIFICIAL
M3. Zahorra artificial, incluso extensión y compactación en
formación de bases.

3.675,00

16 RIEGOS Y MACADAMS BITUMINOSOS

D38GG210 M2 EMULSION ECI IMPRIMACION
M2. Emulsión catónica ECI en riego de imprimación. i/
barrido y preparación de la superficie.

14.700,00

03.02 MEZCLAS BITUMINOSAS

D38GJ205 TM MBC AC16 SURF 50/70 OFITA
TM. Mezcla bituminosa en caliente tipo AC 16 surf 50/70 S ,
incluso betún y filler, totalmente extendida y compactada.

1.800,00

04 SEÑALIZACIÓN
18 SEÑALIZACIÓN VERTICAL

D38ID160 UD SEÑAL CIRCULAR 90
UD. Señal reflectante circular D=90 cm., i/p.p. poste
galvanizado, tornillería, cimentación y anclaje, totalmente
colocada.

3,00

D38IE010 M2 SEÑAL INFORMATIVA CHAPA HIERRO
M2. Señal informativa reflexiva en chapa de hierro, i/p.p.
poste galvanizado, tornillería, cimentación y anclaje,
totalmente colocado.

D38ID140 UD SEÑAL TRIANGULAR 135
UD. Señal reflectante triangular de 135 cm., i/p.p. poste
galvanizado, tornillería, cimentación y anclaje, totalmente
colocada.

50,00

04.01 SEÑALIZACIÓN HORIZONTAL

D38IA030 ML MARCA VIAL 10 CM
ML. Marca vial reflexiva de 10 cm, con pintura reflectante y
microesferas de vidrio, con máquina autopropulsada.

5,00

D38IA020 M2 SUPERFICIE REALMENTE PINTADA
M2. Superficie realmente pintada, con pintura reflectante y
microesferas de vidrio, con máquina autopropulsada.

6.100,00

D38IA060 ML MARCA VIAL 30 CM
ML. Marca vial reflexiva de 30 cm, con pintura reflectante y
microesferas de vidrio, con máquina autopropulsada.

100,00

04.03 BALIZAMIENTO

D38IE050 M2 CARTEL LAMAS ACERO REFLEXIVO E.G
M2. Cartel en lamas de acero reflexivo E.G. con parte
proporcional de IPN, i/p.p. poste galvanizado, tornillería,
cimentación y anclaje, totalmente colocada.

50,00

9,00



17	SISTEMAS DE CONTENCIÓN DE VEHÍCULOS
D38IM030	ML BARRERA DE SEGURIDAD DOBLE ONDA ML. Barrera de seguridad doble onda, i/p.p. poste, captafaros, separador y colocación.
	100,00
05	PLANTACIONES
05.01	EXTENDIDO TIERRA VEGETAL
D38PA030	M3 EXTENDIDO TIERRA VEGETAL M3. Extendido de tierra vegetal.
	250,00
19	HIDROSIEMBRA EN TALUDES
D39QC060	M2 HIDROSIEMBRA EN TALUDES M2. hidrosiembra en taludes a base de 20 gr. de semilla de Pratenses, 5 gr. de Arbustivas, 300 gr. de Mulch, 40 gr. de abono, 20 gr. de estabilizador, incluso colocación de manta orgánica biodregradable de coco de 400 gr/m2.
	4.807,09
06	GESTIÓN DE RESIDUOS
20	GESTIÓN DE RESIDUOS
07	SEGURIDAD Y SALUD
21	SEGURIDAD Y SALUD

**2. CUADRO DE PRECIOS N°1**

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	IMPORTE
01			EXPLANACIONES		
08			TRABAJOS PREVIOS		
09			DESPEJE Y DESBROCE DEL TERRENO		
D38AN015	M2		DESPEJE Y DESBROCE DEL TERRENO		0,40
			M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.		
				CERO EUROS con CUARENTA CÉNTIMOS	
10			FRESADO DE LA CARRETERA		
D38GJ010	M2		M2xCM FRESADO DE PAVIMENTO		0,37
			M2 por cm. de espesor en fresado de pavimento, incluso barrido y transporte de productos a vertedero.		
				CERO EUROS con TREINTA Y SIETE CÉNTIMOS	
11			EXCAVACIONES		
D38AP020	M3		EXCAV/TTE.DTE.TRANSITO.M/MECA.		2,31
			M3. Excavación en desmonte en terreno de tránsito por medios mecánicos, incluso transporte de productos a vertedero o lugar de empleo.		
				DOS EUROS con TREINTA Y UN CÉNTIMOS	
13			RELLENOS		
01.03.01			RELLENOS PROCEDENTES DE EXCAVACIÓN		
D38AR015	M3		TERRAPLEN PROCEDENTE EXCAVACION		1,99
			M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.		
				UN EUROS con NOVENTA Y NUEVE CÉNTIMOS	
01.03			SUELO SELECCIONADO		
D38AR014	M3		TERRAPLEN SUELO SELECCIONADO		4,33
			M3. Suelo seleccionado para formación de explanada en coronación de terraplén y en fondo de desmonte.		
				CUATRO EUROS con TREINTA Y TRES CÉNTIMOS	
14			TERMINACIÓN		
01.04			ACABADO Y REFINO DE TALUDES		
D38AR031	M2		ACABADO Y REFINO DE TALUDES		1,24
				UN EUROS con VEINTICUATRO CÉNTIMOS	
02			DRENAJE		
02.01			CUNETAS		
D38CA015	ML		CUNETA TRIANGULAR REVESTIDA HM-15		14,14
			ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 6/1-4/1 y profundidad		

0.15 m.

			CATORCE EUROS con CATORCE CÉNTIMOS	
12			ARQUETAS	
D38CE030	UD		ARQUETA O.F. CAÑO 100 CM	516,51
			UD. Arqueta tipo en entrada de O.F. para caño D= 1.00 m totalmente terminada.	
			QUINIENTOS DIECISÉIS EUROS con CINCUENTA Y UN CÉNTIMOS	
15			TUBO DE DREN	
D38CV010	ML		TUBO DREN PVC 110 MM. MAT FILTRO	16,54
			ML. Tubería drenaje PVC D=110 mm de diámetro incluso colocación y material filtro.	
			DIECISÉIS EUROS con CINCUENTA Y CUATRO CÉNTIMOS	
02.02			BAJANTES	
D38CC015	ML		BAJANTE PREFABRICADA DE HORMIGON	43,92
			ML. Bajante prefabricada de aguas pluviales, en hormigón HM-12,5/P/40/IIA, i/colocación.	
			CUARENTA Y TRES EUROS con NOVENTA Y DOS CÉNTIMOS	
02.03			TUBOS DE HORMIGÓN	
D38CM315	ML		TUBO D=150CM H.A.RECU.M/GRANULAR	101,19
			ML. Tubo D= 150 cm de hormigón armado i/relleno de material granular y parte proporcional de juntas totalmente colocado.	
			CIENTO UN EUROS con DIECINUEVE CÉNTIMOS	
02.04			BOQUILLAS PARA SALIDAS DE TUBO	
D38CR070	UD		BOQUILLA ALETAS O.F. 150 CM	1.479,92
			UD. Boquilla con aletas en O.F. para caño D=1.50 m totalmente terminada.	
			MIL CUATROCIENTOS SETENTA Y NUEVE EUROS con NOVENTA Y DOS CÉNTIMOS	
03			FIRMES Y PAVIMENTOS	
03.01			ZAHORRAS, SUELOS ESTABILIZADOS Y GRAVAS TRATADAS	
D38GA115	M3		ZAHORRA ARTIFICIAL	15,68
			M3. Zahorra artificial, incluso extensión y compactación en formación de bases.	
			QUINCE EUROS con SESENTA Y OCHO CÉNTIMOS	
16			RIEGOS Y MACADAMS BITUMINOSOS	
D38GG210	M2		EMULSION ECI IMPRIMACION	0,23
			M2. Emulsión catónica ECI en riego de imprimación. i/ barrido y preparación de la superficie.	



		CERO EUROS con VEINTITRÉS CÉNTIMOS	
03.02	MEZCLAS BITUMINOSAS		
D38GJ205	TM MBC AC16 SURF 50/70 OFITA	26,60	
TM. Mezcla bituminosa en caliente tipo AC 16 surf 50/70 S , incluso betún y filler, totalmente extendida y compactada.			
		VEINTISÉIS EUROS con SESENTA CÉNTIMOS	
04	SEÑALIZACIÓN		
18	SEÑALIZACIÓN VERTICAL		
D38ID160	UD SEÑAL CIRCULAR 90	195,29	
UD. Señal reflectante circular D=90 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.			
		CIENTO NOVENTA Y CINCO EUROS con VEINTINUEVE CÉNTIMOS	
D38IE010	M2 SEÑAL INFORMATIVA CHAPA HIERRO	245,86	
M2. Señal informativa reflexiva en chapa de hierro, i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocado.			
		DOSCIENTOS CUARENTA Y CINCO EUROS con OCHENTA Y SEIS CÉNTIMOS	
D38ID140	UD SEÑAL TRIANGULAR 135	202,10	
UD. Señal reflectante triangular de 135 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.			
		DOSCIENTOS DOS EUROS con DIEZ CÉNTIMOS	
04.01	SEÑALIZACIÓN HORIZONTAL		
D38IA030	ML MARCA VIAL 10 CM	0,30	
ML. Marca vial reflexiva de 10 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			
		CERO EUROS con TREINTA CÉNTIMOS	
D38IA020	M2 SUPERFICIE REALMENTE PINTADA	14,46	
M2. Superficie realmente pintada, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			
		CATORCE EUROS con CUARENTA Y SEIS CÉNTIMOS	
D38IA060	ML MARCA VIAL 30 CM	0,90	
ML. Marca vial reflexiva de 30 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			
		CERO EUROS con NOVENTA CÉNTIMOS	
04.03	BALIZAMIENTO		
D38IE050	M2 CARTEL LAMAS ACERO REFLEXIVO E.G	278,63	
M2. Cartel en lamas de acero reflexivo E.G. con parte proporcional de IPN, i/p.p. poste galvanizado, tornillería,			

cimentación y anclaje, totalmente colocada.

DOSCIENTOS SETENTA Y OCHO EUROS con SESENTA Y TRES CÉNTIMOS

17	SISTEMAS DE CONTENCIÓN DE VEHÍCULOS		
D38IM030	ML BARRERA DE SEGURIDAD DOBLE ONDA	30,60	
ML. Barrera de seguridad doble onda, i/p.p. poste, captafaros, separador y colocación.			
		TREINTA EUROS con SESENTA CÉNTIMOS	
05	PLANTACIONES		
05.01	EXTENDIDO TIERRA VEGETAL		
D38PA030	M3 EXTENDIDO TIERRA VEGETAL	0,41	
M3. Extendido de tierra vegetal.			
		CERO EUROS con CUARENTA Y UN CÉNTIMOS	
19	HIDROSIEMBRA EN TALUDES		
D39QC060	M2 HIDROSIEMBRA EN TALUDES	2,38	
M2. hidrosiembra en taludes a base de 20 gr. de semilla de Pratenses, 5 gr. de Arbustivas, 300 gr. de Mulch, 40 gr. de abono, 20 gr. de estabilizador, incluso colocación de manta orgánica biodegradable de coco de 400 gr/m2.			
		DOS EUROS con TREINTA Y OCHO CÉNTIMOS	
06	GESTIÓN DE RESIDUOS		
20	GESTIÓN DE RESIDUOS		
07	SEGURIDAD Y SALUD		
21	SEGURIDAD Y SALUD		

Santander, September 2025

Signed by: Santos Diego Cruz.

**3. CUADRO DE PRECIOS Nº2**

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	IMPORTE
01			EXPLANACIONES		
08			TRABAJOS PREVIOS		
09			DESPEJE Y DESBROCE DEL TERRENO		
D38AN015	M2		DESPEJE Y DESBROCE DEL TERRENO		
			M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.		
				Maquinaria	0,39
				Resto de obra y materiales.....	0,01
			TOTAL PARTIDA.....		0,40
10			FRESADO DE LA CARRETERA		
D38GJ010	M2		M2xCM FRESADO DE PAVIMENTO		
			M2 por cm. de espesor en fresado de pavimento, incluso barrido y transporte de productos a vertedero.		
				Mano de obra.....	0,08
				Maquinaria	0,28
				Resto de obra y materiales.....	0,01
			TOTAL PARTIDA.....		0,37
11			EXCAVACIONES		
D38AP020	M3		EXCAV/TTE.DTE.TRANSITO.M/MECA.		
			M3. Excavación en desmonte en terreno de tránsito por medios mecánicos, incluso transporte de productos a vertedero o lugar de empleo.		
				Sin descomposición	
			TOTAL PARTIDA.....		2,31
13			RELLENOS		
01.03.01			RELLENOS PROCEDENTES DE EXCAVACIÓN		
D38AR015	M3		TERRAPLEN PROCEDENTE EXCAVACION		
			M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.		
				Mano de obra.....	0,89
				Maquinaria	1,04
				Resto de obra y materiales.....	0,06
			TOTAL PARTIDA.....		1,99
01.03			SUELO SELECCIONADO		
D38AR014	M3		TERRAPLEN SUELO SELECCIONADO		
			M3. Suelo seleccionado para formación de explanada en coronación de terraplén y en fondo de desmonte.		
				Sin descomposición	

			TOTAL PARTIDA.....	4,33
14			TERMINACIÓN	
01.04			ACABADO Y REFINO DE TALUDES	
D38AR031	M2		ACABADO Y REFINO DE TALUDES	
			Mano de obra.....	0,43
			Maquinaria	0,77
			Resto de obra y materiales.....	0,04
			TOTAL PARTIDA.....	1,24
02			DRENAJE	
02.01			CUNETAS	
D38CA015	ML		CUNETA TRIANGULAR REVESTIDA HM-15	
			ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 6/1-4/1 y profundidad 0.15 m.	
			Mano de obra.....	0,60
			Resto de obra y materiales.....	13,54
			TOTAL PARTIDA.....	14,14
12			ARQUETAS	
D38CE030	UD		ARQUETA O.F. CAÑO 100 CM	
			UD. Arqueta tipo en entrada de O.F. para caño D= 1.00 m totalmente terminada.	
			Mano de obra.....	40,28
			Resto de obra y materiales.....	476,23
			TOTAL PARTIDA.....	516,51
15			TUBO DE DREN	
D38CV010	ML		TUBO DREN PVC 110 MM. MAT FILTRO	
			ML. Tubería drenaje PVC D=110 mm de diámetro incluso colocación y material filtro.	
			Mano de obra.....	7,37
			Resto de obra y materiales.....	9,17
			TOTAL PARTIDA.....	16,54
02.02			BAJANTES	
D38CC015	ML		BAJANTE PREFABRICADA DE HORMIGON	
			ML. Bajante prefabricada de aguas pluviales, en hormigón HM-12,5/P/40/IIA, i/colocación.	
			Mano de obra.....	19,43
			Maquinaria	1,16
			Resto de obra y materiales.....	23,33
			TOTAL PARTIDA.....	43,92
02.03			TUBOS DE HORMIGÓN	
D38CM315	ML		TUBO D=150CM H.A.RECU.M/GRANULAR	



ML. Tubo D= 150 cm de hormigón armado i/relleno de material granular y parte proporcional de juntas totalmente colocado.

Mano de obra..... 4,77
Maquinaria 2,66
Resto de obra y materiales..... 93,76

TOTAL PARTIDA..... 101,19

02.04 BOQUILLAS PARA SALIDAS DE TUBO

D38CR070 UD BOQUILLA ALETAS O.F. 150 CM

UD. Boquilla con aletas en O.F. para caño D=1.50 m totalmente terminada.

Mano de obra..... 92,68
Resto de obra y materiales..... 1.387,24

TOTAL PARTIDA..... 1.479,92

03 FIRMES Y PAVIMENTOS

03.01 ZAHORRAS, SUELOS ESTABILIZADOS Y GRAVAS TRATADAS

D38GA115 M3 ZAHORRA ARTIFICIAL

M3. Zahorra artificial, incluso extensión y compactación en formación de bases.

Mano de obra..... 1,15
Maquinaria 2,09
Resto de obra y materiales..... 12,44

TOTAL PARTIDA..... 15,68

16 RIEGOS Y MACADAMS BITUMINOSOS

D38GG210 M2 EMULSION ECI IMPRIMACION

M2. Emulsión catónica ECI en riego de imprimación. i/ barrido y preparación de la superficie.

Mano de obra..... 0,03
Maquinaria 0,03
Resto de obra y materiales..... 0,17

TOTAL PARTIDA..... 0,23

03.02 MEZCLAS BITUMINOSAS

D38GJ205 TM MBC AC16 SURF 50/70 OFITA

TM. Mezcla bituminosa en caliente tipo AC 16 surf 50/70 S , incluso betún y filler, totalmente extendida y compactada.

Mano de obra..... 2,04
Maquinaria 5,53
Resto de obra y materiales..... 19,03

TOTAL PARTIDA..... 26,60

04 SEÑALIZACIÓN
18 SEÑALIZACIÓN VERTICAL

D38ID160 UD SEÑAL CIRCULAR 90

UD. Señal reflectante circular D=90 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.

Mano de obra..... 33,11
Maquinaria 4,55
Resto de obra y materiales..... 157,63

TOTAL PARTIDA..... 195,29

D38IE010 M2 SEÑAL INFORMATIVA CHAPA HIERRO

M2. Señal informativa reflexiva en chapa de hierro, i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocado.

Mano de obra..... 46,46
Maquinaria 0,46
Resto de obra y materiales..... 198,94

TOTAL PARTIDA..... 245,86

D38ID140 UD SEÑAL TRIANGULAR 135

UD. Señal reflectante triangular de 135 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.

Mano de obra..... 33,11
Maquinaria 4,55
Resto de obra y materiales..... 164,44

TOTAL PARTIDA..... 202,10

04.01 SEÑALIZACIÓN HORIZONTAL

D38IA030 ML MARCA VIAL 10 CM

ML. Marca vial reflexiva de 10 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.

Mano de obra..... 0,06
Maquinaria 0,02
Resto de obra y materiales..... 0,22

TOTAL PARTIDA..... 0,30

D38IA020 M2 SUPERFICIE REALMENTE PINTADA

M2. Superficie realmente pintada, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.

Mano de obra..... 10,59
Maquinaria 1,24
Resto de obra y materiales..... 2,63



DOCUMENT N.º 1- BUDGET

Santander, September 2025

Signed by: Santos Diego Cruz.

**4. PRESUPUESTO POR CAPÍTULOS**

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
01	EXPLANACIONES			
08	TRABAJOS PREVIOS			
09	DESPEJE Y DESBROCE DEL TERRENO			
D38AN015	M2 DESPEJE Y DESBROCE DEL TERRENO	16.800,00	0,40	6.720,00
	M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.			
	TOTAL 09.....			6.720,00
10	FRESADO DE LA CARRETERA			
D38GJ010	M2 M2xCM FRESADO DE PAVIMENTO	73.500,00	0,37	27.195,00
	M2 por cm. de espesor en fresado de pavimento, incluso barrido y transporte de productos a vertedero.			
	TOTAL 10.....			27.195,00
	TOTAL 08.....			33.915,00
11	EXCAVACIONES			
D38AP020	M3 EXCAV/TTE.DTE.TRANSITO.M/MECA.	28.612,00	2,31	66.093,72
	M3. Excavación en desmonte en terreno de tránsito por medios mecánicos, incluso transporte de productos a vertedero o lugar de empleo.			
	TOTAL 11.....			66.093,72
13	RELLENOS			
01.03.01	RELLENOS PROCEDENTES DE EXCAVACIÓN			
D38AR015	M3 TERRAPLEN PROCEDENTE EXCAVACION	13.376,90	1,99	26.620,03
	M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.			
	TOTAL 01.03.01.....			26.620,03
01.03	SUELO SELECCIONADO			
D38AR014	M3 TERRAPLEN SUELO SELECCIONADO	11.000,00	4,33	47.630,00
	M3. Suelo seleccionado para formación de explanada en coronación de terraplén y en fondo de desmonte.			

	TOTAL 01.03	47.630,00
	TOTAL 13	74.250,03
14	TERMINACIÓN	
01.04	ACABADO Y REFINO DE TALUDES	
D38AR031	M2 ACABADO Y REFINO DE TALUDES	42.000,00 1,24 52.080,00
	TOTAL 01.04	52.080,00
	TOTAL 14	52.080,00
	TOTAL 01	226.338,75
02	DRENAJE	
02.01	CUNETAS	
D38CA015	ML CUNETA TRIANGULAR REVESTIDA HM-15	1.900,00 14,14 26.866,00
	ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 6/1-4/1 y profundidad 0.15 m.	
	TOTAL 02.01	26.866,00
12	ARQUETAS	
D38CE030	UD ARQUETA O.F. CAÑO 100 CM	42,00 516,51 21.693,42
	UD. Arqueta tipo en entrada de O.F. para caño D= 1.00 m totalmente terminada.	
	TOTAL 12	21.693,42
15	TUBO DE DREN	
D38CV010	ML TUBO DREN PVC 110 MM. MAT FILTRO	1.900,00 16,54 31.426,00
	ML. Tubería drenaje PVC D=110 mm de diámetro incluso colocación y material filtro.	
	TOTAL 15	31.426,00
02.02	BAJANTES	
D38CC015	ML BAJANTE PREFABRICADA DE HORMIGON	20,00 43,92 878,40



ML. Bajante prefabricada de aguas pluviales, en hormigón HM-12,5/P/40/IIA, i/colocación.

incluso betún y filler, totalmente extendida y compactada.

TOTAL 02.02.....				878,40
02.03	TUBOS DE HORMIGÓN			
D38CM315	ML TUBO D=150CM H.A.RECU.M/GRANULAR	53,00	101,19	5.363,07
	ML. Tubo D= 150 cm de hormigón armado i/relleno de material granular y parte proporcional de juntas totalmente colocado.			
TOTAL 02.03.....				5.363,07
02.04	BOQUILLAS PARA SALIDAS DE TUBO			
D38CR070	UD BOQUILLA ALETAS O.F. 150 CM	4,00	1.479,92	5.919,68
	UD. Boquilla con aletas en O.F. para caño D=1.50 m totalmente terminada.			
TOTAL 02.04.....				5.919,68
TOTAL 02.....				92.146,57

03	FIRMES Y PAVIMENTOS			
03.01	ZAHORRAS, SUELOS ESTABILIZADOS Y GRAVAS TRATADAS			
D38GA115	M3 ZAHORRA ARTIFICIAL	3.675,00	15,68	57.624,00
	M3. Zahorra artificial, incluso extensión y compactación en formación de bases.			
TOTAL 03.01.....				57.624,00
16	RIEGOS Y MACADAMS BITUMINOSOS			
D38GG210	M2 EMULSION ECI IMPRIMACION	14.700,00	0,23	3.381,00
	M2. Emulsión catónica ECI en riego de imprimación. i/ barrido y preparación de la superficie.			
TOTAL 16.....				3.381,00
03.02	MEZCLAS BITUMINOSAS			
D38GJ205	TM MBC AC16 SURF 50/70 OFITA	1.800,00	26,60	47.880,00
	TM. Mezcla bituminosa en caliente tipo AC 16 surf 50/70 S ,			

TOTAL 03.02				47.880,00
TOTAL 03				108.885,00

04	SEÑALIZACIÓN			
18	SEÑALIZACIÓN VERTICAL			
D38ID160	UD SEÑAL CIRCULAR 90	3,00	195,29	585,87
	UD. Señal reflectante circular D=90 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.			
D38IE010	M2 SEÑAL INFORMATIVA CHAPA HIERRO	50,00	245,86	12.293,00
	M2. Señal informativa reflexiva en chapa de hierro, i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocado.			
D38ID140	UD SEÑAL TRIANGULAR 135	5,00	202,10	1.010,50
	UD. Señal reflectante triangular de 135 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.			

TOTAL 18				13.889,37
04.01	SEÑALIZACIÓN HORIZONTAL			
D38IA030	ML MARCA VIAL 10 CM	6.100,00	0,30	1.830,00
	ML. Marca vial reflexiva de 10 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			
D38IA020	M2 SUPERFICIE REALMENTE PINTADA	100,00	14,46	1.446,00
	M2. Superficie realmente pintada, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			
D38IA060	ML MARCA VIAL 30 CM	50,00	0,90	45,00
	ML. Marca vial reflexiva de 30 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.			

TOTAL 04.01				3.321,00
04.03	BALIZAMIENTO			
D38IE050	M2 CARTEL LAMAS ACERO REFLEXIVO E.G	9,00	278,63	2.507,67



M2. Cartel en lamas de acero reflexivo E.G. con parte proporcional de IPN, i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.

TOTAL 06 63.483,19

TOTAL 04.03..... 2.507,67				
17	SISTEMAS DE CONTENCIÓN DE VEHÍCULOS			
D38IM030	ML BARRERA DE SEGURIDAD DOBLE ONDA	100,00	30,60	3.060,00
	ML. Barrera de seguridad doble onda, i/p.p. poste, captafaros, separador y colocación.			

TOTAL 17..... 3.060,00

TOTAL 04..... 22.778,04

05	PLANTACIONES			
05.01	EXTENDIDO TIERRA VEGETAL			
D38PA030	M3 EXTENDIDO TIERRA VEGETAL	250,00	0,41	102,50
	M3. Extendido de tierra vegetal.			

TOTAL 05.01..... 102,50

19	HIDROSIEMBRA EN TALUDES			
D39QC060	M2 HIDROSIEMBRA EN TALUDES	4.807,09	2,38	11.440,87
	M2. hidrosiembra en taludes a base de 20 gr. de semilla de Pratenses, 5 gr. de Arbustivas, 300 gr. de Mulch, 40 gr. de abono, 20 gr. de estabilizador, incluso colocación de manta orgánica biodregradable de coco de 400 gr/m2.			

TOTAL 19..... 11.440,87

TOTAL 05..... 11.543,37

06	GESTIÓN DE RESIDUOS			
20	GESTIÓN DE RESIDUOS			

TOTAL 20..... 63.483,19

07	SEGURIDAD Y SALUD		
21	SEGURIDAD Y SALUD		

TOTAL 21 55.077,62

TOTAL 07 55.077,62

TOTAL 580.252,54

Santander, September 2025

Signed by: Santos Diego Cruz.



5. RESUMEN DE PRESUPUESTO

CAPÍTULO	RESUMEN	IMPORTE	%
01	EXPLANACIONES.....	226.338,75	39,01
02	DRENAJE.....	92.146,57	15,88
03	FIRMES Y PAVIMENTOS.....	108.885,00	18,77
04	SEÑALIZACIÓN	22.778,04	3,93
05	PLANTACIONES	11.543,37	1,99
06	GESTIÓN DE RESIDUOS	63.483,19	10,94
07	SEGURIDAD Y SALUD	55.077,62	9,49

PRESUPUESTO DE EJECUCIÓN MATERIAL	580.252,54
13,00 % Gastos generales 75.432,83	
6,00 % Beneficio industrial	34.815,15

Suma.....	110.247,98
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PRESUPUESTO BASE DE LICITACIÓN SIN IVA	690.500,52
21% IVA	145.005,11

PRESUPUESTO BASE DE LICITACIÓN	835.505,63
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Asciende el presupuesto a la expresada cantidad de OCHOCIENTOS TREINTA Y CINCO MIL
QUINIENTOS CINCO
EUROS con SESENTA Y TRES CÉNTIMOS
Promotor ENT0001 Proyectista ENT0005 , Septiembre 2025.

Santander, September 2025

Signed by: Santos Diego Cruz.



DOCUMENT Nº2 – BREAKDOWN OF EXPENSES

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1. INTRODUCTION

This appendix details and justifies the unit prices shown in Price Schedule No. 1, which are used to determine the project budget. The material execution price of each work unit is obtained by summing its direct and indirect costs; the latter are calculated as a percentage of the former.

$$P_n = C_D + C_I = C_D * \left(1 + \frac{K}{100}\right)$$

Where:

- P_n material execution price of the work unit (€).
- C_D direct cost of the work unit (€).
- C_I indirect cost of the work unit (€).
- K percentage of indirect costs (%).

2. DIRECT COSTS

The direct costs of each unit of work depend on three components:

- Labor cost.
- Machinery cost.
- Material cost.

2.1. WORKFORCE COST

The labor cost calculation is based on the Cantabria Construction and Public Works Collective Agreement 2025.

The formula used to determine the hourly cost is provided by the Ministerial Order of May 21, 1979:

$$C = k \cdot A + B$$

Where:

- C hourly cost for the company (€/h).
- k coefficient of the contribution rate, the value 1.4 will be taken.

- A total remuneration of the worker with salary character exclusively (€/h).
- B total non-salary remuneration of the worker (€/h).

2.1.1. LABOUR CALENDAR OF CANTABRIA

The Cantabrian Work Schedule for 2025 is detailed in the Resolution ordering the registration and publication of the Agreement of the Negotiating Committee of the Collective Agreement for the Construction and Public Works Sector of Cantabria, regarding the Work Schedule for 2025.

CALENDARIO LABORAL DEL CONVENIO COLECTIVO CONSTRUCCIÓN Y OBRAS PÚBLICAS DE CANTABRIA												
2025												
	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
1	F-N	SAB	SAB	8	F-N	DOM	8	8	8	8	F-N	8
2	F-C	DOM	DOM	8	F-C	8	8	SAB	8	8	DOM	8
3	F-C	8	F-C	8	SAB	8	8	DOM	8	8	8	8
4	SAB	8	8	8	DOM	8	8	8	8	SAB	8	8
5	DOM	8	8	SAB	8	8	SAB	8	8	DOM	8	8
6	F-N	8	8	DOM	8	8	DOM	8	SAB	8	8	F-N
7	8	8	8	8	8	SAB	8	8	DOM	8	8	DOM
8	8	SAB	SAB	8	8	DOM	8	8	8	8	SAB	F-N
9	8	DOM	DOM	8	8	F-L	8	SAB	8	8	DOM	8
10	8	8	8	8	SAB	8	8	DOM	8	8	8	8
11	SAB	8	8	8	DOM	8	8	8	8	SAB	8	8
12	DOM	8	8	SAB	8	8	SAB	8	8	DOM	8	8
13	8	8	8	DOM	8	8	DOM	8	SAB	8	8	SAB
14	8	8	8	8	8	SAB	8	8	DOM	8	8	DOM
15	8	SAB	SAB	8	8	DOM	8	F-N	F-N	8	SAB	8
16	8	DOM	DOM	8	8	8	8	SAB	8	8	DOM	8
17	8	8	8	F-N	SAB	8	8	DOM	8	8	8	8
18	SAB	8	8	F-N	DOM	8	8	8	8	SAB	8	8
19	DOM	8	8	SAB	8	8	SAB	8	8	DOM	8	8
20	8	8	8	DOM	8	8	DOM	8	SAB	8	8	SAB
21	8	8	8	8	8	SAB	8	8	DOM	8	8	DOM
22	8	SAB	SAB	8	8	DOM	8	8	8	8	SAB	8
23	8	DOM	DOM	8	8	8	8	SAB	8	8	DOM	8
24	8	8	8	8	SAB	8	8	DOM	8	8	8	F-C
25	SAB	8	8	8	DOM	8	F-L	8	8	SAB	8	F-N
26	DOM	8	8	SAB	8	8	SAB	8	8	DOM	8	F-C
27	8	8	8	DOM	8	8	DOM	8	SAB	8	8	SAB
28	8	8	8	8	8	SAB	F-N	8	DOM	8	8	DOM
29	8	SAB	8	8	DOM	8	8	8	8	8	SAB	F-C
30	8	DOM	8	8	8	8	SAB	8	8	DOM	F-C	F-C
31	8	8	8	SAB	8	8	DOM	8	F-C	8	F-C	F-C
T. H.	152	160	160	160	160	160	168	160	168	168	160	128
DÍAS	19	20	20	20	20	20	21	20	21	21	20	16

F-N: Fiesta Nacional, F-L: Fiesta Local, F-C: Fiesta Convenio.

HORAS DE CALENDARIO	21 días x 8 horas	1.904 horas
HORAS DE VACACIONES		168 horas
TOTAL HORAS		1.736 horas
DÍAS DE PLUS CONVENIO=	238 días – 21 días de vacaciones =	217 días
TOTAL HORAS EFECTIVAS (Total horas trabajo efectivo)		1.736 horas

VACACIONES AÑO 2025: 30 DÍAS NATURALES DE LOS CUALES DEBE HABER 21 DÍAS LABORABLES
En aquellos municipios de la región en los que sus fiestas locales coincidan en sábado, domingo, fiesta nacional, fiesta de la comunidad o regional, puente o fiesta de convenio, trasladarán el disfrute de estos días feridos al día laborable inmediatamente posterior.

Table 1.1: Labour calendar, Cantabria 2025.

2.1.2. RETRIBUTION WITH SALARY CHARACTER (A)

Salary-based remuneration (A) for each level is calculated as the sum of the base salary, the collective bargaining agreement bonus, vacation time, summer pay, Christmas pay, seniority, and the 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 1.2: Salarial table of daily retribution, Cantabria, 2024.

The base salary, the collective bargaining agreement bonus, vacation time, and summer and Christmas pay are determined by applying the amounts established in the previous salary table for each employee level.

Since information for 2025 is lacking, a 3% increase will be assumed.

2.1.2.1. ANTIQUITY

A 5% seniority bonus on base salary applies to higher levels (supervisor, foreman, and first-class officer) because they are usually permanent employees on the company's payroll. Lower levels are usually temporary employees who depend on the construction site's location; therefore, they do not receive a seniority bonus.

2.1.2.2. DANGEROUSNESS PLUS

A hazard bonus of 10% of the base salary is applied to ordinary laborers to cover hazardous work on site, assuming that these hazardous operations are performed during 50% of the workday.

Taking into account the total of 1,736 teaching hours per year, the following hourly values are obtained, corresponding to salary-based remuneration (A):

	RETIBUCIÓN CON CARÁCTER SALARIAL (A)							
	SALARIO BASE (335 días)	PLUS DE CONVENIO (217 días)	VACACIONES	PAGA DE VERANO	PAGA DE NAVIDAD	ANTIGÜEDAD	PLUS DE PELIGROSIDAD	TOTAL ANUAL
	€/día	€/día	€	€	€	€	€	€
CAPATAZ	39,16	23,15	1796,55	1838,14	1838,14	655,93	0	24270,91
OFICIAL DE 1ª	38,51	23,15	1776,4	1824,51	1824,51	645,0425	0	23994,86
PEÓN ORDINARIO	35,72	23,15	1527,41	1627,54	1627,54	0	598,31	22370,55

Table 1.3: Obtention of retribution with salarial character.

2.1.2. RETRIBUTION WITH NO SALARY CHARACTER (B)

Non-salary compensation (B) is calculated based on per diem, distance, tool wear, work clothing and severance pay.

2.1.2.1. DIETS AND MILEAGE

A full daily allowance will be paid to higher-level workers (foremen and first-class journeymen) and a half-day allowance to lower-level workers (ordinary laborers) for actual days worked.

In addition, a mileage supplement is established to cover workers' travel expenses to their workplace. This supplement is calculated based on a total distance of 30 kilometers (15 kilometers there and 15 kilometers back) and will be paid in euros for each kilometer traveled per day.

Dieta completa	39,57
Media dieta.....	12,97
Kl.	0,3

Table 1.4: Diets and mileage. Cantabria.

2.1.2.2. TOOL WEAR

An average weekly amount of 3.00 euros will be applied for tool wear and tear, applicable to 1st class officers.

**2.1.2.3. COMPENSATION FOR TERMINATION OF CONTRACT**

The agreement establishes daily compensation for severance pay in the event of termination of an open-ended contract. This compensation will be paid for each calendar day of employment, excluding days of absence due to illness, accident, or sick 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

Table 1.5: Indemnizations

This compensation is considered equivalent to 365 days worked.

The sum of the above items results in the following non-salary compensation (B) values for each level:

	RETRIBUCIÓN CON CARÁCTER NO SALARIAL (B)				
	DIETAS (217 días)	KILOMETRAJE (217 días, 30 km)	DESGASTE DE HERRAMIENTA (42 semanas)	INDEMNIZACIÓN	TOTAL ANUAL
	€/día	€/km*día	€/semana	€/día	€
CAPATAZ	39,57	0,3	0	4,54	12196,79
OFICIAL DE 1ª	39,57	0,3	3	4,142	12177,52
PEÓN ORDINARIO	12,97	0,3	0	4,08	6256,69

Table 1.6: Retribution with no salarial character.

2.1.3. TOTAL RETRIBUTION

Through the formula $C = 1,40 \cdot A + B$, we get the following workforce costs:

	COSTE DE LA MANO DE OBRA (C)	
	COSTE ANUAL	COSTE POR HORA
	€	€/h
CAPATAZ	46176,06	26,60
OFICIAL DE 1ª	45770,33	26,37
PEÓN ORDINARIO	37575,46	21,64

Table 1.7: Workforce cost.

2.2. MACHINERY COST

The machinery to be used in the execution of the work is described below with its unit costs.

CÓDIGO	RESUMEN	UD.	PRECIO/UD.
U39AA002	Retroexcavadora neumáticos	H.	25,61
U39AB004	Pala neumáticos CAT.950	H.	23,97
U39AB006	Pala s/neumaticos CAT.980	H.	39,66
U39AB010	Pala s/neumáticos (CAT-920)	H.	17,72
U39AC006	Compactador neumát.autp. 60cv	H.	13,74
U39AC007	Compactador neumát.autp.100cv	H.	29,73
U39AD002	Motoniveladora 130 cv	H.	27,99
U39AE001	Compactador tandem autopropulsado de 10 t	h	65,00
U39AF002	Camión grua 5 Tm.	H.	17,72
U39AG001	Barredora nemát autropopulsad	h	6,20
U39AH003	Camión 5 tm	H.	9,10
U39AH005	Camión basculante 10 tm	H.	11,99
U39AH010	Camión basculante 16 tm	H.	26,10
U39AH024	Camión basculante 125cv	H.	17,50
U39AH025	Camión bañera 200 cv	H.	23,63
U39AI008	Extendedora aglomerado	h	118,00
U39AI012	Equipo extend.base.sub-bases	H.	40,18
U39AL005	Camión cisterna/agua 140 cv	H.	17,10
U39AP001	Marcadora autopropulsada	H.	6,20
U39AQ001	Maqui.hinca postes barre.segu	H.	10,12
U39AT002	Trac. s/orug. bull. 140 cv	H.	28,38
U39AY002	Compr. movil 6 martill.150 cv	H.	16,55
U39BK205	Planta asfáltica en caliente	h	516,00
U40SE150	Motosierra.	h	24,00



2.3. MATERIAL COST

The materials to be used in the execution of the work are described below, with the unit costs extracted from the Reference Price Base of the Government of Cantabria.

CÓDIGO	RESUMEN	UD.	PRECIO/UD.
U04MA210	Hormigón HM-12,5/P/40 central	M3	56,26
U04MA310	Hormigón HM-15/P/40 central	M3	57,12
U04MA510	Hormigón HM-20/P/40/ I central	M3	64,39
U04PY001	Agua	M3	0,55
U39BF101	Fabr. y tte. de hormigón	M3	5,99
U39BH125	Encofr.desencofr.cimient.sole	M2	3,49
U39CE002	Zahorra artificial	M3	10,42
U39CE0020	Emulsion bituminosa C60BF5 IMP	t	305,00
U39CE0021	Emulsión bituminosa C60B3 ADH	t	243,26
U39CK021	Suelo tolerable	M3	1,53
U39CK023	Suelo seleccionado	M3	2,15
U39CQ002	Polvo mineral de aportación	t	56,47
U39DA002	Betún asfáltico B 50/70	t	650,00
U39FD001	Rejilla fundici.tapas arqueta	M2	28,87
U39GD005	Tubo hormig.vibropr. D=90 cm	MI	45,43
U39GD006	Tubo hormig.vibropr. D=120 cm	MI	58,24
U39HA010	Acero B 400 S	Kg	0,55
U39VA002	Pintura marca vial	Kg	2,33
U39VF001	Sñ. peligro triáng. de 135 cm	Ud	124,60
U39VF060	Señal reflectante ø=90 cm	Ud	117,70
U39VH0020	Panel reflec. en chapa de acero	M2	97,42
U39VM003	Poste tubo galvaniz.80x40x2mm	MI	7,66
U39VM007	Poste galvan. CPN 120 de 1.5 m.	MI	16,18
U39VM010	IPN-12	MI	14,90
U39VQ002	Juego tornillería	Ud	2,76
U39VS002	Captafaros	Ud	3,07
U39VW005	Placa comple.reflex.85x17 cm	Ud	29,79
U39VW020	Cartel lamas acero reflexivo E.G	M2	137,93
U39VZ001	Esferitas de vidrio N.V.	Kg	1,10
U39VN025	Banda doble onda galva. 4 m	MI	11,04
U39ZH001	Separador	Ud	4,29
U40MA615	Manta orgánica biodegradable	M2	1,38
U40MA650	Mezcla completa hidrosiembra	Kg	0,79

3. INDIRECT COSTS

Indirect costs (not directly applicable to a unit of work) are obtained by applying a percentage K to direct costs.

The percentage value is calculated using the following expression:

$$K = V + J$$

Where:

- K Percentage of indirect costs
- V Percentage resulting from the relationship between the valuation of indirect costs and the amount of direct costs (5% is applied).
- J Percentage of unforeseen expenses (1% applies to land works).

Therefore, an indirect cost coefficient (K) of 6% is applied to the direct cost of each work unit.

4. UNITARY PRICES

CÓDIGO	UD.	RESUMEN	IMPORTE
D38AN015	M2	DESPEJE Y DESBROCE DEL TERRENO	0,45
D38AP026	M3	EXCAV/TTE.ROCA MARTILLO NEUMATIC	20,11
D38AR010	M3	TERRAPLEN SUELO TOLERABLE	3,70
D38AR014	M3	SUELO SELECCIONADO	4,33
D38AR015	M3	TERRAPLEN PROCEDENTE EXCAVACION	1,66
D38AR031	M2	ACABADO Y REFINO DE TALUDES	1,02
D38CA015	ML	CUNETAS TRIANGULAR REVESTIDA HM-15	14,55
D38CE530	UD	ARQ.DESAG.MEDIANA,DREN,COLECTOR	341,48
D38CM050	ML	TUBO D=90CM H.VIBRO.RECUB.HORM	141,12
D38CM060	ML	TUBO D=120CM H.VIBRO.RECUB.HORM	174,69
D38CR050	UD	BOQUILLA ALETAS O.F. 90 CM	965,94
D38CR060	UD	BOQUILLA ALETAS O.F. 120 CM	1.072,28
D38GA115	M3	ZAHORRA ARTIFICIAL	15,58
D38GJ0010	t	EMULSIÓN C60BF5 IMP	332,59
D38GJ0015	t	EMULSIÓN C60B3 ADH	287,47
D38GJ2001	t	MBC AC 22 BIN 50/70 S CALIZA	100,48
D38GJ2002	t	MBC AC 22 SURF 50/70 D OFITA	107,20
D38IA020	M2	SUPERFICIE REALMENTE PINTADA	10,11
D38IA030	ML	MARCA VIAL 10 CM	0,29
D38ID140	UD	SEÑAL TRIANGULAR 135	194,59
D38ID1400	UD	SEÑAL TRIANGULAR 135 CON PANEL COMPLEMENTARIO	220,41
D38ID160	UD	SEÑAL CIRCULAR 90	187,58
D38IE010	M2	SEÑAL CHAPA ACERO GALVANIZADO	193,17
D38IE050	M2	CARTEL LAMAS ACERO REFLEXIVO RA2	209,16
D38IM030	ML	BARRERA DE SEGURIDAD DOBLE ONDA	28,15
D38PA030	M3	EXTENDIDO TIERRA VEGETAL	0,42
D39QC060	M2	HIDROSIEMBRA EN TALUDES	2,27
D39QE020	UD	TALA ARBOL ENTRE 5.00 Y 7.00 M.	83,83



5. DESCOMPOSED PRICES

CÓDIGO	CANTIDAD UD.	RESUMEN	PRECIO	SUBTOTAL	IMPORTE
01		EXPLANACIONES			
08		TRABAJOS PREVIOS			
09		DESPEJE Y DESBROCE DEL TERRENO			
D38AN015		DESPEJE Y DESBROCE DEL TERRENO	M2		
		M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.			
U39AT002	Trac. s/orug. bull. 140 cv	0,004 H.	28,38	0,11	
U39AB004	Pala neumáticos CAT.950	0,003 H.	23,97	0,07	
U39AH024	Camión basculante 125cv	0,012 H.	17,50	0,21	
%0100000	Costes indirectos...(s/total)	0,004 %	3,00	0,01	
TOTAL PARTIDA.....					0,40
10		FRESADO DE LA CARRETERA			
D38GJ010		M2xCM FRESADO DE PAVIMENTO	M2		
		M2 por cm. de espesor en fresado de pavimento, incluso barrido y transporte de productos a vertedero.			
U01AA006	Capataz	0,001 Hr	13,25	0,01	
U01AA010	Peón especializado	0,006 Hr	11,23	0,07	
U39AH039	Fresadora de pavimento	0,001 H.	153,26	0,15	
U39AG003	Barred. recogedora autropulsad	0,001 H.	61,30	0,06	
U39AH027	Camión bañera de 25 tm.	0,002 H.	33,72	0,07	
%0100000	Costes indirectos...(s/total)	0,004 %	3,00	0,01	
TOTAL PARTIDA.....					0,37
11		EXCAVACIONES			
D38AP020		EXCAV/TTE.DTE.TRANSITO.M/MECA.	M3		
		M3. Excavación en desmonte en terreno de tránsito por medios mecánicos, incluso transporte de productos a vertedero o lugar de empleo.			
Sin descomposición					
TOTAL PARTIDA.....					2,31
13		RELLENOS			
01.03.01		RELLENOS PROCEDENTES DE EXCAVACIÓN			
D38AR015		TERRAPLEN PROCEDENTE EXCAVACION	M3		
		M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.			
U01AA006	Capataz	0,010 Hr	13,25	0,13	
U01AA011	Peón ordinario	0,035 Hr	21,64	0,76	
U39AD002	Motoniveladora 130 cv	0,010 H.	27,99	0,28	
U39AL005	Camión cisterna/agua 140 cv	0,010 H.	17,10	0,17	
U39AC007	Compactador neumát.autp.100cv	0,020 H.	29,73	0,59	
%0100000	Costes indirectos...(s/total)	0,019 %	3,00	0,06	
TOTAL PARTIDA.....					1,99
01.03		SUELO SELECCIONADO			
D38AR014		TERRAPLEN SUELO SELECCIONADO	M3		
		M3. Suelo seleccionado para formación de explanada en coronación de terraplén y en fondo de desmonte.			

Sin descomposición				
TOTAL PARTIDA				
14		TERMINACIÓN		
01.04		ACABADO Y REFINO DE TALUDES		
D38AR031		ACABADO Y REFINO DE TALUDES	M2	
U01AA011	Peón ordinario	0,020 Hr	21,64	0,43
U39AA002	Retroexcavadora neumáticos	0,030 H.	25,61	0,77
%0100000	Costes indirectos...(s/total)	0,012 %	3,00	0,04
TOTAL PARTIDA				
02		DRENAJE		
02.01		CUNETAS		
D38CA015		CUNETA TRIANGULAR REVESTIDA HM-15	ML	
		ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 6/1-4/1 y profundidad 0.15 m.		
U04MA310	Hormigón HM-15/P/40 central	0,134 M3	57,12	7,65
U39BF101	Fabr. y tte. de hormigón	0,134 M3	5,99	0,80
U39BF104	Colocación horm. en cimientos	0,134 M3	4,49	0,60
U39BH125	Encofr.desencofr.cimient.sole	1,340 M2	3,49	4,68
%0100000	Costes indirectos...(s/total)	0,137 %	3,00	0,41
TOTAL PARTIDA				
12		ARQUETAS		
D38CE030		ARQUETA O.F. CAÑO 100 CM	UD	
		UD. Arqueta tipo en entrada de O.F. para caño D= 1.00 m totalmente terminada.		
U04MA510	Hormigón HM-20/P/40/ I central	4,093 M3	64,39	263,55
U04MA210	Hormigón HM-12,5/P/40 central	0,336 M3	56,26	18,90
U39BF101	Fabr. y tte. de hormigón	4,429 M3	5,99	26,53
U39BF108	Colocación hormig. en alzados	3,421 M3	10,45	35,75
U39BF104	Colocación horm. en cimientos	1,008 M3	4,49	4,53
U39BH125	Encofr.desencofr.cimient.sole	22,780 M2	3,49	79,50
U39HA010	Acero B 400 S	132,190 Kg	0,55	72,70
%0100000	Costes indirectos...(s/total)	5,015 %	3,00	15,05
TOTAL PARTIDA				
15		TUBO DE DREN		
D38CV010		TUBO DREN PVC 110 MM. MAT FILTRO	ML	
		ML. Tubería drenaje PVC D=110 mm de diámetro incluso colocación y material filtro.		
U01AA006	Capataz	0,050 Hr	13,25	0,66
U01AA007	Oficial primera	0,100 Hr	12,80	1,28
U01AA011	Peón ordinario	0,251 Hr	21,64	5,43
U39GA001	Tube.ranura.drena.PVC D=110mm	1,000 MI	3,43	3,43
U39CK001	Material filtro drenaje >76mm	0,230 M3	9,20	2,12
U04MA310	Hormigón HM-15/P/40 central	0,055 M3	57,12	3,14
%0100000	Costes indirectos...(s/total)	0,161 %	3,00	0,48
TOTAL PARTIDA				
02.02		BAJANTES		
D38CC015		BAJANTE PREFABRICADA DE HORMIGON	ML	
		ML. Bajante prefabricada de aguas pluviales, en hormigón HM-12,5/P/40/IIA, i/colocación.		
U01AA007	Oficial primera	0,250 Hr	12,80	3,20
U01AA011	Peón ordinario	0,750 Hr	21,64	16,23



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DOCUMENT N.º 2 – BREAKDOWN OF EXPENSES

U39FJ001	Bajante pluviales pref.hormig	1,000 MI	12,90	12,90
U04MA210	Hormigón HM-12,5/P/40 central	0,088 M3	56,26	4,95
U39BF101	Fabr. y tte. de hormigón	0,088 M3	5,99	0,53
U04CA001	Cemento CEM II/A-P 32,5 R Granel	0,027 Tm	73,94	2,00
U39CA008	Arena de río	0,150 M3	11,04	1,66
U04PY001	Agua	0,015 M3	0,55	0,01
U39AO001	Hormigonera 250 l.	0,036 H.	5,46	0,20
U39AU001	Dumper 0.75 m3	0,160 H.	5,98	0,96
%0100000	Costes indirectos...(s/total)	0,426 %	3,00	1,28

TOTAL PARTIDA..... 43,92

02.03 TUBOS DE HORMIGÓN				
D38CM315	TUBO D=150CM H.A.RECU.M/GRANULAR	ML		
ML. Tubo D= 150 cm de hormigón armado i/relleno de material granular y parte proporcional de juntas totalmente colocado.				
U01AA006	Capataz	0,033 Hr	13,25	0,44
U01AA011	Peón ordinario	0,200 Hr	21,64	4,33
U39GG015	Tubo hormig.armado D=150 cm	1,000 MI	76,63	76,63
U39BA205	Rell.mate.granular compactado	1,228 M3	7,79	9,57
U39BA208	Relleno seleccionado compacta	1,533 M3	3,01	4,61
U39AF002	Camión grua 5 Tm.	0,150 H.	17,72	2,66
%0100000	Costes indirectos...(s/total)	0,982 %	3,00	2,95

TOTAL PARTIDA..... 101,19

02.04 BOQUILLAS PARA SALIDAS DE TUBO				
D38CR070	BOQUILLA ALETAS O.F. 150 CM	UD		
UD. Boquilla con aletas en O.F. para caño D=1.50 m totalmente terminada.				
U04MA510	Hormigón HM-20/P/40/ l central	11,143 M3	64,39	717,50
U04MA210	Hormigón HM-12,5/P/40 central	3,453 M3	56,26	194,27
U39BF101	Fabr. y tte. de hormigón	14,596 M3	5,99	87,43
U39BF108	Colocación hormig. en alzados	4,555 M3	10,45	47,60
U39BF104	Colocación horm. en cimientos	10,041 M3	4,49	45,08
U39BH125	Encofr.desencofr.cimient.sole	43,620 M2	3,49	152,23
U39HA010	Acero B 400 S	350,390 Kg	0,55	192,71
%0100000	Costes indirectos...(s/total)	14,368 %	3,00	43,10

TOTAL PARTIDA..... 1.479,92

03 FIRMES Y PAVIMENTOS				
03.01 ZAHORRAS, SUELOS ESTABILIZADOS Y GRAVAS TRATADAS				
D38GA115	ZAHORRA ARTIFICIAL	M3		
M3. Zahorra artificial, incluso extensión y compactación en formación de bases.				
U01AA006	Capataz	0,005 Hr	13,25	0,07
U01AA011	Peón ordinario	0,050 Hr	21,64	1,08
U39CE002	Zahorra artificial	1,150 M3	10,42	11,98
U39AI012	Equipo extend.base,sub-bases	0,010 H.	40,18	0,40
U39AH025	Camión bañera 200 cv	0,060 H.	23,63	1,42
U39AC006	Compactador neumát.autp. 60cv	0,020 H.	13,74	0,27
%0100000	Costes indirectos...(s/total)	0,152 %	3,00	0,46

TOTAL PARTIDA..... 15,68

16 RIEGOS Y MACADAMS BITUMINOSOS				
D38GG210	EMULSION ECI IMPRIMACION	M2		
M2. Emulsión catónica ECI en riego de imprimación. i/ barrido y preparación de la superficie.				

U01AA006	Capataz	0,001 Hr	13,25	0,01
U01AA011	Peón ordinario	0,001 Hr	21,64	0,02
U39AG005	Barredora autopropulsada	0,001 H.	12,14	0,01
U39AM005	Camión bituminador 130 cv	0,001 H.	24,35	0,02
U39DE008	Emulsión bituminosa ECI	0,001 Tm	158,16	0,16
%0100000	Costes indirectos...(s/total)	0,002 %	3,00	0,01

TOTAL PARTIDA 0,23

03.02 MEZCLAS BITUMINOSAS				
D38GJ205	MBC AC16 SURF 50/70 OFITA	TM		
TM. Mezcla bituminosa en caliente tipo AC 16 surf 50/70 S , incluso betún y filler, totalmente extendida y compactada.				
U01AA006	Capataz	0,017 Hr	13,25	0,23
U01AA007	Oficial primera	0,083 Hr	12,80	1,06
U01AA010	Peón especializado	0,067 Hr	11,23	0,75
U39CQ002	Arido silíceo mezclas bitum.	0,945 Tm	7,36	6,96
U39DA002	Betún asfáltico B 60/70	0,055 Tm	205,37	11,30
U39BK205	Planta asfáltica en caliente	0,017 H.	214,56	3,65
U39AI008	Extendedora aglomerado	0,017 H.	39,85	0,68
U39AE001	Compactador tandem	0,017 H.	22,99	0,39
U39AC007	Compactador neumát.autp.100cv	0,017 H.	29,73	0,51
U39AH027	Camión bañera de 25 tm.	0,009 H.	33,72	0,30
%0100000	Costes indirectos...(s/total)	0,258 %	3,00	0,77

TOTAL PARTIDA 26,60

04 SEÑALIZACIÓN				
18 SEÑALIZACIÓN VERTICAL				
D38ID160	SEÑAL CIRCULAR 90	UD		
UD. Señal reflectante circular D=90 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.				
U01AA006	Capataz	0,200 Hr	13,25	2,65
U01AA010	Peón especializado	0,400 Hr	11,23	4,49
U01AA011	Peón ordinario	1,200 Hr	21,64	25,97
U39AH003	Camión 5 tm	0,500 H.	9,10	4,55
U39VF060	Señal reflectante ø=90 cm	1,000 Ud	117,70	117,70
U39VM003	Poste tubo galvaniz.80x40x2mm	3,500 MI	7,66	26,81
U04MA310	Hormigón HM-15/P/40 central	0,130 M3	57,12	7,43
%0100000	Costes indirectos...(s/total)	1,896 %	3,00	5,69

TOTAL PARTIDA 195,29

D38IE010	SEÑAL INFORMATIVA CHAPA HIERRO	M2		
M2. Señal informativa reflexiva en chapa de hierro, i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocado.				
U01AA006	Capataz	0,500 Hr	13,25	6,63
U01AA007	Oficial primera	0,500 Hr	12,80	6,40
U01AA010	Peón especializado	1,000 Hr	11,23	11,23
U01AA011	Peón ordinario	1,000 Hr	21,64	21,64
U39AH003	Camión 5 tm	0,050 H.	9,10	0,46
U39VH002	Panel reflec. en chapa hierro	1,000 M2	137,93	137,93
U39VM003	Poste tubo galvaniz.80x40x2mm	6,000 MI	7,66	45,96
U04MA310	Hormigón HM-15/P/40 central	0,125 M3	57,12	7,14
U39BF101	Fabr. y tte. de hormigón	0,125 M3	5,99	0,75
U39BF104	Colocación horm. en cimientos	0,125 M3	4,49	0,56
%0100000	Costes indirectos...(s/total)	2,387 %	3,00	7,16

TOTAL PARTIDA 245,86



PROYECT FOR THE PLATFORM IMPROVEMENT OF ROAD CA-661: ACCESS TO LA BUSTA.

DOCUMENT N.º 2 – BREAKDOWN OF EXPENSES

D38ID140	SEÑAL TRIANGULAR 135	UD			
	UD. Señal reflectante triangular de 135 cm., i/p.p. poste galvanizado, tornillería, cimentación y anclaje, totalmente colocada.				
U01AA006	Capataz	0,200 Hr	13,25	2,65	
U01AA010	Peón especializado	0,400 Hr	11,23	4,49	
U01AA011	Peón ordinario	1,200 Hr	21,64	25,97	
U39AH003	Camión 5 tm	0,500 H.	9,10	4,55	
U39VF001	Sñ. peligro triáng. de 135 cm	1,000 Ud	124,60	124,60	
U39VM003	Poste tubo galvaniz. 80x40x2mm	3,500 MI	7,66	26,81	
U04MA310	Hormigón HM-15/P/40 central	0,125 M3	57,12	7,14	
%0100000	Costes indirectos...(s/total)	1,962 %	3,00	5,89	
TOTAL PARTIDA.....			202,10		
04.01	SEÑALIZACIÓN HORIZONTAL				
D38IA030	MARCA VIAL 10 CM	ML			
	ML. Marca vial reflexiva de 10 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.				
U01AA006	Capataz	0,001 Hr	13,25	0,01	
U01AA007	Oficial primera	0,001 Hr	12,80	0,01	
U01AA011	Peón ordinario	0,002 Hr	21,64	0,04	
U39VA002	Pintura marca vial	0,072 Kg	2,33	0,17	
U39VZ001	Esferitas de vidrio N.V.	0,048 Kg	1,10	0,05	
U39AG001	Barredora nemát autpopulsad	0,001 H.	6,20	0,01	
U39AP001	Marcadora autopropulsada	0,001 H.	6,20	0,01	
%0200001	Costes indirectos...(s/total)	0,003 %	0,00	0,00	
TOTAL PARTIDA.....			0,30		
D38IA020	SUPERFICIE REALMENTE PINTADA	M2			
	M2. Superficie realmente pintada, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.				
U01AA006	Capataz	0,049 Hr	13,25	0,65	
U01AA007	Oficial primera	0,100 Hr	12,80	1,28	
U01AA011	Peón ordinario	0,400 Hr	21,64	8,66	
U39VA002	Pintura marca vial	0,720 Kg	2,33	1,68	
U39VZ001	Esferitas de vidrio N.V.	0,480 Kg	1,10	0,53	
U39AG001	Barredora nemát autpopulsad	0,100 H.	6,20	0,62	
U39AP001	Marcadora autopropulsada	0,100 H.	6,20	0,62	
%0100000	Costes indirectos...(s/total)	0,140 %	3,00	0,42	
TOTAL PARTIDA.....			14,46		
D38IA060	MARCA VIAL 30 CM	ML			
	ML. Marca vial reflexiva de 30 cm, con pintura reflectante y microesferas de vidrio, con máquina autopropulsada.				
U01AA006	Capataz	0,001 Hr	13,25	0,01	
U01AA007	Oficial primera	0,004 Hr	12,80	0,05	
U01AA011	Peón ordinario	0,006 Hr	21,64	0,13	
U39VA002	Pintura marca vial	0,216 Kg	2,33	0,50	
U39VZ001	Esferitas de vidrio N.V.	0,144 Kg	1,10	0,16	
U39AG001	Barredora nemát autpopulsad	0,002 H.	6,20	0,01	
U39AP001	Marcadora autopropulsada	0,002 H.	6,20	0,01	
%0100000	Costes indirectos...(s/total)	0,009 %	3,00	0,03	
TOTAL PARTIDA.....			0,90		
04.03	BALIZAMIENTO				
D38IE050	CARTEL LAMAS ACERO REFLEXIVO E.G	M2			
	M2. Cartel en lamas de acero reflexivo E.G. con parte proporcional de IPN, i/p.p. poste galvanizado, tornillería,				

	cimentación y anclaje, totalmente colocada.				
U01AA006	Capataz	0,300 Hr	13,25	3,98	
U01AA007	Oficial primera	0,300 Hr	12,80	3,84	
U01AA010	Peón especializado	1,000 Hr	11,23	11,23	
U01AA011	Peón ordinario	3,000 Hr	21,64	64,92	
U39AH003	Camión 5 tm	0,500 H.	9,10	4,55	
U39VM010	IPN-12	1,500 MI	14,90	22,35	
U39VW020	Cartel lamas acero reflexivo E.G	1,000 M2	137,93	137,93	
U04MA310	Hormigón HM-15/P/40 central	0,380 M3	57,12	21,71	
%0100000	Costes indirectos...(s/total)	2,705 %	3,00	8,12	
TOTAL PARTIDA			278,63		
17	SISTEMAS DE CONTENCIÓN DE VEHÍCULOS				
D38IM030	BARRERA DE SEGURIDAD DOBLE ONDA	ML			
	ML. Barrera de seguridad doble onda, i/p.p. poste, captafaros, separador y colocación.				
U01AA006	Capataz	0,075 Hr	13,25	0,99	
U01AA007	Oficial primera	0,150 Hr	12,80	1,92	
U01AA010	Peón especializado	0,150 Hr	11,23	1,68	
U01AA011	Peón ordinario	0,300 Hr	21,64	6,49	
U39AQ001	Maqui.hinca postes barre.segu	0,075 H.	10,12	0,76	
U39AH005	Camión basculante 10 tm	0,075 H.	11,99	0,90	
U39VÑ025	Banda doble onda galva. 4 m	1,000 MI	11,04	11,04	
U39VM007	Poste galvan. CPN 120 de 1.5 m.	0,250 MI	16,18	4,05	
U39VQ002	Juego tornillería	0,250 Ud	2,76	0,69	
U39ZH001	Separador	0,250 Ud	4,29	1,07	
U39VS002	Captafaros	0,040 Ud	3,07	0,12	
%0100000	Costes indirectos...(s/total)	0,297 %	3,00	0,89	
%0100000	Costes indirectos...(s/total)	0,297 %	3,00	0,89	
TOTAL PARTIDA			30,60		
05	PLANTACIONES				
05.01	EXTENDIDO TIERRA VEGETAL				
D38PA030	EXTENDIDO TIERRA VEGETAL	M3			
U01AA011	Peón ordinario	0,009 Hr	21,64	0,19	
U39AH005	Camión basculante 10 tm	0,010 H.	11,99	0,12	
U39AB010	Pala s/neumáticos (CAT-920)	0,010 H.	17,72	0,18	
%0100000	Costes indirectos...(s/total)	0,005 %	3,00	0,02	
TOTAL PARTIDA			0,51		
19	HIDROSIEMBRA EN TALUDES				
D39QC060	HIDROSIEMBRA EN TALUDES	M2			
	M2. hidrosiembra en taludes a base de 20 gr. de semilla de Pratenses, 5 gr. de Arbustivas, 300 gr. de Mulch, 40 gr. de abono, 20 gr. de estabilizador, incluso colocación de manta orgánica biodegradable de coco de 400 gr/m2.				
U01FR009	Jardinero	0,030 Hr	11,95	0,36	
U01FR013	Peón ordinario jardinero	0,030 Hr	9,66	0,29	
U04PY001	Agua	0,150 M3	0,55	0,08	
U40MA615	Manta orgánica biodegradable	1,000 M2	1,38	1,38	
U40MA650	Mezcla completa hidrosiembra	0,250 Kg	0,79	0,20	
%0100000	Costes indirectos...(s/total)	0,023 %	3,00	0,07	
TOTAL PARTIDA			2,38		
06	GESTIÓN DE RESIDUOS				
20	GESTIÓN DE RESIDUOS				
07	SEGURIDAD Y SALUD				
21	SEGURIDAD Y SALUD				



DOCUMENT Nº3 – CONTRACTOR’S CLASSIFICATION



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1. INTRODUCTION

Contractor classification is based on the following regulations:

- Law 9/2017, of November 8, on Public Sector Contracts.
- Royal Decree 773/2015, of August 28, amending certain provisions of the General Regulations of the Law on Public Administration Contracts, approved by Royal Decree 1098/2001, of October 12.
- Royal Decree 1098/2001, of October 12, approving the General Regulations of the Law on Public Administration Contracts.

According to Article 77 of Law 9/2017, contractor classification will be mandatory for construction contracts with an estimated value of €500,000 or more.

2. CONTRACTOR'S CLASSIFICATION

The average annuity is determined as the estimated value of the contract multiplied by 12 and divided by the execution period of said chapter in months:

$$\text{Average annuity} = \text{Estimated value of the contract} \cdot \frac{12}{\text{Execution Time}}$$

Valor estimado del contrato (€)	Plazo ejecución (meses)	Anualidad media (€)
690.500,52	10,27	806.816,58

Table 1.1. Annuity

According to Royal Decree 773/2015, which in its sole article modifies, among others, Article 11 of Royal Decree 1098/2001, the group or subgroup and classification category corresponding to the contract must be specified.

This category will be determined based on the average annual value:

Category	Average annuity (€)
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 1.2: Categories

Thus, this average annuity falls into category 3.

3. CONCLUSION

Therefore, the Contractor is required to have the following classifications:

Grupo		Subgrupo		Categoría
G	Viales y pistas	4	Con firmes de mezcla bituminosa	3

Tabla 1.3: Contractor's classification.



DOCUMENT Nº4 – PRICE REVISION FORMULA



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1. INTRODUCTION

This annex describes the price revision and sets out its conditions of application. It is based on the following regulations:

- Law 2/2015, of March 30, on the deindexation of the Spanish economy.
- Royal Decree 1359/2011, of October 7, approving the list of basic materials and the general standard formulas for price revisions for public works contracts and contracts for the supply of weapons and equipment for the manufacture of public administrations.
- Circular Order 31/2012, of December 12, 2012, on the proposal and establishment of polynomial formulas for price revisions in public works projects of the General Directorate of Roads.

2. PRICE REVISION FORMULA

Royal Decree 1359/2011 establishes the following price review formula for road construction projects using bituminous mixture pavements:

$$K_t = 0,01 * \frac{A_t}{A_0} + 0,05 * \frac{B_t}{B_0} + 0,09 * \frac{C_t}{C_0} + 0,11 * \frac{E_t}{E_0} + 0,01 * \frac{M_t}{M_0} + 0,01 * \frac{O_t}{O_0} + 0,02 * \frac{P_t}{P_0} \\ + 0,01 * \frac{Q_t}{Q_0} + 0,12 * \frac{R_t}{R_0} + 0,17 * \frac{S_t}{S_0} + 0,01 * \frac{U_t}{U_0} + 0,39$$

Where:

- K_t Theoretical revision coefficient for the execution time t.
- A_t Aluminium cost index at the time of execution t.
- A_0 Aluminium cost index at tender date.
- B_t Bituminous materials cost index at the time of execution t.
- B_0 Cost index of bituminous materials at the tender date.
- C_t Cement cost index at the time of execution t.
- C_0 Cement cost index at tender date.
- E_t Energy cost index at runtime t.
- E_0 Energy cost index at the tender date.

- M_t Cost index of wood at the time of execution t.
- M_0 Cost index of wood at the tender date.
- O_t Cost index of the plants at the time of execution t.
- O_0 Cost index of the plants at the tender date.
- P_t Cost index of plastic products at the time of execution t.
- P_0 Cost index of plastic products at the tender date.
- Q_t Chemical cost index at run time t.
- Q_0 Chemical product cost index at tender date.
- R_t Cost index of aggregates and rocks at the time of execution t.
- R_0 Cost index of aggregates and rocks at the tender date.
- S_t Steelmaking materials cost index at the time of execution t.
- S_0 Cost index of steel materials at the tender date.
- U_t Copper cost index at the time of execution t.
- U_0 Copper cost index at tender date.

To carry out the price review, the product of the initially contracted price and the K_t coefficient provided by the formula will be determined.

2.1. APPLICABLE CONDITIONS

To apply the price review, Law 2/2015 establishes the following conditions:

- At least 20% of the contract amount must have been executed.
- At least two years must have elapsed since the contract was formalized.

3. CONCLUSION

Since the execution period of the work is less than two years, the price review will not apply, unless the duration of the work is extended beyond two years for reasons beyond the Contractor's control.



DOCUMENT Nº5 – BUDGET FOR THE KNOWLEDGE OF THE ADMINISTRATION



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1. INTRODUCTION

En este anejo se valora la cuantía del Presupuesto para el Conocimiento de la Administración, que estará constituido por el Precio Base de Licitación y los importes correspondientes a expropiaciones y servicios afectados.

2. BUDGET FOR THE KNOWLEDGE OF THE ADMINISTRATION

Concepto		Precio (€)	
		Parcial	Total
1	Presupuesto de Ejecución Material		580252,54
2	Gastos Generales, 13%	75432,83	
3	Beneficio Industrial, 6%	34815,15	
4	Presupuesto Base de Licitación sin IVA (1+2+3)		690500,52
5	IVA, 21%	145005,11	
6	Presupuesto Base de Licitación (4+5)		835505,63
7	Expropiaciones		284580
8	Servicios Afectados		20000
9	PRESUPUESTO PARA CONOCIMIENTO DE LA ADMINISTRACIÓN (6+7+8)		1140085,63

PART №6 – EXECUTION PLAN



DOCUMENT Nº1 – CONSTRUCTION SCHEDULE



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1. INTRODUCTION

An initial planning of the works is then carried out. This work program provides an idea of the sequential development of the main project activities and their duration. All of this is included in the government contracting regulations.

It is important to note that both the duration of the activities and the start time of each activity can be affected by a large number of variables, resulting in their alteration. Therefore, the provisions of the program are for information purposes only and have no contractual value.

To ensure that the construction plan provides minimum guarantees of viability, the following considerations have been taken into account:

- Optimization of construction procedures associated with the selection of solutions.
- Measurements of the most significant units due to their impact on the execution time.

For the execution of the works included in this project, a period of approximately 10 months is considered necessary, beginning on October 6, 2025, and ending on August 14, 2026.

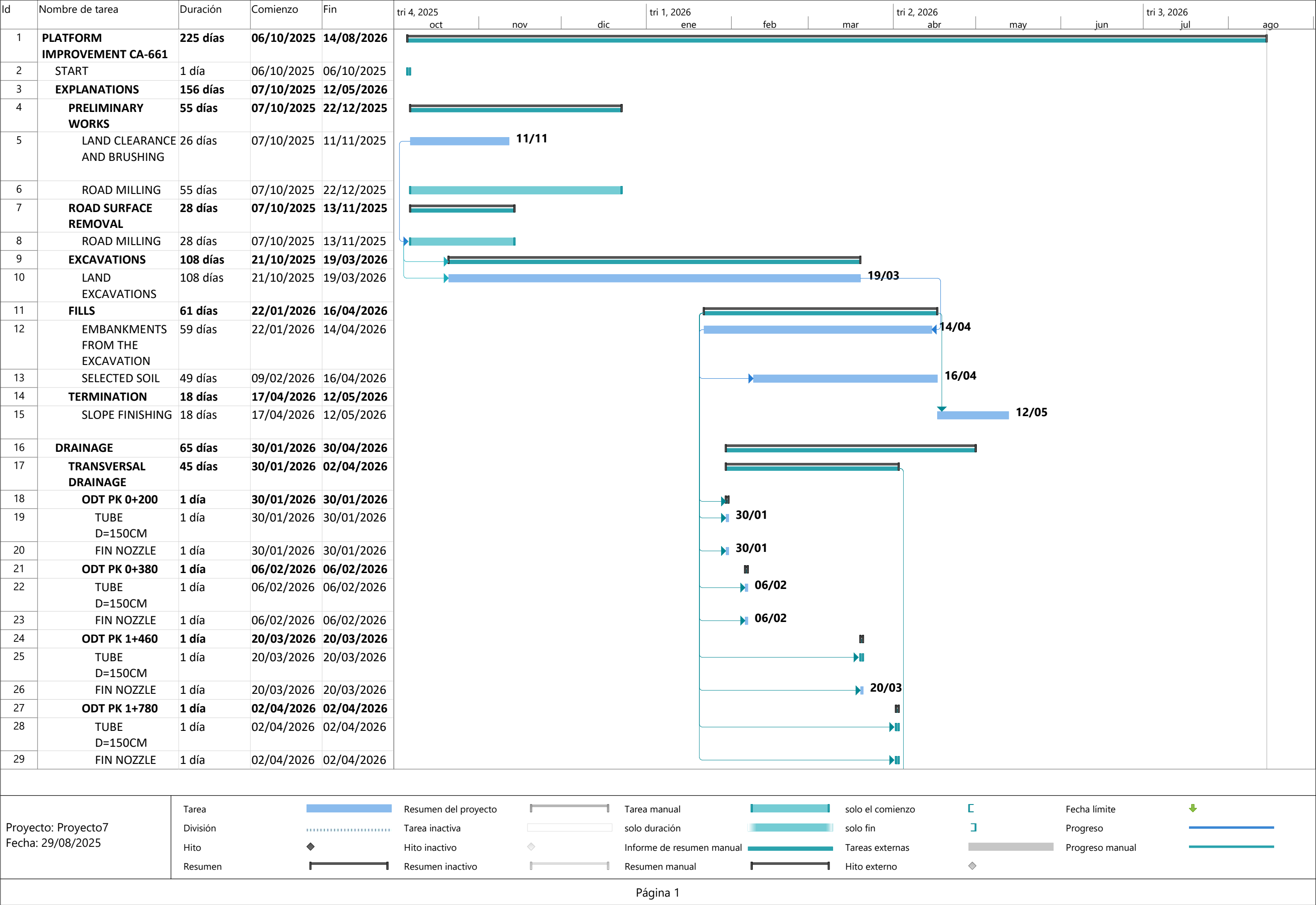
2. DEFINITION OF THE ACTIVITIES

For the previously defined project planning, the most significant activities were considered, listed below:

- Explanations
- Drainage
- Road structure
- Signaling
- Environmental integration
- Construction Waste management
- Health and safety

3. CONSTRUCTION SCHEDULE

The following is the construction plan with an ESTIMATED COMPLETION TIME OF 10 MONTHS for the total completion of the work.



Página 1



DOCUMENT N°2 – RISK MANAGEMENT, HEALTH AND SAFETY STUDY



REPORT

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1. OBJECTIVE AND SCOPE OF THE STUDY

This Health and Safety Study is drafted in compliance with the provisions of Royal Decree 1627/1997, of October 24, which establishes minimum health and safety provisions for construction projects. Its objectives are to prevent workplace accidents, occupational diseases, and damage to third parties that may occur during the execution of the project.

Article 4 of this law states that a Health and Safety Study will be required when:

- The contracted execution budget included in the project is equal to or greater than 75 million pesetas (approximately €450,000).
- The estimated duration is more than 30 working days, with more than 20 workers being employed simultaneously at some point.
- The estimated labor volume, meaning the total number of days worked by all workers on the project, exceeds 500.
- The construction of tunnels, galleries, underground pipelines, and dams is carried out.

Therefore, due to compliance with the first two conditions, this Project must include a Health and Safety Study.

This Study analyzes the characteristics of the construction project (materials, work units, processes, machinery, etc.) to determine the risks they may pose to the health of workers. Based on these, a series of measures are determined to ensure safety and health in the work environment. These measures will be mandatory for workers.

The Study includes the budget for the health and safety elements required for the project, along with their price lists and measurements. The Documentation Document with the requirements associated with these elements that must be met during the project is also included.

2. CHARACTERISTICS OF THE CONSTRUCTION PROJECT

2.1. DESCRIPTION OF THE PROJECT

The project is part of the improvement of the CA-661 roadbed at the access point to the town of La Busta, San Juan de la Cistierna (municipality of Soba).

The route is designed with a design speed of 40 km/h. The roadway has two lanes, each 3 meters wide, for one direction of traffic. 0.5-meter-wide shoulders are planned. The road begins at the intersection with the CA-256 road, and the project improvement will extend to PK 2+100. Along the 2,100-meter length of the road, there are also four overpass structures that will be built to facilitate cross drainage. The construction of these structures is not the subject of this project.

2.2. ESTIMATED STAFF

It is estimated to be needed **14 workers**.

2.3. HEALTH AND EMERGENCY CENTERS

- Consultorio Médico de Casatablas – Casatablas(0,3 km):
 - o Barrio Casatablas s/n, 39806 Rozas, Cantabria.
 - o Tfno...: 942 639 077
- Consultorio Médico de La Gándara – La Gándara(12,4 km):
 - o Barrio La Gándara, s/n, 39806 Lavín, Cantabria
 - o Tfno...: 942 677 237
- Hospital Comarcal de Laredo (29,1 km):
 - o Av. Derechos Humanos, 40, 39770 Laredo, Cantabria.
 - o Tfno.: 942 638 500
- Hospital Marqués de Valdecilla (66,9 km):
 - o Av. Valdecilla 25, 39008 Santander, Cantabria.
 - o Tfno.: 942 20 25 20



The construction company will indicate the location of the Health Center of the Mutual Society to which it belongs, with a location plan referring to the location of the work, which must also be posted on the Safety Communications Board visible to all workers.

- Other important telephone numbers:
 - o Guardia Civil: 062
 - o Emergencias: 112

3. CONSTRUCTIVE UNITS

3.1. PRELIMINARY WORKS

- Layout.
- Access and road clearance.
- Installation of temporary installations.
- Intake construction work.
- Removal of enclosures.
- Construction signage.

3.2. EXPLANATIONS AND EARTHWORKS

- Land clearing and cleaning.
- Removal and stockpiling of topsoil.
- Land excavation.
- Embankment construction.
- Slope profiling.
- Construction of the esplanade with selected soils.

3.3. DRAINAGE

- Longitudinal drainage: gutters, collectors, drain pipes, downpipes, manholes.
- Transverse drainage: ODT pipes, nozzles.

3.4. ROAD STRUCTURE

- Placement of the subbase.
- Placement of the bituminous mix layers.

3.5. SIGNALING

- Placement of road markings.
- Installation of vertical signage.
- Installation of containment barriers.

3.6. ENVIRONMENTAL INTEGRATION

- Placement of topsoil.
- Hydroseeding of slopes.

3.7. FINISHING WORKS

- Dismantling of auxiliary facilities.
- Replacement of access points.
- Replacement of existing enclosures.
- Replacement of affected services.

4. MACHINERY, MEANS AND STATIONS

Earthworks Machinery

- Tractors.
- Loaders.
- Backhoes.
- Motor Graders.
- Compactors.
- Trucks.

**Concreting Machinery and Means**

- Manufacturing plants
- Concrete mixer trucks
- Self-propelled concrete pumps
- Vibrators

Road Structure Construction and Implementation Means

- Asphalt mix manufacturing plants.
- Aggregate pavers.
- Compactors.
- Dump trucks.

Stockpiles and Storage

- Stockpiling of soil and aggregates.
- Stockpiling of pipes, prefabricated elements, and rebar, etc.
- Storage of paint, formwork, and fuel, etc.

Auxiliary Installations

- Aggregate crushing plant.
- Aggregate sorting and separation plant.
- Fixed conveyor belts (large belts).
- Transportable conveyor belts (small belts).
- Temporary electrical installations for the construction site.

Diverse Machinery and Tools

- Crane truck.
- Compressors.
- Dust sweeper.
- Irrigation trucks.
- Self-propelled marker.

- Hydroseed drill.
- Post driver.
- Road marking machine.

5. AUXILIARY MEANS

- Metal scaffolding.
- Ladders.

6. HAND TOOLS

- Chainsaw.
- Paintbrushes, brushes, and rollers.
- Level, ruler, set square, plumb line.
- Pick, shovel, hoe, pickaxe.
- Hacksaw.
- Ironworker's pliers.
- Pincers, hammers, pliers.

7. RISK IDENTIFICATION**7.1. RISKS ACCORDING TO TYPE OF ACTIVITY****Earthworks****Land Clearance and Brushing**

- Entity (order of magnitude): medium.
- Means of execution:
 - o Removal of sparse vegetation, debris, topsoil, etc. with a tractor.
 - o Transport to the landfill with a dump truck.
 - o Stockpiling of topsoil for reuse with a shovel.
- Risks:



- o a Projected particles.
- o Landslides caused by improperly positioned machinery.
- o Accidents that occur.
- o People falling at the same level.
- o Injuries caused by sharp objects.
- o Insect bites.
- o Dust in the air.
- o Dust clouds that impair visibility.
- o Noise.

Tree woodcutting and removal

- Entity (order of magnitude): reduced.
- Means of execution:
 - o Felling with a tractor and felling, using chainsaws, axes, etc., of large trees affected by the construction work.
 - o Transporting unusable materials to a landfill using dump trucks.
- Risks:
 - o Cuts or amputations.
 - o Injuries from embedded branches or splinters.
 - o Insect bites.
 - o Being run over.
 - o People falling at the same level.
 - o People falling at different levels.
 - o Entrapment by a falling tree.
 - o Dust in the air.
 - o Clouds of dust that reduce visibility.
 - o Noise.

Mechanical means excavation

- Entity (order of magnitude): high.
- Means of execution:

- o Excavation with a tracked backhoe.
- o Transport to the landfill or construction site using dump trucks.
- Risks:
 - o Run-overs and collisions with construction machinery and vehicles.
 - o Persons being trapped by machinery.
 - o Collisions and overturns of machinery or construction vehicles.
 - o Personnel falling to different levels.
 - o Landslides or rockfalls.
 - o Induced subsidence in nearby structures.
 - o Direct or indirect contact with power lines.
 - o Struck by objects and tools.
 - o Falling objects.
 - o Flooding due to ruptured water pipes.
 - o Fires or explosions due to leaks or ruptures in oil or gas pipelines.
 - o Explosion of buried mills.
 - o Dust in the atmosphere.
 - o Dust clouds that impair visibility.
 - o Noise.

Embankments and Landfills

- Entity (order of magnitude): high.
- Means of execution:
 - o Land preparation with a crawler tractor.
 - o Dumping of material with a dump truck.
 - o Spreading of material with a crawler tractor.
 - o Grading with a motor grader and compaction with a compactor.
 - o Irrigation of the surface with a tanker truck.
- Risks:
 - o Runovers and collisions with machinery and construction vehicles.
 - o People trapped by machinery.
 - o Collisions and overturns of machinery or construction vehicles.



- Personnel falling to different levels.
- Landslides or rockfalls.
- Direct or indirect contact with power lines.
- Struck by objects and tools.
- Falling objects.
- Dust in the environment.
- Dust clouds that impair visibility.
- Noise.

Ditches

- Entity (order of magnitude): reduced.
- Means of execution:
 - Excavation with a backhoe.
 - Stockpiling soil at the edge of the excavation with a backhoe, or transporting it to a landfill with a truck.
- Risks:
 - Collapse of ground walls.
 - Falls of people on the same level.
 - Falls of people on different levels.
 - Interference with buried electrical lines.
 - Flooding due to burst pipes or heavy rains.
 - Gas leaks due to burst pipes.
 - Struck by objects or tools.
 - Objects falling on workers.
 - People being trapped by machinery.
 - Struck by construction vehicles or machinery.
 - Impact on nearby buildings or structures.
 - Dust in the environment.
 - Noise.

Road Structure

Road Surface

- Entity (order of magnitude): high.
- Means of execution:
 - Spreading of gravel with a paver, truck, and compactor.
 - Primer and adhesion application with a tanker truck.
 - Spreading of chipboard with a chipboard paver onto which dump trucks unload the material; compaction with compactors.
- Risks:
 - Falls from the same level.
 - Run-overs.
 - Struck by machinery and collisions.
 - Construction traffic accidents.
 - Damage to roads in use.
 - Burns.
 - Dehydration.
 - Entrapment by moving machinery parts.
 - Dust in the air.
 - Dust clouds that impair visibility.
 - Noise.

Affected Services

Aerial lines of electric energy transportation

- Entity (order of magnitude): low.
- Risks:
 - Falls from different levels.
 - Direct electrical contact.
 - Indirect electrical contact.
 - Electrical contact with machinery.



- o Illnesses caused by working under adverse weather conditions.
- o Overexertion.

Underground lines of electric energy transportation

- Entity (order of magnitude): low.
- Risks:
 - o Pipe rupture.
 - o Direct electrical contact.
 - o Electrical contact with machinery.
 - o Falls from a depth.
 - o Illnesses caused by working under adverse weather conditions.
 - o Overexertion.

Underground water lines

- Entity (order of magnitude): low.
- Means of execution:
 - o Pipeline rupture.
 - o Flooding.
 - o Deep falls.
 - o Landslides.
 - o Illnesses caused by working under adverse weather conditions.
 - o Overexertion.

Interferencias con vías en servicio (desvíos, cortes, ...)

Removal and replacement of services

- Entity (order of magnitude): low.
- Risks:
 - o Accidents that occur.
 - o Inhalation of toxic gases released by paint.

- o Encroachment on the roadway with tools or equipment.
- o Injuries caused by tools.
- o Overexertion.
- o Dust in the air.
- o Clouds of dust that reduce visibility.
- o Noise.

Lane cut

- Entity (order of magnitude): low.
- Risks:
 - o Run-overs.
 - o Vehicles colliding.
 - o Invading the roadway with tools or objects.
 - o Noise.

Lane detour

- Entity (order of magnitude): medium.
- Risks:
 - o Accidents in transit
 - o Vehicles leaving the roadway, rollovers, collisions, etc.
 - o Vehicles trespassing on the roadway with tools or objects.
 - o Noise.

Diverse activities

Earthworks geometric design

- Entity (order of magnitude): medium.
- Risks:
 - o Traffic accidents "in transit."
 - o Landslides.



- o Falling objects or rocks down the slope.
- o Being run over.
- o Dehydration, heatstroke, sunburn.
- o Sprains.
- o Animal or insect bites.
- o Illnesses caused by working under adverse weather conditions.
- o Overexertion.
- o Dust in the air.

Signaling, beaconing and containment systems

Vertical Signaling

- Entity (order of magnitude): medium.
- Means of execution:
 - o Transport of elements by truck.
 - o Installation with hand tools.
- Risks:
 - o Falls from the same or different levels.
 - o Falling objects due to handling.
 - o Overturning machinery.
 - o Being run over.
 - o Getting caught between objects.
 - o Overexertion.
 - o Blows and cuts caused by tools or other materials: transportation, stockpiling, etc.
 - o Noise.

Containment Systems

- Entity (order of magnitude): medium.
- Means of execution:
 - o Installation of a safety barrier using a post driver, hand tools, and a dump truck.

- Risks:
 - o Falls from the same or different levels.
 - o Falling objects due to handling.
 - o Being run over.
 - o Getting caught between objects.
 - o Overexertion.
 - o Blows and cuts caused by tools or other materials.
 - o Noises.

Road Signs

- Entity (order of magnitude): medium.
- Means of execution:
 - o Cleaning with a sweeper.
 - o Painting markings with a marker.
- Risks:
 - o Falls from the same or different levels.
 - o Splashes.
 - o Being hit by vehicles and machinery.
 - o Overexertion.
 - o Contact with harmful substances.

Drain works

- Entity (order of magnitude): medium.
- Means of execution:
 - o Site preparation using a tractor, loader, or backhoe.
 - o Pipe laying using a crane truck.
 - o Concrete coating using vibrators.
 - o Backfilling with shovels.
- Risks:
 - o Crushing injuries from falling suspended loads.
 - o Burying injuries from landslides.



- o Dermatitis.
- o Injuries caused by tools or other sharp objects.
- o Vehicles falling into ditches on the road.
- o Overexertion.
- o Dust in the air.
- o Dust clouds that impair visibility.
- o Noise and vibrations.
- o Working in adverse conditions

Ditches

- Entity (order of magnitude): medium.
- Means of execution:
 - o Site preparation with an excavator.
 - o Concrete pouring with a concrete mixer truck.
 - o Finishing with hand tools.
- Risks:
 - o Falls from the same or different levels.
 - o Landslides.
 - o Dermatitis.
 - o Being run over by machinery and vehicles.
 - o Overexertion.
 - o Bumps and cuts from tools or other materials.
 - o Noise and vibrations.
 - o Entrapment in moving parts of machinery.
 - o Machinery overturning.
 - o Working in adverse conditions.

Prefabricated downspouts

- Entity (order of magnitude): reduced.
- Means of execution:
 - o Transport of the elements by truck.

- o Unloading of the prefabricated parts with a crane truck
- Risks:
 - o Falls from the same or different levels.
 - o Landslides.
 - o Falling suspended objects.
 - o Being run over by machinery and vehicles.
 - o Overexertion.
 - o Blows and cuts from tools or other materials.
 - o Entrapment.
 - o Overturning machinery.
 - o Working in adverse conditions.

Environmental Integration

Hydroseeding

- Entity (order of magnitude): reduced.
- Means of execution:
 - o Transport and spreading of topsoil with a dump truck and shovel.
 - o Spreading of the hydroseeding mixture with a hydroseeder.
- Risks:
 - o Falls at the same or different levels.
 - o Landslides.
 - o Being run over by machinery and vehicles.
 - o Struck by moving objects.
 - o Thermal contact.
 - o Electrical contact.
 - o Inhalation or ingestion of harmful or toxic substances.
 - o Fires and explosions.
 - o Traffic accidents.
 - o Noise.



7.2. RISKS ACCORDING TO TYPE OF MACHINERY

Earthworks

Tractors

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Loaders

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Slopes or excavation faces collapsing under or onto the machine.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Machine contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of ground materials.

- Vibrations transmitted by the machine.
- Dust in the environment.
- Clouds of dust that reduce visibility.
- Noise.

Motor Graders

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machines colliding with other machines or vehicles.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Backhoes

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Slopes or excavation faces collapsing under or onto the machine.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Machine contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.



- Impacts or projections of ground materials.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Compactors

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machines colliding with other machines or vehicles.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Trucks

- Traffic accidents during merging or detours to/from the construction site.
- Spillage of transported material.
- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disconnecting or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Machine contact with overhead power lines.

- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Concreting

Concrete Plants

- Falls from different levels.
- Falls from the same level.
- Direct electrical contact.
- Indirect electrical contact.
- Crushing injuries from falling suspended loads.
- Entrapment.
- Dermatoses.
- Burns.
- Injuries caused by sharp objects.
- Noise.

Concreting Truck

- Traffic accidents during merging or detours to/from the construction site.
- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces or in ditches.
- Uncontrolled machinery due to the driver's abandonment without disengaging or setting the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Machine contact with overhead power lines.
- Entrapment by tools or transmissions.



- Burns during repair or maintenance work.
- Vibrations transmitted by the machine.
- Dust in the environment.
- Dust clouds that impair visibility.
- Noise.

Self-propelled concrete pump

- Traffic accidents during entrances or detours to/from the construction site.
- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces or in ditches.
- Uncontrolled machinery due to the driver's abandonment without disconnecting or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.
- Machine contact with overhead power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Projection of pumped concrete onto workers or the public.
- Sudden detachment or whipping of concrete hoses and conduits.
- Uncontrolled projection of dry concrete plugs.
- Noise.

Vibrators

- Direct electrical contact.
- Indirect electrical contact.
- Impact to other workers with the vibrator.
- Overexertion.
- Lower back pain.
- Hose bursts or nozzle leaks.
- Noise.

Road Structure Construction and Implementation Means

Bituminous Mixtures Producing Plants

- Falls from different levels.
- Falls from the same level.
- Direct electrical contact.
- Indirect electrical contact.
- Crushing from falling suspended loads.
- Entrapment.
- Burns.
- Fires.
- Unhealthy environment due to fumes.
- Injuries from sharp objects.
- Noise.

Chipboard Spreader

- People being run over or struck by moving machinery.
- People falling to different levels from the machine.
- Machine colliding with other machines or vehicles.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Vibrations transmitted by the machine.
- Fires.
- Unhealthy environment due to fumes.
- Noise.

Tire Compactor

- Accidents on construction site roads.
- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's failure to disengage or apply the brakes.



- People falling from the machine to different levels.
- Machines colliding with other machines or vehicles.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Dust in the environment.
- Unhealthy environment due to fumes.
- Noise.

Self-propelled vibrating roller

- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disengaging or applying the brakes.
- People falling from the machine to different levels.
- Machines colliding with other machines or vehicles.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Vibrations transmitted by the machine.
- Dusty environment.
- Unhealthy environment due to bituminous fumes.
- Noise.

Basculating Truck

- Traffic accidents during entrances or detours to/from the construction site.
- Spillage of transported material.
- People being run over or struck by moving machinery.
- Machines sliding and/or tipping over on inclined surfaces.
- Uncontrolled machinery due to the driver's abandonment without disconnecting or applying the brakes.
- People falling from the machine to different levels.
- Machine colliding with other machines or vehicles.

- Machine contact with overhead power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Unhealthy environment due to fumes.
- Vibrations transmitted by the machine.
- Dust in the air.
- Dust clouds that impair visibility.
- Noise.

Stockpiles and Storage

Earth and aggregate storage

- Landslides (self-inflicted or induced).
- Traffic accidents due to improper storage location.
- Environmental damage and/or property invasion.
- Dust in the environment.

Stockpiling of pipes, prefabricated elements, ironwork, etc.

- Induction of landslides in nearby excavations.
- Collapse of stockpiles.
- Crushing of joints.
- Sprains.
- Traffic accidents due to improper stockpile placement.
- Environmental damage and/or property invasion.
- Overexertion.

Storage of paints, release agents, fuels, etc.

- Inhalation of toxic fumes.
- Fires or explosions.
- Skin irritation and eye irritation from contact with or splashing of substances.



- Splashes.
- Environmental damage from leaks or spills.

Auxiliar Installations

Aggregate crushing plant

- Entrapment by moving parts.
- Direct electrical contact.
- Indirect electrical contact.
- Falls from different levels.
- Falls from the same level.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Dust in the environment.
- Dust that impairs visibility.
- Noise.

Aggregate classification and separation plant

- Compartment collapse.
- Direct electrical contact.
- Indirect electrical contact.
- Falls to different levels.
- Falls to the same level.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts from throwing the bucket.
- Dust in the environment.
- Dust obstructing visibility.
- Noise.

Temporary electrical installation for construction sites

- Direct electrical contacts.
- Indirect electrical contacts.
- Improper handling of switches or disconnectors.
- Fires due to overvoltage.
- Induction of dangerous magnetic fields into other equipment.
- Noise.

Diverse machinery and tools

Crane Truck

- Accidents en route to the work site.
- Accidents that occur when run over.
- Crane overturning.
- Landslides caused by nearby excavations.
- Crushing by falling suspended loads.
- Electrical contact of the boom with overhead lines.
- Fires due to power surges.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.

Compressors

- Fires and explosions.
- Hose whipping.
- Particle projection.
- Hose or nozzle bursts.
- Exhaust gas inhalation.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Noise.

Jackhammers

- Projected particles.
- Risk due to inexperience.
- Hammer blows.
- Overexertion.
- Contact with buried power lines.
- Bursts in hoses or nozzles.
- Dust in the environment.
- Noise and vibrations.

Saws

- Cuts or amputations.
- Impacts from objects thrown by the blade.
- The saw falling to a different level.
- Indirect electrical contact.
- Projected particles.
- Injuries caused by sharp objects.
- Fires caused by power surges.
- Noise.

Nail Gun

- Accidental nail firing.
- Burst of the pressure hose.
- Indirect electrical contact.
- The gun falling to a different level.
- Falls to the same level due to excessive thrust.

Welders

- Explosions due to overheating of cylinders.
- Flashback explosions.

- Poisoning due to leaking cylinders.
- Fires.
- Burns.
- Equipment falling from a different level.
- Overexertion.
- Crushing of joints.
- Risk due to inexperience.

Elevating Machines

- Falls from different levels during assembly or maintenance.
- Machine overturning.
- Direct or indirect electrical contact.
- Crushing by falling suspended loads.
- Fires due to overvoltage.
- Falls from different levels due to being pulled or pushed by the load.

Post Driving Machine

- Falls of people from the machine to different levels.
- Vehicle collisions with the machine.
- Machine contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Dust in the environment.
- Vibrations transmitted by the machine.
- Noise.

Self-propelled marker

- Falls to different levels by people from the machine.
- Machine colliding with other machines or vehicles.
- Entrapment by tools or transmissions.



- Burns during repair or maintenance work.
- Vibrations transmitted by the machine.

Portable Drill

- Accidental drilling of extremities.
- Indirect electrical contact.
- The drill falling from a different level.
- Falls from the same level due to tripping.
- Noise.

Hand Tools

- Tools falling from different levels.
- People falling from the same level.
- Burns during repair or maintenance work.
- Impacts or projections of materials from the ground.
- Dust in the environment.
- Vibrations transmitted by the machine.
- Noise.

Hand Ladders

- Falls from different levels.
- Falling objects.
- Struck by moving objects.
- Caught between objects.
- The ladder slipping on its support.
- Overturning due to improper support.
- Breakage due to hidden defects.
- Risks due to improper use.

8. PREVENTIVE MEASURES

8.1. PREVENTIVE MEASURES ACCORDING TO TYPE OF ACTIVITY

Geometric Design

- El jefe del equipo que realice el replanteo tendrá en cuenta y advertirá de los posibles riesgos al equipo para que se tomen las precauciones debidas.
- Los trabajadores contarán con los equipos de protección individual necesarios, tales como casco, chaleco reflectante, guantes, botas, etc.
- Antes de comenzar el replanteo, se llevará a cabo una evaluación in situ para determinar la peligrosidad de la zona.

Land Clearance and Brushing

- Se inspeccionará la zona para detectar posibles irregularidades o desniveles que pudieran provocar el vuelco de la maquinaria.
- La tala de árboles se realizará utilizando motosierras y será realizada por trabajadores con experiencia. Durante el proceso de derribo, no se permitirá la circulación de ninguna otra maquinaria de construcción en el área. Se marcará la zona y se brindará asistencia utilizando cuerdas. Para la posterior extracción de los tocones, se circulará a una velocidad reducida para evitar tirones, utilizando anclas y escarificadores.
- La maleza se eliminará preferentemente mediante desbrozador, evitando recurrir al fuego. Se colocarán bandas de señalización en las zonas con riesgo de caída.
- Se prohibirá la circulación de la maquinaria en el entorno de desniveles; estas serán guiadas por una persona durante sus maniobras.
- La velocidad de circulación en obra no será superior a 20 km/h.
- Se utilizarán los siguientes EPI: casco de seguridad, ropa reflectante, botas de goma de seguridad, trajes impermeables, guantes de goma, protectores auditivos, mascarillas autofiltrantes y fajas y cinturones antivibratorios.
- Se dispondrán los siguientes equipos de protección colectiva: topes de madera en zanjas y taludes, señalización.
- Se realizarán riegos periódicos para evitar levantamiento de polvo.



Tala de árboles

- A single individual will be responsible for overseeing all tree removal operations and will direct all workers involved.
- All workers present in the area will be verbally warned of the tree felling.
- Workers will wear leather gloves and coveralls to prevent injuries caused by splinters, as well as protective eyewear to prevent branches or shavings from entering their eyes.
- Sling hooks, as well as the crane hook, will always be equipped with safety latches.
- In the event of exceptionally strong winds, slinging and tree felling operations will be suspended until conditions improve.

Excavations

- A pre-inspection of the site will be conducted.
- Vehicles and machinery will be periodically inspected.
- All personnel handling vehicles and machinery will be experienced and have supporting documentation.
- Shoring of the excavation walls will be performed when a risk of collapse is considered.
- The excavation face will not exceed the maximum approach height of the machine arm by more than one meter.
- The minimum safety distance from the excavation edge will be marked.
- The crest of the excavated slope will be protected by a guardrail.
- All work at the foot of slopes that do not meet the stability characteristics defined by the Construction Management will be halted.
- Remaining or working at the foot of a recently opened, uncleaned excavation face will be prohibited.
- Vehicle traffic will not be allowed within 3 meters of the edge of the slope.
- The following personal protective equipment will be used: overalls, safety helmet, safety boots, waterproof suits, dust masks, anti-vibration belt, rubber gloves, and general-purpose gloves.
- The following collective protection equipment will be installed: platforms for workers, railings at the top of slopes, containers for containing toxic substances, traffic signs for machinery, and a buffer zone at the edges of the ramp.

Embankments

- Vehicles and machinery will be periodically inspected.
- Vehicles will not be loaded above the specified maximum allowable load.
- All personnel handling vehicles and machinery will be experienced and have supporting documentation.
- Traffic signs will be installed to mark vehicle access and internal routes within the construction site, and each backfill team will be under the direction of a team leader during maneuvers.
- The presence of persons within a radius of less than 5 meters around compaction machinery is prohibited.
- Periodic watering will be carried out to prevent dust from rising.
- The following personal protective equipment will be used: safety helmet, safety boots, dust masks, general-purpose gloves, anti-vibration belts, and overalls.

Artificial Gravel

- The paving task must be supervised by a competent, designated technician, who will maintain complete control over the work area at all times.
- The paving process will begin with the unloading of the materials from the truck. The operator in charge must have a clear view of the area and will be assisted by another operator.

Construction of the road surface with bituminous mixture

The bitumen tank operator must take the following preventive measures into account:

- Sound the horn before starting the operation and sound the warning when reversing.
- Wear a seat belt.
- Use the multipurpose powder fire extinguisher in the cab, if applicable.
- Drive at low speeds, taking extreme caution if there are stones.

The compactor operator must take the following preventive measures into account:

- Check that the brakes and reverser system are working properly.
- Maintain safe distances, taking extreme caution near uneven surfaces and slopes.
- Block the machinery at the end of the day to ensure it is properly immobilized.



The paver operator must take the following precautionary measures into account:

- Do not work without the augers.
- Follow the guidance instructions provided by specialized personnel familiar with the operation of the machines.
- Assume responsibility in the absence of the foreman.

The following personal protective equipment must be worn: safety helmet, general-purpose gloves, safety boots, overalls, safety glasses, hearing protectors, and raincoats.

Drainage

- Material stockpiles will be placed, establishing appropriate buffers and measures to prevent unwanted material movement, until they are transported to the work area.
- Personnel will avoid standing under suspended loads.
- The transport maneuver will be carried out under the supervision and supervision of specialized personnel.
- Access to the bottom of the excavation will be via ladders equipped with non-slip elements, secured at the top, and of adequate length.
- The following personal protective equipment will be used: work overalls, safety helmet, safety boots, waterproof suits, dust masks, anti-vibration belts, rubber gloves, and general-purpose gloves.
- The following collective protective equipment will be in place: walkways for workers, railings at the top of slopes, containers for containing toxic substances, signage for guiding machinery, and a buffer at the edges of the ramp.

Signaling and Beacons

- Workers will exercise extreme caution when placing roadwork signs on existing roads, given the risk of collisions.
- Stockpiling materials will be done in designated areas, avoiding interference with the movement of machinery.
- The use of open flames or sparks, as well as welding, will be prohibited in the area where road markings are being painted or near the stockpile of paints and flammable items.

- The use of personal protective equipment will be mandatory, including reflective overalls, safety helmets, safety boots, waterproof suits, and masks to protect against paint fumes used for road markings.

Hydroseeding

- The use of safety helmets is mandatory at all times.
- Machines must be sufficiently marked to be visible to operators.
- In areas with poor visibility, an operator must warn traffic of the presence of hydroseeding operations.
- Operators operating the hydroseeder must be aware of the potentially harmful products contained in the mixture.
- Operators must exercise extreme caution when spraying the mixture to avoid splashing other workers.
- The following personal protective equipment must be used: safety helmet, face shield, safety gloves, safety boots, safety goggles, waterproof suits, and protective masks.
- The following collective protective equipment must be in place: traffic signs and work area markings.

8.2. PREVENTIVE MEASURES ACCORDING TO TYPE OF MACHINERY

The following preventive measures must be followed to ensure 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 developed by the Contractor.

Both general measures for all types of heavy machinery and specific measures for each specific type are listed.

8.2.1. GENERAL MEASURES FOR HEAVY MACHINERY

Machinery Reception

- Upon arrival at the site, each machine must have the safety regulations for operators in its documentation folder.
- Upon arrival at the site, each machine must have a properly sealed fire extinguisher and up-to-date inspections.



- The machines must have anti-tip and impact-resistant cabs.
- Machinery operators must have been adequately trained to operate the machine safely; if not, they will be replaced or appropriately trained.
- The cabs must not show any deformations due to a tip-over.
- The machinery must be equipped with lights and a horn or backup siren, all in proper working order.

Machinery Use

- Before starting each work shift, check that the machine controls are working properly.
- Access to the machine cab is prohibited when wearing loose clothing, jewelry, or accessories that could get caught in the controls and protrusions.
- The horn must be sounded before starting to move the machine.
- The seat must be properly adjusted so that the operator can work comfortably and safely.
- All passengers must board and disembark the machine from the designated location, using the steps and handholds provided and never using the wheels, tires, or fenders. Do not jump directly from the machine to the ground, except in cases of imminent danger to the operator.
- Only persons authorized by the Site Manager may access the machine.
- The operator must verify that all controls are in neutral before starting the engine to prevent unintended starting.
- Before starting off, the driver must check that there is no danger of running over nearby personnel.
- Chocks must be installed to immobilize the machine before releasing the brakes.
- If it is necessary to start the engine using the battery of another machine, always with a similar voltage, extreme caution must be exercised, and perfect coordination must exist between the personnel performing the maneuver.
- When working with machines with pneumatic undercarriage, it is necessary to ensure that the tire pressure meets the manufacturer's recommendation. While inflating the tires, the operator must stand away from the connection point to avoid damage in the event of a tire burst.
- Whenever 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 anticipated, the engine must also be stopped.

- The operator must report any faults or malfunctions in the machine, interrupting work whenever these faults affect the brakes or steering until the fault is corrected.
- Climbing onto the machine while it is moving is prohibited.
- Driving and parking within 3 meters of the edge of ditches and slopes is prohibited due to the risk of tipping or collapse of the slope.
- When carrying out earthworks on slopes, check that there are no people or objects at the base of the slope that could be affected by a possible landslide.
- Driving with the lights on must be prohibited when, due to dust, visibility of the operator or other people toward the machine may be reduced.
- Transporting people on the machine is not permitted unless there is a suitable seat.
- The machine must never be used beyond its mechanical capabilities; that is, it must not be subjected to excessive loads or driven on steep slopes.

Repairs and Maintenance in the workplace

- Machinery faults must always be corrected before resuming operations.
- During maintenance operations, the machine must always be kept with the engine stopped, the work tool resting on the ground, the handbrake engaged, and the machine secured with chocks.
- No objects that are not part of the machine must be placed on it to avoid the risk of fire.
- The radiator cap must not be lifted when hot; the high-temperature vapors released can cause burns to the operator.
- The engine and hydraulic system oil must always be changed when the engine is cold to avoid burns.
- Protective goggles and impermeable gloves must be worn when changing the machine's battery.
- Any fire or spark may ignite in the vicinity of batteries.
- Tools used when handling batteries must be insulated to avoid short circuits.
- Avoid placing tools or metal objects on the battery, as they could cause a short circuit.
- Whenever possible, shielded batteries with fully covered intermediate terminals will be used.
- During fueling, precautions will be taken to avoid proximity to ignition sources that could ignite the fuel.



- Checking the coolant level in the radiator must always be done with due caution, always releasing internal pressure before fully opening the cap.
- When it is necessary to manipulate the machine's electrical system, the operator must shut off the engine and remove the key from the switch.
- When welding hydraulic system lines, they must always be drained and cleaned of oil.

8.2.2. EARTHWORKS MACHINERY

Bulldozers and tractors

In addition to general machinery safety measures, the following specific preventive measures will be established, which will be detailed in more detail in the corresponding health and safety plan:

- Driving at speeds exceeding 3 km/h will be avoided during earthmoving.
- Tractor use will only be permitted on slopes less than 50%.
- During clearing work at the base of existing slopes, an inspection will be carried out for materials (trees, rocks, etc.) that may pose a risk of accidental collapse into the work area. Only once the slope has been properly secured and cleaned will work with machinery begin.

Loaders

- Loaders will be equipped with a first aid kit in perfect condition for use at any time.
- All engine exhaust points will be periodically inspected to ensure that combustion gases do not enter the cab.
- Loaders that must travel on public roads will be authorized to do so.
- Drivers will ensure that there is no danger to workers inside pits or trenches near the machine's work area.
- Before starting new routes, drivers will walk the work path to observe any irregularities that may cause vertical or horizontal oscillations of the bucket.
- The driver will not start the engine without first ensuring that no one is in the operating area.
- The transportation or lifting of personnel inside the bucket is strictly prohibited under any circumstances.
- The bucket must remain as low as possible during earth transport to ensure maximum stability.

- Always raise or lower the bucket while loaded using low gears.
- Travel over uneven terrain at low speeds.
- Avoid handling heavy loads in windy conditions to prevent unstable conditions.
- Resting under the shade cast by the stopped machine is strictly prohibited.

Motor Graders

- The operator will constantly check the proper position of the blade, adjusting it according to ground conditions and the current work phase.
- Always drive at a moderate speed.
- The driver will use the horn when necessary to warn of his presence and whenever he is about to reverse.
- When leaving the machine, the driver will ensure that it is braked and cannot be started by unauthorized persons.
- The operator will wear a helmet whenever he is outside the cab.
- Maintenance and repair operations will be performed on the machine with the blade resting on the ground.
- No one will be allowed in the machine's work area.
- Extreme caution must be exercised around slopes and ditches.
- When moving vehicles, drive with caution and keep the blade raised, ensuring it does not exceed the width of the machine.
- Pay special attention to reversing maneuvers, also sounding the horn before starting them.
- No casual access by people, machinery, or vehicles to the machine's work area will be permitted.
- When stopping, the driver must place the scarifier and blade on the ground, positioning the blade no wider than the machine's width.

Backhoes

- The backhoes used on this project will be equipped with lights and a fully operational backup horn.



- It is prohibited to perform work or allow personnel to remain within a distance equal to the maximum reach of the excavator arm.
- Extreme caution must be exercised in the presence of other backhoes working in parallel or any other machine. In such cases, the presence of a signalman is recommended.
- Internal roads on the site will be maintained in good condition to prevent the formation of muddy areas that could hinder the safe movement 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 bucket must be supported on the machine during movement to prevent swinging.
- The loaded bucket must be raised or lowered at slow speeds.
- It is strictly prohibited to transport people on the backhoe to prevent falls, collisions, and other risks.
- Earthmoving maneuvers will be prohibited without first putting the hydraulic immobilization supports into operation.
- Handling large loads in strong winds will be prohibited.
- If, exceptionally, the backhoe is used as a crane, the following precautions must be taken:
 - The bucket will have a ring welded on its rear exterior specifically for hanging objects.
 - Hanging will be done using hooks or a safety carabiner built into the dipper.
 - Pipes will always be suspended from the ends (two points), parallel to the trench axis, with the machine facing the trench and on its axis. A direct mounting lug may be used.
 - The load will be guided by ropes handled by two operators.
 - The maneuver will be supervised by a specialist.
 - If the trench walls are unsafe, work will be immediately stopped.
 - The backhoe's arm will be repositioned by pointing it in the direction of travel (except for very short distances).
 - Any other type of work inside trenches or ditches, within the reach of the backhoe's arm, is prohibited.
 - A danger sign will be installed on a right foot, marking the safety zone within the reach of the backhoe arm. This sign will move as the excavation progresses.

- Dumping excavated products with the backhoe within 2 m of the upper cutting edge of a trench or ditch will be prohibited, to avoid risks from overloading the ground.

- When excavating below its support plane, the bucket must never be below the chassis.
- During the excavation phase, the machine must never be exposed to the risk of collapse of the excavation face.
- To avoid injuries during maintenance operations, the operator must first place the bucket on the ground, stop the engine, engage the parking brake, and lock the machine. Then, perform the necessary maintenance tasks.

Compactors

- The operator must have been informed that he or she is operating a dangerous machine and that specific precautions must be taken to avoid accidents.
- The machinists must be skilled workers, to prevent risks due to inexperience.
- The site must be watered to reduce dust buildup. Dust masks must be worn in cases of heavy and persistent dust.
- The use of helmets or earplugs must be mandatory to prevent possible ear injuries.
- Elastic belts must be provided on-site for use while working with tampers or rollers to protect against the risk of lower back pain.
- The area to be compacted must be closed to traffic of machinery and construction vehicles.

Trucks y dumpers (dump truck)

- The driver of each truck must hold the required driver's license and must comply with the regulations of the highway code and comply with the construction site signage at all times.
- Access to and internal circulation of trucks on the construction site will be carried out as determined in the Health and Safety Plan.
- Loading and unloading of trucks will be carried out in the locations indicated in the plans for this purpose.
- Vehicles must be in perfect condition and upkeep.
- Before starting the loading and unloading of materials, in addition to the truck cab's handbrake being installed, chocks will be placed to immobilize the vehicle.
- Truck bodies will be raised and lowered using ladders.



- Loading and unloading maneuvers using inclined planes will be controlled from the truck body by a minimum of two operators using a lowering rope. There will be no personnel at the end of the plane.
- The maximum permitted height for loose materials will not exceed the ideal slope of 5% and will be covered with a tarp, in anticipation of landslides.
- Loads must be distributed evenly over the body, balancing the weight as evenly as possible.
- The driver must wear gloves to avoid hand injuries and safety boots to prevent crushing or hitting their feet. When leaving the cab, they must put on their helmet.
- Jumping from the load or the body to the ground is prohibited unless it is to avoid a serious risk.
- Dumpers must be equipped with:
 - Front lights.
 - Rear backup lights.
 - Flashing turn signal lights.
 - Front and rear position lights.
 - Overhead marker lights on the front of the body.
 - Power-assisted braking system.
 - Parking brakes.
 - Automatic backup horn.
 - Rollover-proof cabs.
 - Additional features may be required, such as air-conditioned cabs, tarpaulins to cover the load, among others.
- Before starting each workday, a daily inspection will be conducted 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 cab and driving area is prohibited for any unauthorized person.
- Driving the dumper with the body raised is prohibited. The body must be lowered once unloading is complete.
- Fuel or other flammable products may not be stored on the truck.
- Working or remaining within 10 m of the dumper trucks is prohibited.
- The truck's load must be surface-watered to avoid dust that could affect surrounding traffic.

- The load must not exceed the maximum load indicated by the manufacturer.
- Danger signs and no-entry signs must be posted 15 m from dumper dumping sites.

8.2.3. ROAD STRUCTURE CONSTRUCTION AND IMPLEMENTATION MEANS

Bituminous Mixture Fabrication Plants

- Bituminous mix manufacturing plants will be equipped with lighting, fire extinguishing equipment, and signage.
- When planning the location of these facilities, the direction of the prevailing winds will be considered to avoid contamination of inhabited or frequently used areas.
- Pipelines transporting hot substances will be insulated externally to protect personnel and prevent heat loss.
- A fixed, properly marked vehicle circulation circuit will be established, avoiding, as far as possible, the passage of people through it.
- Access points, stairs, platforms, and walkways located at a height of more than two meters will be provided with guards.
- Lighting fires or sparks in the vicinity of flammable products is prohibited.
- Inspections, repairs, and cleaning or maintenance operations will always be carried out while the facility is shut down.
- Special attention will be paid to checking electrical installations, pipe joints, and the temperature of the materials.

Asphalt Paver

- No one other than the operator will be permitted to remain on the paver while it is moving.
- The maneuvers for approaching and pouring asphalt products into the hopper will always be directed by a specialist with experience in this type of work.
- All emergency workers will remain in position on the curb or sidewalk, in front of the machine, during hopper filling operations, to prevent entrapment and run-over risks during these maneuvers.
- The side edges of the paver, to prevent entrapment, will be marked with panels with alternating yellow and black stripes.
- Multi-purpose fire extinguishers in good condition will be placed on the machine platform.



- Operators are prohibited from accessing the vibrating screed during paving operations.

Tire Compactor

- No one other than the operator will be permitted on the compactor.
- The compactor will be equipped with visibility lights, machine position indicators, and an audible reverse signal.
- A metal ladder will be provided for boarding and disembarking the machine's bodies.
- The ladder leading to the driving platform and its outer edge will have non-slip coating.
- Tire pressure will be checked before the start of the day.
- The machine's operating condition will be monitored.
- Lighting fires or sparks is prohibited during fueling operations and checking the machine's battery level.

Self-propelled tandem compactor

- No one other than the operator will be permitted to remain on the compactor to prevent accidents due to falls from the machine.
- All pedestrians in the aggregate pit will remain positioned on the curb or sidewalk, in front of the compactor, to prevent the risk of entrapment and being run over during its movements.
- The ladder leading to the driving platform and its outer edge will have non-slip coating.
- The operator must take special care to ensure the stability of the roller when traveling on inclined surfaces or stepping on the edge of the aggregate layer.
- The machine's operating condition must be systematically maintained.
- Instructions and enforcement of the smoking ban must be ensured during fueling operations and checking the machine's battery level.
- An anti-vibration seat must be provided, or, failing that, the use of an anti-vibration belt is mandatory.

Self-propelled vibrating roller

- It is strictly prohibited for any individual to remain on the compactor roller, except for the operator, in order to prevent accidents related to falls from the machine.
- All workers in the work area of the aggregate layer must remain positioned on the curb or sidewalk, always in front of the compactor, as a precautionary measure against the risk of entrapment and runover during the machine's movement.
- The ladder used to access the driving platform and the outer edge of said platform must be provided with a non-slip surface.
- The machine operator is responsible for paying special attention to the stability of the roller, especially when traveling on inclined surfaces or when stepping on the edge of the aggregate layer.
- Constant vigilance must be maintained over the machine's operating status.
- Education and supervision must be focused on ensuring no smoking during fueling operations and while checking the machine's battery level.
- The presence of an anti-vibration seat must be guaranteed or, failing that, the use of an anti-vibration belt must be required.

Basculating Truck

- The truck driver must possess a valid driver's license and must comply with the highway code regulations and the construction site signage at all times.
- During the positioning and coupling maneuver in front of the paver, the driver must fully comply with the instructions and direction of the paving pit supervisor, as well as the instructions of the warning assistant.
- Once unloading is complete, the body must be lowered before resuming operation.
- Attention must be paid to the presence of overhead electrical or telephone lines before beginning to raise the body.
- All inspection or maintenance operations that must be performed with the dump truck raised must be carried out ensuring that its lowering is prevented by means of interlocks.



8.2.4. DIVERSE MACHINERY AND TOOLS

Crane Truck

- Before starting the loading or unloading process, ensure that the vehicle is properly secured with chocks on all four wheels and on the stabilizing jacks.
- Loading and unloading maneuvers must be supervised by a specialist.
- All lifting hooks, rigging, outriggers, and slings or stirrups must always have safety latches.
- The maximum permissible load established by the truck manufacturer must not be exceeded.
- The crane operator must always keep the suspended load in view, and if this is not possible at all times, all maneuvers must be supervised by an expert signalman.
- Towing the load is prohibited.
- The crane truck must never park or drive within 2 meters of the edge of ditches or excavations.
- People must not remain near the crane truck at distances of less than 5 meters, nor must they remain under suspended loads.
- The driver is prohibited from reversing without the presence and assistance of a signalman, nor is he permitted to leave the truck with a suspended load.
- Unauthorized personnel are prohibited from accessing the truck cab or operating its controls.
- Leather gloves and non-slip footwear must be worn when operating with a crane truck, as well as a safety helmet when the crane operator leaves the cab.

Compressors

- The compressor must be dragged and placed at its work site more than 2 meters from the edge of trenches or excavations.
- Once positioned, it must be leveled and secured with wheel chocks.
- Fueling operations must always be carried out with the engine stopped.
- The compressor's protective casings must always remain closed except for performing necessary maintenance.
- If the compressor is not a silent type, it must be clearly marked and warned of the high sound pressure level in its vicinity, and workers operating in that area must wear hearing protection.

Saws

- The condition of hoses and nozzles must be systematically checked, looking for possible bursts and leaks.
- The saws will have the following protective elements:
 - Cutting knife.
 - Pusher for the workpiece to be cut and guide.
 - Blade cover housing.
 - Protective housing for transmissions and pulleys.
 - Waterproof switch.
 - Ground connection.
- They will be positioned in locations away from vehicle traffic, activities, and areas with a risk of falling people or objects.
- The operator operating the saw will be specifically trained and authorized by the Site Manager for this task.
- The operator will wear leather gloves, protective goggles, a dust mask, safety shoes, and an elastic belt.
- The cutting blade and its teeth will be checked for good condition and the work area will be clean.
- A powder fire extinguisher will be located next to the saw.

Nail Guns

- The operator handling the nail gun will be specifically trained and authorized by the Site Manager for this task.
- Extreme caution will be exercised when nailing work is carried out with other workers nearby.
- The use of a safety helmet, leather gloves, wrist guards or sleeves, and safety glasses to protect against possible projections will be mandatory.

**Oxyacetylene welding and oxyfuel cutting**

- The supply, transportation, and storage of liquefied gas cylinders will always be controlled, ensuring that:
 - The valves are always protected by the appropriate caps.
 - The cylinders are transported on caged trays or safety carts, in a vertical position and properly secured, to prevent possible overturning.
 - Cylinders of different gases must not be mixed during storage.
 - Empty cylinders must always be treated as if they were full for safety reasons.
- Liquefied gas cylinders must not be left exposed to sunlight for extended periods of time.
- Cylinders must never be used horizontally or at an angle less than 45°. Burners must always be equipped with a flashback preventer, installed on both lines, both at the cylinder outlet and at the torch inlet.
- Hoses must be checked to ensure they are in good condition and have no sharp bends.

Portable Drill

- Drills will have double electrical insulation, and their electrical equipment will be housed in sealed compartments.
- It is strictly prohibited to place the portable drill on the ground or leave it unattended while connected to the electrical grid.
- Drills will only be repaired by specialized personnel; disassembling them on the job site is prohibited.
- Workers will wear leather gloves, a helmet, safety shoes, and protective eyewear.

Hand Tools

- Ensure they are in good condition and clean before use. Likewise, they must be cleaned upon completion of the task, especially if they become stained with grease or other slippery materials.
- They must be stored on specific shelves or in boxes and must not be left unattended in the work area.
- Workers must wear leather gloves, safety boots, a helmet, and/or protective eyewear if necessary.

Post Driving Machine

- Machine operations will be directed by qualified personnel.
- A specific order will be established for jacking.
- Climbing onto the undercarriage is prohibited.
- Only authorized personnel may climb onto the machine.
- All engine exhaust points will be checked periodically.
- Before performing any maneuver, the driver must check that there are no people in the vicinity.
- Do not open the radiator cap directly; the steam released can cause burns.

Self-propelled marker

- Only an authorized operator may use the machine.
- The side edges of the machine will be marked with alternating yellow and black stripes to prevent entrapment.
- Two multipurpose, well-maintained fire extinguishers will be placed on the machine platform.

Hand Ladder

- Ladders must be installed at a 75° angle to the horizontal.
- The ladder must be secured to the structure at the top; at the bottom, it must have anti-slip elements. If it consists of extendable sections, these must be secured before use.
- Ensure that the ladder is placed on level ground and stable, without risk of slipping or tipping. Wheeled ladders must be immobilized before use.
- Avoid resting the ladder on pipes or electrical cables.
- Ladders must be no longer than 5 meters in length.
- When the working height is considerable or the operator must make movements or exert effort that compromise stability, the worker must wear a safety harness.
- Only one worker may use the ladder at a time.
- The rungs must be checked periodically to ensure they are properly secured.
- Never ascend or descend with your back to the ladder.
- The raising or lowering of loads must be carried out in a manner that ensures the stability of the worker and the ladder at all times.



- Workers must wear non-slip footwear and keep their soles and hands clean of grease or other lubricating substances.

Slings

- A new cable must be subjected to reduced load cycles before its first use.
- If the cable has been exposed to low temperatures, it must be loaded with less weight or warmed up before use.
- Sharp bends in the cable must be avoided.
- Slings and slings must not be left abandoned at the construction site; they must be stored in a dry, ventilated area protected from adverse weather conditions.
- Knotted ropes, cables, or chains must not be used.
- Slings and slings must be inspected for deformation, abnormal elongation, wire breakage, wear, corrosion, etc., that would require replacement.
- When used to lift loads with sharp edges, a soft block or rounded protective angles must be placed between the chain and the load.
- Specific connecting rings must be used to join different elements. Under no circumstances should they be knotted or tied together directly.
- When slings and slings are under load, workers must remain at a safe distance, given the risk of injury if they break.

Elevating Platform

- The platform must only be used by personnel trained and authorized for this activity.
- Before use, it must be checked to ensure it is in proper working order and maintenance, and the control panel and instrument panel must be examined to ensure that all safety, measurement, and control devices are functioning properly.
- The machine must have redundant control equipment, both on the platform and on the ground.
- The machine must not be used until the hydraulic oil has reached the appropriate working temperature.
- The operator must have visibility and ensure that there are no workers nearby who may be at risk.

- The vehicle must travel with the lights on, obey all signs, and operate at a low speed.
- The platform must not be raised in strong winds or if the surface is slippery, unstable, or excessively inclined.
- Transporting people on the machine or lifting them without proper equipment is prohibited.
- The operator must climb and descend the machine using the ladder and must not jump directly from the machine except in dangerous situations.
- Auxiliary means, such as ladders or scaffolding, may not be used to increase height.
- If there is a risk of falling objects, the work area must be cordoned off.
- After completing the work, the machine must be turned off and immobilized, with the keys removed.



9. CONCLUSION AND SIGNATURE

This Health and Safety Study includes a detailed description of the project, advance planning of the tasks to be performed, and an analysis of the potential risks associated with these activities and the machinery required to carry them out. In addition, a series of preventive measures are defined to minimize or eliminate the identified risks, and the PPE and EPC to be used are detailed.

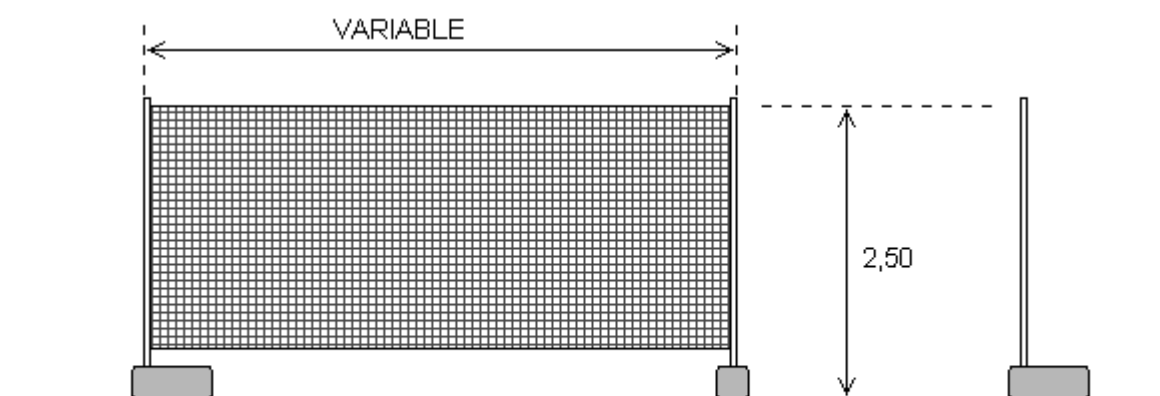
Based on this Health and Safety Study, the contractor will prepare the Health and Safety Plan for the project, as a concrete application of this study to the construction processes it will employ in the execution of the project.

Santander, September 2025

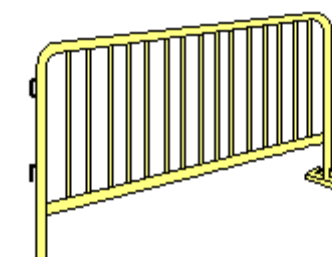
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PLANS



VALLA DE DELIMITACIÓN Y CERRAMIENTO DE LA OBRA (Tipo)

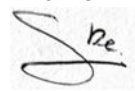


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UNIVERSIDAD DE CANTABRIA
Proyecto Fin de Carrera

CONSTRUCTION PROJECT
RISK MANAGEMENT, HEALTH AND
SAFETY PLAN

TITLE:
PATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY: SOBA
REGION: CANTABRIA

AUTHOR:

Santos Diego Cruz

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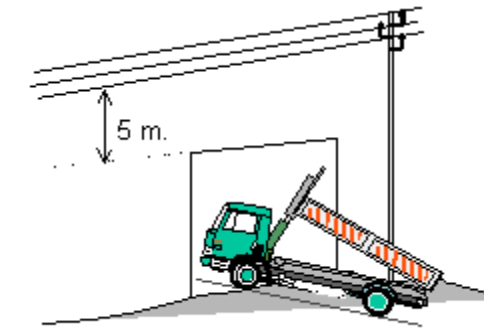
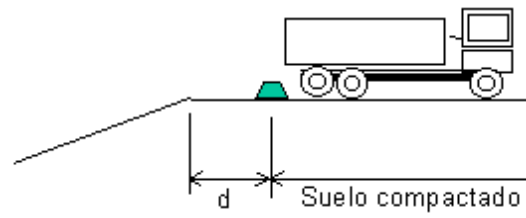
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DATE:

SEPTEMBER 2025

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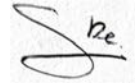


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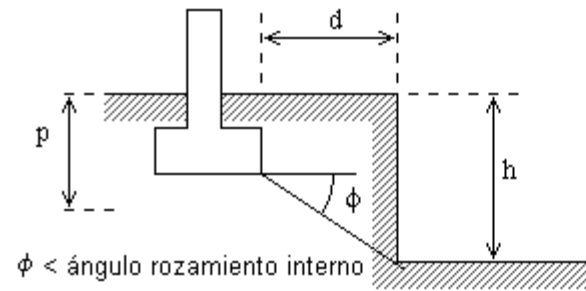
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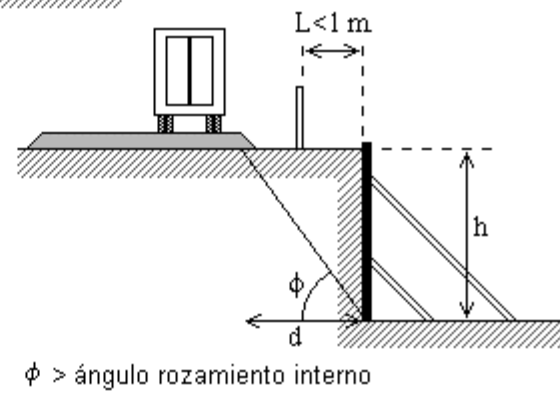
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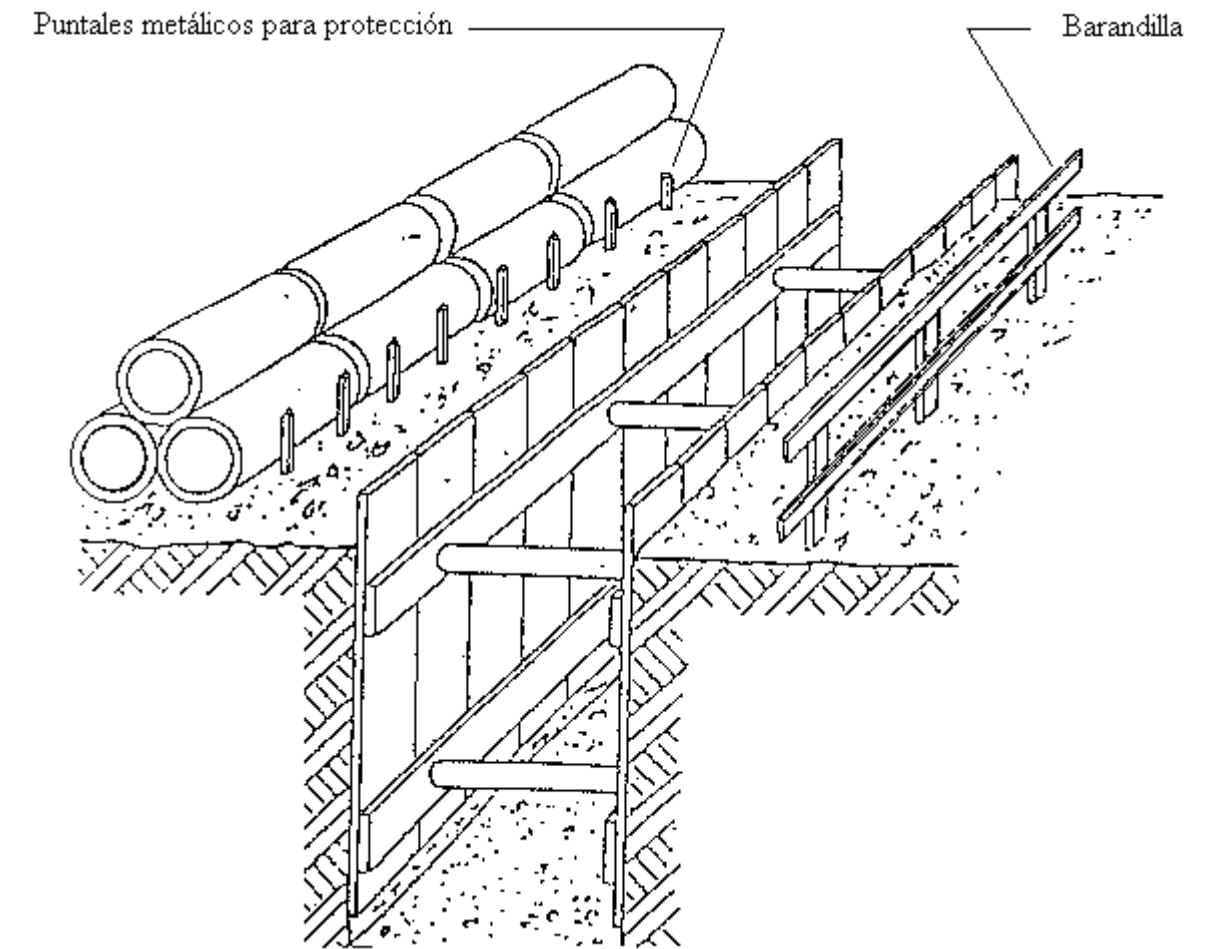
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CONDICIÓN DE PROXIMIDAD
DE CIMIENTOS A EXCAVACIÓN
SIN ENTIBACIÓN ESPECÍFICA



EXCAVACIÓN CON
ENTIBACIÓN ESPECÍFICA
CALCULADA BAJO CARGA
(OBLIGATORIO UTILIZAR
MÓDULOS METÁLICOS O
BLINDAJES EN ZANJAS)

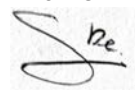


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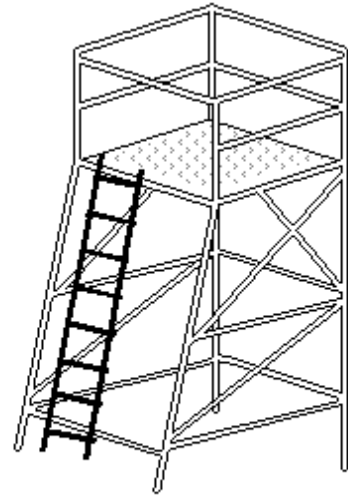
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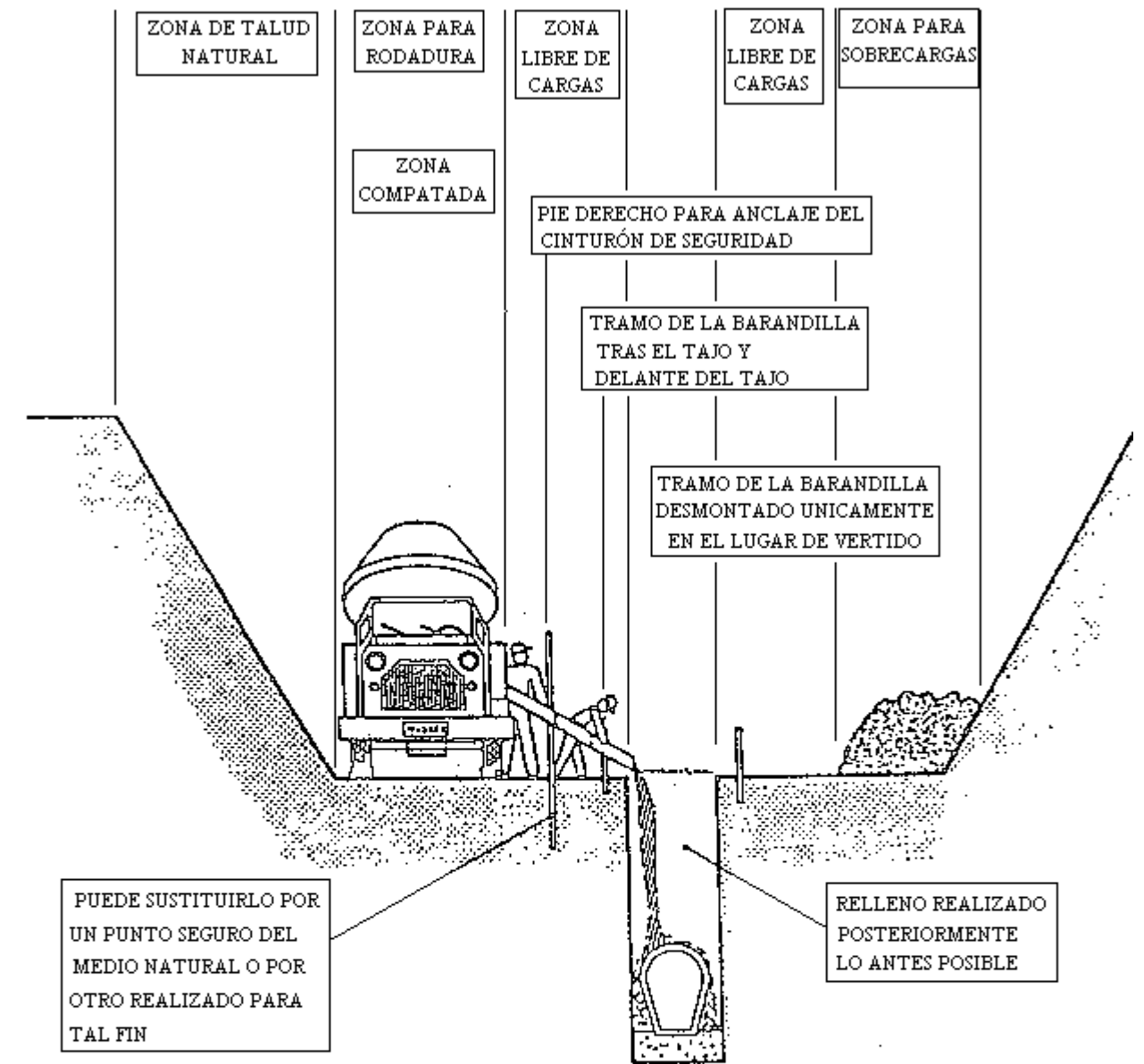
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CASTILLETE METÁLICO



- * 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

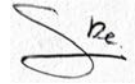


ESCUELA TÉCNICA SUPERIOR DE INGENIEROS
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UNIVERSIDAD DE CANTABRIA
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CONSTRUCTION PROJECT
RISK MANAGEMENT, HEALTH AND
SAFETY PLAN

TITLE:
PATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

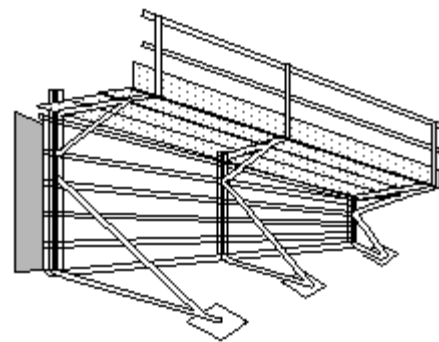
MUNICIPALITY: SOBA
REGION: CANTABRIA

AUTHOR:

Santos Diego Cruz

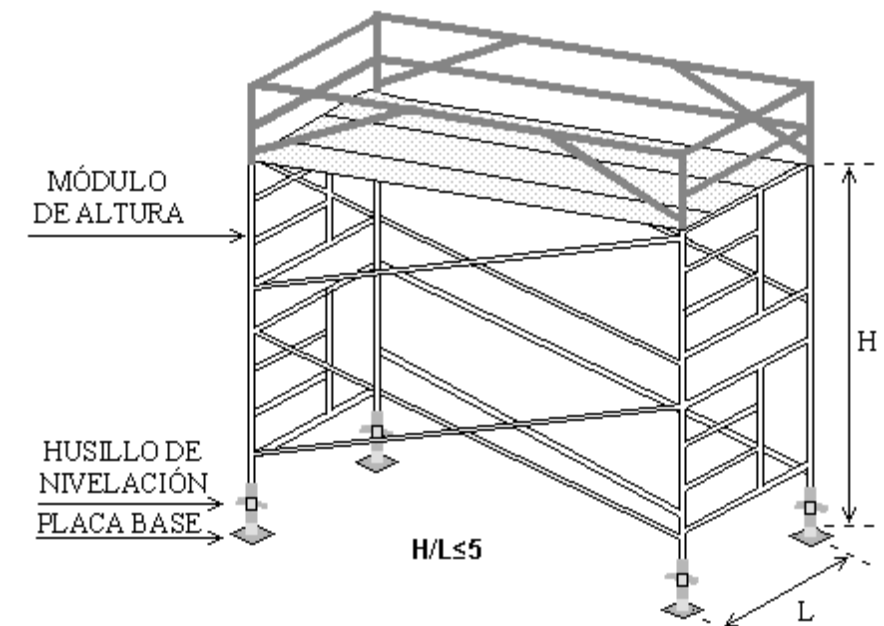
SCALE:
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DATE:
SEPTEMBER 2025

DRAWING:
4



PLATAFORMA PARA EL
HORMIGONADO DE MUROS



CROQUIS DE MONTAJE DE ANDAMIO TUBULAR

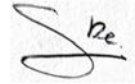


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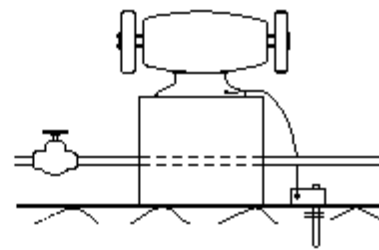
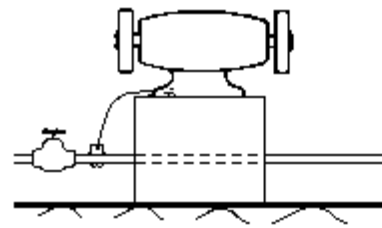
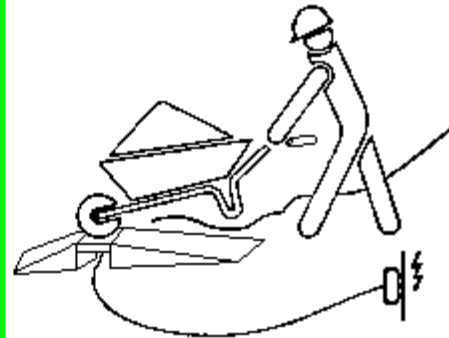
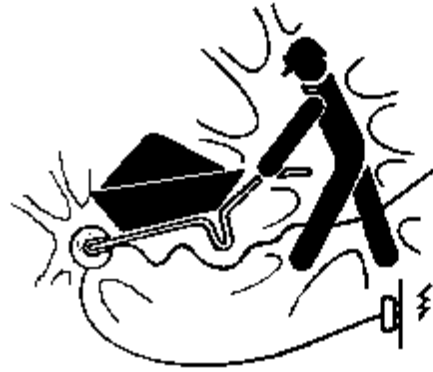
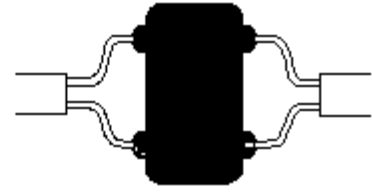
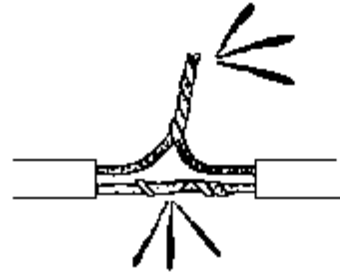
MUNICIPALITY: SOBA
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AUTHOR:

Santos Diego Cruz

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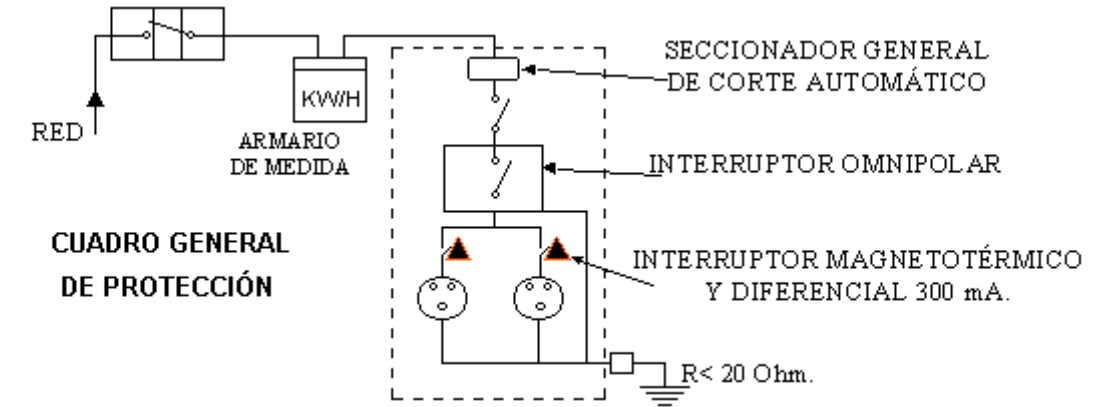
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SEPTEMBER 2025

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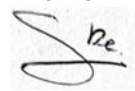


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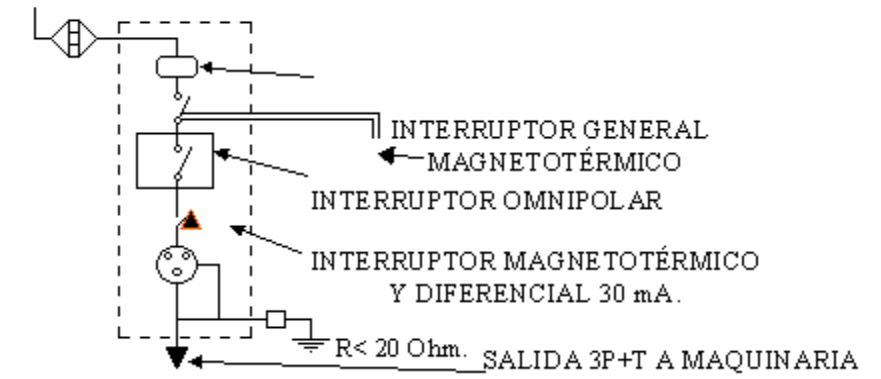
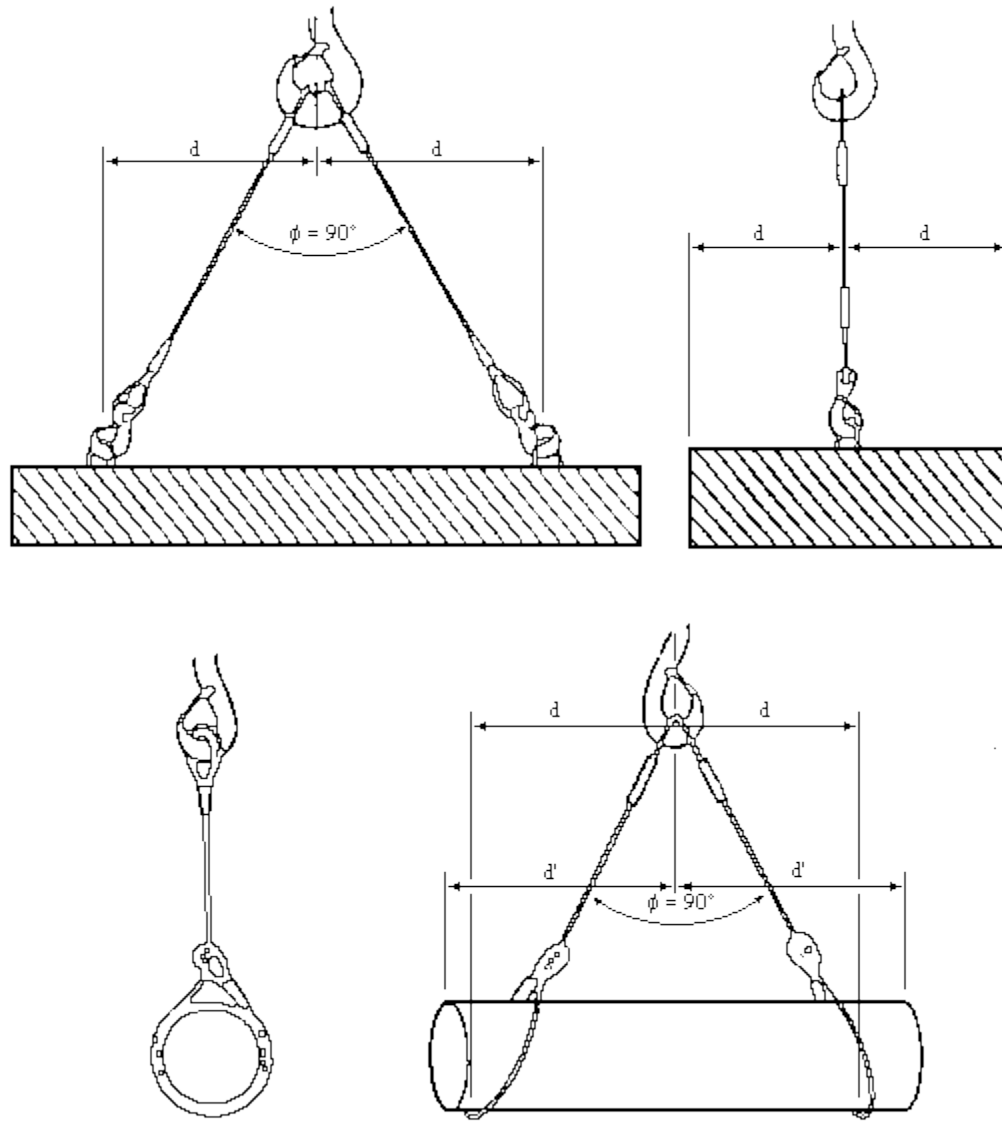
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AUTHOR:

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SCALE:
NO SCALE

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SEPTEMBER 2025

DRAWING:
6



**CUADRO SECUNDARIO
PARA ALIMENTACIÓN ÚNICA**
(SIERRA, VIBRADOR, MAQUINILLO, ETC.)

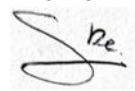


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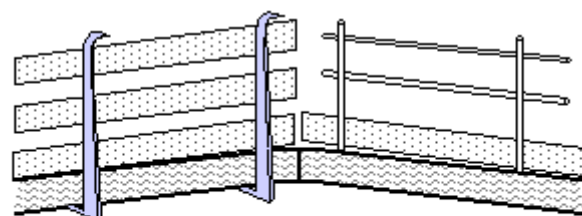
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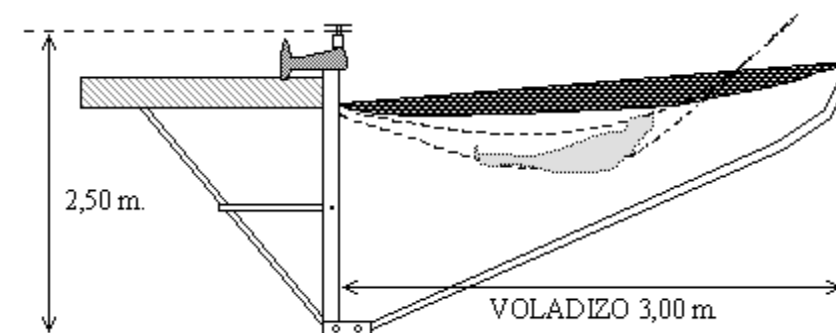
DATE:
SEPTEMBER 2025

DRAWING:
7



**GUARDACUERPOS
TIPO SARGENTO**

**ANTEPECHO DE
REDONDOS**



**CROQUIS DE RED DE BANDEJA
CON JABALCÓN**

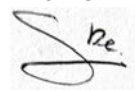


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DRAWING:

8



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 RADIATIVAS



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

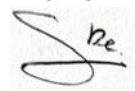


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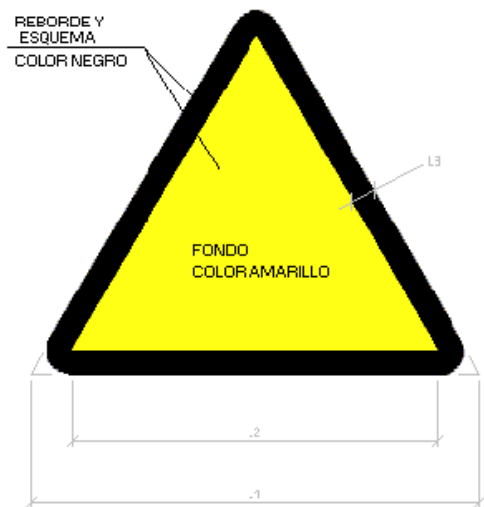
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DATE:

SEPTEMBER 2025

DRAWING:

9



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



CARGAS SUSPENDIDAS



VEHÍCULOS DE
MANUTENCIÓN



MATERIAS COMBURENTES



RADIACIONES NO
IONIZANTES



RIESGO BIOLÓGICO



MATERIAS TÓXICAS



MATERIAS CORROSIVAS



MATERIAS RADIATIVAS



RIESGO ELÉCTRICO



PELIGRO GENERAL



RADIACIONES LÁSER



CAMPO MAGNÉTICO
INTENSO



RIESGO DE TROPEZAR



CAIDAS A DISTINTO NIVEL



BAJAS TEMPERATURAS



MATERIAS NOCIVAS O
IRRITANTES

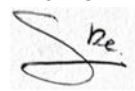


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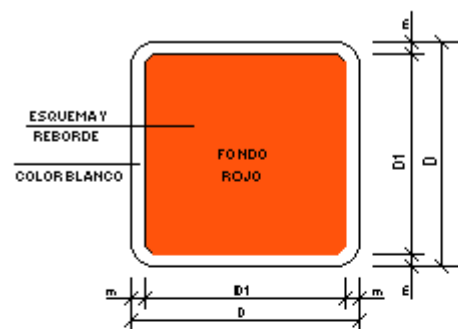
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DATE:

SEPTEMBER 2025

DRAWING:

10



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

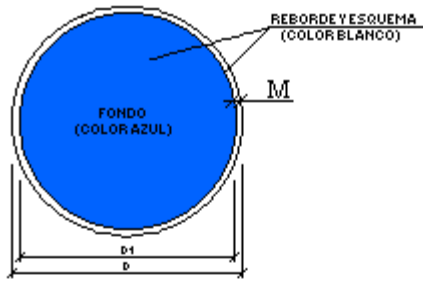


PROHIBIDO A LOS VEHÍCULOS DE MANUTENCIÓN



NO TOCAR





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
(ACOMPÑADA, SI
PROCEDE, DE SEÑAL
ADICIONAL)



PROTECCIÓN OBLIGATORIA
DEL CUERPO



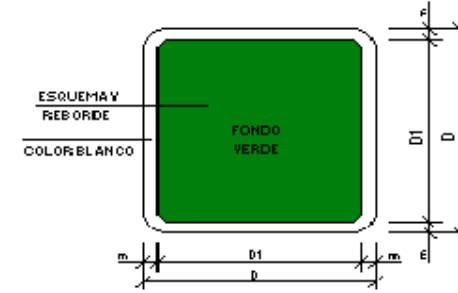
PROTECCION OBLIGATORIA
DE LA CARA



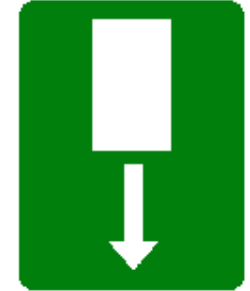
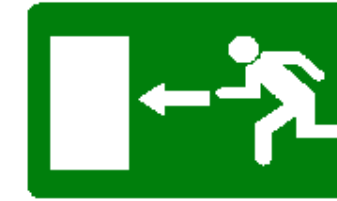
PROTECCIÓN INDIVIDUAL
OBLIGATORIA CONTRA
CAÍDAS



VÍA OBLIGATORIA PARA
PEATONES



DIMENSIONES EN mm		
D	D 1	m
594	534	30
420	378	21
297	267	15
210	188	11
148	132	8
105	95	5



PRIMEROS AUXILIOS



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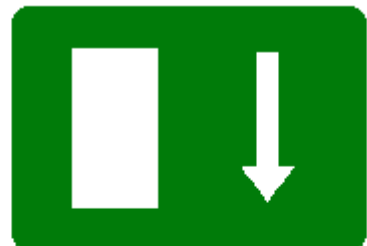
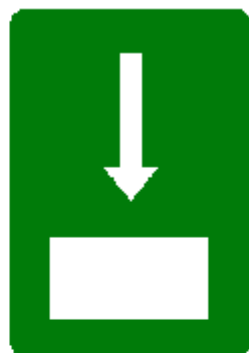
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DATE:
SEPTEMBER 2025

DRAWING:
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VÍA SALIDA DE SOCORRO



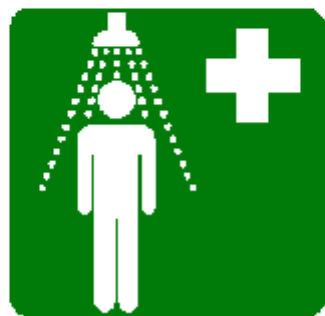
TELÉFONO DE
SALVAMENTO



DIRECCIÓN QUE DEBE SEGUIRSE
(SEÑAL INDICATIVA ADICIONAL A LAS SIGUIENTES)



CAMILLA



DUCHA DE SEGURIDAD



LAVADO DE OJOS

ELEMENTOS LUMINOSOS

CLAVE	SEÑAL	DENOMINACIÓN
TL-1		SEMAFORO (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		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 PORTÁTIL
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)



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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

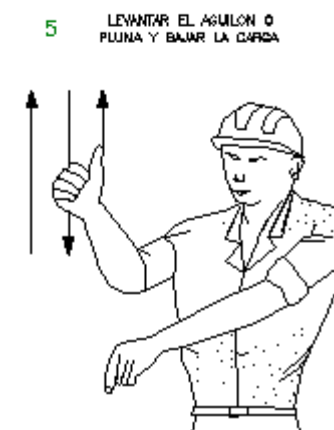
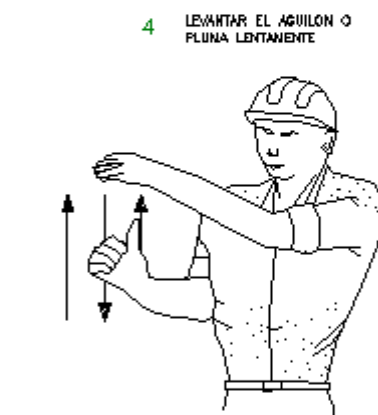
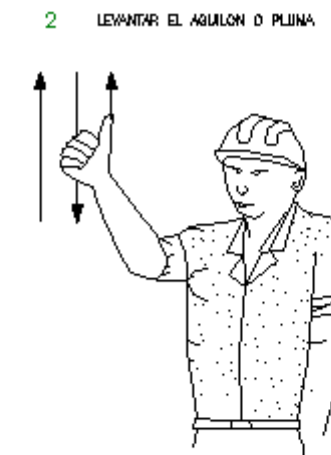
ELEMENTOS DE BALIZAMIENTO REFLECTANTES

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		DESUDIO DE UN CARRIL POR CALZADA OPUESTA
TS-61		DESUDIO DE UN CARRIL POR CALZADA OPUESTA MANTENIENDO OTRO POR LAS OBRAS
TS-62		DESUDIO DE DOS CARRILES POR CALZADA OPUESTA
TS-210		CARTEL CROQUIS

CODIGO DE SEÑALES DE MANIOBRAS



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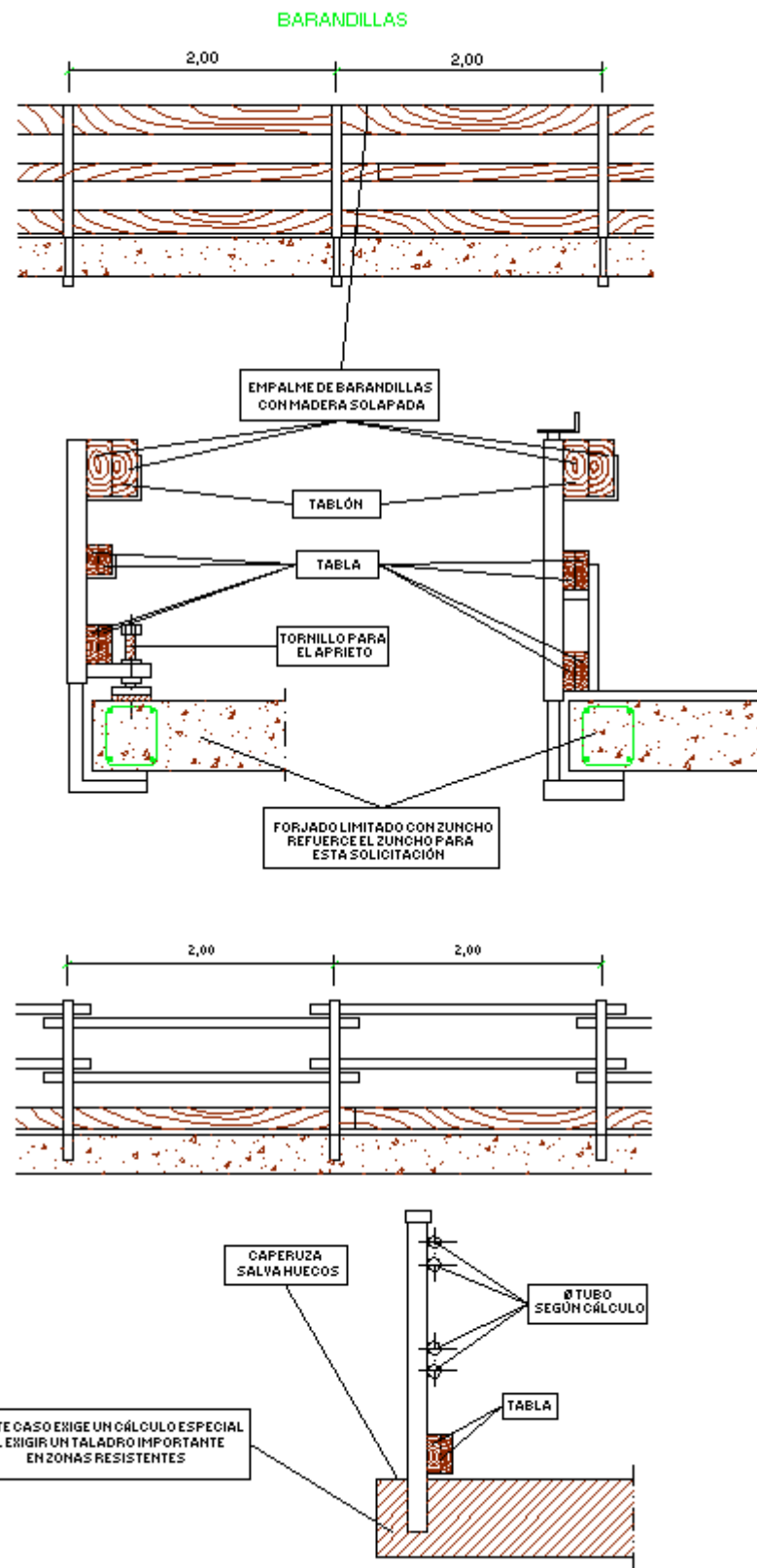
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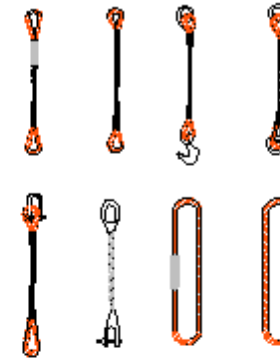
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DATE:
SEPTEMBER 2025

DRAWING:
14



TIPOS DE ESLINGAS



MANEJO DE MATERIALES

LA MISMA ESLINGA

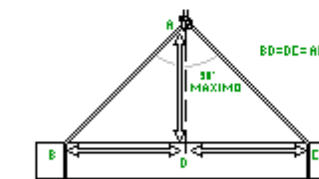
ÁNGULO 30° 1000 K_q
 ÁNGULO 60° 850 K_q
 ÁNGULO 90° 750 K_q
 ÁNGULO 120° 500 K_q



GAZAS



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 90°



MÉTODO CORRECTO



MÉTODOS INCORRECTOS

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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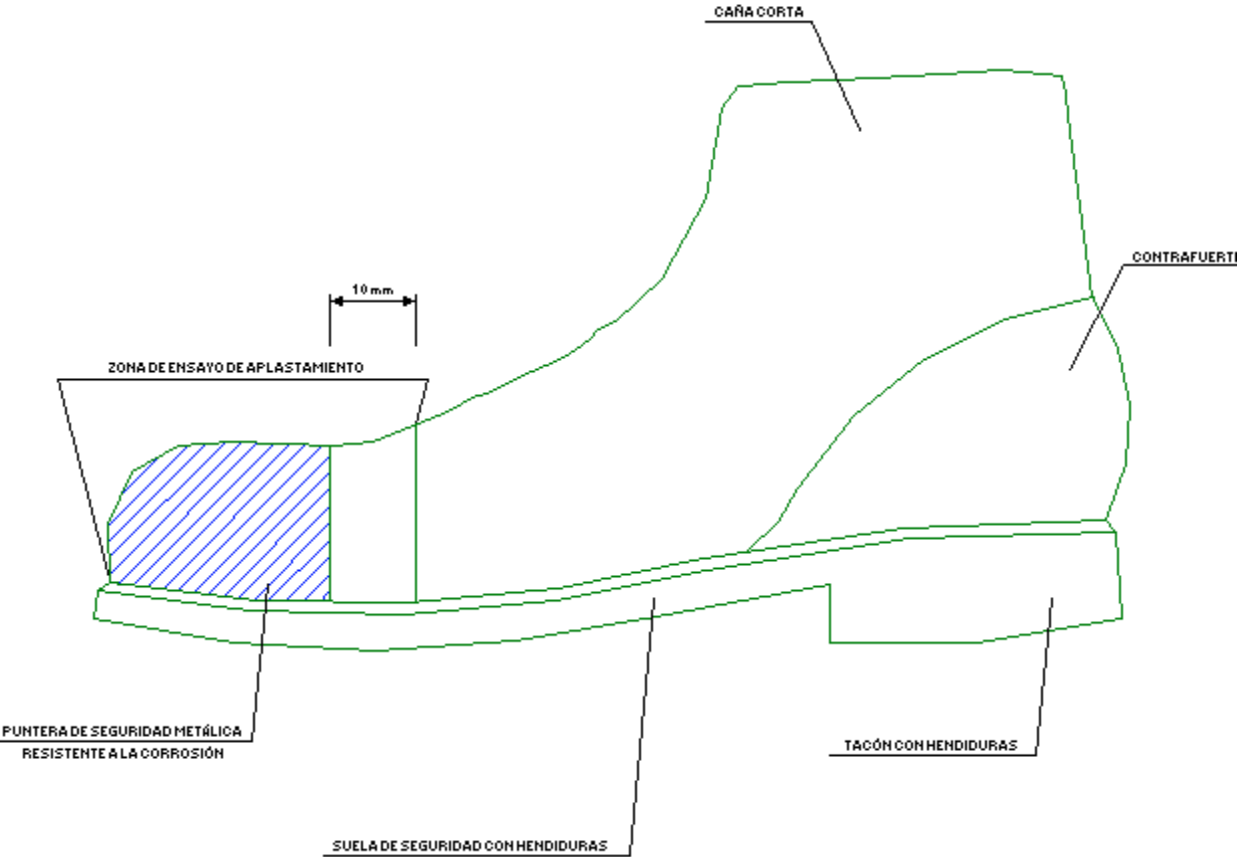
 Santos Diego Cruz

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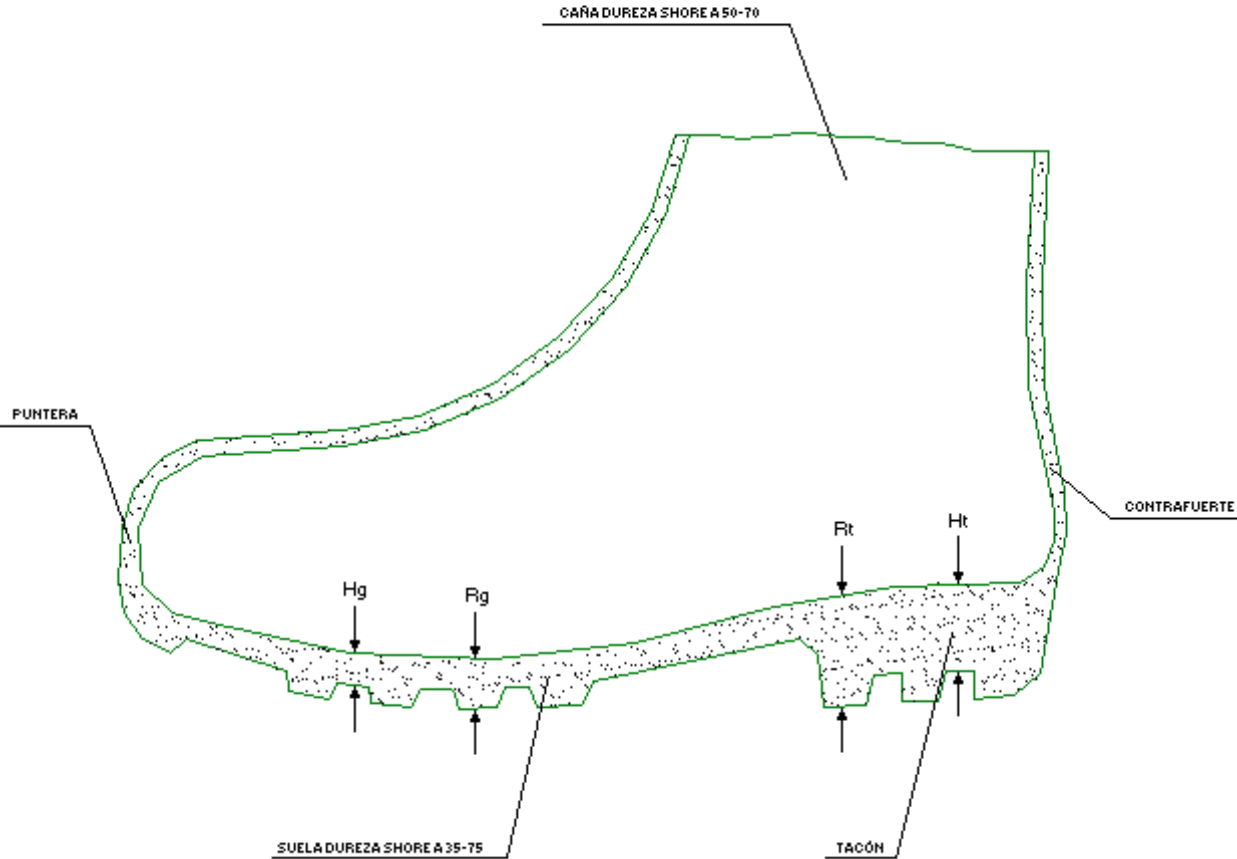
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 15

BOTA DE SEGURIDAD CLASE III
BOTAS DE SEGURIDAD CLASE III



BOTA IMPERMEABLE AL AGUA Y A LA HUMEDAD

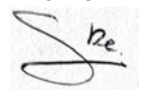


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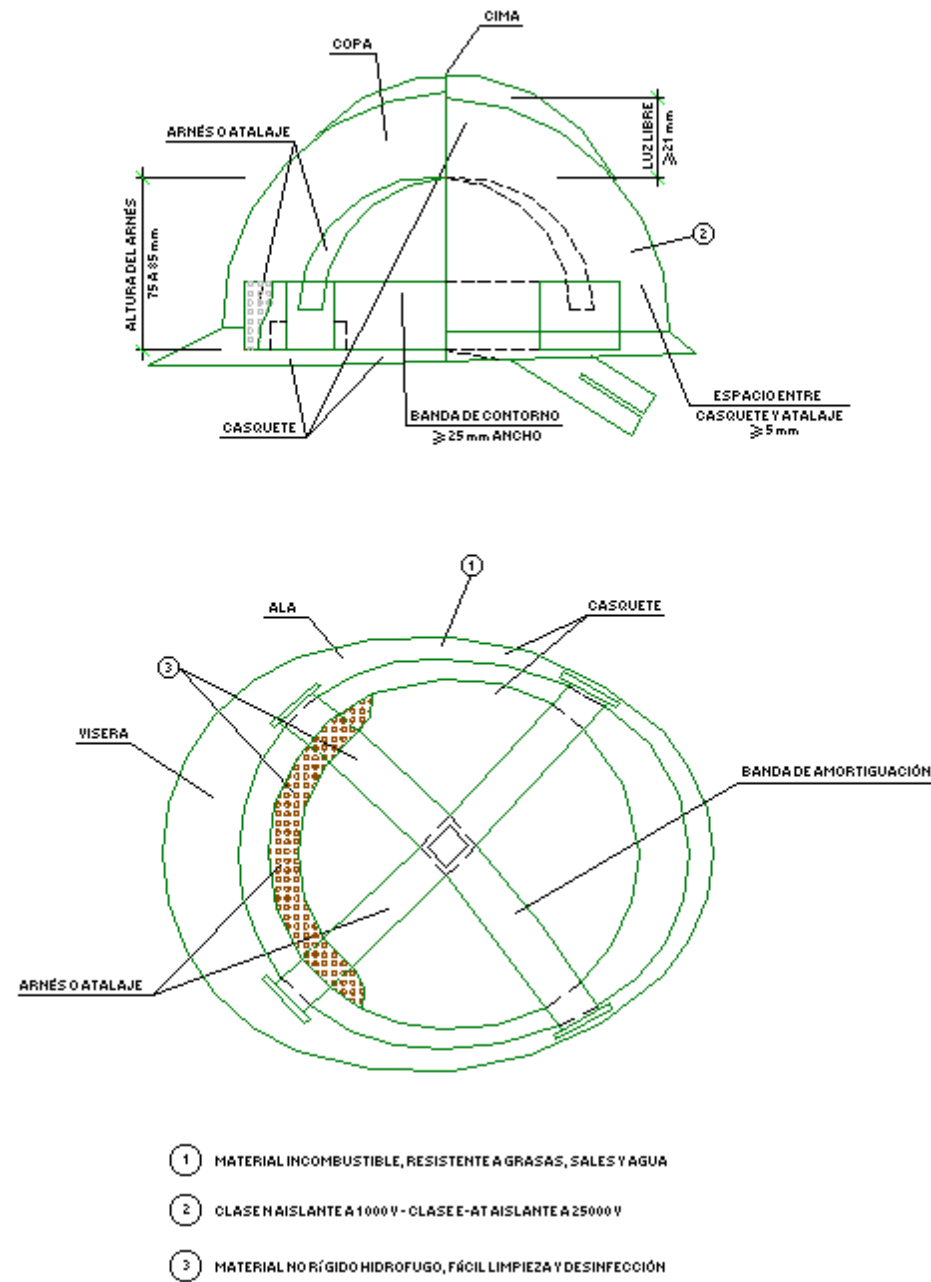
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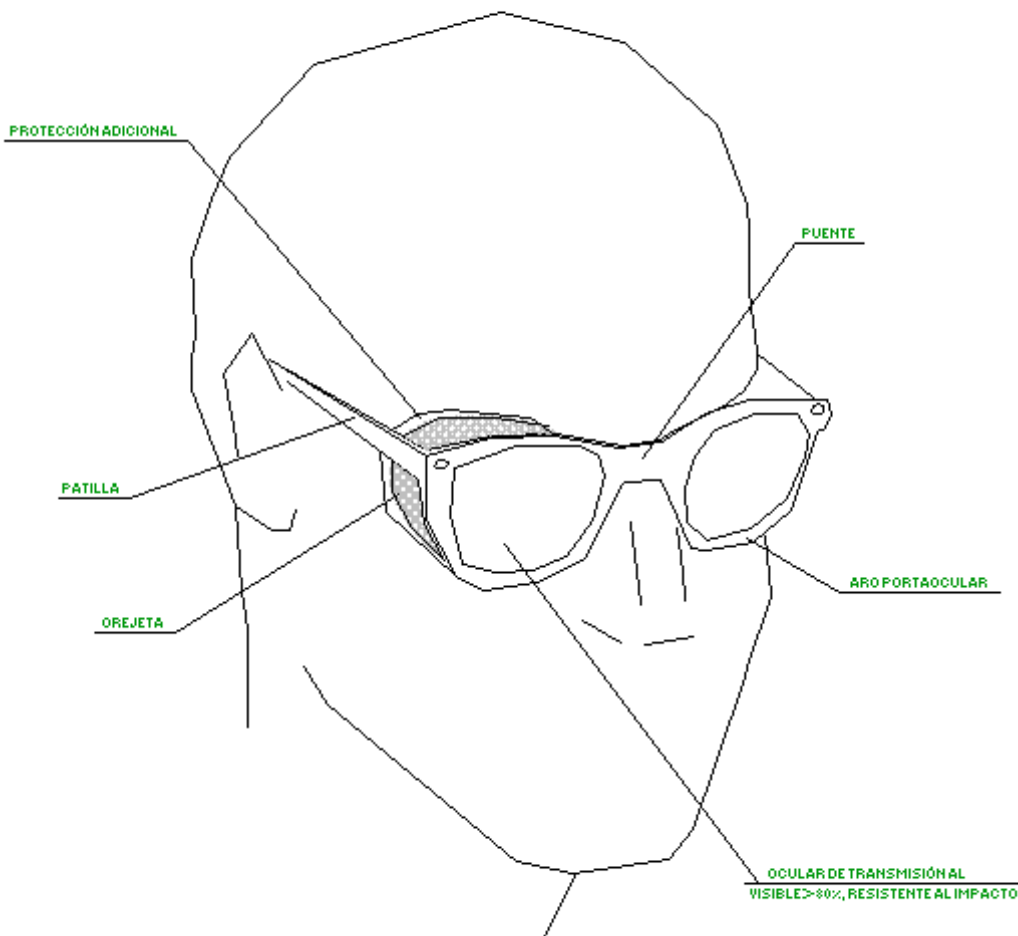
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UNIVERSIDAD DE CANTABRIA
Proyecto Fin de Carrera

CONSTRUCTION PROJECT
RISK MANAGEMENT, HEALTH AND
SAFETY PLAN

TITLE:
PATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY: SOBA
REGION: CANTABRIA

AUTHOR:

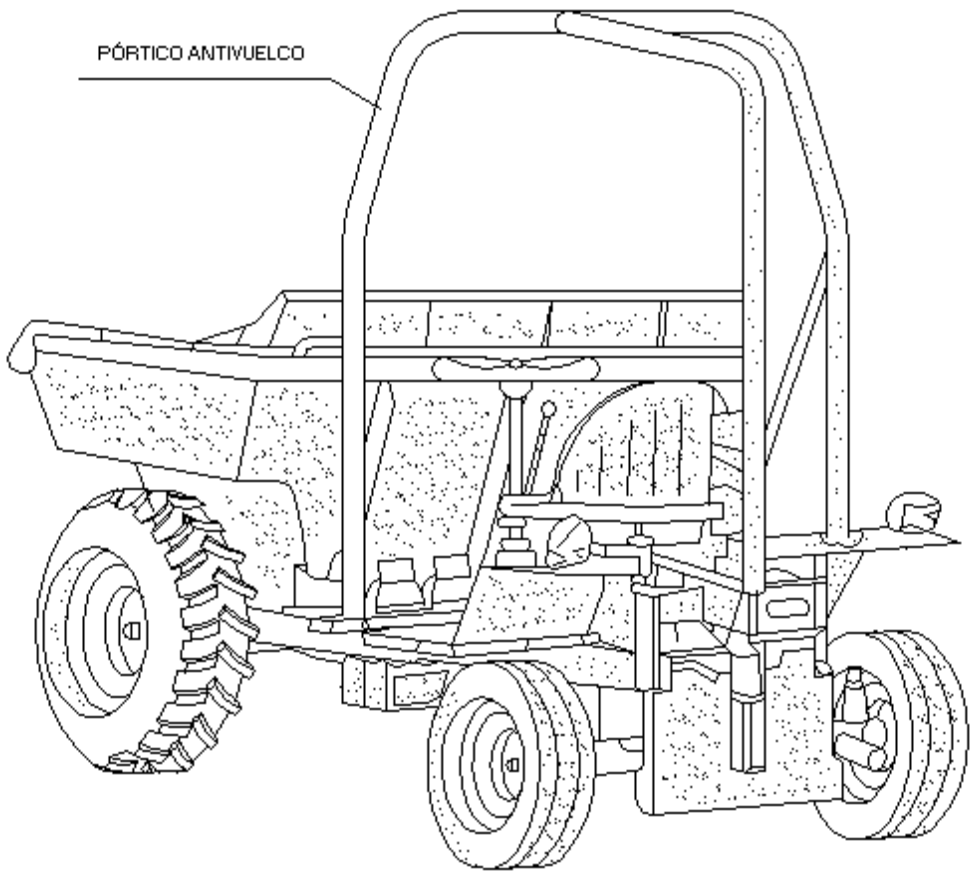
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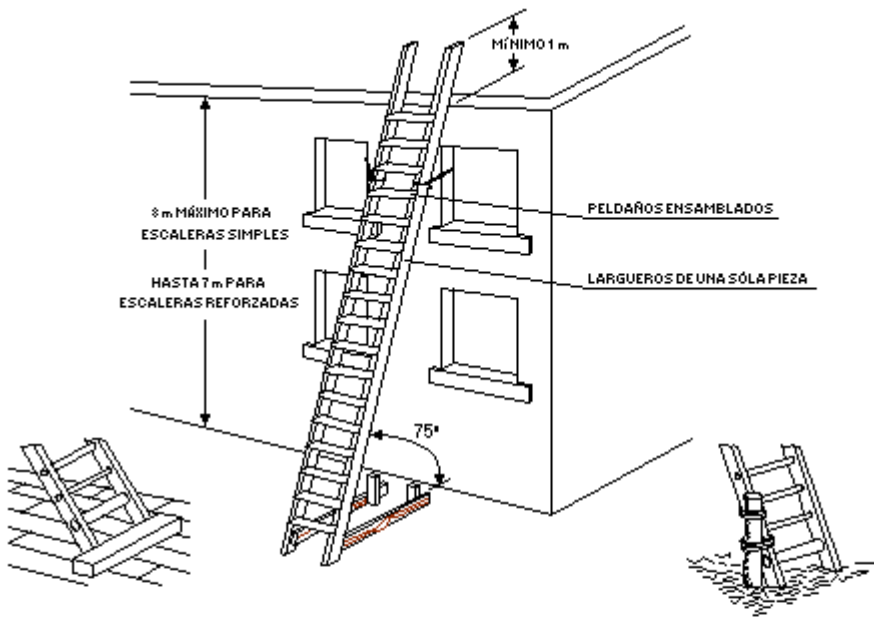
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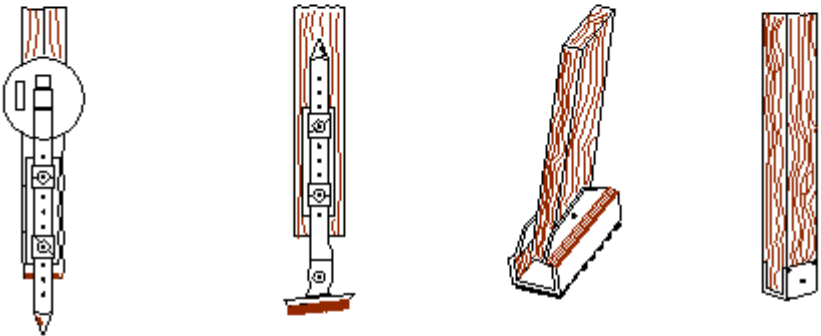
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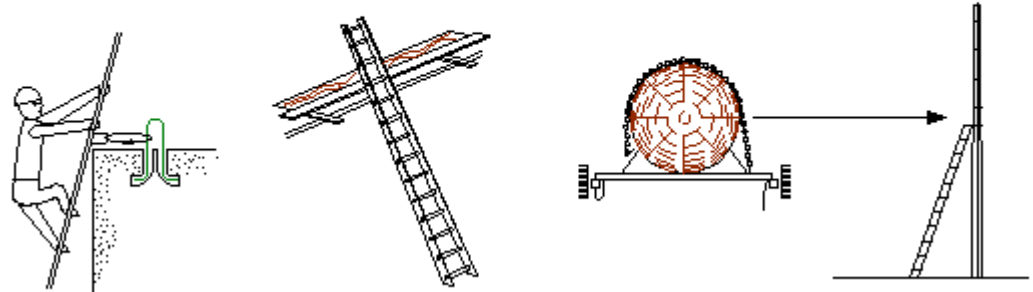
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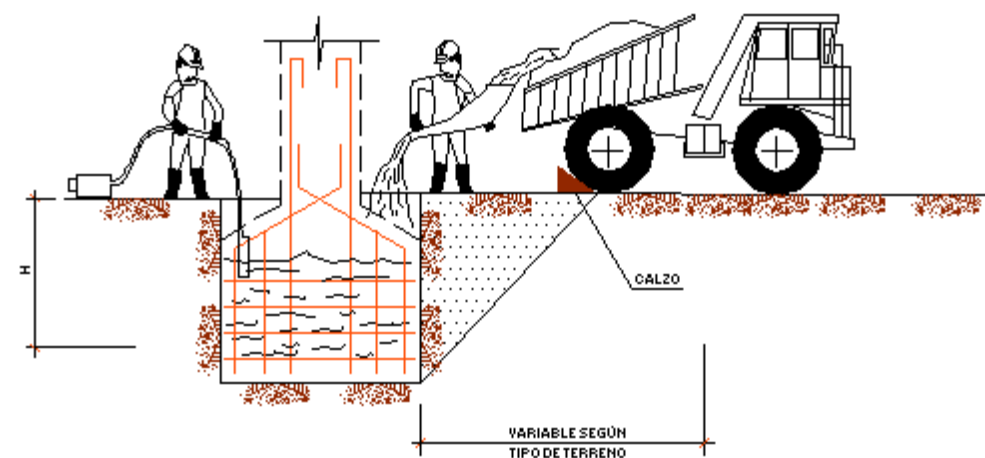
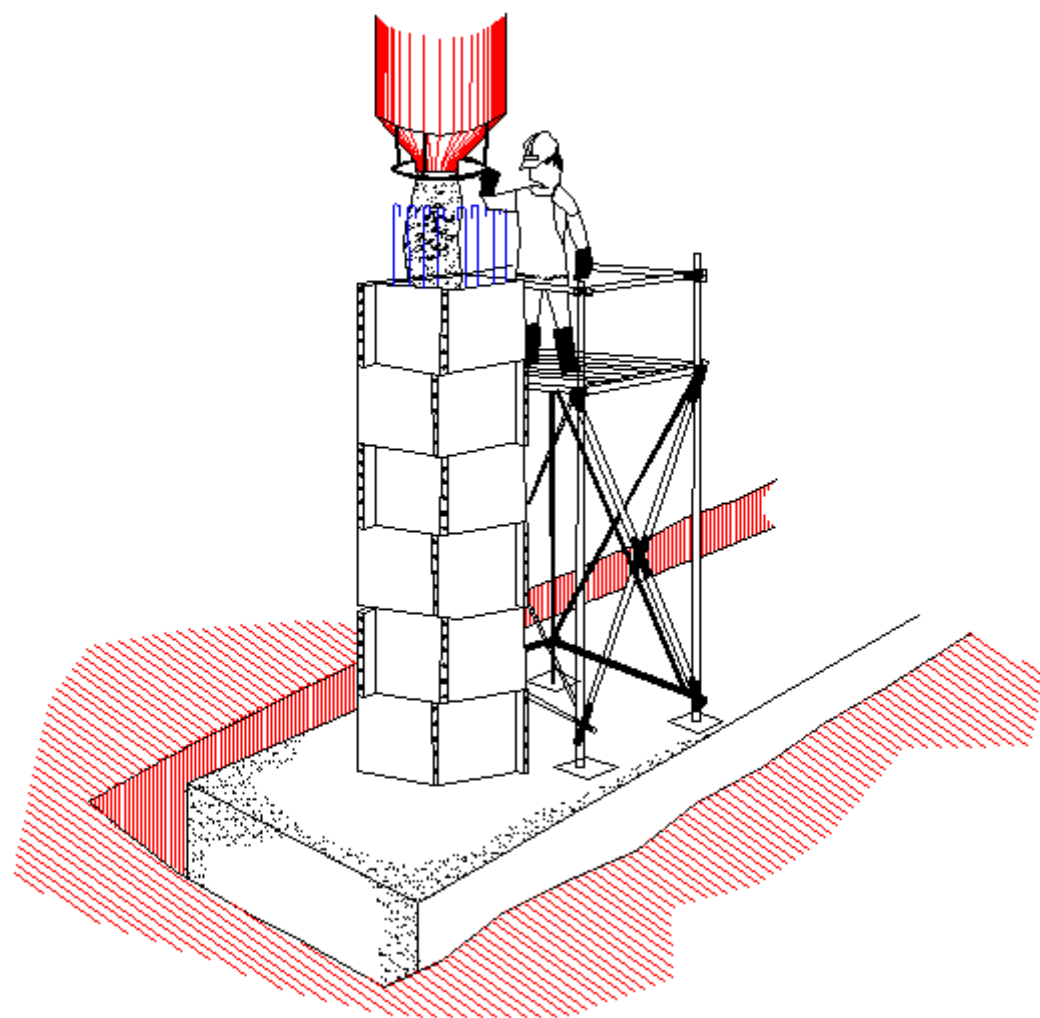
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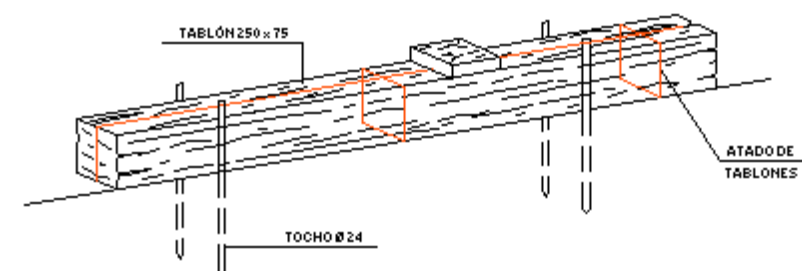
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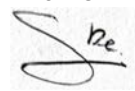


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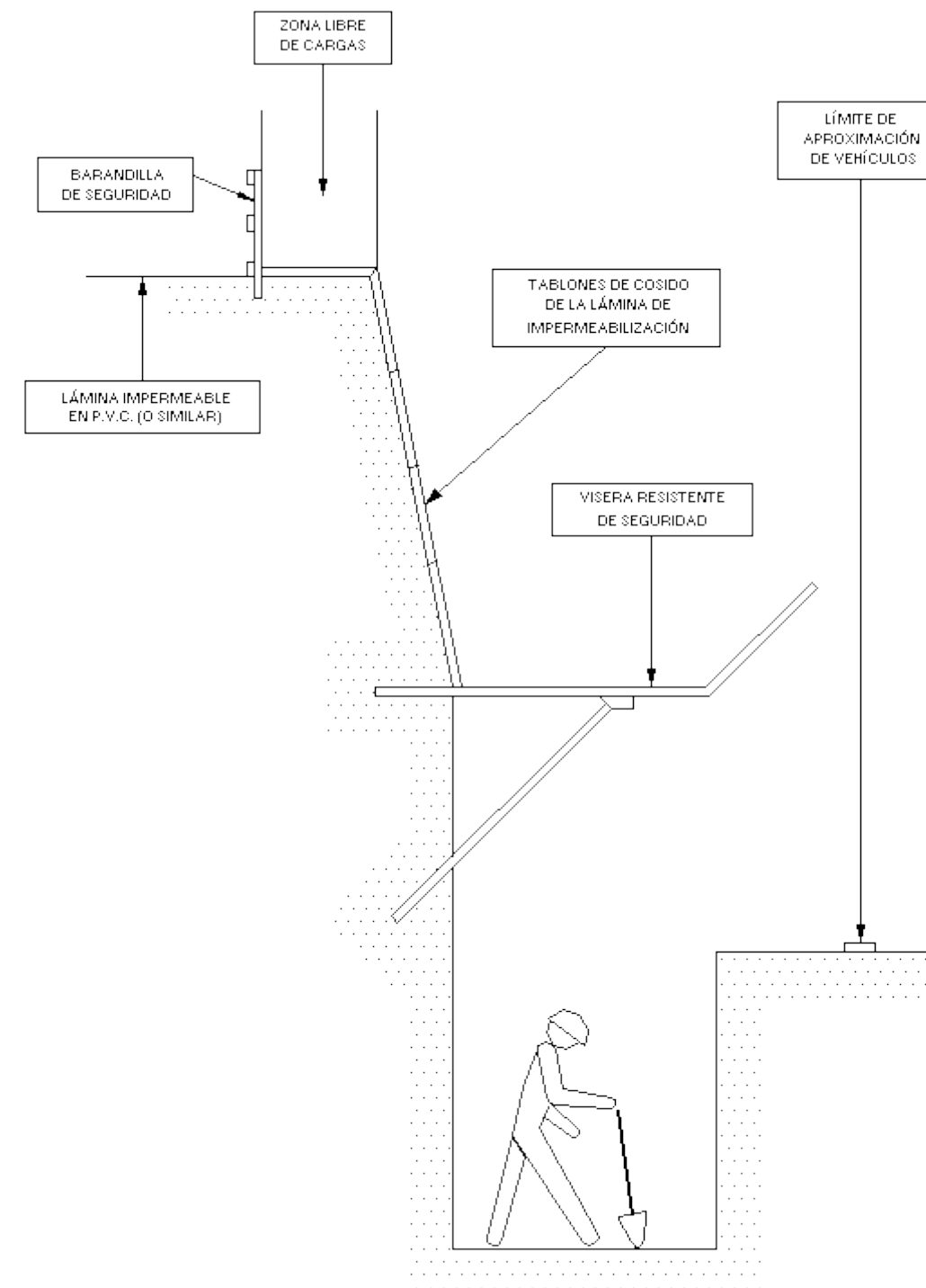
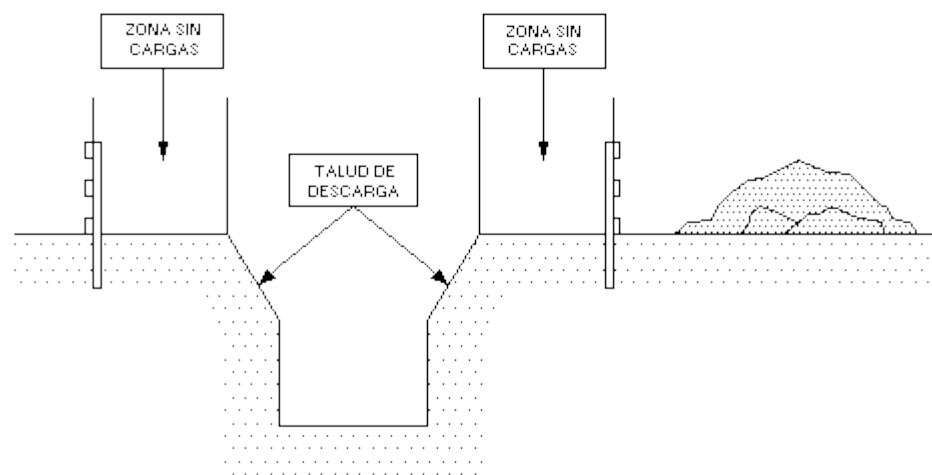
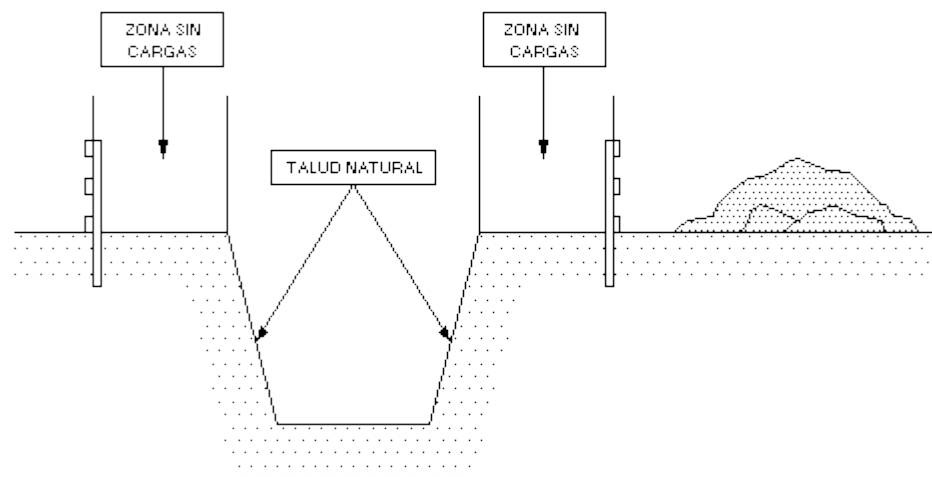
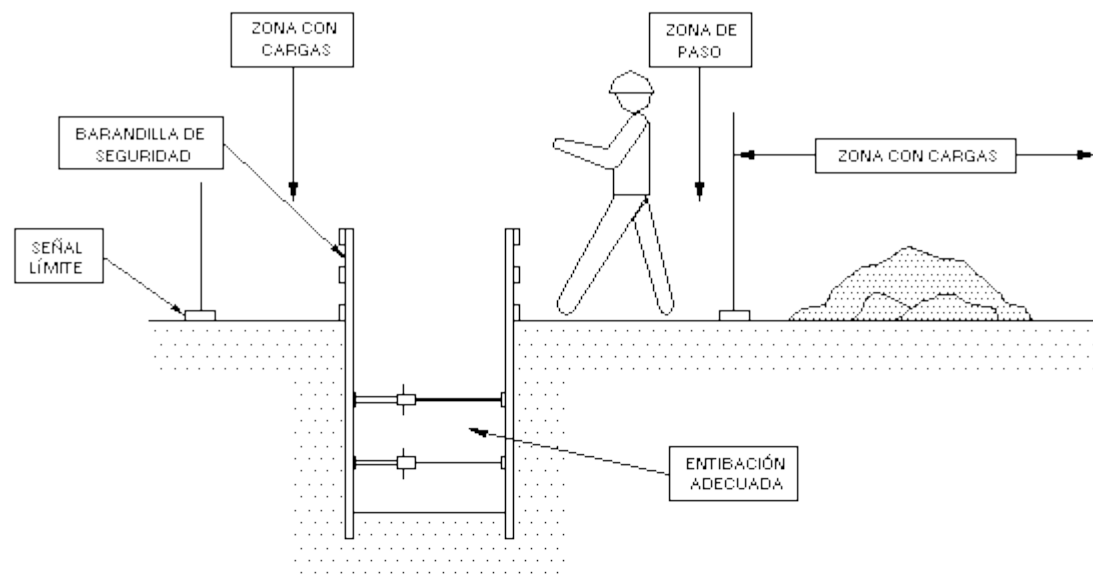
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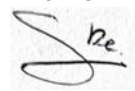


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TECHNICAL SPECIFICATIONS

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1. SCOPE OF APPLICATION

This Specific Technical Specifications Document is part of the Health and Safety Study for the construction project "Improvement of the CA-661 road platform." This document is drafted in compliance with Article 5 of Royal Decree 1627/1997, of October 24, on minimum health and safety provisions for construction projects. This article specifies that "The study shall contain, as a minimum, the following documents: [...] Specific specifications that will take into account the legal and regulatory standards applicable to the technical specifications of the project in question, as well as the requirements that must be met regarding the characteristics, use, and maintenance of the machinery, tools, systems, and preventive equipment."

This document therefore refers, from the enumeration of the legal and regulatory standards applicable to the work, to the establishment of the organizational and technical requirements that are required in relation to the prevention of occupational risks during the course of construction and, in particular, to the definition of the preventive organization that corresponds to the contractor and, where appropriate, to the subcontractors of the work and their preventive actions, as well as to the definition of the technical requirements that must be met by the protection systems and equipment that are to be used in the works, whether or not they form part of work equipment and machines.

Given the characteristics of the conditions to be regulated, the content of this Document is substantially supplemented by the definitions made in the Report of this Health and Safety Study, regarding the preventive technical characteristics to be met by work equipment and machinery, as well as the personal and collective protection systems and equipment to be used, their composition, transport, storage, and replacement, as appropriate. Under these circumstances, the regulatory content of this Document must be considered expanded with the technical provisions of the Report, both documents forming a single set of requirements enforceable during the execution of the works.

2. LEGISLATION AND REGULATIONS

The provisions established in the following shall be applicable and mandatory::

- Law 31/1995, of November 8, on Occupational Risk Prevention and Implementing Regulations (amendments made by Law 54/03 reforming the regulatory framework for occupational risk prevention).
- Law 54/2003, of December 12, reforming the regulatory framework for occupational risk prevention.
- Law 32/2006, of October 18, regulating subcontracting in the Construction Sector.
- Royal Decree 171/2004, of January 30, implementing Article 24 of the Occupational Risk Prevention Law regarding the coordination of business activities.
- Royal Decree 1627/1997, of October 24, establishing minimum health and safety provisions on construction sites.
- Royal Decree 39/1997, of January 17, approving the Regulations on Prevention Services.
- Royal Decree 604/2006, of May 19, amending Royal Decree 39/1997, of January 17, approving the Regulations on Prevention Services, and Royal Decree 1627/1997, of October 24, establishing minimum health and safety provisions for construction sites. (Official State Gazette of May 29, 2006).
- Royal Decree 1627/2007, of August 24, implementing Law 32/2006, of October 18, regulating subcontracting in the construction sector.
- Royal Decree 337/2010, of March 19, amending Royal Decree 39/1997, of January 17, approving the Regulations on Prevention Services; Royal Decree 1109/2007, of August 24, implementing Law 32/2006, of October 18, regulating subcontracting in the construction sector; and Royal Decree 1627/1997, of October 24, establishing minimum health and safety provisions for construction sites.
- Royal Decree 773/1997, of May 30, on minimum health and safety provisions relating to the use of personal protective equipment by workers.
- Royal Decree 286/2006, of March 10, on the protection of the health and safety of workers against risks related to noise exposure.
- Royal Decree 1311/2005, of November 4, on the protection of the health and safety of workers against risks arising or that may arise from exposure to mechanical vibrations.
- Royal Decree 1215/1997, of July 18, establishing the minimum health and safety provisions for the use of work equipment by workers.



- Royal Decree 2177/2004, of November 12, amending Royal Decree 1215/1997, of July 18, establishing the minimum health and safety provisions for the use of work equipment by workers for temporary work at height.
- Royal Decree 485/1997, of April 14, on minimum provisions on occupational health and safety signage.
- Royal Decree 614/2001, of June 8, on minimum provisions for the protection of workers' health and safety against electrical risks.
- Royal Decree 374/2001, of April 6, on the protection of workers' health and safety against risks related to chemical agents at work.
- Royal Decree 780/1998, of April 30, amending Royal Decree 39/1997, of January 17, approving the Regulations on prevention services.
- Royal Decree 665/1997, of May 12, on the protection of workers from risks related to exposure to carcinogens at work.
- Royal Decree 1124/2000, of June 16, amending Royal Decree 665/1997, of May 12, on the protection of workers from risks related to exposure to carcinogens at work.
- Royal Decree 349/2003, of March 21, amending Royal Decree 665/1997, of May 12, on the protection of workers against risks related to exposure to carcinogenic agents at work, and extending its scope to mutagenic agents.
- Royal Decree 664/1997, of May 12, on the protection of workers against risks related to exposure to biological agents at work.
- Royal Decree 488/1997, of April 14, on minimum health and safety provisions relating to work with equipment including display screens.
- Royal Decree 487/1997, of April 14, on minimum health and safety provisions relating to the manual handling of loads that entail risks, particularly to the lower back, for workers.
- Royal Decree 486/1997, of April 14, establishing minimum health and safety provisions in the workplace.
- Royal Decree 1407/1992, of November 20, regulating the conditions for the marketing and free intra-Community movement of personal protective equipment.
- Order of May 16, 1994, amending the transitional period established in Royal Decree 1407/1992, of November 20, regulating the conditions for the marketing and free intra-Community movement of personal protective equipment.

- Royal Decree 159/1995, of February 3, amending Royal Decree 1407/1992, of November 20, regulating the conditions for the marketing and free circulation of personal protective equipment within the Community.
- Order of February 20, 1997, amending the annex to Royal Decree 159/1995, of February 3, which in turn amended Royal Decree 1407/1992, of November 20, regarding the conditions for the marketing and free circulation of personal protective equipment within the Community.
- Royal Decree 396/2006, of March 31, establishing the minimum health and safety provisions applicable to work involving the risk of exposure to asbestos.
- Royal Decree 2291/1985, of November 8, approving the Regulations on Lifting and Handling Equipment.
- Royal Decree 1314/1997, of August 1, amending the Regulation on Lifting and Handling Equipment approved by Royal Decree 2291/1985, of November 8.
- Royal Decree 837/2003, of June 27, approving the new, amended and consolidated text of the Complementary Technical Instruction "MIE-AEM-4" of the Regulation on Lifting and Handling Equipment, referring to self-propelled mobile cranes.
- Current Low Voltage Electrical Regulations.
- Current High Voltage Overhead Line Regulations.
- Standard 8.3-IC "Construction Signaling."
- Workers' Statute.
- Cantabria Construction Collective Agreement.
- Other applicable provisions on this matter.

3. CONTRACTOR'S PREVENTIVE OBLIGATIONS

The successful Contractor, as such, must comply with the requirements established in general terms as mandatory for entrepreneurs in the preventive provisions:

- Law 31/1995, of November 8, on Occupational Risk Prevention. Amended by Law 50/1998, of December 30, on Administrative, Fiscal, and Social Order Measures, by Royal Legislative Decree 5/2000, of August 4, approving the consolidated text of the Law on Infractions and Sanctions in the Social Order, and by Law 54/2003, of December 12, reforming the regulatory framework for occupational risk prevention.
- Royal Decree 39/1997, of January 17, approving the Regulations on Prevention Services. Amended by Royal Decree 780/1998, of April 30.



- Royal Decree 171/2004, of January 30, implementing Article 24 of Law 31/95.
- Circular 1/02 of the General Secretariat of the Ministry of Public Works, of January 2, 2002, on the management procedure to be implemented from the award of the contract to the start of its execution (Official Gazette of March 14, 2002).
- Furthermore, for the construction work covered by this document, the Contractor must carry out the actions required by both previous legislation and Royal Decree 1627/1997, of 24 October, which establishes minimum health and safety provisions for construction work, in order to harmonise the company-wide preventive measures (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.

In any case, the Contractor shall comply with the following requirements in this area, regardless of whether they are included in the ESS or the EBSS:

- It will effectively comply with the applicable occupational risk prevention regulations established in Article 1 of the LPRL.
- The Health and Safety Plan (HSP) to be submitted by the employer will be signed, and its content will be acknowledged by at least:
 - o The Contractor or their Delegate.
 - o The Site Manager.
 - o The Safety Technician from their own or third-party Prevention Service, who has collaborated in its development or, where applicable, is its author. (This safety technician will be, on the one hand, a higher or intermediate engineering specialist, and, on the other, competent in the construction of the works covered by this Project, authorized to perform the higher function of Royal Decree 39/1997, which approves the Regulations for Prevention Services, or will provide proof of completion of a course with the minimum training program established in Annex 8 of the Technical Guide for the evaluation and prevention of occupational risks related to construction works of the Official Institute of Safety and Hygiene at Work).
- The PSS, prepared in accordance with the applicable provisions, shall be submitted to the Project Manager within twenty-five (25) calendar days from the day following the date of notification of the award. If, based on the indications or reports of the Health and Safety Coordinator or, where applicable, the D.O., it needs to be modified, this shall be done with the utmost urgency so that the final version returns to the D.O. within fifteen (15) calendar days from the date of signing the Contract so that it may

be informed (where applicable, favorably) and processed for approval. All of this in accordance with Circular 1/02 of the General Secretariat of O.P. (BOC of 14-03-2002).

- The tasks and activities to be carried out during the execution of the works will adhere at all times to the established preventive planning.
- No activity will be started whose execution procedure does not comply with the provisions of the aforementioned PSS. Therefore, it is mandatory for the Contractor to specifically and timely plan each and every one of the new activities that may arise during the course of the works. To this end, it must adhere to the provisions in both Royal Decree 1627/1997 and Circular 01/02 of the General Secretariat of Public Works.
- These considerations will extend to possible changes that occur in the methods and systems of execution of the activities already planned in the current PSS. In any case, these variations or alterations to the PSS, whether in the form of Modifications or Adaptations, must be approved by regulation in the established manner, well in advance of the commencement of the works in question.
- The Contractor shall scrupulously and rigorously comply with its preventive obligations in circumstances involving the concurrence of activities established in Article 24 of the LPR and developed in RD 171/2004, both with subcontractors and self-employed workers as well as with other concurrent entrepreneurs (for changes in affected services, etc.).
- Attend the Coordination Meetings convened by the S&S Coordinator (or, where applicable, the D.O.), at which minutes will be kept, recording the matters discussed, the agreements and commitments reached, and the signatures of those attending. These minutes will be incorporated into the construction safety file.
- Through its on-site safety organization, which will guarantee the presence of its safety resources, it will require 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 Articles 15, 17, and 24.3 of the LPRL. To this end, it will provide each subcontractor, with sufficient notice for their analysis, with the relevant portion of the PSS, so that, once reviewed, they may attend the next Coordination Meeting and comply with it during execution.
- Likewise, it will urge subcontractors to transmit the contents of the PSS to their workers, requiring the corresponding receipt, which will be included in the project's preventive documentation file. As established by law, the main contractor will be jointly liable for any breaches by subcontractors.



- The Contractor shall inform and provide appropriate instructions to its workers, subcontractors, and self-employed workers regarding the measures to be adopted regarding their safety and health on the site, as well as the matters discussed in the Coordination Meetings.
- The Contractor shall maintain all preventive measures in proper condition, bearing in mind that it is responsible for ensuring their availability, correct use, and employment by workers at the appropriate time, so as to prevent risks before they arise. Therefore, before beginning each activity, a member of the Contractor's preventive organization on the site shall verify that the safety measures are properly in place and ready for installation. It is the Contractor's obligation to guarantee their condition, stability, and reliability.
- Regarding 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. Likewise, it is responsible not only for providing the protective equipment but also for ensuring its proper use.
- Without prejudice to the provisions of the subcontracting paragraph of Article C704.104 of this Document, the Contractor must inform the Health and Safety Coordinator, in due time, of the incorporation of any contractor, subcontractor, or self-employed worker on the project.
- The Contractor must immediately notify the Health and Safety Coordinator or, where applicable, the Director of Operations, of all accidents and incidents occurring on the project, regardless of their severity, as well as any accidents that occur on the job. After the first notification, the Contractor must submit a full report on the matter, also providing any information generated, where applicable, by the intervention of the Labor and Social Security Inspectorate, the Health and Safety Office, and other institutions. The aforementioned documentation must also be submitted when the aforementioned agencies intervene for any other preventive reason, regardless of the cause.

Presence of preventive resources. Contractor's preventive organization on site

For the proper fulfillment of the contractor's preventive obligations within the context of Article C704.101, more specifically those relating to the integration of preventive activities (as established in Article 1 of Royal Decree 39/97 and the reforms introduced by Law 54/2003), the presence of preventive resources on site (in accordance with the new Article 32 bis of Law 31/95 and the new additional provision fourteen thereof), and the coordination of concurrent activities (Article 24 of the Law and Royal Decree 171/2004), the contractor shall have the preventive equipment and organization established herein on site as a minimum, which must be

specified in the PSS. Under the supervision and maximum direction of the employer or, where appropriate, the Contractor's Delegate (who may establish the hierarchies, specific organization and responsibilities in the PSS in the manner he deems appropriate according to his own business organization, maintaining the qualifications and knowledge required here as a minimum in each position), the following will be appointed:

- The Faculty Officer in Charge or Responsible for compliance with the contractor's obligations on the project, who will have a continuous presence on the site to monitor effective compliance with the PSS: The Contractor's Delegate or preferably the Site Manager (if they are not the same) for the type of work that requires it; for all other projects, at least the General Manager or similar.
- The Safety Technician, designated by the company for this project, who must plan preventive measures, train and inform its workers, report and investigate accidents and incidents, liaise with the health and safety coordinator during the execution of the project, supervise the rest of the Contractor's preventive personnel, organize and direct preventive coordination with other companies participating in the project, and perform other similar functions.
- Worker in charge of safety on the site, with the responsibility of monitoring compliance with the provisions of the PSS regarding the activities carried out by their company, as well as verifying the application of 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 for each job site, at the discretion of the Contractor, for jobsites where their magnitude and complexity require it.
- Worker in charge of equipping and maintaining the condition of the Personal Protective Equipment (PPE) for all workers.
- Worker in charge of keeping their company's health and safety file on the site up-to-date and complete.
- Worker in charge of controlling the access of authorized persons to the site and the manner in which this task is carried out, taking into account, where applicable, compatibility with public traffic and other requirements for the use of the roadway being worked on.

Depending on the magnitude of the activities to be carried out, depending on the project, the roles listed in the preceding paragraphs, with the exception of the safety technician, may even be assigned to a single worker. The definitive establishment of this organization will be carried out within the PSS, and RD 171/2004 will be taken into account.



The Contractor is obliged to incorporate into its PSS, regardless of what the ESS or EBSS 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, it must notify the D.O. and the S. and S. Coordinator in writing of said personnel, without prejudice to making justified changes during execution, which must also be communicated in the same manner.

4. MEASURES PREVIOUS TO THE BEGINNING OF THE PROJECT

4.1. GENERAL CONDITIONS

No work should begin on the site without prior approval of the Health and Safety Plan drafted by the Construction Company.

Before the start of work, the hygiene and well-being facilities and services for workers must be in place.

Before beginning any type of work on the site, the contractor must have the relevant permits, licenses, and regulatory authorizations, such as: installation of fences or enclosures, signage, pedestrian and vehicle traffic diversions and closures, access, stockpiling, etc.

Before starting any work on the site, appropriate protections must be implemented, where applicable, against annoying, harmful, unhealthy, or dangerous activities carried out in the immediate vicinity of the site that may affect the health of workers.

4.2. PREVIOUS INFORMATION

Before undertaking any of the preparatory operations or work for the execution of the works, the contractor must be informed of all aspects that may affect the required health and safety conditions. To this end, they will gather prior information relating primarily to:

- Easements or impediments to installation and service networks and other hidden elements that may be affected by the works or interfere with their progress.
- Traffic intensity and type on the roads adjacent to the works, as well as the dynamic loads caused by them, in order to assess the possibility of landslides, subsidence, or other actions that could cause accident risks during the execution of the works.

- Vibrations, tremors, or other similar effects that may occur due to activities or work carried out or to be carried out in the immediate vicinity of the works and that may affect the safety and health conditions of workers.
- Activities that take place in the immediate vicinity of the construction site and may be harmful, unhealthy, or dangerous to the health of workers.

4.3. AFFECTED SERVICES

Before beginning any work on the site, it must be clearly defined which public or private utility networks may interfere with its execution and pose a risk to the health of workers or third parties.

In the case of overhead power lines that cross the construction area or are close to it in such a way that they interfere with the execution of the work, work should not begin until they have been modified by the utility company. For this purpose, the utility company will be requested to de-energize the line or reroute it.

If the above is not feasible, minimum safety distances will be considered, measured between the closest live point and the closest part of the worker's body or tool, or the machine, always taking into account the most unfavorable situation. It must be ensured at all times that the aforementioned minimum safety distances are maintained.

In the case of underground gas, water, or electricity networks that affect the project, their exact position must be confirmed before beginning any work. To this end, if there is any doubt, the necessary information must be obtained from the affected companies. The possibility of rerouting them or shutting them down must be considered. These operations must be carried out by the aforementioned companies. If this is not feasible, they must be identified on-site. Once the network has been located, it must be marked with its direction, layout, and depth. The safety area must also be indicated, and visible signs must be posted warning of the danger and the corresponding protections.

4.4. ACCESS, INTERIOR CIRCULATION AND DELIMITATION OF THE WORK

Signs stating "No entry to anyone not involved in the construction site" and "Helmet use is mandatory" will be posted at all entrances to the site, and signs indicating "Vehicle Entry and Exit" will be posted at vehicle entrances.



Before exiting the public roadway, vehicles will have a horizontal section of solid or paved ground no less than one and a half times the wheelbase or 6 meters in length. If this is not possible, auxiliary signaling personnel will be available to carry out maneuvers.

Ramps for the movement of trucks and/or machinery will have a minimum width of 4.5 meters, widening at curves. Their gradients will not exceed 12% and 8%, respectively, depending on whether the sections are straight or curved. In all cases, the maneuverability of the vehicles used must be taken into account.

Loading, unloading, stockpiling, and storage areas must be fenced and delimited.

5. GENERAL MEASURES DURING CONSTRUCTION

5.1. GENERALITIES

During the execution of any work or unit of work:

- The specifications of the project's Technical Specifications Document and the Project Management's orders and instructions must be followed at all times regarding the execution process.
- Regarding the health and safety of workers, the requirements of the Study, the standards contained in the Health and Safety Plan, and the orders and instructions issued by the person responsible for monitoring and controlling it must be observed.
- The health and safety measures adopted must be reviewed and inspected as frequently as necessary, and the planned frequencies for carrying out this task must be recorded in detail.
- Work must be suspended when unfavorable weather conditions exist (strong winds, rain, snow, etc.).

After each work unit is completed:

- The necessary collective protective equipment and safety measures will be in place to prevent further potential risk situations.
- Workers will be given the necessary warnings and instructions regarding the use, upkeep, and maintenance of the completed work, as well as the collective protection and safety measures in place.

Once the work is completed, all 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 must be solid and stable, taking into account:

- The number of workers occupying them.
- The maximum loads they may be required to withstand, as well as their distribution and possible lateral thrusts.
- The external influences that may affect them.

For the above purposes, they must have structures appropriate to their type of use, and the loads they can support or suspend must be indicated by signs or inscriptions.

If the support and other elements of these workstations do not possess intrinsic stability, their stability must be guaranteed by appropriate and secure fixing elements to prevent any unintentional movement of the whole or part of it.

The indicated stability and solidity must be verified periodically, and in particular after any change in the height or depth of the workstation.

Workstations must be subject to appropriate technical maintenance to allow for the quickest possible correction of any deficiencies that may affect the safety and health of workers, as well as cleaning to ensure adequate hygiene conditions.

The area occupied by personnel engaged in sampling and on-site testing must be adequately demarcated and marked.

5.3. ZONES OF SPECIAL RISK

In general, two areas are considered to be at special risk:

- Access to the workplace. Access to the site will be provided at points where it intersects with existing roads and at the ends. In these areas, both workers on foot and operators entering or exiting the site operating machinery or construction vehicles must exercise extreme caution due to the presence of vehicles traveling on the roadway.



- Structure. The execution of the structure is not considered; it will be the subject of a separate project. Only the risk of falls from height will be taken into account when laying the pavements, installing signage and vehicle restraints, and, in general, any activity carried out on the structure.

Furthermore, construction areas that pose serious risks, such as fuel storage facilities, transformer stations, etc., must be equipped with devices to prevent unauthorized workers from entering.

Appropriate measures must be taken to protect workers authorized to enter the hazard zones, and only workers who have received appropriate information may access areas or enclosures with serious and specific risks.

Hazard zones must be clearly and clearly marked, and expressly and conditionally prohibited areas must be delimited and marked.

5.4. TRANSIT ZONES

The construction site's transit areas and circulation routes, including stairs and fixed ladders, must be designed, located, equipped, and prepared for use in such a way that they can be used easily, safely, and in accordance with their intended use.

It must be ensured that workers employed in the vicinity of such transit areas or circulation routes are not at risk.

When means of transport are used on circulation routes, sufficient safety distances or appropriate protective measures for pedestrians must be provided.

Any construction site where workers must circulate and which, due to recent construction, incomplete completion, or any other reason, pose a hazard, must have walkways or catwalks made of planks with a minimum width of 60 cm and other similar elements, ensuring the safety of personnel who must circulate there, unless the area in question is accessed through a prohibited area.

Catwalks located more than 2 meters above the ground or floor must have a minimum width of 60 cm, must have a connected floor, and must have 90 cm high handrails and 20 cm high toeboards. Catwalks must have easy and safe access and must be kept free of obstacles. The necessary measures must be taken to prevent the floor from becoming slippery.

Efforts shall be made to limit loading of floors or work platforms to that extent necessary for the execution of the work, and materials shall be lifted according to these needs.

Gaps and openings that, due to their particular location, are hazardous shall be suitably protected by solid railings, mesh netting, and other similar solid and stable elements, in accordance with the needs of the work.

When wooden ladders are required, their beams shall be made of a single piece.

Therefore, joining two ladders shall not be permitted, and the rungs must be securely joined together, not merely nailed together.

Circulation routes for vehicles and machinery must be located at a sufficient distance from pedestrian crossings, walkways, etc.

Transit areas and circulation routes must be kept at all times free of objects and obstacles that impede their proper use and could pose a risk to workers. They must also be clearly marked, signposted, and sufficiently illuminated.

All areas left unprotected will be marked off to prevent dangerous approaches, with appropriate signage.

5.5. ACTIVITIES WITH SPECIAL RISKS

The handling and storage of substances likely to produce dust, fumes, odors, 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 the smallest number of workers possible, taking appropriate precautions, unless otherwise prescribed by the applicable Regulations.

These substances shall preferably be used in closed equipment that prevents the harmful element from escaping into the environment. If this is not possible, the fumes, mists, vapors, and gases they produce shall be extracted at their source by extraction to prevent their diffusion.

In addition, an effective general ventilation system, natural or artificial, shall be installed to constantly renew the air in these premises.

Personnel employed in work involving special risks shall be previously trained by competent technicians and must demonstrate their competence through a theoretical and practical examination or test.



Containers containing explosive, corrosive, toxic, infectious, irritant, or radioactive substances shall be labeled, indicating their contents and the precautions for their use and handling by the workers who must use them.

Persistent or particularly unpleasant odors shall be prevented by using the most effective extraction and expulsion systems, and if this is not possible, respiratory masks shall be mandatory.

Workers exposed to corrosive, irritant, toxic, or infectious substances or hazardous radiation must be provided with appropriate work clothing and personal protective equipment and shall be informed verbally and through written instructions of the risks inherent to their work and the means provided for their protection.

5.6. NOISES AND VIBRATIONS

Noise and vibrations will be prevented and reduced, as far as possible, at their source, attempting to minimize their spread to the workplace.

Machinery and equipment that produce noise, vibrations, or tremors will be anchored using the most effective techniques to achieve optimal static and dynamic balance. These include benches weighing 1.5 to 2.5 times the weight of the machine they support, through isolation from the general structure, or other technical resources.

Machines that produce disturbing noise or vibrations will be adequately insulated. Extreme care and maintenance will be taken for machines and equipment that produce vibrations that are disturbing or dangerous to workers, especially moving parts and devices that transmit the vibrations they generate.

At levels above 80 decibels, and unless the noise level can be reduced by other means, personal protective equipment such as earplugs, helmets, etc., must be used. At levels above 110 decibels, such protection must be intensified to completely avoid painful or severe sensations.

Machines or tools that cause vibrations must be equipped with forks or other shock-absorbing devices, and workers using them must be provided with anti-vibration protective equipment.

Self-driving machines that cause vibrations must be equipped with shock-absorbing seats, and their operators must be provided with appropriate personal protective equipment, such as goggles, gloves, etc.

5.7. LOW TENSION ELECTRIC CURRENTS

Workers shall not approach any low-voltage element at a distance of less than 0.50 m unless they are wearing appropriate protective gear, including safety glasses, a helmet, insulated gloves, and tools specifically protected for working at low voltage. If it is suspected that the element is under high voltage, while the successful contractor determines the voltage to which it is subjected, workers and the tools they use shall be required, with appropriate signage, to remain at a distance of no less than 4 m.

If the work interferes with a low-voltage overhead line that cannot be removed, the corresponding protective porticos shall be installed, keeping the portico lintel at a minimum distance of 0.50 m from the conductors in all directions.

Protection against indirect contact shall be achieved by appropriately combining the Complementary Technical Instructions MI BT. 039, 021, and 044 of the Low Voltage Electrotechnical Regulations.

The grounding of all possible masses will be combined with differential switches, so that, in the possibly humid outdoor environment of the work, no mass will ever receive a voltage equal to or greater than 24 volts.

The ground is obtained using one or more copper-coated steel rods, with a minimum diameter of 14 millimeters and a minimum length of 2 meters. If there are multiple rods, the distance between them will be at least one and a half of their length, and their heads will always be 50 centimeters below the ground. If there are several, they will be connected in parallel. The conductor will be copper with a cross-section of 35 square millimeters. The ground connection will have a resistance of less than 20 ohms.

It will be connected to the ground connections of all low-voltage main panels on the site. All possible grounds must be grounded.

All lighting outputs in the low-voltage main panels on the site will be equipped with a 30 mA residual current device (RCD), and all power outputs in these panels will be equipped with a 300 mA residual current device (RCD).

The ground connection will be remeasured during the driest season of the year.



5.8. HIGH TENSION ELECTRIC CURRENTS

Whenever there are high-voltage elements belonging to the work or interfering with it, the Contractor is required to know the exact voltage; they must contact the electricity distribution company or the entity that owns the live element.

Depending on the voltage, minimum safety distances for work near live installations will be measured between the closest live point and any extreme part of the worker'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 above 250 kV: 4.00 m

If the project interferes with a high-voltage overhead line, protective porticos will be installed, keeping the portico lintel at a minimum distance of 4 m from the conductors in all directions. If this does not allow vehicles and workers to pass below the lintel, the table above will be used.

Work on high-voltage installations must be carried out by specialized personnel, with at least two people available to assist each other. The following precautions must be taken:

- Open all voltage sources with visible isolation, using switches and disconnectors that ensure their untimely closure is impossible.
- Interlock or block, if possible, the disconnecting devices.
- Recognize the absence of voltage.
- Ground and short-circuit all possible voltage sources.
- Post appropriate safety signs delimiting the work area.

Service must only be restored to a high-voltage electrical installation when it is completely certain that no one is working on it.

The operations leading to commissioning must be performed in the following order:

- 1) At the workplace, the grounding and additional protective equipment will be removed, and the work manager, after the final inspection, will notify that the work has been completed.
- 2) At the source of the power supply, once communication has been received that the work has been completed, the signaling material will be removed and the cutting and maneuvering devices will be unlocked.

When, for the needs of the work, it is necessary to install high voltage equipment, such as a high voltage line and power transformer, requiring them to be energized, due care will be taken to comply with the Regulation on Technical Conditions and Safety Guarantees in Power Plants, Substations and Transformation Centers, and especially its Complementary Technical Instructions MIE-RAT 09 and 13.

5.9. ORDER AND CLEARANCE OF THE WORK

Internal circulation routes, transit areas, and workplaces, as well as worker hygiene and well-being 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 transit areas, as well as those of the premises, must always be free of obstacles, protrusions, holes, sharp or cutting elements, slippery substances, and, in general, anything that could pose a risk to the health and safety of workers.

In premises and transit areas likely to generate large amounts of dust, cleaning will be carried out using wet cleaning methods, or alternatively, wet cleaning.

All premises must undergo periodic cleaning, as frequently as necessary.

When work is continuous, extreme precautions will be taken to avoid unpleasant or harmful effects of dust and residues and the hindrances that cleaning itself may cause to work.

Cleaning operations will be carried out with greater care in the vicinity of areas occupied by machinery, equipment, or devices whose use poses a greater risk. The pavement will not be flooded and will be kept free of oil, grease, or other slippery materials.



Workers responsible for cleaning premises, workplaces, or elements of the construction site facilities that pose a health hazard will be provided with appropriate protective equipment.

Equipment, machinery, and facilities must always be kept in a good state of cleanliness by the workers responsible for their operation.

Detergents will preferably be used as cleaning or degreasing fluids. In cases where cleaning or degreasing with gasoline or other petroleum derivatives is essential, smoking is prohibited in the vicinity, and appropriate notices will be given.

5.10. WILDFIRE PREVENTION AND CONTAINMENT

The Contractor shall take all appropriate measures to:

- Avoid fire hazards.
- Extinguish any fire quickly and effectively.
- Ensure the rapid and safe evacuation of personnel in the event of a fire.

Sufficient and appropriate means shall be provided for the storage of potentially flammable materials. Access to premises where potentially flammable materials are stored or stockpiled shall be limited to authorized personnel only.

Smoking shall be prohibited in all areas where potentially flammable or easily combustible materials are present, and signs shall be posted advising of this prohibition.

In all confined spaces and areas of the construction site, particularly tunnels, excavation shafts, and other enclosed structures, where flammable gases, vapors, or dust may pose a hazard, the following must be observed:

- Only use properly protected electrical appliances, machinery, or installations.
- Avoid naked flames or any other similar source of combustion.
- Post signs announcing the prohibition of smoking.
- Promptly remove all rags, waste, and clothing soaked 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 workplaces and must be stored in suitable containers.

Areas where there is a risk of fire must be inspected periodically.

Welding and flame-cutting operations, as well as all other hot work, must be carried out under the supervision of a competent supervisor or foreman, and always by qualified and specialized personnel, after taking all appropriate and required precautions to avoid the risk of fire.

Workplaces, to the extent of their characteristics, must be equipped with:

- Adequate and sufficient fire-extinguishing equipment, clearly visible and easily accessible.
- An adequate supply of sufficient water at the necessary pressure.

The competent health and safety officer must inspect fire-extinguishing equipment at appropriate intervals, which must always be in perfect condition and working order. Access to fire-extinguishing equipment and installations must be kept clear at all times.

All supervisors and foremen, and the necessary number of workers, will be trained in the use of fire-fighting equipment and facilities, so that there is a sufficient number of trained personnel on all shifts to deal with a fire.

Workers must be instructed on the evacuation methods provided in case of fire. All emergency exits, provided for fires, must be properly marked.

The evacuation methods provided must be kept clear at all times, and regular inspections must be carried out, especially in areas with restricted and difficult access, such as the tunnel.

Appropriate means of raising the alarm in case of fire must be installed. This alarm must be clearly audible in all areas where workers are operating.

Notices must be posted in clearly visible locations indicating:

- The location of the nearest alarm device.
- The telephone number and address of the nearest emergency response and rescue services.



5.11. LOAD ELEVATION

The passage of people under suspended loads must be avoided, and whenever possible, the lifting area must be fenced off.

For lifting loose materials, trays with mesh or sheet metal protection on the sides must be used to prevent the load from falling out. Under no circumstances must the loads extend beyond the edges of the trays.

For lifting props, planks, etc., and similar materials, the pieces must be tied down beforehand to prevent them from slipping and, therefore, causing parts of the load to fall.

For lifting pastes (mortar, concrete, etc.), buckets with a discharge gate and support legs must be used. They must not be filled to overflow the rim.

Workers who must lift loads from above must wear safety belts, unless there are safety railings protecting the space. In any case, as a complementary measure, the operator may use extension cords to facilitate the approach of loads, although their length must be limited to prevent falls.

Instructions will be given to ensure that loads are not left suspended above other workers or in areas outside the construction site that could affect people, vehicles, or other structures.

The crane operator will position himself in a position with sufficient visibility, and if this is not possible, he will seek assistance from other personnel who will warn him via pre-established signal systems. Standing under loads suspended by cranes is prohibited.

6. WORK TEAMS

6.1. PREVIOUS CONDITIONS

Any machinery, apparatus, instrument, or installation used in the workplace shall be selected so as not to pose additional risks to the safety and health of workers and/or third parties.

Work equipment and its constituent elements or devices attached to it shall be designed and constructed so that people are not exposed to hazards when their assembly, use, and maintenance are carried out in accordance with the conditions specified by the manufacturer.

The various parts of the equipment, as well as their constituent elements, must be able to withstand the stresses to which they will be subjected over time, as well as any other external or internal influences that may occur under normal operating conditions.

The equipment used shall be based on the specific conditions and characteristics of the work to be performed and the risks existing in the workplace. It shall comply with the applicable standards and regulations in force, depending on its type, use, and subsequent handling by workers. Work equipment may not be used for operations and under conditions for which it is not suitable.

6.2. SIGNALING

Work equipment must carry the essential warnings and signs to ensure worker safety.

Work equipment's operating systems that impact safety must be clearly visible and identifiable and, where appropriate, marked 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 from the emissions of gases, dust, liquids, vapors, or other substances produced by it or used or stored in it.

All work equipment must be suitable to prevent the risk of explosion of the equipment itself or of substances produced by it or used or stored in it.

All work equipment must be suitable to protect exposed workers against the risk of direct and indirect contact with electricity.

To prevent the loss of stability of the work equipment, especially during normal operation, appropriate technical measures must be taken in accordance with the installation and operating conditions specified by the manufacturer.

Any work equipment that poses risks due to emissions of gases, vapors, or liquids or dust emissions must be equipped with appropriate collection and/or extraction devices near the source of those risks.



Equipment capable of emitting ionizing radiation or other radiation that could affect human health must be equipped with effective protection systems.

6.4. INFORMATION AND INSTRUCTIONS

Workers will be provided with information on work equipment, its use, and required maintenance, through graphic brochures and, if necessary, through training courses on these matters; they will also be warned of foreseeable risks and abnormal situations. The graphic or verbal information must be understandable to the workers involved. Workers who operate or maintain equipment with specific risks will receive mandatory and special training on such equipment.

Instructions and appropriate means for transporting the equipment will be provided to ensure the lowest possible risk. For these purposes, for stationary equipment:

- The weight of the equipment or any removable parts weighing more than 500 kg must be indicated.
- The transport position that ensures the stability of the equipment must be indicated, and it must be properly secured.
- Equipment or parts that are difficult to secure must be provided with appropriately strong securing points; in all cases, the method of securing must be indicated, at least in Spanish.
- The necessary instructions must be provided to ensure that the work equipment can be assembled correctly and with the least possible risk.
- The necessary instructions for the normal operation of the work equipment must be provided, indicating the maneuvering spaces and dangerous areas that may affect people as a result of their impact.

6.5. NECESSARY CONDITIONS FOR ITS 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 prevent it.

The equipment shall contain adequate devices or protections to prevent entrapment risks at points of operation, such as fixed guards, body restraints, stop bars, automatic feeding devices, etc.

The company shall adopt the necessary measures to ensure that the work equipment made available to workers is suitable for the work units to be performed and properly adapted for this purpose, so that the safety and health of workers is not compromised when used.

Equipment equipped with rotating elements whose breakage or detachment could cause damage must be equipped with a protective system that retains any fragments, preventing them from impacting people.

When there are parts of the equipment whose loss of support could create hazards, additional precautions must be taken to prevent such parts from impacting people.

Equipment must be designed, constructed, assembled, protected, and, if necessary, maintained to muffle the noise and vibrations produced, so as not to cause harm to human health. In any case, the emission of noise levels exceeding the limits established by current regulations must be avoided.

Any work equipment that poses risks due to falling objects, projections, explosions, or breakage of its components or the material being worked must be equipped with safety devices appropriate to these risks.

When the moving elements of work equipment pose risks of mechanical contact that could lead to accidents, they must be equipped with guards or devices that prevent access to hazardous areas or that stop dangerous maneuvers before access to such areas.

The guards and protective devices:

- They must be of solid construction.
- They must not pose additional risks.
- They must not be easy to remove or render unusable.
- They must be located at a sufficient distance from the hazardous area.
- They must not restrict observation of the work cycle more than necessary.
- They must allow for essential interventions for the installation and/or replacement of components, as well as for maintenance work, limiting access only to the area where the work is to be performed and, if possible, without removing the guard 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 to workers.



All work equipment must be equipped with clearly identifiable devices that allow it to be isolated from each of its energy sources. They may only be reconnected when there is no danger to the workers involved.

The operator operating the equipment must be able to verify, from their workstation, that no one is in the hazardous areas affected by the equipment. If this is not possible, start-up must always be automatically preceded by a safety system, such as an audible and/or visual signal. The signals emitted by these systems must be easily perceptible and understandable, and unambiguously.

The drive systems must be safe. A failure or damage to them must not lead to a dangerous situation. They must not cause additional risks when handled. Likewise, they must not pose risks as a result of unintentional manipulation.

Work equipment can only be started 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 completely shut down under safe conditions. Work equipment stop orders will have priority over start-up orders.

If equipment stops, even momentarily, due to a power failure, and its unexpected restart could pose a danger, it cannot be restarted automatically when the power supply is restored.

If equipment stops due to the activation of a protection system, restarting it again will only be possible after safety conditions have been restored and after the activation of the device that ordered the start-up.

7. TEMPORARY INSTALLATIONS

7.1. GENERALITIES

Installations must be designed to prevent fire or explosion hazards and to ensure that people are adequately protected against the risk of electrocution from direct or indirect contact.

The design and selection of materials and safety devices for temporary installations must take into account the type and power of the distributed energy, the external influences, and the competence of the persons who have access to the various parts of the installation.

7.2. ELECTRICAL INSTALLATIONS

Assembly and installation

The installation must be assembled by specialized personnel under the supervision of a qualified technician.

Once the assembly is complete and before commissioning, the contractor must provide the person responsible for monitoring the Safety Plan with the certification accrediting the above.

Electrical panels

They will be placed in locations where there is no risk of falling materials or objects from work carried out at higher levels, unless specific protection is used to prevent such risks. This protection will extend to both the location of each panel and the access area for people who must approach it.

All panels in the temporary electrical installation will be properly separated from the passage of machinery and vehicles and always within the construction site.

Access to the location of each panel will be free of objects and materials that obstruct access, such as debris, material storage areas, etc.

The base for people who must access the panels for handling will be made of an insulating platform, raised at least 25 cm from the ground to avoid risks arising from possible flooding.

There will be a main switchboard from which branches will be taken for other auxiliary devices, thus facilitating the connection of machines and portable equipment and avoiding long electrical wiring.

Whenever possible, the main switchboard will be located near the construction offices or where the personnel responsible for facility maintenance are located.

Grounding

Machine and equipment structures and their motor covers when operating at more than 24 volts and not double-insulated, as well as the metal covers of all electrical devices inside or on boxes, must be connected to the grounding system.



The grounding resistance will depend on the sensitivity of the residual current circuit breaker at the origin of the installation. The grounding circuits must form an electrically continuous line in which neither masses nor metallic elements, regardless of their nature, may be included in series.

It is prohibited to insert disconnectors, fuses, or switches into grounding circuits.

The minimum requirements for the components of the installation must comply with the requirements of the Low Voltage Electrotechnical Regulations, in its Instruction 039.

The electrodes may be made of copper or galvanized iron and may be used in the form of rods or plates.

In the case of rods:

- The minimum diameter of copper rods will be 14 mm.
- The minimum external diameter of galvanized iron rods will be 25 mm.
- The minimum length, in both cases, will be 2 m.

In the case of plates:

- The minimum thickness of copper rods will be 2 mm.
- The minimum thickness of galvanized iron rods will be 2.5 mm.
- In no case will the useful surface area of the plate be less than 0.5 m².

The use of other materials must comply with the requirements of the aforementioned Regulations and be subject to appropriate calculations performed by a specialized technician. Electrodes that do not meet these minimum requirements will be rejected.

The ground should preferably be moist.

7.3. DRINKING WATER INSTALLATIONS

The construction company will provide its personnel with drinking water by installing running water taps throughout the construction site, in addition to the dining and restroom areas.

All supply points will be marked, and the water supply will be clearly indicated as potable or non-potable.

If potable water is not available, a potable water service will be provided with clean containers, preferably plastic due to their cleanability and to prevent breakage.

If there is any doubt about the water's potability, the relevant tests will be requested from an approved laboratory. Drinking water will be prohibited until confirmation of its suitability for human consumption is made. Until then, the provisions of the previous section will be taken into account.

If there are potable and non-potable water pipes, extreme precautions will be taken to avoid contamination.

Ensure that they are separated from areas where they could interfere with the electrical system.

Likewise, they will be placed in locations where there is no risk of materials or objects falling from work carried out at higher levels.

7.4. HYGIENE AND WELFARE INSTALLATIONS

The changing rooms, dining rooms, restrooms, toilets, sinks, 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 sections 15 to 18 of Part A of Royal Decree 1627/1997. In any case, there will be one toilet for every 25 workers, usable by them and located within 50 meters of the workstations; one sink for every 10 workers; and one locker or suitable place for each worker to leave clothing and personal belongings. Drinking water will also be provided on-site in sufficient quantities and in suitable conditions for workers to use.

A first-aid kit will always be available, located on-site, in adequate condition and contents, easily accessible, signposted, and with emergency telephone numbers. At least one worker will be trained in first aid on-site. All facilities and services on the site will be defined in the Health and Safety Plan. The Site Manager will designate specific personnel for cleaning and maintaining the facilities.

The design of the facilities and services will take into account the following conditions:

- When workers are required to wear work clothes, suitable changing rooms must be available. Changing rooms must be easily accessible, of sufficient size, and have seating and facilities for each worker. When circumstances require, work clothes must be able to be stored separately from street clothes and personal belongings; in this case, a double locker or a single locker attached to a specific wall hook may be used.



- The recommended area for changing rooms can be estimated at 2.00 m² per worker. Generally speaking, this area will include lockers, as well as benches and seats, provided this allows for the use of the facilities without difficulty or inconvenience to workers.
- The minimum height of these rooms will be 2.50 m.
- Lockers must be lockable and have sufficient capacity to store clothing and footwear.
- Appropriate showers must be made available to workers in sufficient numbers. Showers must be of adequate size to allow all workers to wash themselves without obstacles and in hygienic conditions. Showers must have running water, both hot and cold. If showers or toilets and changing rooms are separate, communication between them must be easy.
- Appropriate showers and toilets must be provided on all construction sites, with a minimum number of one shower and one toilet for every 10 workers or fraction thereof working the same shift. The minimum dimensions of the shower trays shall be 70 x 70 cm.
- Workers must have special facilities equipped with a sufficient number of toilets and toilets near their workstations, rest areas, changing rooms, and showers. The minimum number shall be:
 - o One toilet for every 25 men and one for every 15 women.
 - o One toilet for every toilet.
 - o One urinal for every 25 men.
- All the units mentioned refer to people who work the same shift.
- In linear extension projects, toilets will also be installed in larger work sites or those with a high concentration of workers. These toilets may be biochemical, and it is recommended that they be connected to the general sewage system whenever possible, or that they be used for collecting and subsequently collecting sewage, with the specific precautions for this type of facility.
- Changing rooms, showers, sinks, and toilets will be separate for men and women; their separate use must be provided. In restrooms designated for women, special, sealed containers will be placed for the disposal of sanitary napkins or similar items.
- The facilities will have the corresponding electrical installation, grounding, and other factors established in the specific regulations, both for electricity and sanitation.

The cost of installing and maintaining worker hygiene and well-being services will be borne by the contractor, regardless of whether they are included in the project budget or not. If so, they will be compensated by the Administration in accordance with these budgets, provided they are actually carried out.

8. SIGNALS

There are two types of construction signage: signage affecting workers on site and signage for external traffic affected by the construction.

In the former case, the provisions established by Royal Decree 485/1997, of April 14, apply.

Traffic signage and markings, for their part, are regulated by Standard 8.3-IC of the General Directorate of Roads, as appropriate to its content and technical application. This distinction does not exclude the possible addition of traffic signage during construction when required for the safety of workers working in the vicinity of such traffic, to prevent accidental intrusion of traffic into the work areas. Such additions, when deemed necessary, must be included in the construction site's health and safety plan.

9. PERSONAL PROTECTIONS

9.1. GENERAL PRESCRIPTIONS

All personal protective equipment must comply with the standards contained in Royal Decrees 542/2020 and 773/1997. Additionally, unless modified by the above, the Technical Regulatory Standards M.T. (Spanish acronym for "Technical Standards") for the approval of equipment will be considered applicable, in application of the Order of May 17, 1974, which regulates the approval of workers' personal protective equipment.

As a general rule, ergonomic personal protective equipment has been selected to avoid refusals to use it. All personal protective equipment used on site will have the "CE" mark, in accordance with PPE standards.

Personal protective equipment that complies with the instructions stated in the previous point is authorized for use during its validity period. Upon reaching its expiration date, it will be stored in an organized collection, which will be reviewed by the health and safety coordinator during the execution of the work to authorize its disposal. Any damaged personal protective equipment in use will be replaced immediately, with a written record kept at the construction site 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 ensure the use of this protection is as serious as possible.



The standards for the use of personal protective equipment will comply with the provisions of current regulations.

In cases where there is no official Approval Standard, they must be of adequate quality for the respective performance required, for which a report on the tests performed will be requested from the manufacturer.

When work-related circumstances cause a specific garment or piece of equipment to deteriorate more rapidly, it will be replaced, regardless of the expected duration or delivery date.

Any garment or piece of protective equipment that has been subjected to extreme treatment (the maximum for which it was designed) will be discarded and replaced immediately.

Garments that, due to use, have acquired more slack or tolerances than those allowed by the manufacturer will be replaced immediately.

All garments or personal protective equipment, and all elements of collective protection, will be appropriately designed and sufficiently finished so that their use never poses a risk or harm in itself.

9.2. WORK UNIFORMS

They will be manufactured in various cuts and constructed in a single piece, with a double-zipper front closure, with a short section from the pelvis to the waist. They will have six pockets: two at chest level, two at the front, and two at the back of the trousers, each closed by a zipper. They will be fitted with an elastic lumbar band for adjustment on the back at waist level. They will be made of cotton and come in yellow or orange. They will have the CE mark, in accordance with PPE standards.

The work coveralls or overalls will comply with the following standards: UNE 863/96, UNE 1149/96.

9.3. PVC RAINSUIT

It will be manufactured in yellow or orange from heat-sealed PVC, consisting of a jacket and trousers. The jacket will have two front side pockets and a single-button closure. The trousers will be secured and adjusted at the waist with a cotton waistband embedded in the waistband.

CE marked, in accordance with PPE standards.

9.4. REFLECTIVE VEST

Consisting of a bib and back, it will be made of breathable, reflective, or capadioptic synthetic fabrics, in white, yellow, or orange. Adjustable at the waist with Velcro straps.

Reflective vests must comply with the following standards: UNE.EN 471/95, UNE.EN 966/95.

9.5. SECURITY HELMET

The helmets used by 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, insulating for high voltage (25,000 V), and Class E-B, resistant to very low temperatures (-15°C).

The helmet will be secured to the head by a harness or harness, which will ensure a correct and ergonomic fit. The adjustable chin strap will be secured at two or more points.

The headband, the distance between the inside of the crown (highest part of the helmet) and the top of the harness, will always be greater than 21 millimeters.

The height of the harness, measured from the lower edge of the contour band to the highest part of the helmet, will vary from 75 millimeters to 85 millimeters, from the smallest to the largest possible size.

The mass of the complete helmet, determined under normal conditions and excluding accessories, shall in no case exceed 450 grams. The width of the perimeter band shall be at least 25 millimeters.

Helmets shall be made of non-combustible materials resistant to grease, salts, and atmospheric elements.

The parts that come into contact with the user's head must not affect the skin and must be made of rigid, water-repellent material that is easy to clean and disinfect.

The helmet must have a smooth surface, with or without ribs, rounded edges, and be free of dangerous sharp edges and protrusions, both externally and internally. It must not have roughness, cracks, bubbles, or defects that diminish its resistant and protective characteristics.



Neither the joining areas nor the harness itself must cause damage or exert uncomfortable pressure on the user's head.

There must be a ventilation space of at least five millimeters between the helmet and harness, except in the area where the harness and helmet are connected.

The standard model must have undergone the following tests:

- Shock test, using a steel striker, with no part of the harness or helmet showing any breakage.
- Puncture test, using a steel punch, with a penetration depth of no more than 8 millimeters.
- Flame resistance test, with no flaming 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 puncture test, raising the voltage to 2.5 kV for fifteen seconds, the leakage current may not exceed 3 mA. In the case of the class E-AT helmet, the insulation and puncture 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 class E-B helmet, the standard model will undergo impact and perforation tests, with good results, having been conditioned to $-15^{\circ} \pm 2^{\circ} \text{ C}$.

All helmets used by workers will be approved according to the specifications and tests contained in the Regulatory Technical Standard MT-1, Resolution of the General Directorate of Labor of December 14, 1974.

Safety helmets will comply with the following standards: UNE-EN 397/95, UNE-EN 966/95.

9.6. SECURITY FOOTWEAR

Safety footwear shall consist of Class III safety boots, equipped with a metal safety toe cap to protect the toes from falling objects, impacts, and crushing, and a safety sole to protect the soles of the feet from punctures.

The boot must adequately cover the foot and be securely fastened, allowing for movement appropriate for the job. It must be free of imperfections and treated to prevent damage from water or moisture. The lining and other internal parts must not produce harmful effects, allowing breathability as much as possible. It must not weigh more than 800 grams. It must have shock-absorbing reinforcements made of elastic material. Both the toe cap and the safety sole must be an integral part of the boot and cannot be separated without destroying it. The material must be suitable for the intended use, free of burrs and sharp edges, and assembled in such a way

that it does not pose a risk or cause harm to the user. All metallic elements that serve a protective function must be corrosion-resistant.

The standard model must undergo the following tests:

- Crush resistance test on the toe cap up to 1,500 kg (14,715 N), with a free span greater than 15 millimeters during the test, with no breakage.
- Impact test, maintaining a minimum free span and no breakage observed.
- Puncture test, using a punch with a minimum puncture force of 110 kg (1079 N) on the sole, with no noticeable perforation.
- Bending test using a flexometer, allowing the angle formed by the sole and heel to vary from 0° to 60° , 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 throughout the test period, and showing no signs of corrosion.

All Class III safety boots used by workers must be approved according to the specifications and tests contained in the Regulatory Technical Standard MT-5, Resolution of the General Directorate of Labor of January 31, 1980.

Safety boots must 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. RAIN-RESISTANT FOOTWEAR

The waterproof and moisture-resistant boots worn by workers will be class N, although class E may also be used.

Waterproof boots must adequately cover the foot and at least the lower third of the leg, allowing the wearer to move freely while walking in most jobs. They must be made of natural or synthetic rubber or other non-rigid synthetic products, and must not affect the wearer's skin.

They must be free of imperfections or deformations that impair their properties, as well as holes, foreign bodies, or other defects that could impair their functionality.

The sole and heel materials must have gripping properties that prevent slipping, both on dry and wet surfaces.



The boot material must have properties that prevent the passage of ambient moisture into the interior.

Waterproof boots must be manufactured, if possible, in a single piece, and may adopt a closure system designed to ensure the boot remains watertight.

They may be made with or without support, unlined, or lined internally with one or more layers of non-absorbent fabric that does not produce harmful effects on the wearer.

The surface of the sole and heel, where it comes into contact with the ground, must be provided with raised ridges and grooves, open at the ends to facilitate the removal of adhering material.

Waterproof boots must be flexible enough to cause no discomfort to the wearer and must be designed to be easy to put on.

When the closure system or any other accessory is metallic, it must be corrosion-resistant.

The thickness of the barrel must be as uniform as possible, avoiding irregularities that could affect its quality, functionality, and performance.

The standard model must pass the following tests:

- Hot aging.
- Cold aging.
- Humidity.
- Impermeability.
- Punching.

All waterproof boots must be approved in accordance with the specifications and tests of Regulatory Technical Standard M-27, Resolution of the General Directorate of Labor of 3-12-1981.

9.8. HEARING PROTECTOR

The hearing protector used by operators must be at least Class E.

The protector must consist of two caps that fit snugly on each side of the head using padded elements, with the outer ear flaps inside the ear cups, and the harness fastening system.

The standard model must have been tested by a person with a hearing loss of no more than 10 dB relative to a normal audiogram in each ear and for each of the test frequencies, known as the "listening" test.

The reference threshold must be defined as the minimum sound pressure level capable of producing an auditory sensation in the listener located at the test location without a hearing protector. The test threshold must be the minimum sound pressure level capable of producing an auditory sensation in the listener at the test location with the standard hearing protector in place and subjected to testing. The attenuation must be the difference, expressed in decibels, between the test threshold and the reference threshold.

Pure tones of the following frequencies will be used as test signals to perform the threshold attenuation measurement: 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz.

For low frequencies of 250 Hz, the minimum sum of attenuation will be 10 dB. For medium frequencies of 500 to 4000 Hz, the minimum sum of attenuation will be 20 dB, and the minimum sum of attenuation will be 95 dB. For high frequencies of 6000 and 8000 Hz, the minimum sum of attenuation will be 35 dB.

All hearing protectors used by operators must be approved by the tests contained in the Regulatory Technical Standard MT-2, Resolution of the General Directorate of Labor of June 28, 1975.

Hearing protectors must comply with the following standards: UNE.EN 352-1/94, UNE.EN 352-2/94, UNE.EN 352-3/94.

9.9. SECURITY GLOVES

Safety gloves shall be general-purpose, cut-resistant, puncture-resistant, and abrasion-resistant for handling materials, objects, and tools.

They shall be made of natural or synthetic, non-rigid materials, impervious to commonly used aggressive materials, and have adequate mechanical characteristics. They shall be free of holes, cracks, or any deformation or imperfection that would impair their properties.

They shall adapt to the shape of the hands, making them comfortable to wear. They shall not be ambidextrous under any circumstances.



The size, measured from the perimeter of the glove at the base of the fingers, will be appropriate for the operator.

The length, expressed in millimeters, from the tip of the middle or middle finger to the edge of the glove, i.e., the sleeve end, will generally be 320 millimeters or less. In other words, gloves will generally be short, except in cases where special tasks require the use of medium-length gloves, ranging from 320 to 430 millimeters, or longer than 430 millimeters.

The materials used in their composition and construction will never cause dermatosis.

Gloves made of full-grain leather and canvas will comply with the UNE.EN 388/95 standard.

Gloves made of waterproof cotton canvas will comply with the UNE.EN 388/95 standard.

9.10. ELECTRICAL INSULATING GLOVES

The electrical insulating gloves used by operators will be for work on low-voltage installations, up to 1,000 V, or for work on high-voltage installations up to 30,000 V.

The gloves may be manufactured using high-quality natural or synthetic rubber, or any other material with similar insulating and mechanical characteristics, and may or may not have an inner lining of natural textile fibers. In the case of gloves that have such a lining, it must cover the entire inner surface of the glove.

They must be free of seams, cracks, or any deformation or imperfection that would impair their properties.

Dyes and other additives may be used in the manufacturing process, provided they do not diminish their characteristics or cause dermatitis.

They must adapt to the shape of the hands, making them comfortable to wear. Under no circumstances must they be ambidextrous.

Low-voltage insulating gloves must be standard gloves, with a length from the tip of the middle or middle finger to the edge of the glove of less than or equal to 430 millimeters. The high-voltage insulators will be long, exceeding 430 millimeters in length. The thickness will vary depending on the glove's specific points, but the maximum will be 2.6 millimeters.

In the standard model, the tensile strength shall not be less than 110 kg/cm², the elongation at break shall not be less than 600 percent, and the permanent deformation shall not exceed 18 percent.

They shall be subjected to aging testing, after which they shall retain at least 80 percent of their mechanical characteristics and retain the indicated electrical properties.

Low-voltage gloves will have a leakage current of 8 mA at a voltage of 5,000 V and a break-through voltage of 6,500 V, all measured with a 50 Hz frequency source. High-voltage gloves will have a leakage current of 20 mA at a test voltage of 30,000 V and a break-through voltage of 35,000 V.

All electrically insulating gloves used by operators must be approved according to the specifications and tests of the Regulatory Technical Standard MT-4, Resolution of the General Directorate of Labor of July 28, 1975.

9.11. SECURITY GOGGLES

Safety glasses shall have a universal impact-resistant frame, at least class A, with class D being desirable.

The glasses shall be lightweight and well-finished, free of burrs or sharp or pointed edges. They shall be easy to clean and shall tolerate periodic disinfection without compromising their performance. There shall be no gaps in the fit of the eyepieces to the frame. They shall have sufficient ventilation to prevent fogging of the eyepieces under normal use conditions.

All metallic parts or elements, in the standard model, shall be subjected to a corrosion test, and no noticeable corrosion shall be observed. The non-metallic materials they contain shall not ignite when subjected to a 500°C temperature test.

The eyepieces shall be firmly attached to the frame and shall not be detached as a result of being impacted by a 44-gram steel ball from a height of 130 cm, repeated three consecutive times.

They must be made of any ophthalmic material, provided it can withstand the corresponding tests. They must have a good finish and be free of surface or structural defects that could impair the user's normal vision. Their transmission, measured with a spectrophotometer, must be greater than 89%.

If the standard model passes the impact test with a 44-gram steel ball from a height of 130 cm, repeated three times, it will be Class A. If it passes the impact test with a punch, it will be Class B. If it passes the impact test



with a 4.5-millimeter diameter lead shot, it will be Class C. If it passes all of the aforementioned tests, it will be classified as Class D.

All safety glasses must be approved according to the specifications and tests contained in Regulatory Technical Standard MT-16, Resolution of the General Directorate of Labor of June 14, 1978.

The tests on safety glasses against projections and impacts must comply with the following standards: UNE.EN 167/96, UNE.EN 168/96.

9.12. DUST-PROTECTING MASK

They must be approved in all cases.

The materials used to make up the mask body may be metallic, elastomeric, or plastic. They must not cause skin irritation, and their odor must not cause discomfort to the worker. They must be non-combustible or slow-burning. The harness straps must be elastomeric and have the characteristics mentioned above.

The masks may come in various sizes and must always be dimensioned to perfectly cover the airway openings.

The filter connection piece must not leak when coupled.

Regarding the inhalation valve, its leakage rate may not exceed 2,400 ml/min upon exhalation, and its pressure drop upon inhalation may not exceed 25 millimeters of water column.

For exhalation valves, the inhalation leakage rate may not exceed 40 ml/min, and the exhalation pressure loss may not exceed 25 millimeters of water column.

The mask body must provide a close fit to the user's face, and its connections to the various components must seal tightly.

All dust masks used by workers must be approved according to the specifications and tests contained in the Regulatory Technical Standard MT-7, Resolution of the General Directorate of Labor of July 28, 1975.

9.13. OVEREXERTION BELT

It will be manufactured in various sizes and made of lightweight, synthetic elastic material. It can be adjusted using Velcro fasteners. It is CE marked, complying with PPE standards.

It will be used for all loading, unloading, and shoulder carrying of heavy objects, as well as for all other tasks subject to the risk of overexertion, according to the risk analysis contained in the report for this study.

10. COLECTIVE PROTECTIONS

10.1. GENERAL PRESCRIPTIONS

The requirements established below are complemented by those set forth in relation to collective protection in the Report for this Study.

The cost of acquiring, constructing, assembling, storing, and maintaining the collective protection equipment used on the project will be borne by the corresponding contractor or subcontractors. These costs will be considered, in the budget, as indirect costs for each work unit in which they must be used, as corresponds to minimum auxiliary production elements, required by regulations and independent of the administrative labor classification of the project and, consequently, independent of its specific budgeting. Collective protection equipment is considered, without prejudice to any specific applicable regulations, to be the minimum required use on the project for the different production units.

Notwithstanding the foregoing, if the budget for this health and safety study includes the collective protection systems and signage that must be provided for application in all activities and movements on the project or in a set of work sections, without strict application to a specific work unit. Consequently, these costs will be reimbursed by the Administration according to this budget, provided that they are actually allocated to the project.

They will be installed prior to the start of any work requiring their assembly. Thus, the start of any work or activity requiring collective protection is prohibited until it is fully installed within the scope of the risk it neutralizes or eliminates.



The Construction Execution Plan will specify the dates for installation, maintenance, relocation, and removal of each of the collective protections referred to in this Study.

Collective protections in use that show signs of deterioration, effectively reducing their actual quality, will be immediately dismantled. 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, work protected by the damaged section will be suspended, and the area will be effectively isolated to prevent accidents. These operations will be protected through the use of personal protective equipment. In any case, these situations are assessed as an intolerable risk.

During the execution of the works, it may be necessary to change the method or arrangement of the collective protection installation provided for in the approved Health and Safety Plan. If this involves modifying the content of the Health and Safety Plans to specify the exact new arrangement or assembly method, these must be approved by the Health and Safety Coordinator.

The Contractor, pursuant to current legislation, will be responsible for the assembly, maintenance, and removal of the collective protection, either by its own means or through subcontracting. In the event of failure of the protections, it will be obliged to keep them in their intended and installed position until the necessary investigation is carried out, and the Health and Safety Coordinator will be informed.

The correct assembly and use of the collective protection defined in this Study is preferable to the use of personal protective equipment to protect against the same risk. Therefore, changing the use of collective protection to personal protective equipment will not be permitted.

10.2. PROTECTION AND DELIMITATION FENCES

The freestanding protective and space-delimiting fences 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. Their paintwork will be in good condition and will not show any signs of rust or bent or broken elements.

10.3. RAILINGS AND WALKWAYS

Handrails on walkways and work platforms must have sufficient strength, both in themselves and through their fixing and anchoring system, to ensure worker retention, even in situations of impact due to displacement or violent collapse.

The overall reference strength of the handrails must be equal to or greater than 150 kg/m.

All walkways and work platforms must have a minimum width of 60 cm and, when located more than 2.00 meters from the ground, must be provided with handrails at least 90 cm high, with an intermediate bar and toeboard of at least 15 cm.

10.4. HAND LADDERS

Ladders must always have non-slip pads and be sufficiently stable. Ladders must never be used joined together on construction sites, nor placed on uneven or unstable surfaces, such as boards, bricks, or other loose materials.

10.5. PROTECTION AGAINST ELECTRICITY

The resistance of the grounding connections shall not exceed that guaranteed by a maximum voltage of 24 V, in accordance with the sensitivity of the residual current device (RCD), which shall be at least 30 mA for lighting and 300 mA for power.

It shall be periodically verified that the disconnection occurs when the RCD test button is pressed. It is absolutely mandatory to have it inspected by specialized personnel or replaced if it does not disconnect.

Every general electrical panel, fully insulated in its active parts, shall be equipped with an all-pole main switch capable of removing the entire area of the construction site from service. Distribution panels must have all metal parts grounded.

All electrical components, such as fuses, circuit breakers, and switches, shall be enclosed, capable of preventing accidental electrical contact with persons or objects. The connection terminals shall be equipped with appropriate protectors.



Switches, one per socket, shall be provided in the main electrical panel to allow the power to be cut off in the sockets to which machinery of 10 or more amperes will be connected, so that the machine can be plugged in and unplugged in the absence of power. The socket-outlet support panels in the auxiliary electrical panels shall be securely fixed to rigid elements to prevent accidental disconnection of the power conductors, as well as contact with metallic elements that could cause electric shocks to persons or objects.

Portable electric lamps shall have an insulated handle and a lamp protection device, and shall be powered by a 24-volt supply or, failing that, shall be powered by a circuit-separating transformer.

All electrical machines shall be grounded, with a maximum allowable resistance of the electrodes or plates of 5 to 10 ohms, and shall have cables with double waterproof insulation and a sufficiently resistant sheath. The hoses connecting to the ground sockets will have an additional wire for connection to the ground pole of the plug.

10.6. FIRE EXTINGUISHERS

Construction fire extinguishers will be multipurpose powder extinguishers and comply with UNE Standard 23010. They will be placed in areas with the highest risk of fire, at a height of 1.5 meters above the ground. They will be properly marked.

11. SECURITY LABOUR

This section includes the following units:

- Health and Safety Committee. Composed of a safety technician with the rank of supervisor, two workers with the rank of 2nd-class officer, an assistant, and a security guard with the rank of 1st-class officer, with a minimum of one meeting per month. Paid by the hour.
- Occupational health and safety training. One hour per week and conducted on request. Paid by the hour.
- Mandatory medical examination. This applies to all workers at the start of construction. Paid by the unit, with the units corresponding to the number of workers.
- Cleaning and maintenance equipment. One hour per day for temporary construction facilities. Paid by the hour.

- Hiring a first aid company. This aims to assist workers in the event of an accident and includes ambulance transport to the appropriate medical center. Paid by the month.

12. PROTOCOL IN CASE OF AN ACCIDENT

The Contractor must inform the Health and Safety Coordinator, in due time, of the incorporation of any contractor, subcontractor, or self-employed worker on the site.

They must immediately notify the Health and Safety Coordinator or, where appropriate, the Construction Manager, of all accidents and incidents occurring on the site, regardless of their severity, as well as any accidents that occur on the job site (without sick leave). After the initial notification, they must submit a full report on the matter, also providing any information generated, where applicable, by the intervention of the Labor and Social Security Inspectorate, the Health and Safety Office, and other institutions. The aforementioned documentation must also be provided when the aforementioned agencies intervene for any other preventive reason, regardless of the cause.

The Contractor must include the following emergency relief principles in its Health and Safety Plan:

- The injured worker will have absolute priority. They will receive immediate care to prevent the injuries from worsening or progressing.
- In the event of a fall from a height or an electrical accident, taking into account the potential for serious injuries, primary care precautions will be taken on-site, applying special techniques for immobilizing the injured person until the ambulance arrives, and resuscitation in the case of an electrical accident.
- In cases of manifest severity, the injured person will be evacuated by stretcher and ambulance. The use of private transportation will be avoided, as far as possible, in the best judgment of the people initially attending to the injured person, due to the risks and discomfort they pose to the injured person.
- The Contractor will reflect in the Health and Safety Plan the health infrastructure, whether owned, jointly managed, or contracted, that it has in place to ensure the care and evacuation of injured persons.



- The Contractor shall indicate in the Health and Safety Plan the name and address of the nearest healthcare center, provided for the provision of healthcare to injured parties, depending on its organization.

The Contractor is obligated to install a series of signs, visible from a distance of 2 m, providing workers and other personnel involved with the necessary information to identify the healthcare center, its address, contact telephone number, etc. Signs will be installed at the site entrance, in the construction office, in the cafeteria, in the changing rooms, in the staff restrooms, and inside each first aid kit. This obligation is considered a fundamental condition for effective healthcare in the event of a work-related accident.

The Contractor must also include a recommended evacuation route for potential accident victims in their Health and Safety Plan, in order to avoid errors in critical situations that could aggravate the injured party's injuries.

12.1. FIRST AID KIT

First aid kits will be available at the worksite and in designated locations containing the following items:

- Hydrogen peroxide.
- 96-proof alcohol.
- Iodine tincture.
- Mercurochrome or crystalmine.
- Ammonia.
- Sterile gauze.
- Sterile absorbent cotton.
- Anti-allergy adhesive tape.
- Anti-hemorrhagic tourniquets.
- Water or ice pack.
- Sterile gloves.
- Clinical thermometer.
- Self-adhesive bandages.
- Antispasmodics.
- Analgesics.
- Emergency cardiac tonics.

- Disposable syringes.

13. RISK MANAGEMENT, HEALTH AND SAFETY PLAN

The Contractor of the works is required to draft, before the start of the works, a Health and Safety Plan (HSP) that develops and complements the provisions contained in this Study, adapted to its means and methods of execution, as prescribed in Article 7 of Royal Decree 1627/1997 of October 24.

This Plan will be submitted for approval to the public administration that awarded the contract, with the corresponding report from the Health and Safety Coordinator, who will oversee its practical implementation.

A copy of this Plan will be permanently available to the Project Management, and another copy will be provided to the workers' representatives.

Santander, September 2025

Signed by: Santos Diego Cruz.



BUDGET



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1. MEDICIONES

CÓDIGO	RESUMEN	UDS	LONGITUD	ANCHURA	ALTURA	CANTIDAD
001	INS. PROVISIONALES DE OBRA					
001.1	ALQUILER CASSETAS PREFE. OBRA					
D41AA210	Ud ALQUILER CASSETA PREFE.OFICINA Ud. Més de alquiler de caseta prefabricada para oficina de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.					18,00
D41AA310	Ud ALQUILER CASSETA PREFE.COMEDOR Ud. Més de alquiler de caseta prefabricada para comedor de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.					18,00
D41AA320	Ud ALQUILER CASSETA P.VESTUARIOS. Ud. Més de alquiler de caseta prefabricada para vestuarios de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.					32,00
D41AA420	Ud A.A/2INOD,2DUCHA,LAV.3G,TERMO Ud. Més de alquiler de caseta prefabricada para aseos de obra de 4.10x1.90 m. con dos inodoros, dos duchas, un lavabo con tres grifos y termo eléctrico de 50 litros de capacidad; con las mismas características que las oficinas. Suelo de contrachapado hidrófugo con capa fenólica antideslizante y resistente al desgaste. Piezas sanitarias de fibra de vidrio acabadas en Gel-Coat blanco y pintura					32,00

D41AA601	antideslizante. Puertas interiores de madera en los compartimentos. Instalación de fontanería con tuberías de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático. Ud ALQUILER CASSETA PREFE.ALMACEN Ud. Més de alquiler de caseta prefabricada para almacén de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	18,00
D41AA820	Ud TRANSPORTE CASSETA PREFABRICAD Ud. Transporte de caseta prefabricada a obra, incluso descarga y posterior recogida.	8,00
001.2	ACOMETIDAS PROVISIONALES	
D41AE001	Ud ACOMET.PROV.ELECT.A CASSETA. Ud. Acometida provisional de electricidad a casetas de obra.	4,00
D41AE101	Ud ACOMET.PROV.FONTAN.A CASSETA. Ud. Acometida provisional de fontanería a casetas de obra.	4,00
D41AE201	Ud ACOMET.PROV.SANEAMT.A CASSETA. Ud. Acometida provisional de saneamiento a casetas de obra.	4,00
001.3	MOBILIARIO Y EQUIPAMIENTO	
D41AG201	Ud TAQUILLA METALICA INDIVIDUAL. Ud. Taquilla metálica individual con llave de 1.78 m. de altura colocada. (10 usos)	14,00
D41AG210	Ud BANCO POLIPROPILENO 5 PERS. Ud. Banco de polipropileno para 5 personas con soportes metálicos, colocado. (10 usos)	4,00
D41AG401	Ud JABONERA INDUSTRIAL. Ud. Jabonera de uso industrial con dosificador de jabón, en acero inoxidable, colocada. (10 usos)	5,00
D41AG410	Ud PORTARROLLOS INDUS.C/CERRADUR Ud. Portarrollos de uso industrial con cerradura, en acero inoxidable, colocado. (10 usos)	4,00
D41AG610	Ud CALIENTA COMIDAS 25 SERVICIOS Ud. Calienta comidas para 25 servicios, colocado. (20 usos)	2,00
D41AG630	Ud MESA MELAMINA 10 PERSONAS. Ud. Mesa metálica para comedor con una capacidad de 10 personas, y tablero superior de melamina colocada. (10 usos)	2,00
D41AG700	Ud DEPOSITO DE BASURAS DE 800 L. Ud. Deposito de basuras de 800 litros de capacidad realizado en polietileno inyectado, acero y bandas de caucho, con ruedas para su transporte, colocado. (10 usos)	1,00
D41AG801	Ud BOTIQUIN DE OBRA. Ud. Botiquín de obra instalado.	2,00
D41AG820	Ud CAMILLA PORTATIL EVACUACIONES	1,00



Ud. Camilla portátil para evacuaciones, colocada. (20 usos)		
002	SEÑALIZACIONES	
002.1	SEÑALES	
D41CA010	Ud SEÑAL STOP I/SOPORTE. Ud. Señal de stop tipo octogonal de D=600 mm. normalizada, con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura incluso parte proporcional de apertura de pozo, hormigonado, colocación y desmontado. (3 usos)	7,00
D41CA040	Ud CARTEL INDICAT.RIESGO I/SOPOR Ud. Cartel indicativo de riesgo de 0,30x0,30 m. con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura, incluso apertura de pozo, hormigonado, colocación y desmontado.	7,00
D41CA240	Ud CARTEL INDICAT.RIESGO SIN SO. Ud. Cartel indicativo de riesgo de 0,30x0,30 m., sin soporte metálico, incluso colocación y desmontado	2,00
002.2	ACOTAMIENTOS	
D41CC020	Ud VALLA DE OBRA CON TRIPODE. Ud. Valla de obra de 800x200 mm. de una banda con trípode, terminación en pintura normal dos colores rojo y blanco, incluso colocación y desmontado. (20 usos)	20,00
D41CC210	MI VALLA COLGANTE SEÑALIZACION. MI. Valla colgante de señalización realizada con material plástico pintado en rojo y blanco, incluso cordón de sujección, soporte metálico, colocación y desmontado.	40,00
D41CC230	MI CINTA DE BALIZAMIENTO R/B. MI. Cinta corrida de balizamiento plástica pintada a dos colores roja y blanca, incluso colocación y desmontado.	800,00
003	PROTECCIONES PERSONALES	
003.1	PROTECCIONES PARA CABEZA	
D41EA001	Ud CASCO DE SEGURIDAD. Ud. Casco de seguridad con desudador, homologado CE.	18,00
D41EA201	Ud PANT.SEGURID. PARA SOLDADURA. Ud. Pantalla de seguridad para soldadura, homologada CE.	4,00
D41EA210	Ud PANTALLA CONTRA PARTICULAS. Ud. Pantalla para protección contra partículas con arnes de cabeza y visor de policarbonato claro rígido, homologada CE.	10,00
D41EA220	Ud GAFAS CONTRA IMPACTOS. Ud. Gafas contra impactos antirayadura, homologadas CE.	18,00
D41EA230	Ud GAFAS ANTIPOLVO. Ud. Gafas antipolvo tipo visitante incolora, homologadas CE.	18,00
D41EA401	Ud MASCARILLA ANTIPOLVO. Ud. Mascarilla antipolvo, homologada.	18,00
D41EA410	Ud FILTRO RECAMBIO MASCARILLA. Ud. Filtro recambio mascarilla, homologado.	36,00
D41EA601	Ud PROTECTORES AUDITIVOS. Ud. Protectores auditivos, homologados.	18,00
003.2	PROTECCION TOTAL DEL CUERPO	

D41EC001	Ud MONO DE TRABAJO. Ud. Mono de trabajo, homologado CE.	16,00
D41EC010	Ud IMPERMEABLE. Ud. Impermeable de trabajo, homologado CE.	16,00
D41EC030	Ud MANDIL SOLDADOR SERRAJE Ud. Mandil de serraje para soldador grado A, 60x90 cm. homologado CE.	4,00
D41EC050	Ud PETO REFLECTANTE BUT./AMAR. Ud. Peto reflectante color butano o amarillo, homologada CE.	16,00
D41EC401	Ud CINTURON SEGURIDAD CLASE A. Ud. Cinturón de seguridad clase A (sujeción), con cuerda regulable de 1,8 m. con guarda cabos y 2 mosquetones, homologada CE.	7,00
D41EC500	Ud CINTURON ANTILUMBAGO Ud. Cinturón antilumbago cieere hebilla, homologado CE.	14,00
D41EC510	Ud FAJA ELASTICA SOBRESFUERZOS. Ud. Faja elástica para protección de sobreesfuerzos con hombreras y cierre velcro, homologada CE.	14,00
D41EC550	Ud CUERDA AMARRE REGUL. POLIAM. UD. Cuerda de amarre regulable de longitud 1,10-1,80 mts, realizado en poliamida de alta tenacidad de 14 mm de diámetro, i/ argolla de polimida revestida de PVC, homologado CE.	7,00
D41EC520	Ud CINTURON PORTAHERRAMIENTAS. Ud. Cinturón portaherramientas, homologado.	14,00

003.3 PROTECCIONES PARA MANOS Y BRAZOS

D41EE001	Ud PAR GUANTES LATEX INDUSTRIAL Ud. Par de guantes de latex industrial naranja, homologado CE.	16,00
D41EE010	Ud PAR GUANTES NEOPRENO 100% Ud. Par de neopreno 100%, homologado CE.	14,00
D41EE020	Ud PAR GUANTES SOLDADOR 34 CM Ud. Par de guantes para soldador serraje forrado ignífugo, largo 34 cm., homologado CE.	6,00
D41EE030	Ud PAR GUANTES AISLANTES. Ud. Par de guantes aislantes para electricista, homologados.	6,00

003.4 PROTECCIONES PARA PIES Y PIERNAS

D41EG005	Ud PAR BOTA AGUA INGENIERO Ud. Par de botas de agua ingeniero, forrada, con cremallera, marrón, homologadas CE.	16,00
D41EG010	Ud PAR BOTAS SEGUR.PUNT.SERR. Ud. Par de botas de seguridad S2 serraje/lona con puntera y metálicas, homologadas CE.	16,00
D41EG030	Ud PAR BOTAS AISLANTES. Ud. Par de botas aislantes para electricista, homologadas CE.	6,00
D41EG401	Ud PAR POLAINAS SOLDADOR Ud. Par de polainas para soldador serraje grad A, homologadas CE.	16,00



004	PROTECCIONES COLECTIVAS	
004.1	PROTECCIONES HORIZONTALES	
D41GA001	M2 RED HORIZONTAL PROTEC.HUECOS. M2. Red horizontal para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.	40,00
D41GA201	M2 MALLAZO PROTECCION HUECOS. M2. Mallazo electrosoldado 15x15 cm. D=4 mm. para protección de huecos, incluso colocación y desmontado.	40,00
004.2	PROTECCIONES VERTICALES	
D41GC210	MI BARANDILLA PUNTALES Y TABLON. MI. Barandilla con soporte de puntales telescópicos y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.	150,00
D41GC450	MI ENREJADO MET.PREF. MI. Enrejado metálico tipo panel móvil de 3x2ml. formado por soportes de tubo y cuadrícula de 15x15cm varilla D=3mm con protección de intemperie Aluzín, y pie de hormigón prefabricado para doble soporte.	250,00
005	MANO DE OBRA DE SEGURIDAD	
D41IA001	H. COMITE DE SEGURIDAD E HIGIENE H. Comité de seguridad compuesto por un técnico en materia de seguridad con categoria de encargado, dos trabajadores con categoria de oficial de 2ª, un ayudante y un vigilante de seguridad con categoria de oficial de 1ª, considerando una reunión como mínimo al mes.	24,00
D41IA020	H. FORMACION SEGURIDAD E HIGIENE H. Formación de seguridad e higiene en el trabajo, considerando una hora a la semana y realizada por un encargado.	48,00
D41IA040	Ud RECONOCIMIENTO MEDICO OBLIGAT Ud. Reconocimiento médico obligatorio.	12,00
D41IA201	H. EQUIPO DE LIMPIEZA Y CONSERVA H. Equipo de limpieza y conservación de instalaciones provisionales de obra, considerando una hora diaria de oficial de 2ª y de ayudante.	400,00
D41IA220	Ud CONTRATACIÓN EMPRESA DE PRIMEROS AUXILIOS Ud. Contratación de empresa de primeros auxilios por meses.	14,00



2. CUADRO DE PRECIOS N°1

Nº	CÓDIGO	UD. RESUMEN	PRECIO EN LETRA	IMPORTE
001		INS. PROVISIONALES DE OBRA		
001.1		ALQUILER CASETAS PREFA. OBRA		
D41AA210	Ud	ALQUILER CASETA PREFA.OFICINA		129,22
		Ud. Más de alquiler de caseta prefabricada para oficina de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	CIENTO VEINTINUEVE EUROS con VEINTIDÓS CÉNTIMOS	
D41AA310	Ud	ALQUILER CASETA PREFA.COMEDOR		110,47
		Ud. Más de alquiler de caseta prefabricada para comedor de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	CIENTO DIEZ EUROS con CUARENTA Y SIETE CÉNTIMOS	
D41AA320	Ud	ALQUILER CASETA P.VESTUARIOS.		120,51
		Ud. Más de alquiler de caseta prefabricada para vestuarios de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	CIENTO VEINTE EUROS con CINCUENTA Y UN CÉNTIMOS	
D41AA420	Ud	A.A/2INOD,2DUCHA,LAV.3G,TERMO		222,27
		Ud. Más de alquiler de caseta prefabricada para aseos de		

obra de 4.10x1.90 m. con dos inodoros, dos duchas, un lavabo con tres grifos y termo eléctrico de 50 litros de capacidad; con las mismas características que las oficinas. Suelo de contrachapado hidrófugo con capa fenólica antideslizante y resistente al desgaste. Piezas sanitarias de fibra de vidrio acabadas en Gel-Coat blanco y pintura antideslizante. Puertas interiores de madera en los compartimentos. Instalación de fontanería con tuberías de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático.

DOSCIENTOS VEINTIDÓS EUROS con VEINTISIETE CÉNTIMOS
DOSCIENTOS VEINTIDÓS EUROS con VEINTISIETE CÉNTIMOS

D41AA601	Ud	ALQUILER CASETA PREFA.ALMACEN		110,47
		Ud. Más de alquiler de caseta prefabricada para almacén de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	CIENTO DIEZ EUROS con CUARENTA Y SIETE CÉNTIMOS	
D41AA820	Ud	TRANSPORTE CASETA PREFABRICAD		213,70
		Ud. Transporte de caseta prefabricada a obra, incluso descarga y posterior recogida.	DOSCIENTOS TRECE EUROS con SETENTA CÉNTIMOS	
001.2		ACOMETIDAS PROVISIONALES		
D41AE001	Ud	ACOMET.PROV.ELECT.A CASETA.		102,44
		Ud. Acometida provisional de electricidad a casetas de obra.	CIENTO DOS EUROS con CUARENTA Y CUATRO CÉNTIMOS	
D41AE101	Ud	ACOMET.PROV.FONTAN.A CASETA.		90,38
		Ud. Acometida provisional de fontanería a casetas de obra.	NOVENTA EUROS con TREINTA Y OCHO CÉNTIMOS	
D41AE201	Ud	ACOMET.PROV.SANEAMT.A CASETA.		74,98
		Ud. Acometida provisional de saneamiento a casetas de obra.	SETENTA Y CUATRO EUROS con NOVENTA Y OCHO CÉNTIMOS	
001.3		MOBILIARIO Y EQUIPAMIENTO		
D41AG201	Ud	TAQUILLA METALICA INDIVIDUAL.		12,61
		Ud. Taquilla metálica individual con llave de 1.78 m. de altura colocada. (10 usos)		



D41AG210	Ud	BANCO POLIPROPILENO 5 PERS. Ud. Banco de polipropileno para 5 personas con soportes metalicos, colocado. (10 usos)	DOCE EUROS con SESENTA Y UN CÉNTIMOS 21,29	D41CA240	Ud	CARTEL INDICAT.RIESGO SIN SO. Ud. Cartel indicativo de riesgo de 0,30x0,30 m., sin soporte metálico, incluso colocación y desmontado	DIECISIETE EUROS con TREINTA CÉNTIMOS 6,84
D41AG401	Ud	JABONERA INDUSTRIAL. Ud. Jabonera de uso industrial con dosificador de jabón, en acero inoxidable, colocada. (10 usos)	VEINTIÚN EUROS con VEINTINUEVE CÉNTIMOS 4,80				SEIS EUROS con OCHENTA Y CUATRO CÉNTIMOS
D41AG410	Ud	PORTARROLLOS INDUS.C/CERRADUR Ud. Portarrollos de uso industrial con cerradura, en acero inoxidable, colocado. (10 usos)	CUATRO EUROS con OCHENTA CÉNTIMOS 4,81	002.2	ACOTAMIENTOS		
D41AG610	Ud	CALIENTA COMIDAS 25 SERVICIOS Ud. Calienta comidas para 25 servicios, colocado. (20 usos)	CUATRO EUROS con OCHENTA Y UN CÉNTIMOS CUATRO EUROS con OCHENTA Y UN CÉNTIMOS 95,10	D41CC020	Ud	VALLA DE OBRA CON TRIPODE. Ud. Valla de obra de 800x200 mm. de una banda con trípode, terminación en pintura normal dos colores rojo y blanco, incluso colocación y desmontado. (20 usos)	4,67
D41AG630	Ud	MESA MELAMINA 10 PERSONAS. Ud. Mesa metálica para comedor con una capacidad de 10 personas, y tablero superior de melamina colocada. (10 usos)	NOVENTA Y CINCO EUROS con DIEZ CÉNTIMOS 22,03	D41CC210	MI	VALLA COLGANTE SEÑALIZACION. MI. Valla colgante de señalización realizada con material plástico pintado en rojo y blanco, incluso cordón de sujección, soporte metálico, colocación y desmontado.	CUATRO EUROS con SESENTA Y SIETE CÉNTIMOS 6,62
D41AG700	Ud	DEPOSITO DE BASURAS DE 800 L. Ud. Deposito de basuras de 800 litros de capacidad realizado en polietileno inyectado, acero y bandas de caucho, con ruedas para su transporte, colocado. (10 usos)	VEINTIDÓS EUROS con TRES CÉNTIMOS 18,27	D41CC230	MI	CINTA DE BALIZAMIENTO R/B. MI. Cinta corrida de balizamiento plástica pintada a dos colores roja y blanca, incluso colocación y desmontado.	SEIS EUROS con SESENTA Y DOS CÉNTIMOS 1,28
D41AG801	Ud	BOTIQUIN DE OBRA. Ud. Botiquín de obra instalado.	DIECIOCHO EUROS con VEINTISIETE CÉNTIMOS 21,43				UN EUROS con VEINTIOCHO CÉNTIMOS
D41AG820	Ud	CAMILLA PORTATIL EVACUACIONES Ud. Camilla portátil para evacuaciones, colocada. (20 usos)	VEINTIÚN EUROS con CUARENTA Y TRES CÉNTIMOS 6,78	003	PROTECCIONES PERSONALES		
			SEIS EUROS con SETENTA Y OCHO CÉNTIMOS	003.1	PROTECCIONES PARA CABEZA		
002	SEÑALIZACIONES			D41EA001	Ud	CASCO DE SEGURIDAD. Ud. Casco de seguridad con desudador, homologado CE.	3,05
002.1	SEÑALES			D41EA201	Ud	PANT.SEGURID. PARA SOLDADURA. Ud. Pantalla de seguridad para soldadura, homologada CE.	TRES EUROS con CINCO CÉNTIMOS 12,31
D41CA010	Ud	SEÑAL STOP I/SOPORTE. Ud. Señal de stop tipo octogonal de D=600 mm. normalizada, con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura incluso parte proporcional de apertura de pozo, hormigonado, colocación y desmontado. (3 usos)	39,81	D41EA210	Ud	PANTALLA CONTRA PARTICULAS. Ud. Pantalla para protección contra partículas con arnes de cabeza y visor de policarbonato claro rígido, homologada CE.	DOCE EUROS con TREINTA Y UN CÉNTIMOS 13,25
D41CA040	Ud	CARTEL INDICAT.RIESGO I/SOPOR Ud. Cartel indicativo de riesgo de 0,30x0,30 m. con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura, incluso apertura de pozo, hormigonado,	TREINTA Y NUEVE EUROS con OCHENTA Y UN CÉNTIMOS 17,30	D41EA220	Ud	GAFAS CONTRA IMPACTOS. Ud. Gafas contra impactos antirayadura, homologadas CE.	TRECE EUROS con VEINTICINCO CÉNTIMOS 11,36
				D41EA230	Ud	GAFAS ANTIPOLVO. Ud. Gafas antipolvo tipo visitante incolora, homologadas CE.	ONCE EUROS con TREINTA Y SEIS CÉNTIMOS 2,52
				D41EA401	Ud	MASCARILLA ANTIPOLVO. Ud. Mascarilla antipolvo, homologada.	DOS EUROS con CINCUENTA Y DOS CÉNTIMOS 2,84
				D41EA410	Ud	FILTRO RECAMBIO MASCARILLA. Ud. Filtro recambio mascarilla, homologado.	DOS EUROS con OCHENTA Y CUATRO CÉNTIMOS 0,69
				D41EA601	Ud	PROTECTORES AUDITIVOS. Ud. Protectores auditivos, homologados.	CERO EUROS con SESENTA Y NUEVE CÉNTIMOS 7,89
							SIETE EUROS con OCHENTA Y NUEVE CÉNTIMOS



003.2 PROTECCION TOTAL DEL CUERPO		
D41EC001	Ud MONO DE TRABAJO. Ud. Mono de trabajo, homologado CE.	16,41
	DIECISÉIS EUROS con CUARENTA Y UN CÉNTIMOS	
D41EC010	Ud IMPERMEABLE. Ud. Impermeable de trabajo, homologado CE.	9,47
	NUEVE EUROS con CUARENTA Y SIETE CÉNTIMOS	
D41EC030	Ud MANDIL SOLDADOR SERRAJE Ud. Mandil de serraje para soldador grado A, 60x90 cm. homologado CE.	14,70
	CATORCE EUROS con SETENTA CÉNTIMOS	
D41EC050	Ud PETO REFLECTANTE BUT./AMAR. Ud. Peto reflectante color butano o amarillo, homologada CE.	18,93
	DIECIOCHO EUROS con NOVENTA Y TRES CÉNTIMOS DIECIOCHO EUROS con NOVENTA Y TRES CÉNTIMOS	66,89
D41EC401	Ud CINTURON SEGURIDAD CLASE A. Ud. Cinturón de seguridad clase A (sujeción), con cuerda regulable de 1,8 m. con guarda cabos y 2 mosquetones, homologada CE.	
	SESENTA Y SEIS EUROS con OCHENTA Y NUEVE CÉNTIMOS	
D41EC500	Ud CINTURON ANTILUMBAGO Ud. Cinturón antilumbago cieere hebilla, homologado CE.	17,45
	DIECISIETE EUROS con CUARENTA Y CINCO CÉNTIMOS	
D41EC510	Ud FAJA ELASTICA SOBRESFUERZOS. Ud. Faja elástica para protección de sobre esfuerzos con hombrreras y cierre velcro, homologada CE.	33,45
	TREINTA Y TRES EUROS con CUARENTA Y CINCO CÉNTIMOS	
D41EC550	Ud CUERDA AMARRE REGUL. POLIAM. UD. Cuerda de amarre regulable de longitud 1,10-1,80 mts, realizado en poliamida de alta tenacidad de 14 mm de diámetro, i/ argolla de polimida revestida de PVC, homologado CE.	15,63
	QUINCE EUROS con SESENTA Y TRES CÉNTIMOS	
D41EC520	Ud CINTURON PORTAHERRAMIENTAS. Ud. Cinturón portaherramientas, homologado.	21,00
	VEINTIÚN EUROS	
003.3 PROTECCIONES PARA MANOS Y BRAZOS		
D41EE001	Ud PAR GUANTES LATEX INDUSTRIAL Ud. Par de guantes de latex industrial naranja, homologado CE.	1,89
	UN EUROS con OCHENTA Y NUEVE CÉNTIMOS	
D41EE010	Ud PAR GUANTES NEOPRENO 100% Ud. Par de neopreno 100%, homologado CE.	2,52
	DOS EUROS con CINCUENTA Y DOS CÉNTIMOS	
D41EE020	Ud PAR GUANTES SOLDADOR 34 CM Ud. Par de guantes para soldador serraje forrado ignífugo, largo 34 cm., homologado CE.	7,89
	SIETE EUROS con OCHENTA Y NUEVE CÉNTIMOS	

D41EE030	Ud PAR GUANTES AISLANTES. Ud. Par de guantes aislantes para electricista, homologados.	27,00
	VEINTISIETE EUROS	
003.4 PROTECCIONES PARA PIES Y PIERNAS		
D41EG005	Ud PAR BOTA AGUA INGENIERO Ud. Par de botas de agua ingeniero, forrada, con cremallera, marrón, homologadas CE.	25,87
	VEINTICINCO EUROS con OCHENTA Y SIETE CÉNTIMOS	
D41EG010	Ud PAR BOTAS SEGUR.PUNT.SERR. Ud. Par de botas de seguridad S2 serraje/lona con puntera y metálicas, homologadas CE.	24,61
	VEINTICUATRO EUROS con SESENTA Y UN CÉNTIMOS	
D41EG030	Ud PAR BOTAS AISLANTES. Ud. Par de botas aislantes para electricista, homologadas CE.	26,19
	VEINTISÉIS EUROS con DIECINUEVE CÉNTIMOS	
D41EG401	Ud PAR POLAINAS SOLDADOR Ud. Par de polainas para soldador serraje grad A, homologadas CE.	10,41
	DIEZ EUROS con CUARENTA Y UN CÉNTIMOS	
004 PROTECCIONES COLECTIVAS		
004.1 PROTECCIONES HORIZONTALES		
D41GA001	M2 RED HORIZONTAL PROTEC.HUECOS. M2. Red horizontal para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.	3,22
	TRES EUROS con VEINTIDÓS CÉNTIMOS	
D41GA201	M2 MALLAZO PROTECCION HUECOS. M2. Mallazo electrosoldado 15x15 cm. D=4 mm. para protección de huecos, incluso colocación y desmontado.	2,68
	DOS EUROS con SESENTA Y OCHO CÉNTIMOS	
004.2 PROTECCIONES VERTICALES		
D41GC210	MI BARANDILLA PUNTALES Y TABLON. MI. Barandilla con soporte de puntales telescópicos y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.	4,86
	CUATRO EUROS con OCHENTA Y SEIS CÉNTIMOS	
D41GC450	MI ENREJADO MET.PREF. MI. Enrejado metálico tipo panel móvil de 3x2ml. formado por soportes de tubo y cuadrícula de 15x15cm varilla D=3mm con protección de intemperie Aluzín, y pie de hormigón prefabricado para doble soporte.	9,28
	NUEVE EUROS con VEINTIOCHO CÉNTIMOS	



005	MANO DE OBRA DE SEGURIDAD		
D411A001	H. COMITE DE SEGURIDAD E HIGIENE	54,34	
	H. Comité de seguridad compuesto por un técnico en materia de seguridad con categoria de encargado, dos trabajadores con categoria de oficial de 2ª, un ayudante y un vigilante de seguridad con categoria de oficial de 1ª, considerando una reunión como mínimo al mes.		
		CINCUENTA Y CUATRO EUROS con TREINTA Y CUATRO CÉNTIMOS	
D411A020	H. FORMACION SEGURIDAD E HIGIENE	12,05	
	H. Formación de seguridad e higiene en el trabajo, considerando una hora a la semana y realizada por un encargado.		
		DOCE EUROS con CINCO CÉNTIMOS	
D411A040	Ud RECONOCIMIENTO MEDICO OBLIGAT	43,33	
	Ud. Reconocimiento médico obligatorio.		
		CUARENTA Y TRES EUROS con TREINTA Y TRES CÉNTIMOS	
D411A201	H. EQUIPO DE LIMPIEZA Y CONSERVA	21,16	
	H. Equipo de limpieza y conservación de instalaciones provisionales de obra, considerando una hora diaria de oficial de 2ª y de ayudante.		
		VEINTIÚN EUROS con DIECISÉIS CÉNTIMOS	
D411A220	Ud CONTRATACIÓN EMPRESA DE PRIMEROS AUXILIOS	1.000,00	
	Ud. Contratación de empresa de primeros auxilios por meses.		
		MIL EUROS	

Santander, September 2025

Signed by: Santos Diego Cruz.



3. PRESUPUESTO POR CAPÍTULOS

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
001	INS. PROVISIONALES DE OBRA			
001.1	ALQUILER CASSETAS PREFA. OBRA			
D41AA210	Ud ALQUILER CASETA PREFA.OFICINA Ud. Més de alquiler de caseta prefabricada para oficina de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	18,00	129,22	2.325,96
D41AA310	Ud ALQUILER CASETA PREFA.COMEDOR Ud. Més de alquiler de caseta prefabricada para comedor de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	18,00	110,47	1.988,46
D41AA320	Ud ALQUILER CASETA P.VESTUARIOS. Ud. Més de alquiler de caseta prefabricada para vestuarios de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Aislamiento interior con lana de vidrio combinada con poliestireno expandido. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	32,00	120,51	3.856,32
D41AA420	Ud A.A/2INOD,2DUCHA,LAV.3G,TERMO Ud. Més de alquiler de caseta prefabricada para aseos de obra de 4.10x1.90 m. con dos inodoros, dos duchas, un lavabo con tres grifos y termo eléctrico de 50 litros de capacidad; con las mismas características que las oficinas. Suelo de contrachapado hidrófugo con capa fenólica antideslizante y resistente al desgaste. Piezas sanitarias de fibra de vidrio acabadas en Gel-Coat blanco y pintura antideslizante. Puertas interiores de madera en los	32,00	222,27	7.112,64

D41AA601	compartimentos. Instalación de fontanería con tuberías de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático. Ud ALQUILER CASETA PREFA.ALMACEN Ud. Més de alquiler de caseta prefabricada para almacén de obra de 6x2.35 m., con estructura metálica mediante perfiles conformados en frio y cerramiento chapa nervada y galvanizada con terminación de pintura prelacada. Revestimiento de P.V.C. en suelos y tablero melaminado en paredes. Ventanas de aluminio anodizado, con persianas correderas de protección, incluso instalación eléctrica con distribución interior de alumbrado y fuerza con toma exterior a 220 V.	18,00	110,47	1.988,46
D41AA820	Ud TRANSPORTE CASETA PREFABRICAD Ud. Transporte de caseta prefabricada a obra, incluso descarga y posterior recogida.	8,00	213,70	1.709,60
TOTAL 001.1				18.981,44
001.2	ACOMETIDAS PROVISIONALES			
D41AE001	Ud ACOMET.PROV.ELECT.A CASETA. Ud. Acometida provisional de electricidad a casetas de obra.	4,00	102,44	409,76
D41AE101	Ud ACOMET.PROV.FONTAN.A CASETA. Ud. Acometida provisional de fontanería a casetas de obra.	4,00	90,38	361,52
D41AE201	Ud ACOMET.PROV.SANEAMT.A CASETA. Ud. Acometida provisional de saneamiento a casetas de obra.	4,00	74,98	299,92
TOTAL 001.2				1.071,20
001.3	MOBILIARIO Y EQUIPAMIENTO			
D41AG201	Ud TAQUILLA METALICA INDIVIDUAL. Ud. Taquilla metálica individual con llave de 1.78 m. de altura colocada. (10 usos)	14,00	12,61	176,54
D41AG210	Ud BANCO POLIPROPILENO 5 PERS. Ud. Banco de polipropileno para 5 personas con soportes metálicos, colocado. (10 usos)	4,00	21,29	85,16
D41AG401	Ud JABONERA INDUSTRIAL. Ud. Jabonera de uso industrial con dosificador de jabón, en acero inoxidable, colocada. (10 usos)	5,00	4,80	24,00
D41AG410	Ud PORTARROLLOS INDUS.C/CERRADUR Ud. Portarrollos de uso industrial con cerradura, en acero inoxidable, colocado. (10 usos)	4,00	4,81	19,24
D41AG610	Ud CALIENTA COMIDAS 25 SERVICIOS Ud. Calienta comidas para 25 servicios, colocado. (20 usos)	2,00	95,10	190,20
D41AG630	Ud MESA MELAMINA 10 PERSONAS. Ud. Mesa metálica para comedor con una capacidad de 10 personas, y tablero superior de melamina colocada. (10 usos)	2,00	22,03	44,06
D41AG700	Ud DEPOSITO DE BASURAS DE 800 L.	1,00	18,27	18,27



	Ud. Deposito de basuras de 800 litros de capacidad realizado en polietileno inyectado, acero y bandas de caucho, con ruedas para su transporte, colocado. (10 usos)				
D41AG801	Ud BOTIQUIN DE OBRA.	2,00	21,43	42,86	
D41AG820	Ud. Botiquín de obra instalado. Ud CAMILLA PORTATIL EVACUACIONES	1,00	6,78	6,78	
	Ud. Camilla portátil para evacuaciones, colocada. (20 usos)				
	TOTAL 001.3.....			607,11	
	TOTAL 001.....				20.659,75
002	SEÑALIZACIONES				
002.1	SEÑALES				
D41CA010	Ud SEÑAL STOP I/SOPORTE. Ud. Señal de stop tipo octogonal de D=600 mm. normalizada, con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura incluso parte proporcional de apertura de pozo, hormigonado, colocación y desmontado. (3 usos)	7,00	39,81	278,67	
D41CA040	Ud CARTEL INDICAT.RIESGO I/SOPOR Ud. Cartel indicativo de riesgo de 0,30x0,30 m. con soporte metálico de hierro galvanizado 80x40x2 mm. y 1,3 m. de altura, incluso apertura de pozo, hormigonado, colocación y desmontado.	7,00	17,30	121,10	
D41CA240	Ud CARTEL INDICAT.RIESGO SIN SO. Ud. Cartel indicativo de riesgo de 0,30x0,30 m., sin soporte metálico, incluso colocación y desmontado	2,00	6,84	13,68	
	TOTAL 002.1.....				413,45
002.2	ACOTAMIENTOS				
D41CC020	Ud VALLA DE OBRA CON TRIPODE. Ud. Valla de obra de 800x200 mm. de una banda con trípode, terminación en pintura normal dos colores rojo y blanco, incluso colocación y desmontado. (20 usos)	20,00	4,67	93,40	
D41CC210	MI VALLA COLGANTE SEÑALIZACION. MI. Valla colgante de señalización realizada con material plástico pintado en rojo y blanco, incluso cordón de sujección, soporte metálico, colocación y desmontado.	40,00	6,62	264,80	
D41CC230	MI CINTA DE BALIZAMIENTO R/B. MI. Cinta corrida de balizamiento plástica pintada a dos colores roja y blanca, incluso colocación y desmontado.	800,00	1,28	1.024,00	

TOTAL 002.2 1.382,20

TOTAL 002 1.795,65

003	PROTECCIONES PERSONALES				
003.1	PROTECCIONES PARA CABEZA				
D41EA001	Ud CASCO DE SEGURIDAD. Ud. Casco de seguridad con desudador, homologado CE.	18,00	3,05	54,90	
D41EA201	Ud PANT.SEGURID. PARA SOLDADURA. Ud. Pantalla de seguridad para soldadura, homologada CE.	4,00	12,31	49,24	
D41EA210	Ud PANTALLA CONTRA PARTICULAS. Ud. Pantalla para protección contra partículas con arnes de cabeza y visor de policarbonato claro rígido, homologada CE.	10,00	13,25	132,50	
D41EA220	Ud GAFAS CONTRA IMPACTOS. Ud. Gafas contra impactos antirayadura, homologadas CE.	18,00	11,36	204,48	
D41EA230	Ud GAFAS ANTIPOLVO. Ud. Gafas antipolvo tipo visitante incolora, homologadas CE.	18,00	2,52	45,36	
D41EA401	Ud MASCARILLA ANTIPOLVO. Ud. Mascarilla antipolvo, homologada.	18,00	2,84	51,12	
D41EA410	Ud FILTRO RECAMBIO MASCARILLA. Ud. Filtro recambio mascarilla, homologado.	36,00	0,69	24,84	
D41EA601	Ud PROTECTORES AUDITIVOS. Ud. Protectores auditivos, homologados.	18,00	7,89	142,02	
	TOTAL 003.1				704,46
003.2	PROTECCION TOTAL DEL CUERPO				
D41EC001	Ud MONO DE TRABAJO. Ud. Mono de trabajo, homologado CE.	16,00	16,41	262,56	
D41EC010	Ud IMPERMEABLE. Ud. Impermeable de trabajo, homologado CE.	16,00	9,47	151,52	
D41EC030	Ud MANDIL SOLDADOR SERRAJE Ud. Mandil de serraje para soldador grado A, 60x90 cm. homologado CE.	4,00	14,70	58,80	
D41EC050	Ud PETO REFLECTANTE BUT./AMAR. Ud. Peto reflectante color butano o amarillo, homologada CE.	16,00	18,93	302,88	
D41EC401	Ud CINTURON SEGURIDAD CLASE A. Ud. Cinturón de seguridad clase A (sujeción), con cuerda regulable de 1,8 m. con guarda cabos y 2 mosquetones, homologada CE.	7,00	66,89	468,23	
D41EC500	Ud CINTURON ANTILUMBAGO Ud. Cinturón antilumbago cieere hebilla, homologado CE.	14,00	17,45	244,30	
D41EC510	Ud FAJA ELASTICA SOBRESFUERZOS. Ud. Faja elástica para protección de sobreesfuerzos con hombreras y cierre velcro, homologada CE.	14,00	33,45	468,30	
D41EC550	Ud CUERDA AMARRE REGUL. POLIAM. UD. Cuerda de amarre regulable de longitud 1,10-1,80 mts, realizado en poliamida de alta tenacidad de 14 mm de diámetro, i/ argolla de polimida revestida de PVC, homologado CE.	7,00	15,63	109,41	



D41EC520	Ud CINTURON PORTAHERRAMIENTAS. Ud. Cinturón portaherramientas, homologado.	14,00	21,00	294,00
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TOTAL 003.2..... 2.360,00

003.3 PROTECCIONES PARA MANOS Y BRAZOS

D41EE001	Ud PAR GUANTES LATEX INDUSTRIAL Ud. Par de guantes de latex industrial naranja, homologado CE.	16,00	1,89	30,24
D41EE010	Ud PAR GUANTES NEOPRENO 100% Ud. Par de neopreno 100%, homologado CE.	14,00	2,52	35,28
D41EE020	Ud PAR GUANTES SOLDADOR 34 CM Ud. Par de guantes para soldador serraje forrado ignífugo, largo 34 cm., homologado CE.	6,00	7,89	47,34
D41EE030	Ud PAR GUANTES AISLANTES. Ud. Par de guantes aislantes para electricista, homologados.	6,00	27,00	162,00

TOTAL 003.3..... 274,86

003.4 PROTECCIONES PARA PIES Y PIERNAS

D41EG005	Ud PAR BOTA AGUA INGENIERO Ud. Par de botas de agua ingeniero, forrada, con cremallera, marrón, homologadas CE.	16,00	25,87	413,92
D41EG010	Ud PAR BOTAS SEGUR.PUNT.SERR. Ud. Par de botas de seguridad S2 serraje/lona con puntera y metálicas, homologadas CE.	16,00	24,61	393,76
D41EG030	Ud PAR BOTAS AISLANTES. Ud. Par de botas aislantes para electricista, homologadas CE.	6,00	26,19	157,14
D41EG401	Ud PAR POLAINAS SOLDADOR Ud. Par de polainas para soldador serraje grad A, homologadas CE.	16,00	10,41	166,56

TOTAL 003.4..... 1.131,38

TOTAL 003..... 4.470,70

004 PROTECCIONES COLECTIVAS

004.1 PROTECCIONES HORIZONTALES

D41GA001	M2 RED HORIZONTAL PROTEC.HUECOS. M2. Red horizontal para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.	40,00	3,22	128,80
D41GA201	M2 MALLAZO PROTECCION HUECOS. M2. Mallazo electrosoldado 15x15 cm. D=4 mm. para	40,00	2,68	107,20

protección de huecos, incluso colocación y desmontado.

TOTAL 004.1 236,00

004.2 PROTECCIONES VERTICALES

D41GC210	MI BARANDILLA PUNTALES Y TABLON. Ml. Barandilla con soporte de puntales telescópicos y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.	150,00	4,86	729,00
D41GC450	MI ENREJADO MET.PREF. Ml. Enrejado metálico tipo panel móvil de 3x2ml. formado por soportes de tubo y cuadrícula de 15x15cm varilla D=3mm con protección de intemperie Aluzín, y pie de hormigón prefabricado para doble soporte.	250,00	9,28	2.320,00

TOTAL 004.2 3.049,00

TOTAL 004 3.285,00



005	MANO DE OBRA DE SEGURIDAD			
D411A001	H. COMITE DE SEGURIDAD E HIGIENE H. Comité de seguridad compuesto por un técnico en materia de seguridad con categoria de encargado, dos trabajadores con categoria de oficial de 2ª, un ayudante y un vigilante de seguridad con categoria de oficial de 1ª, considerando una reunión como mínimo al mes.	24,00	54,34	1.304,16
D411A020	H. FORMACION SEGURIDAD E HIGIENE H. Formación de seguridad e higiene en el trabajo, considerando una hora a la semana y realizada por un encargado.	48,00	12,05	578,40
D411A040	Ud RECONOCIMIENTO MEDICO OBLIGAT Ud. Reconocimiento médico obligatorio.	12,00	43,33	519,96
D411A201	H. EQUIPO DE LIMPIEZA Y CONSERVA H. Equipo de limpieza y conservación de instalaciones provisionales de obra, considerando una hora diaria de oficial de 2ª y de ayudante.	400,00	21,16	8.464,00
D411A220	Ud CONTRATACIÓN EMPRESA DE PRIMEROS AUXILIOS Ud. Contratación de empresa de primeros auxilios por meses.	14,00	1.000,00	14.000,00
TOTAL 005.....				24.866,52
TOTAL				55.077,62

Santander, September 2025

Signed by: Santos Diego Cruz.



4. RESUMEN DE PRESUPUESTO

CAPÍTULO	RESUMEN	IMPORTE	%
001	INS. PROVISIONALES DE OBRA	20.659,75	37,51
002	SEÑALIZACIONES.....	1.795,65	3,26
003	PROTECCIONES PERSONALES	4.470,70	8,12
004	PROTECCIONES COLECTIVAS.....	3.285,00	5,96
005	MANO DE OBRA DE SEGURIDAD	24.866,52	45,15
		PRESUPUESTO DE EJECUCIÓN MATERIAL	55.077,62
Asciende el presupuesto a la expresada cantidad de CINCUENTA Y CINCO MIL SETENTA Y SIETE			
EUROS con SESENTA Y DOS CÉNTIMOS			
, Julio 2024.			
Promotor ENT0001		Proyectista ENT0005	

Santander, September 2025

Signed by: Santos Diego Cruz.

PART №7 – APPENDICES



DOCUMENT Nº1 – TECHNICAL DRAWINGS AND PLANS



Tabla de contenido

Plan 1.1- Situation Plan

Plan 1.2- Location Plan

Plan 1.3- Set Plan

Plan 2.1- Layout Plans

Plan 2.2- Longitudinal Profile Plans

Plan 2.3- Floor Plans

Plan 2.4- Intersection Plan

Plan 3.1- Section Type Plan

Plan 3.2- Transversal Section Plans

Plan 4.1- Drainage Floor Plans

Plan 4.1.1- Drainage System Plan

Plan 4.2.1- Drainage ODT Detail Plans

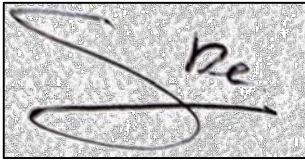
Plan 4.2.2- Drainage Detail Plans

Plan 5.1- Signaling Floor Plans

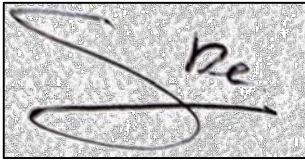
Plan 5.2- Signaling Detail Plans

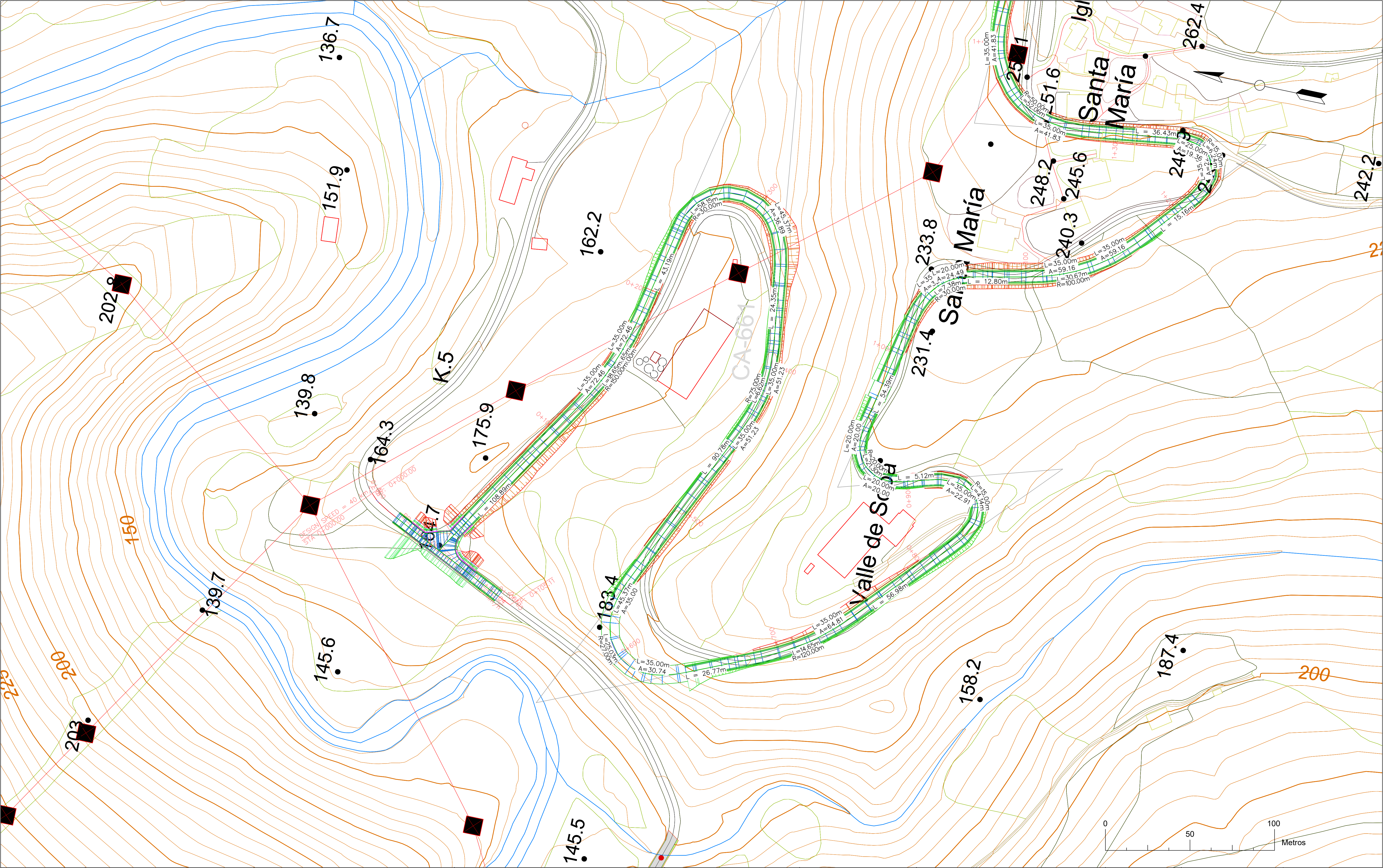
Plan 6- Environmental Integration Plans

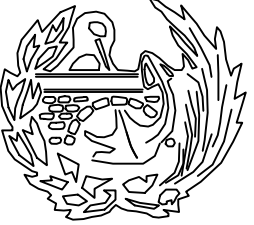
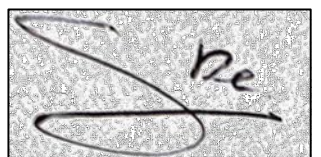


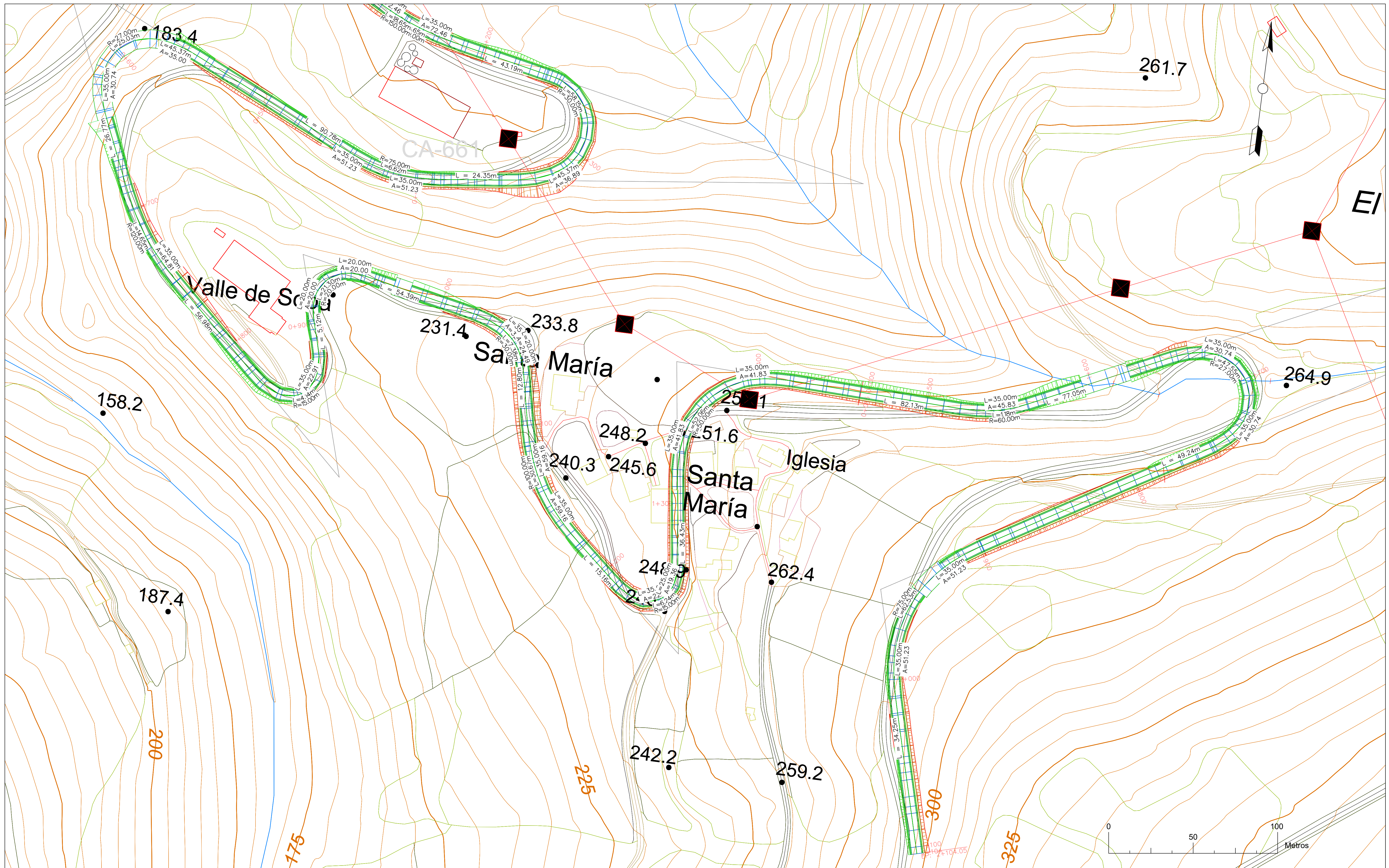
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				REGION CANTABRIA					SHEET 1 OF 1



	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE LOCATION PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/5000	DATE SEPTEMBER 2025	DRAWING 1.2
				REGION CANTABRIA						SHEET 1 OF 1



	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE LAYOUT PLAN	AUTHOR SANTOS DIEGO CRUZ 	SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 2.1
				REGION CANTABRIA					SHEET 1 OF 3



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

CONSTRUCTION PROJECT

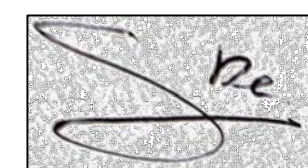
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ROAD CA-661, ACCES TO "LA BUSTA"

MUNICIPALITY	SOBA
REGION	CANTABRIA

DRAWING TITLE

LAYOUT PLAN

AUTHOR
SANTOS
DIEGO CRUZ



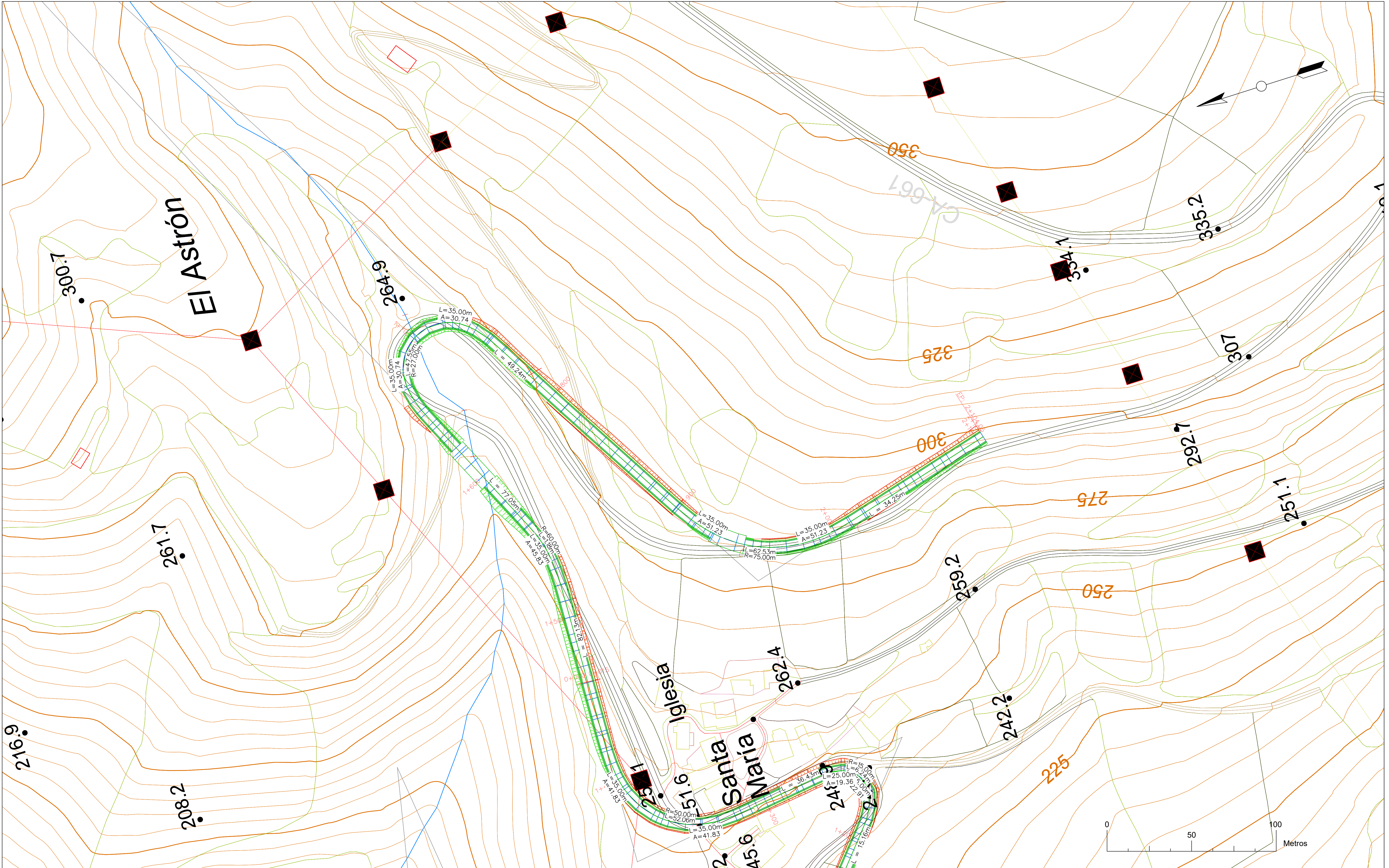
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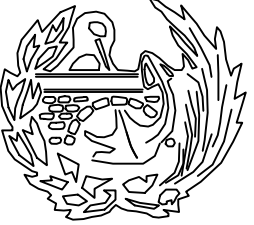
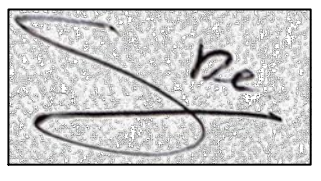
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SEPTEMBER 2025

DRAWING 2.1

SHEET 2 OF 3

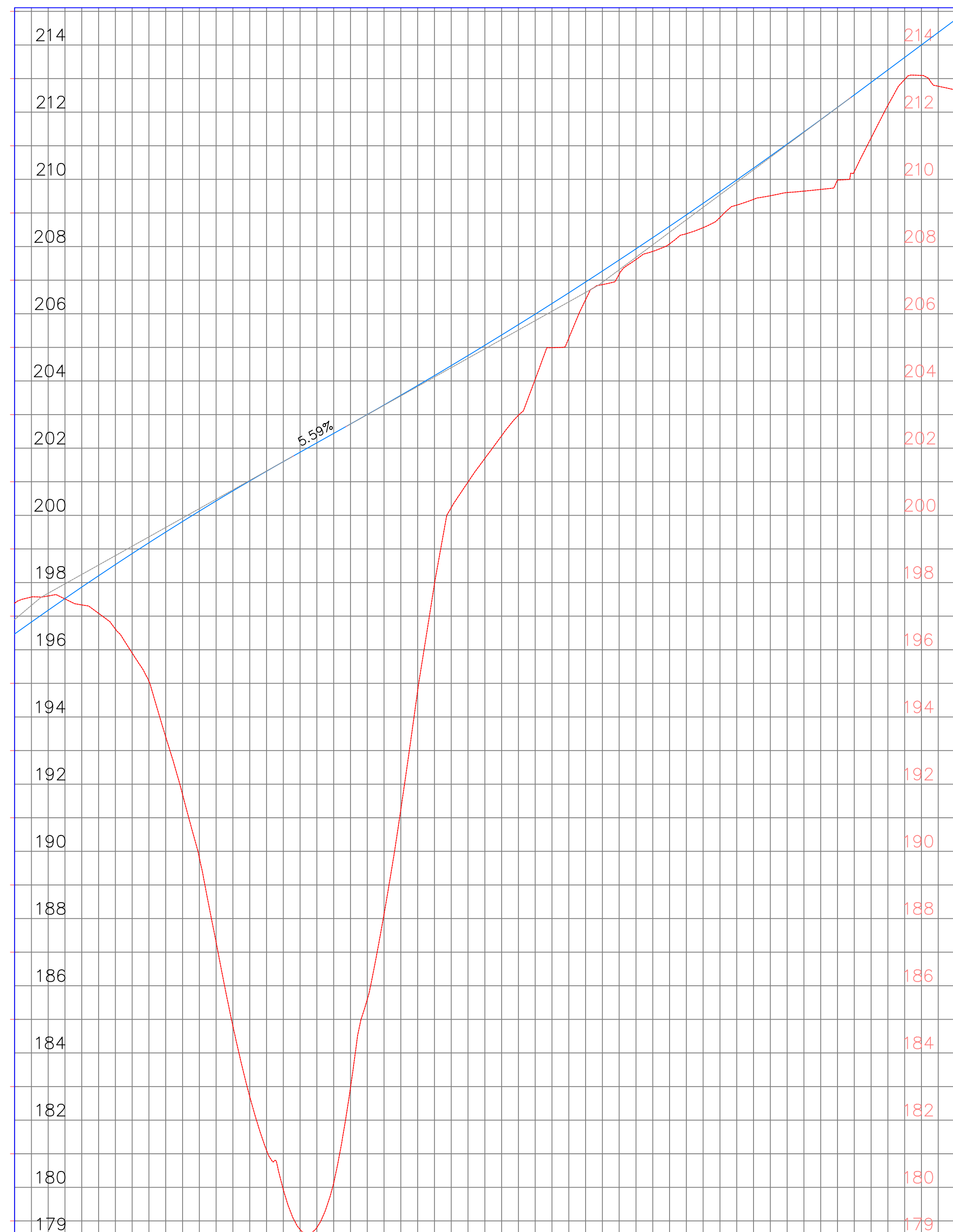
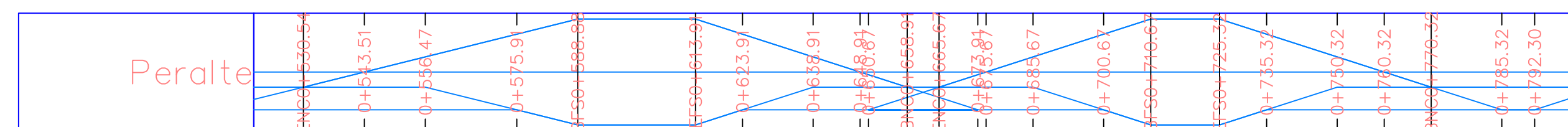
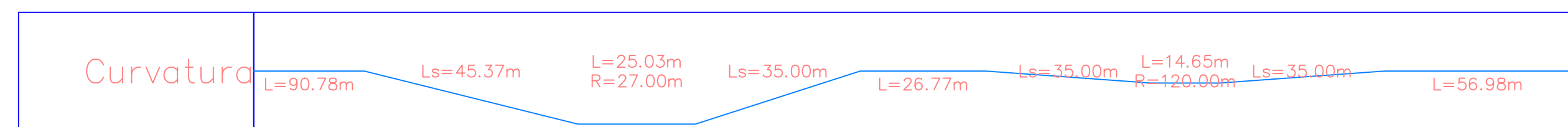


	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE LAYOUT PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 2.1
				REGION CANTABRIA						SHEET 3 OF 3

ALINEACION PROFILE



ALINEACION PROFILE

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ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

CONSTRUCTION PROJECT

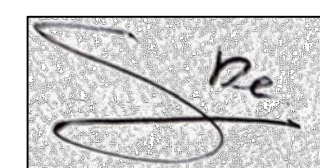
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ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE

LONGITUDINAL PROFILE

AUTHOR
SANTOS
DIEGO CRUZ



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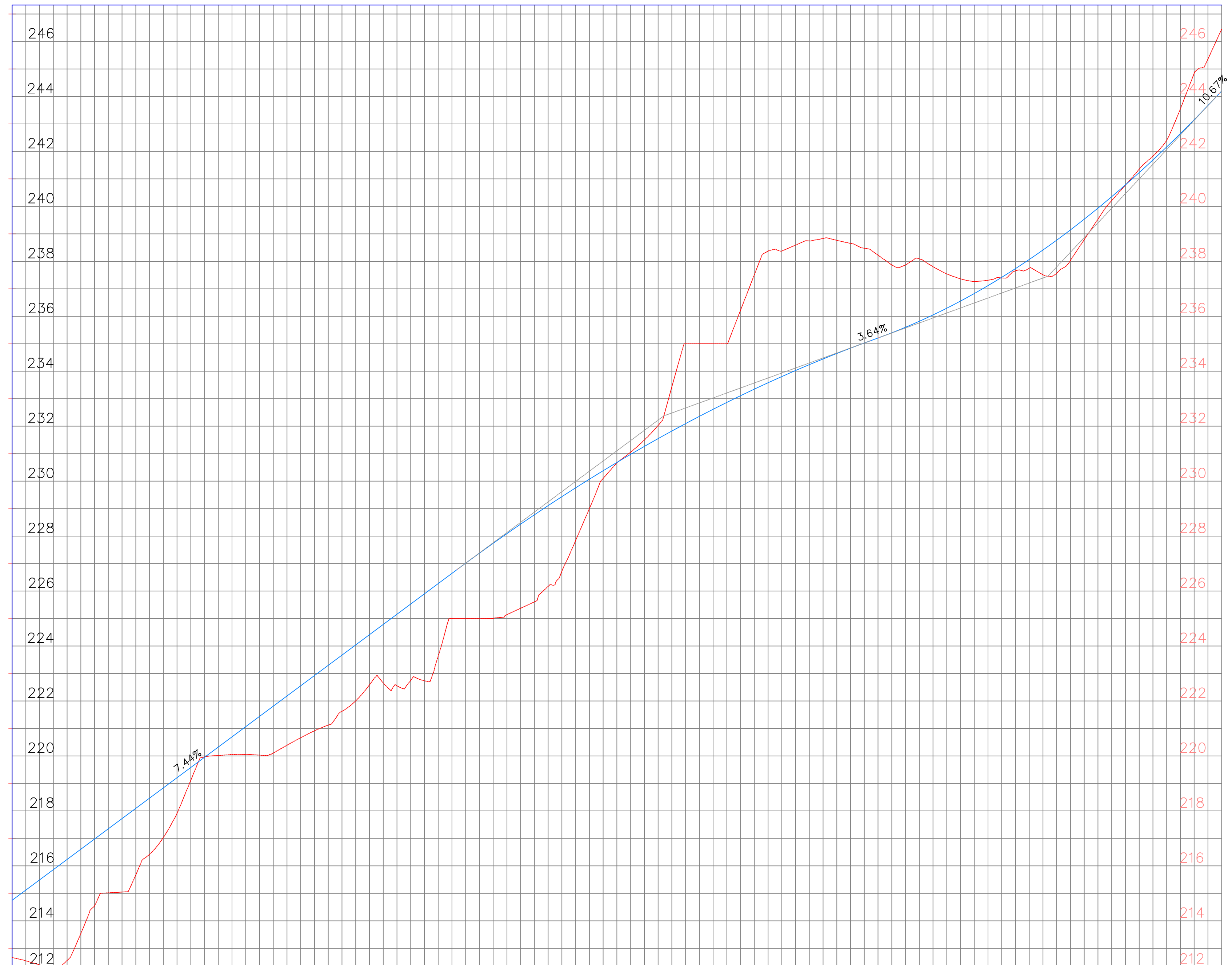
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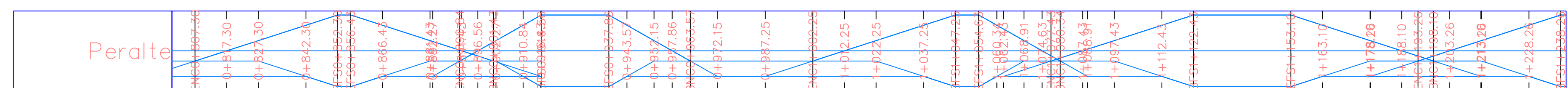
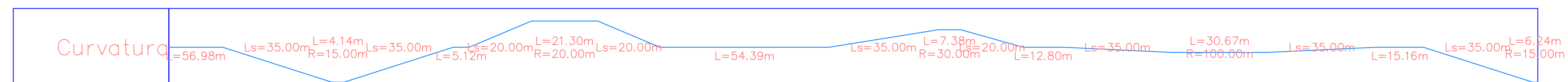
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SHEET 2 OF 5

ALINEACION PROFILE



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240.35	240.352
242.16	242.162
244.20	244.200



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

CONSTRUCTION PROJECT

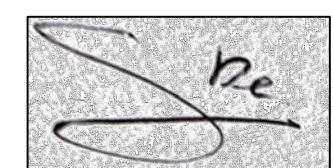
TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE

LONGITUDINAL PROFILE

AUTHOR
SANTOS
DIEGO CRUZ



SCALE

1/1000H 1/100V

DATE

SEPTEMBER 2025

DRAWING 2.2

SHEET 3 OF 5

ALINEACION PROFILE

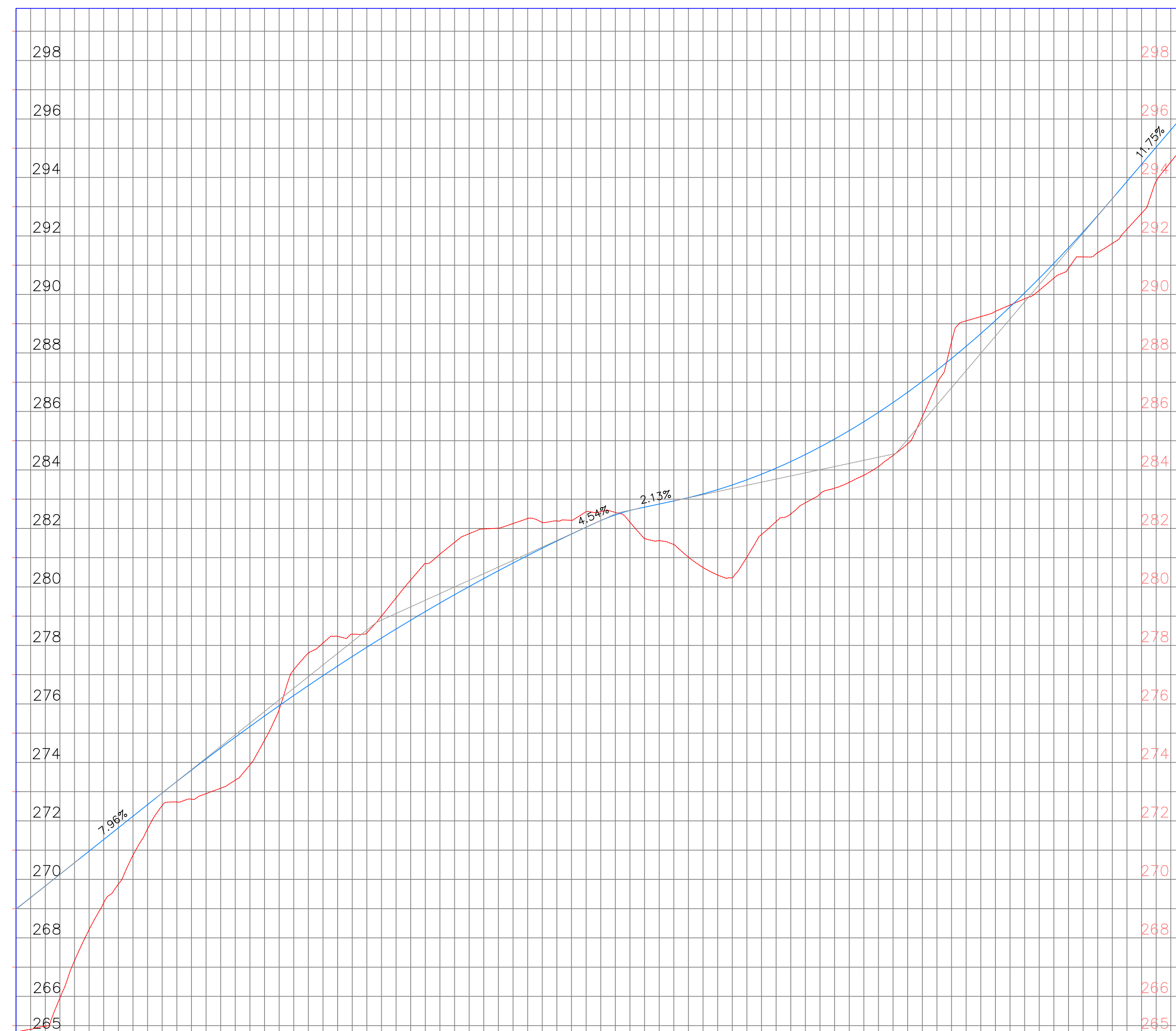


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	244.200	246.158	247.796	249.113	250.109	250.785	251.141	251.279	251.417	251.684	252.127	252.746	253.542	254.513	255.661	256.985	258.433	259.888	261.359	262.848	264.355	265.881	267.425	268.987
	1+240			1+300					1+400					1+500					1+600					1+700

Curvatura	L=6.24m R=5.00m	L=25.00m	L=36.43m	Ls=35.00m	L=52.06m R=50.00m	Ls=35.00m	L=82.13m	Ls=35.00m	L=1.18m R=60.00m	L=77.05m	Ls=35.00m	L=47.55m R=27.00m

Peralte	+244.5	+231.65	+232.36	+236.50	+236.64	+230.94	+237.36	+235.94	+235.94	+235.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94	+230.94
	1+240	1+245	1+250	1+255	1+260	1+265	1+270	1+275	1+280	1+285	1+290	1+295	1+300	1+305	1+310	1+315	1+320	1+325	1+330	1+335	1+340	1+345	1+350	1+355	1+360

ALINEACION PROFILE

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ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

CONSTRUCTION PROJECT

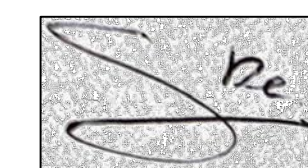
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PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE

LONGITUDINAL PROFILE

AUTHOR
SANTOS
DIEGO CRUZ



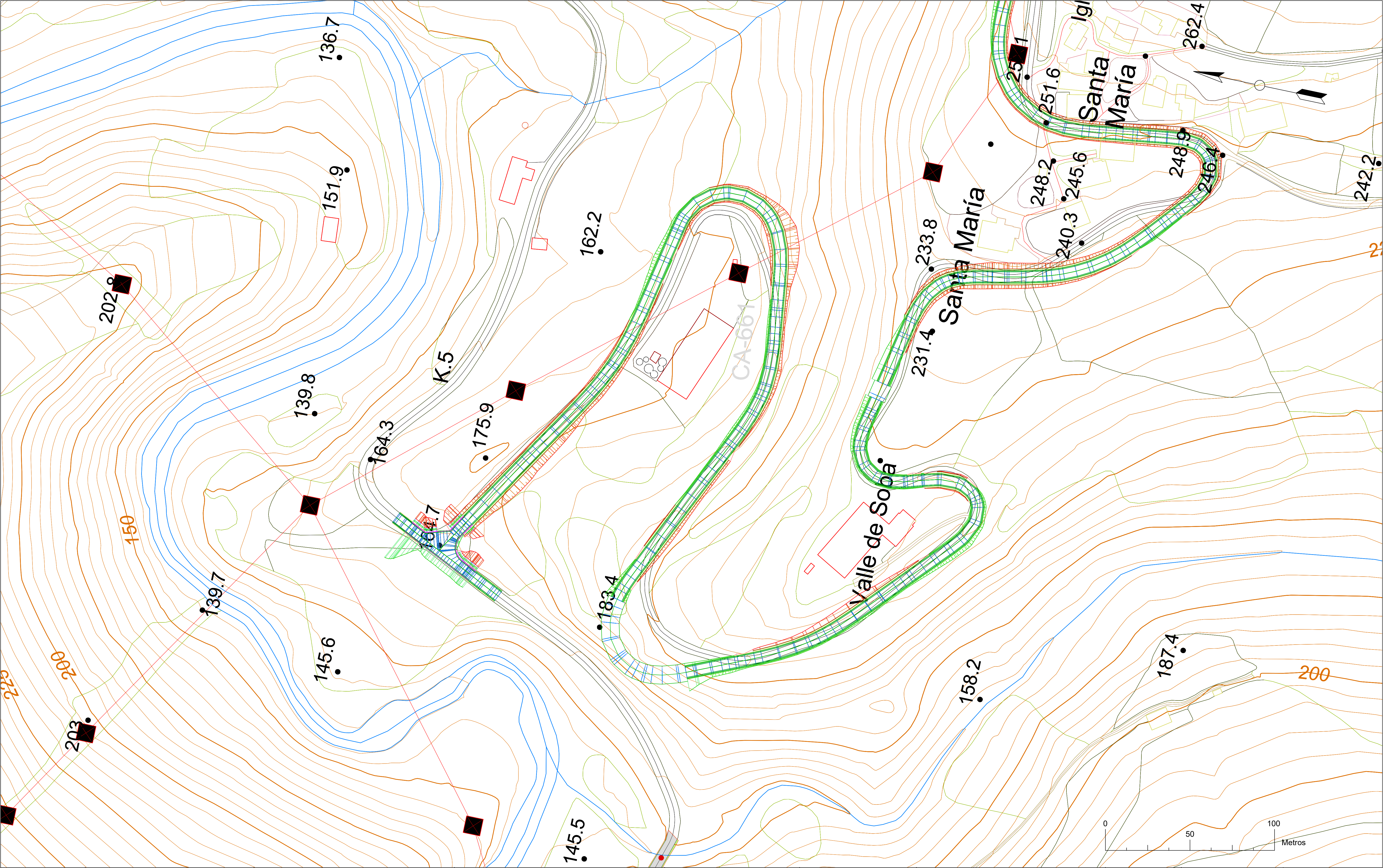
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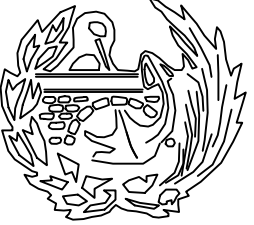
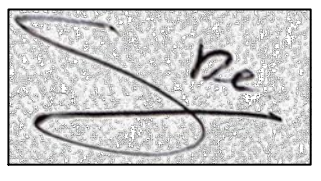
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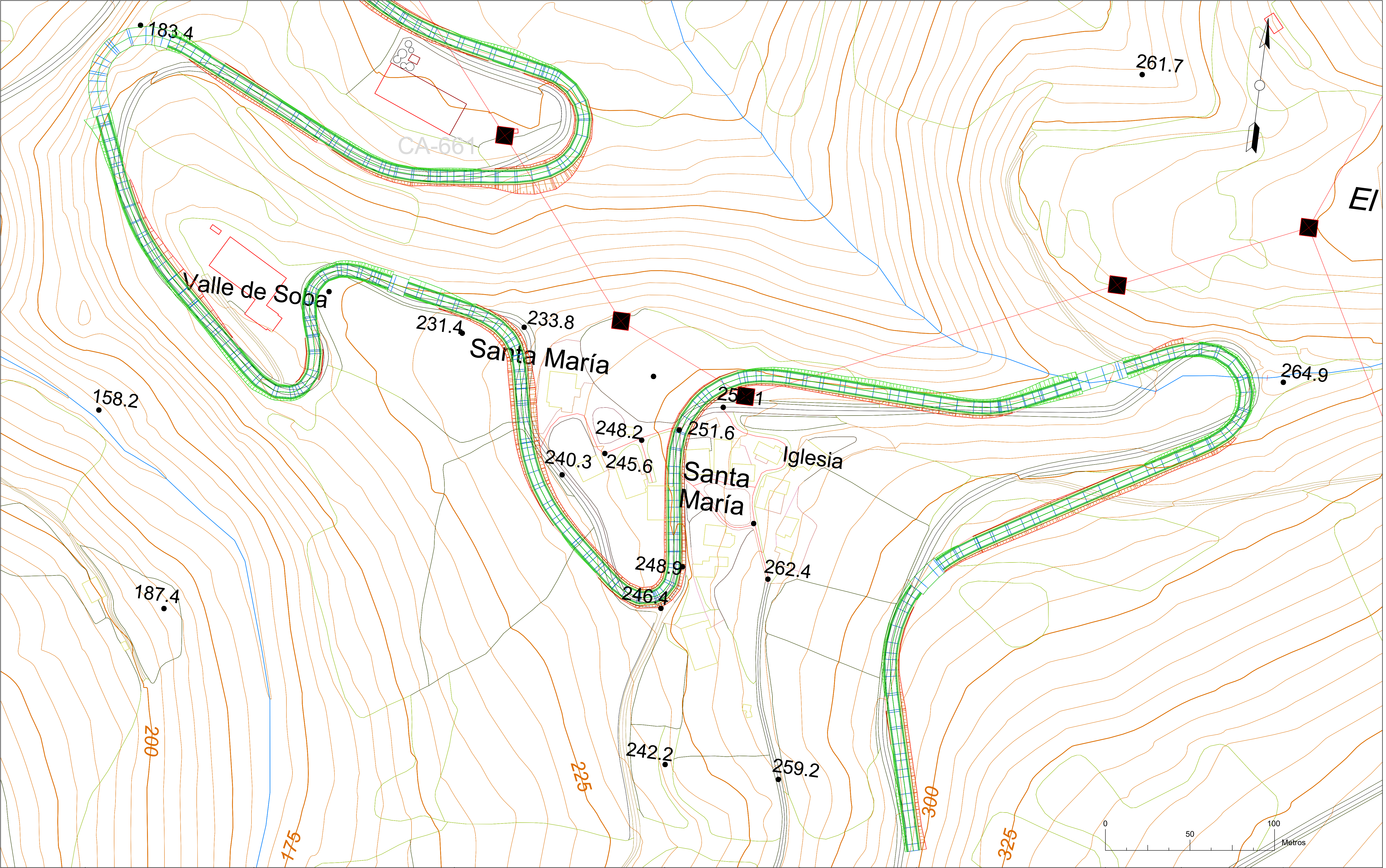
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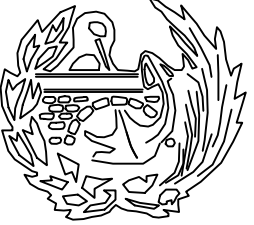
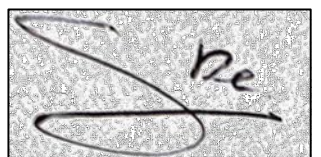
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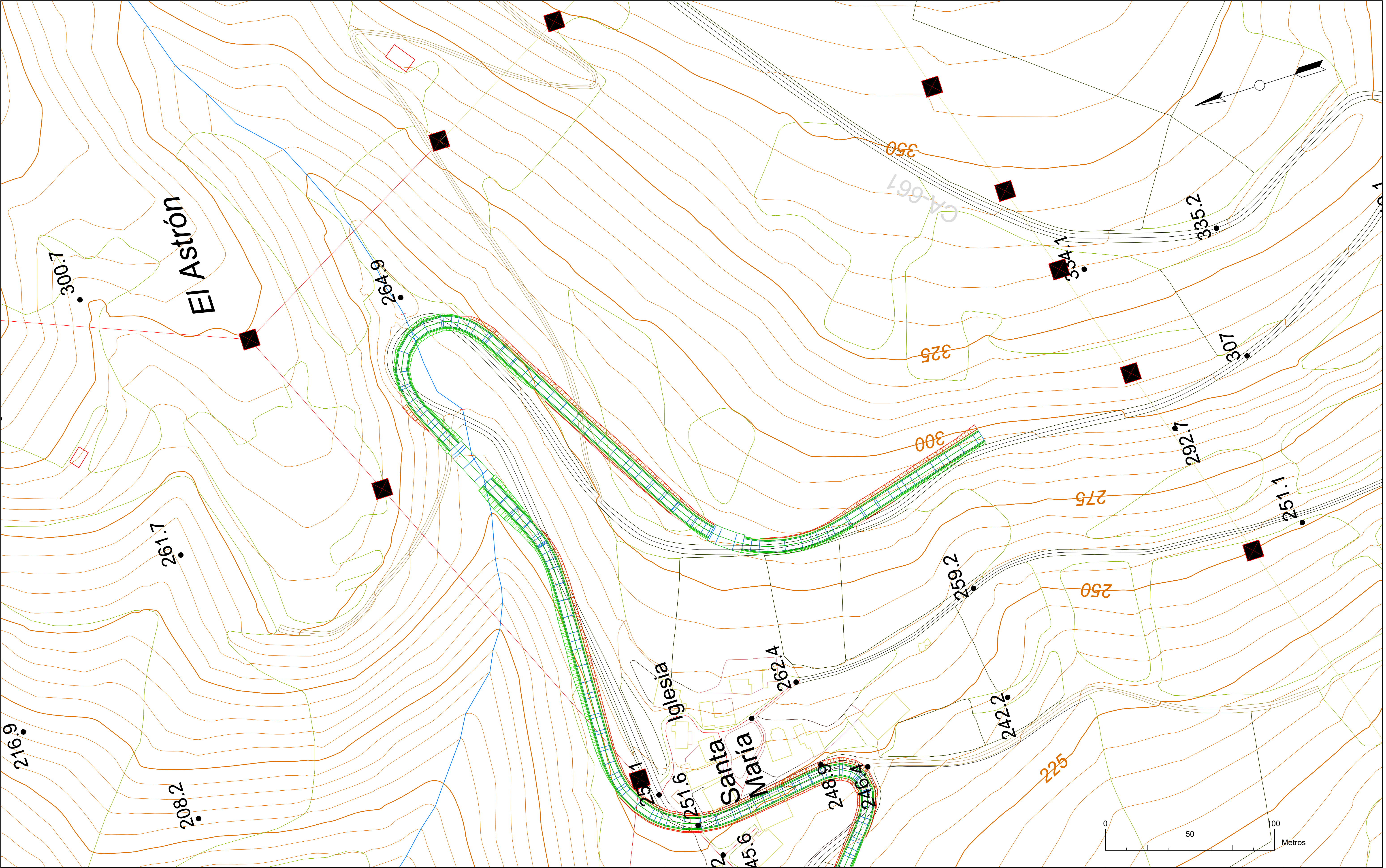
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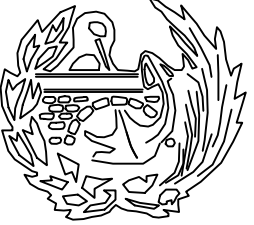
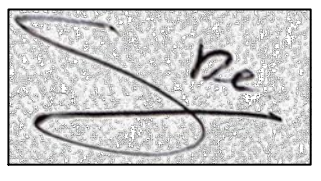


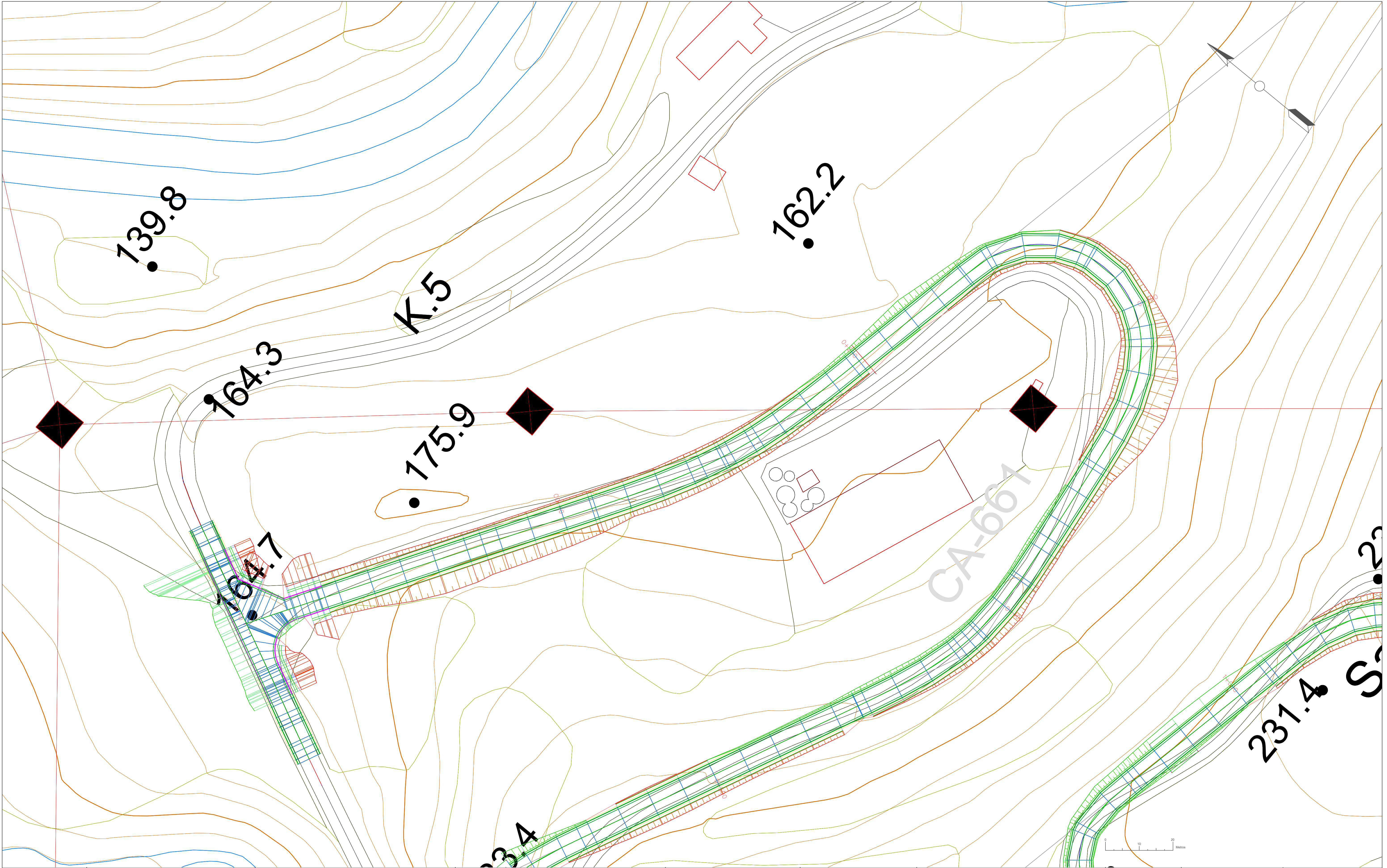
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				REGION CANTABRIA						SHEET 1 OF 3



	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 2.3
				REGION CANTABRIA						SHEET 2 OF 3



	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 2.3
				REGION CANTABRIA						SHEET 3 OF 3



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

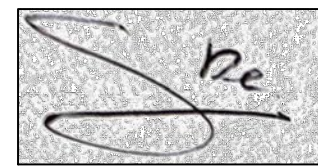
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CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
INTERSECTION PLAN

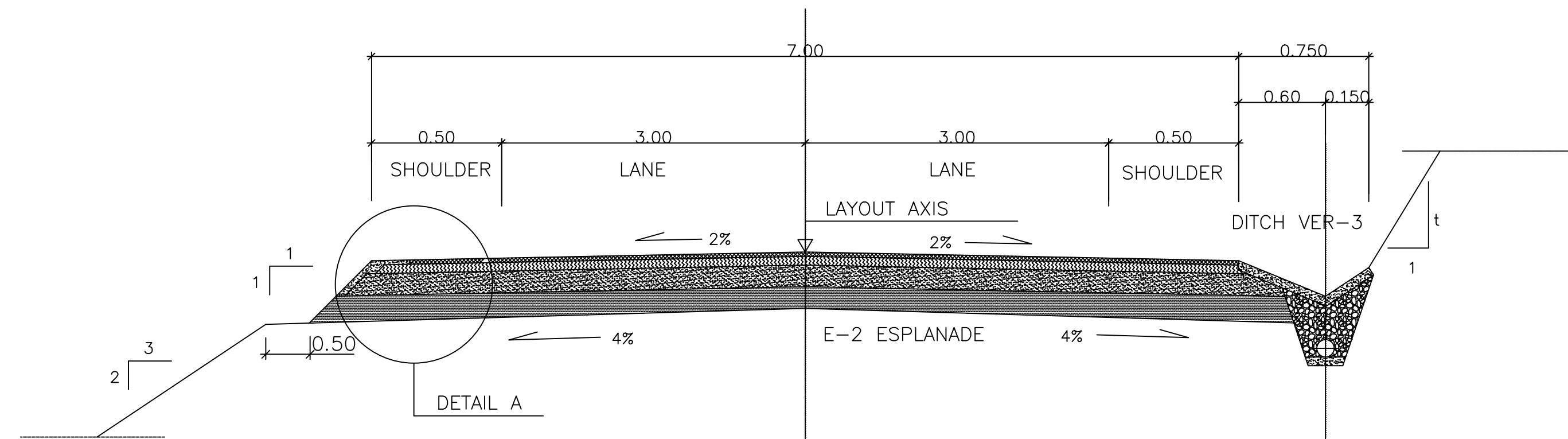
AUTHOR
SANTOS
DIEGO CRUZ



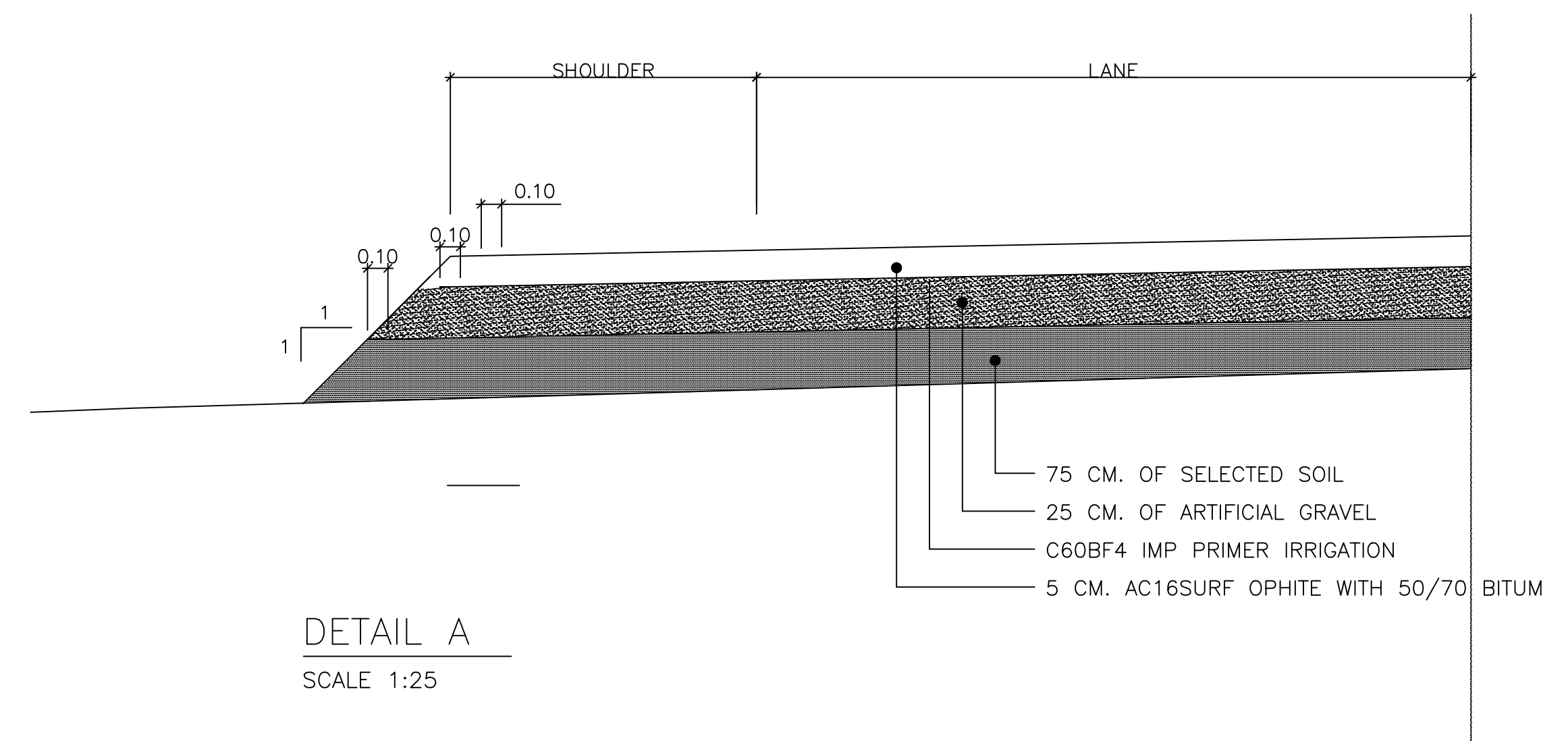
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DATE
SEPTEMBER 2025

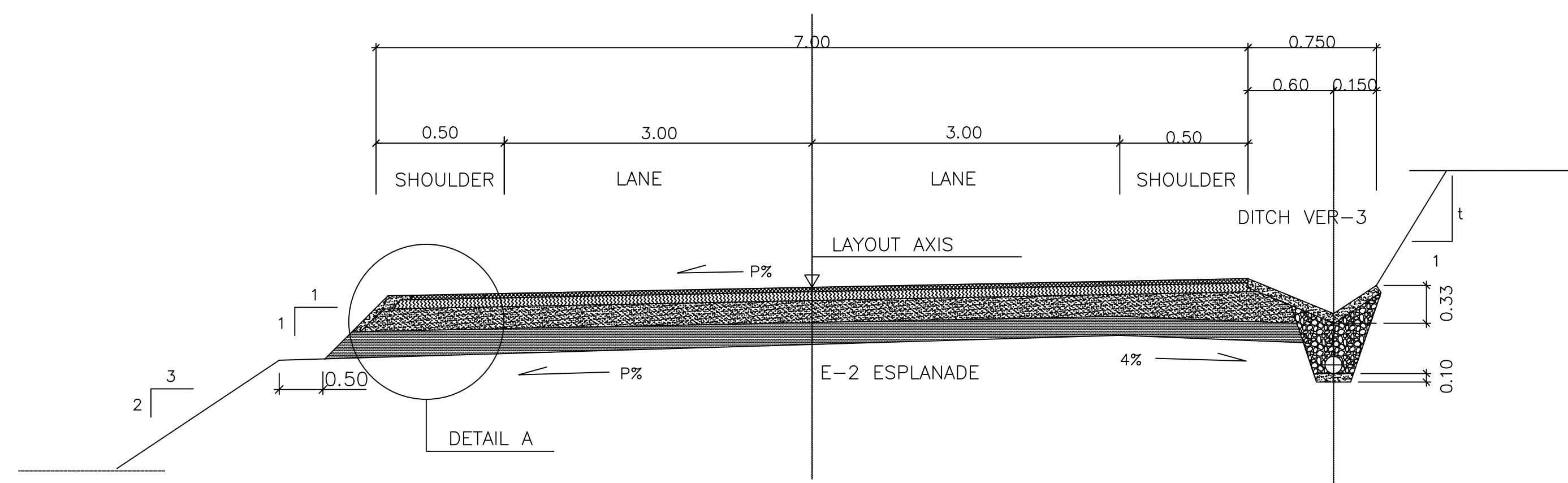
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SHEET 1 OF 1



SECTION TYPE IN STRAIGHT LINE
SCALE 1:50



DETAIL A
SCALE 1:25



SECTION TYPE IN CURVE
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ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

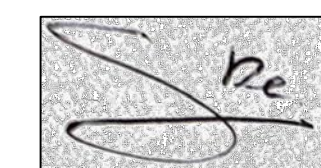
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CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

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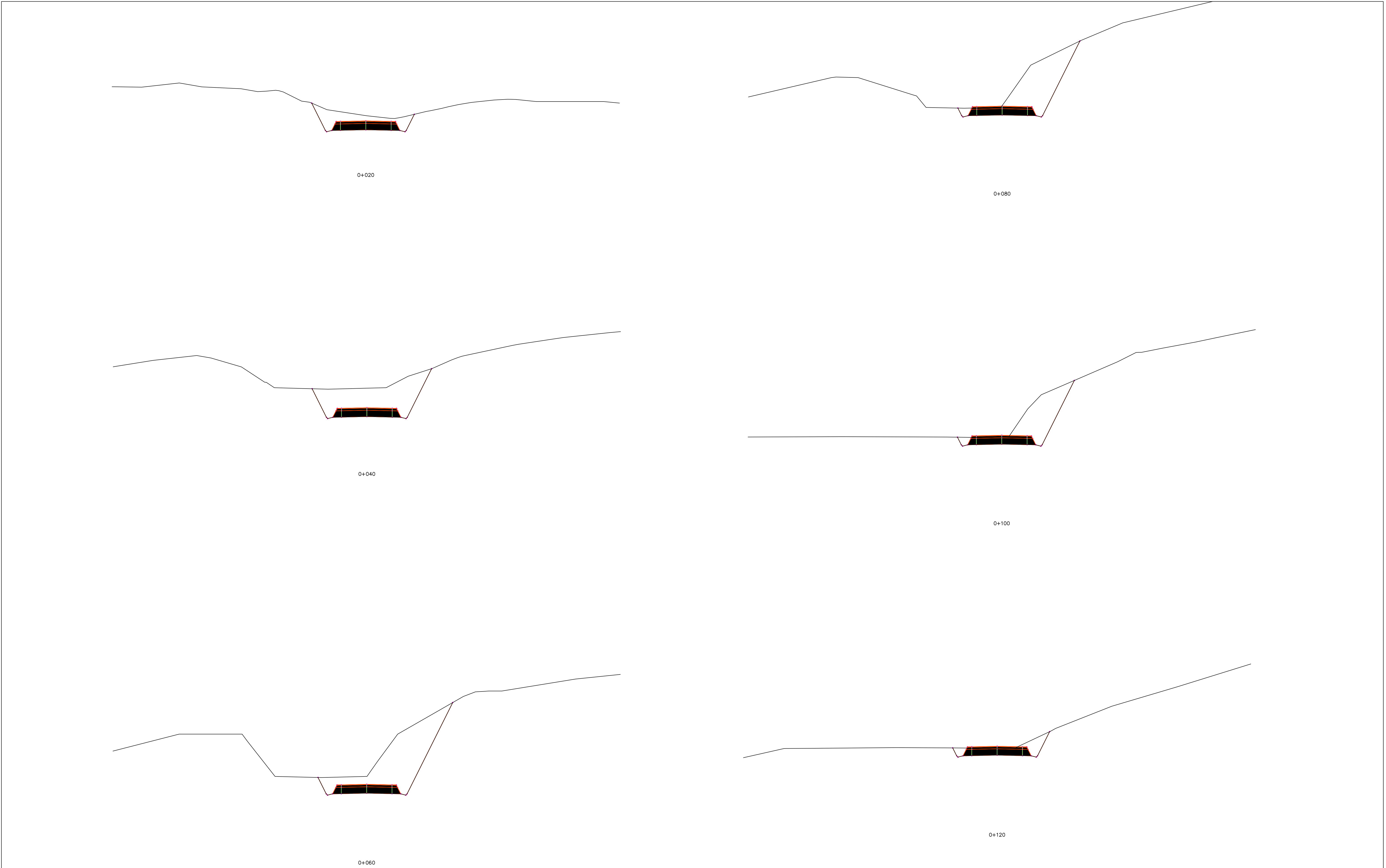
AUTHOR
SANTOS
DIEGO CRUZ



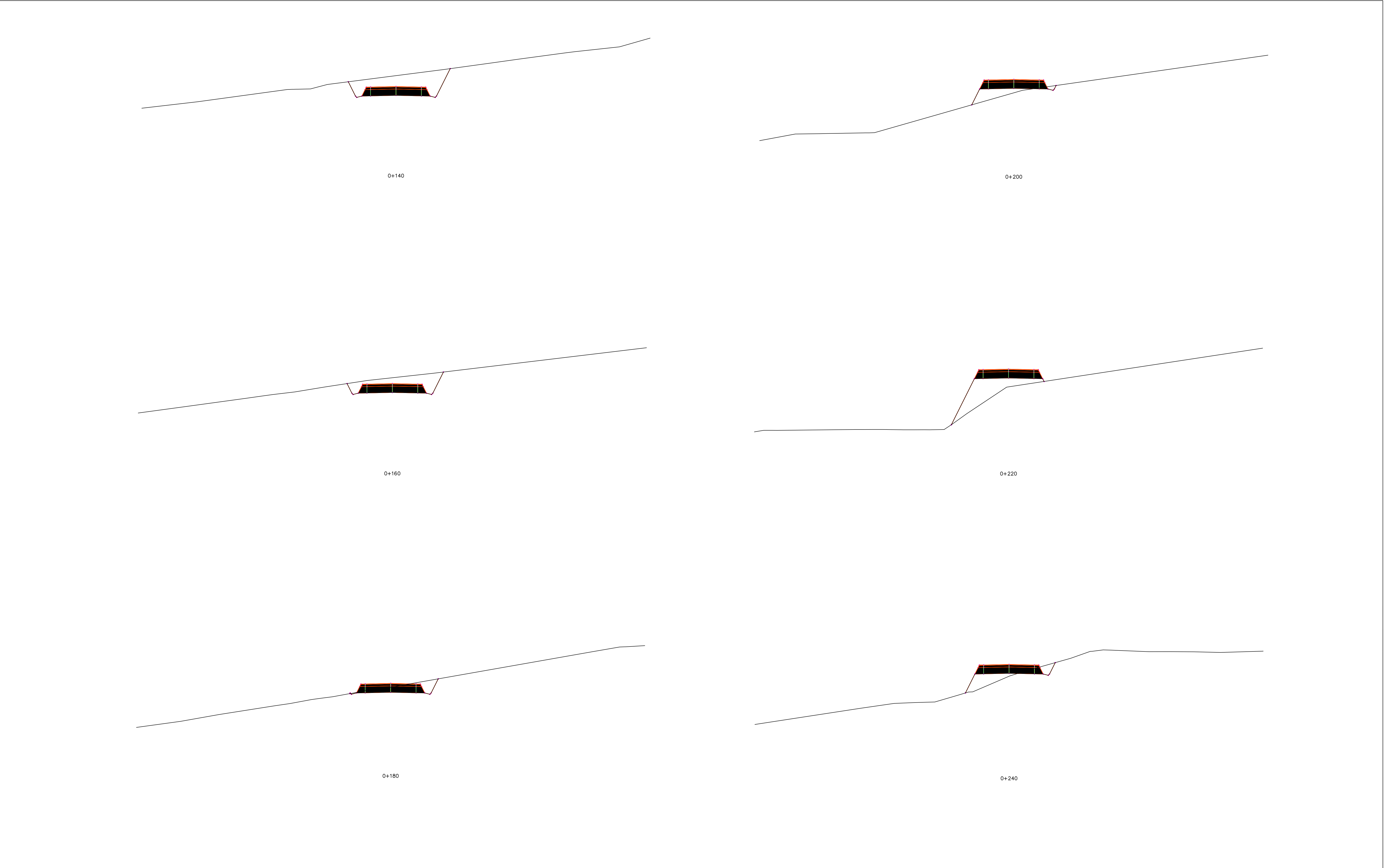
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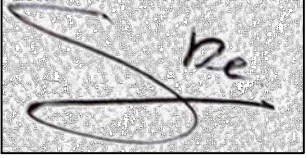
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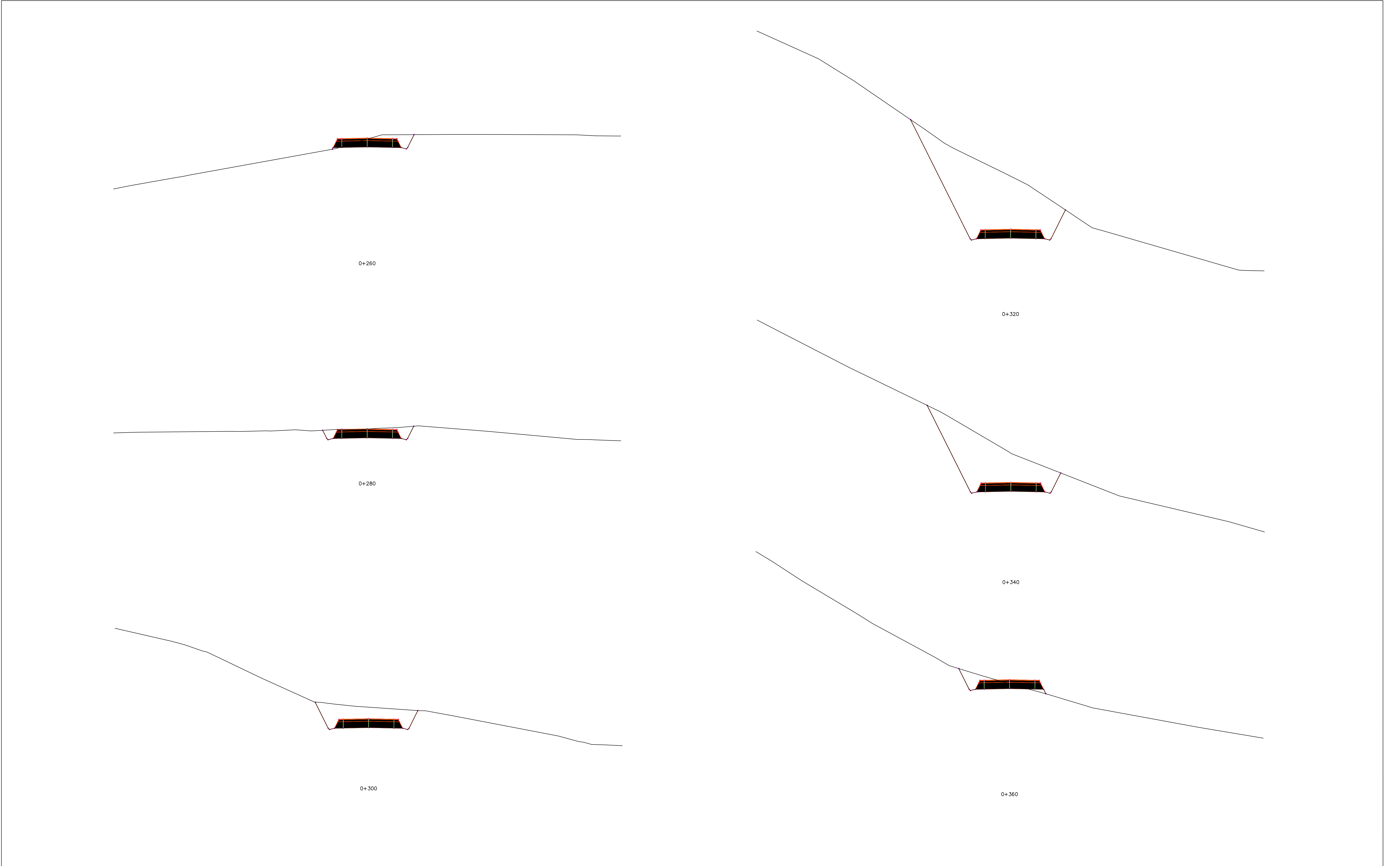
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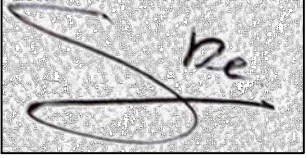


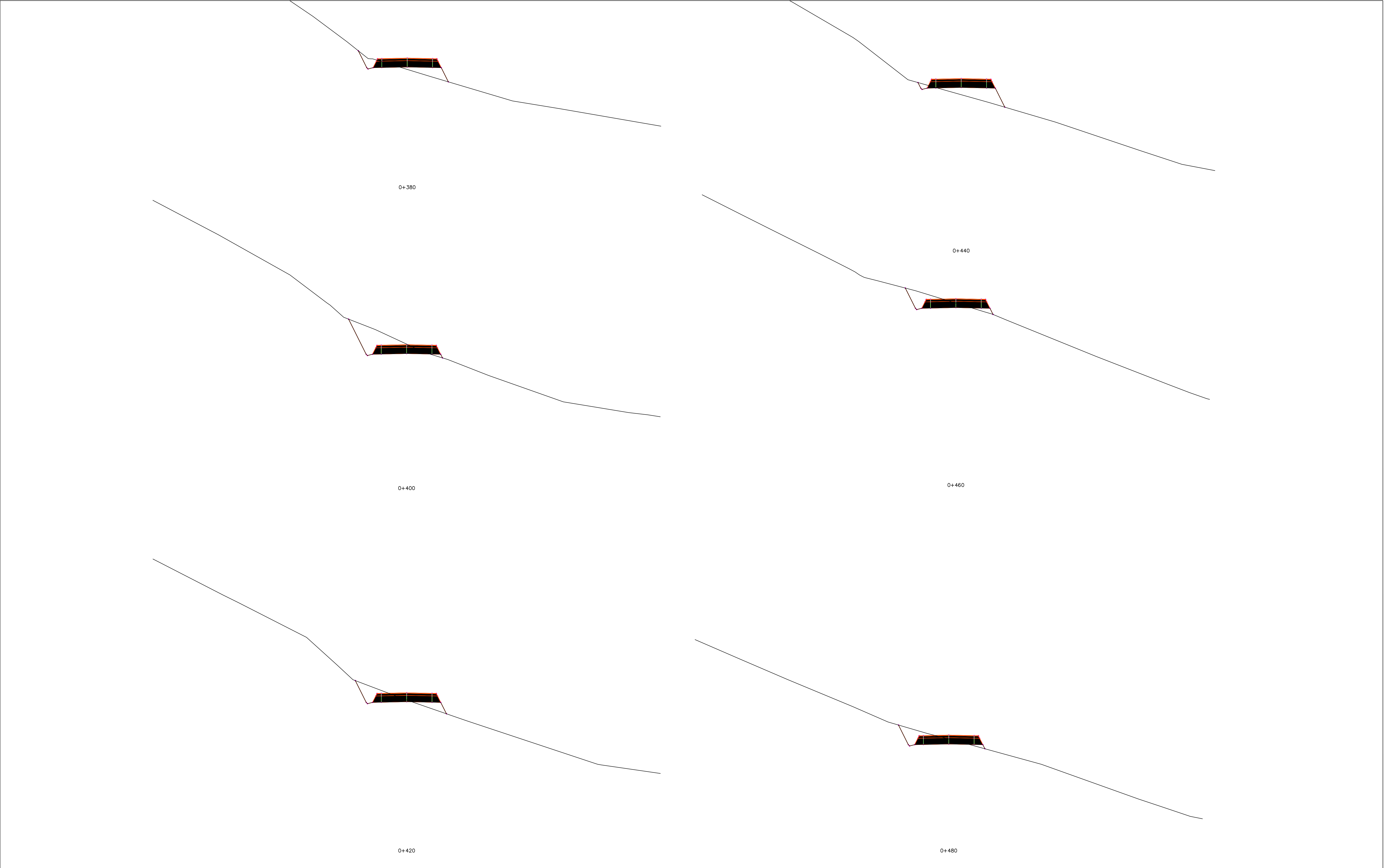
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				REGION CANTABRIA						SHEET 1 OF 18

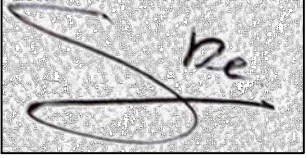


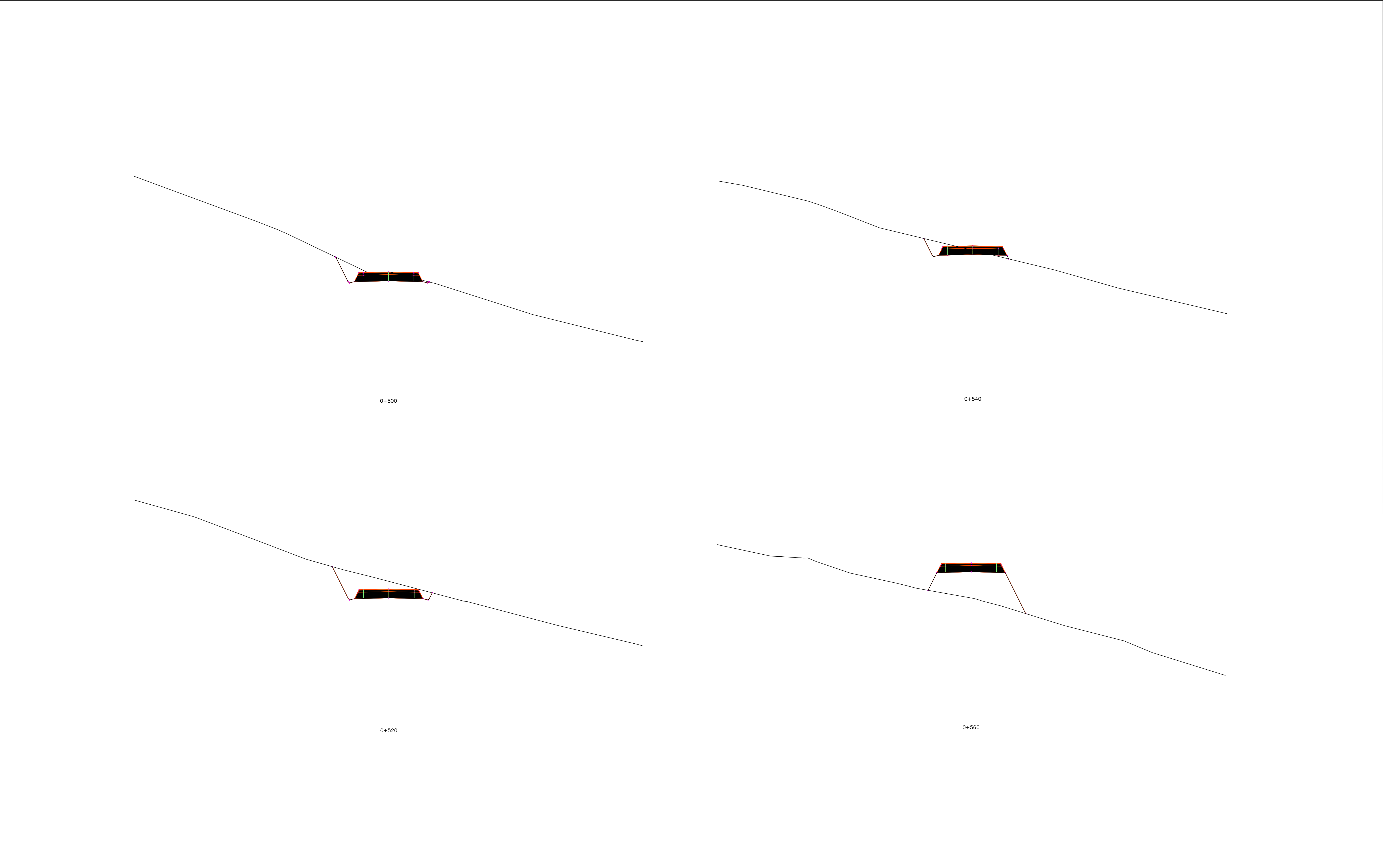
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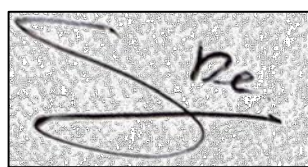


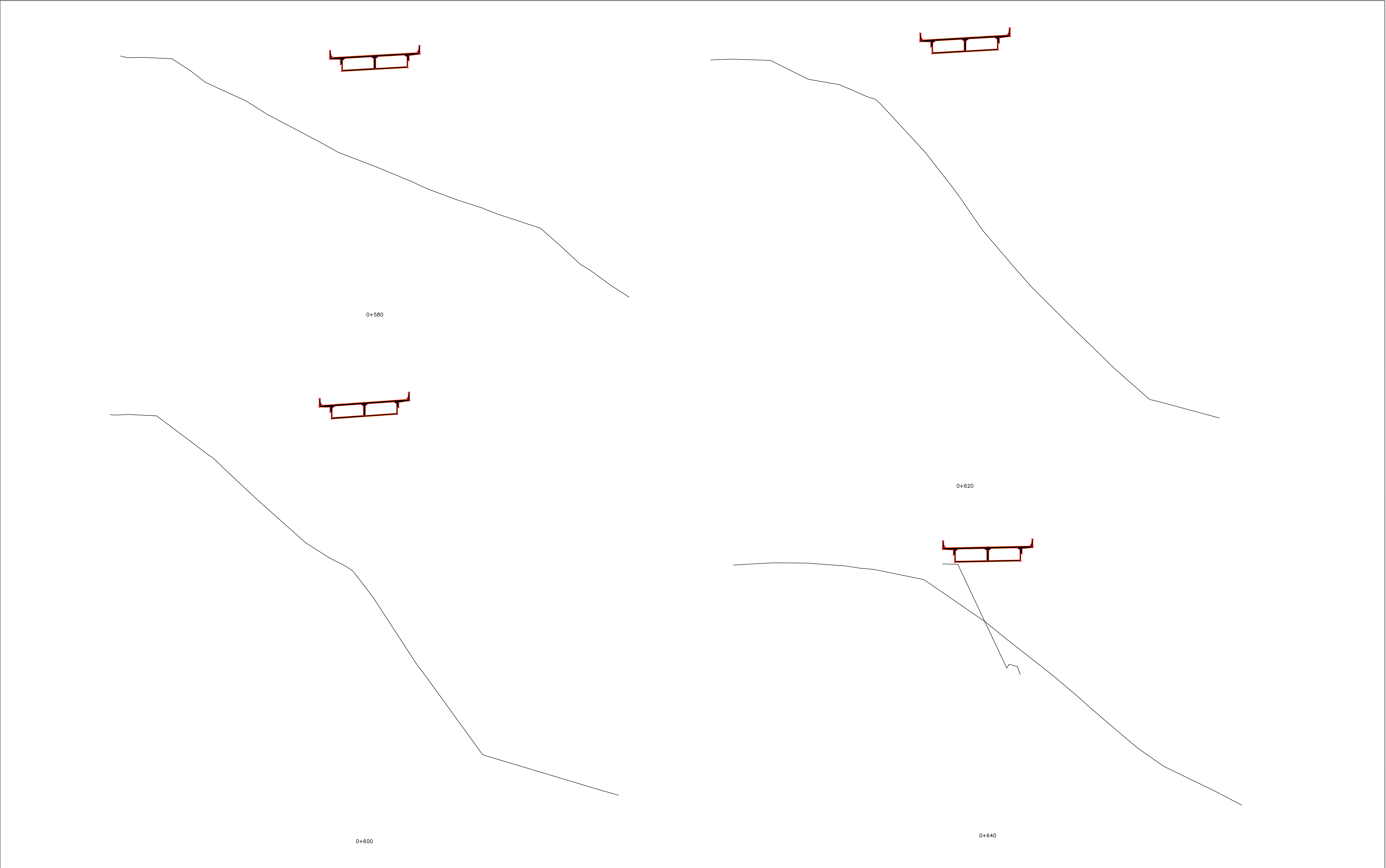
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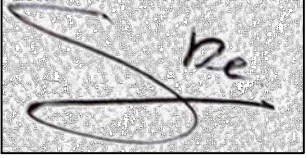


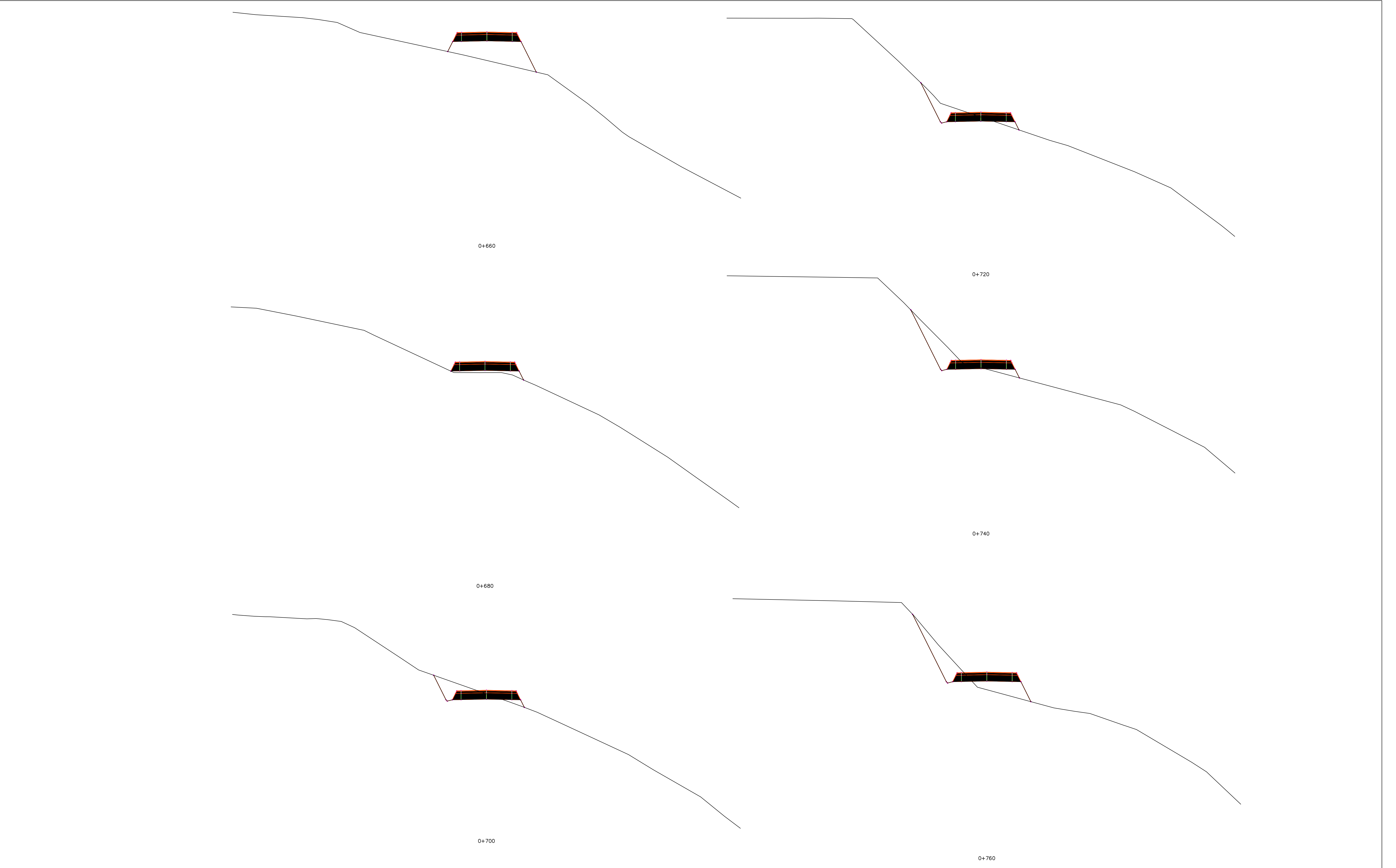
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				REGION CANTABRIA						SHEET 4 OF 18



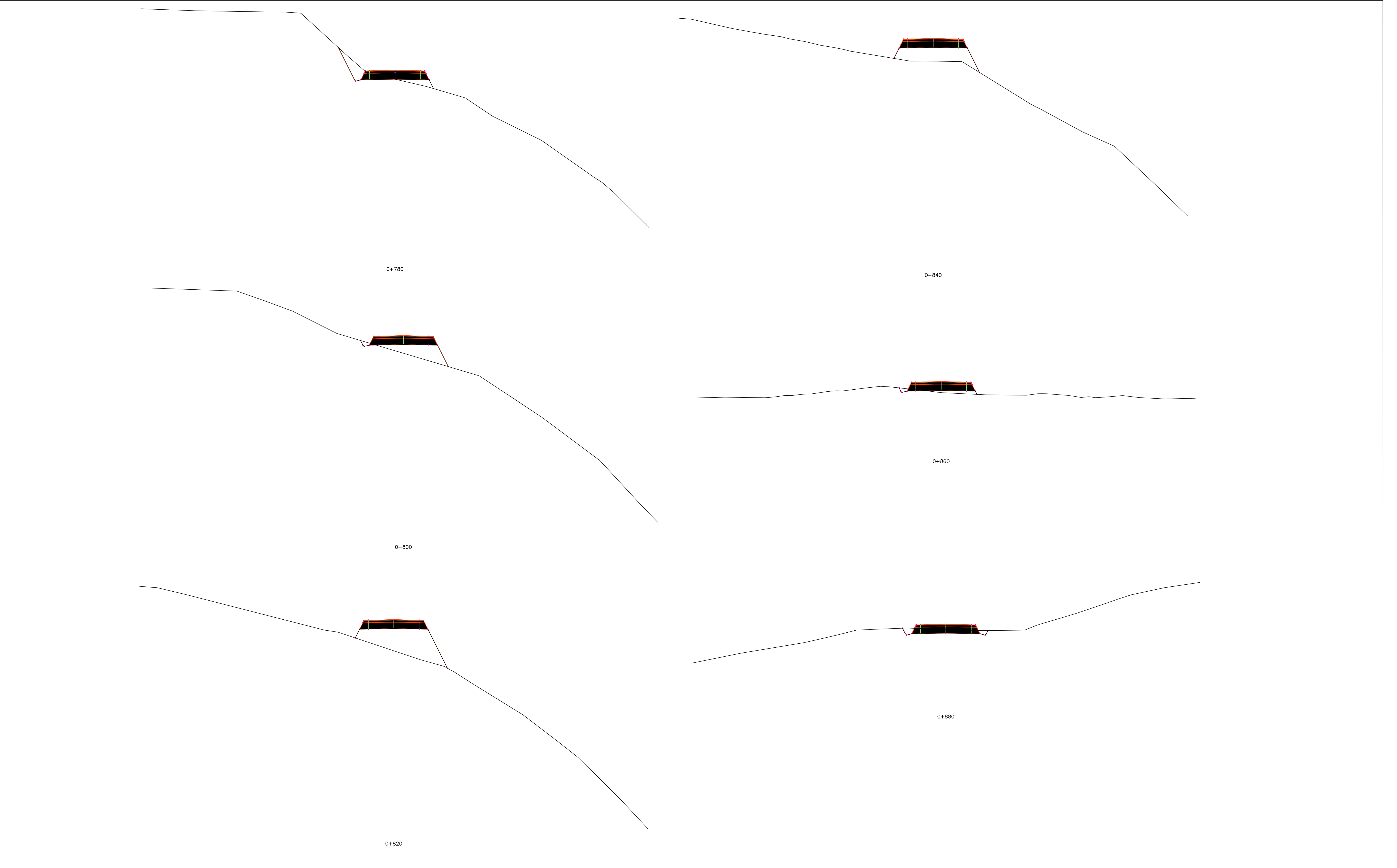
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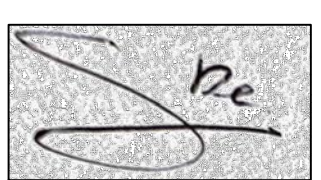


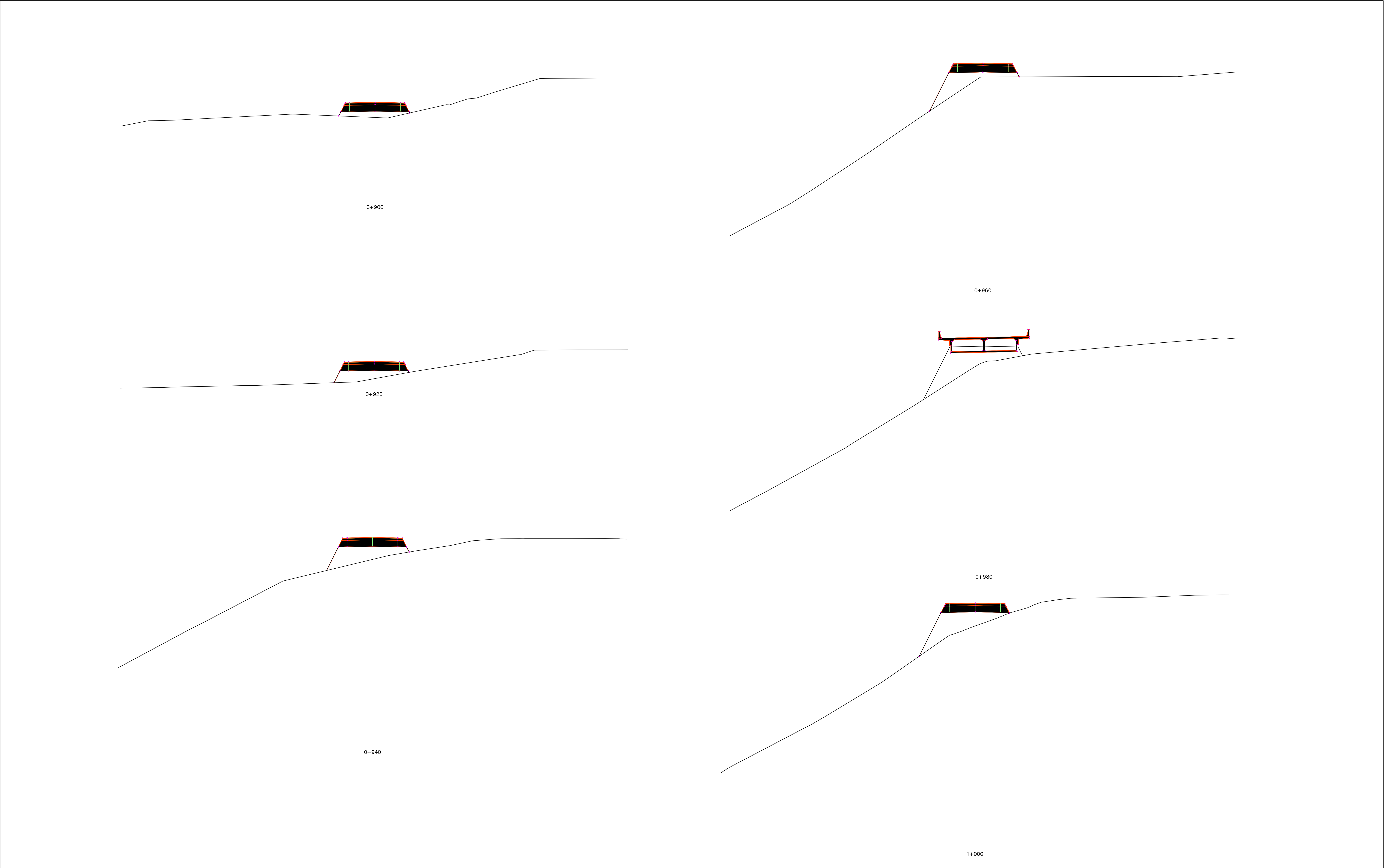
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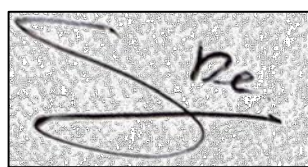


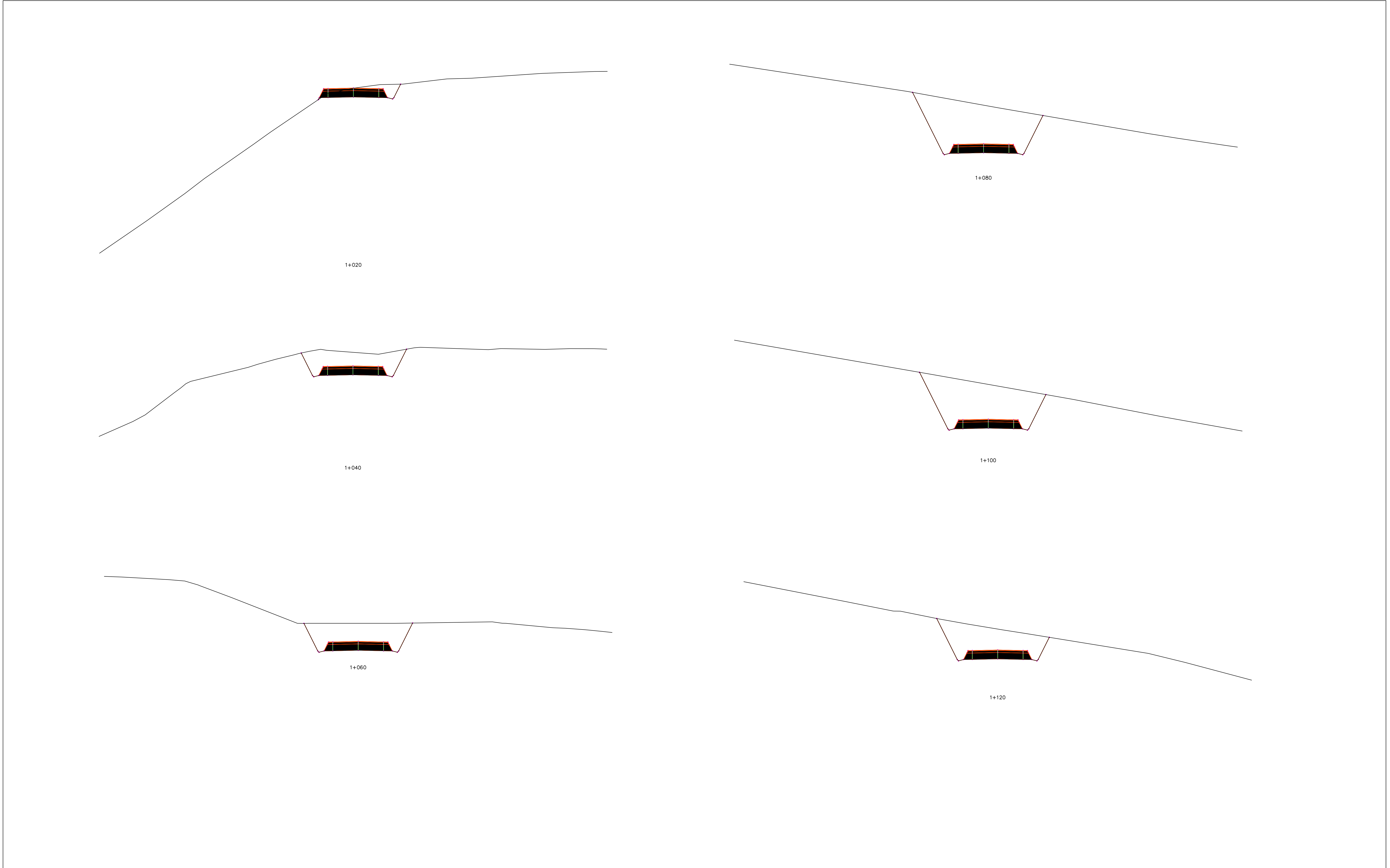
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	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE TRANSVERSAL PROFILE	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/200	DATE SEPTEMBER 2025	DRAWING 3.2
				REGION CANTABRIA						SHEET 8 OF 18



	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE TRANSVERSAL PROFILE	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/200	DATE SEPTEMBER 2025	DRAWING 3.2
				REGION CANTABRIA						SHEET 9 OF 18



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

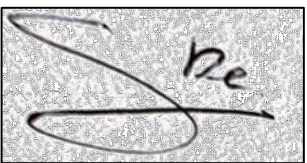
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TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
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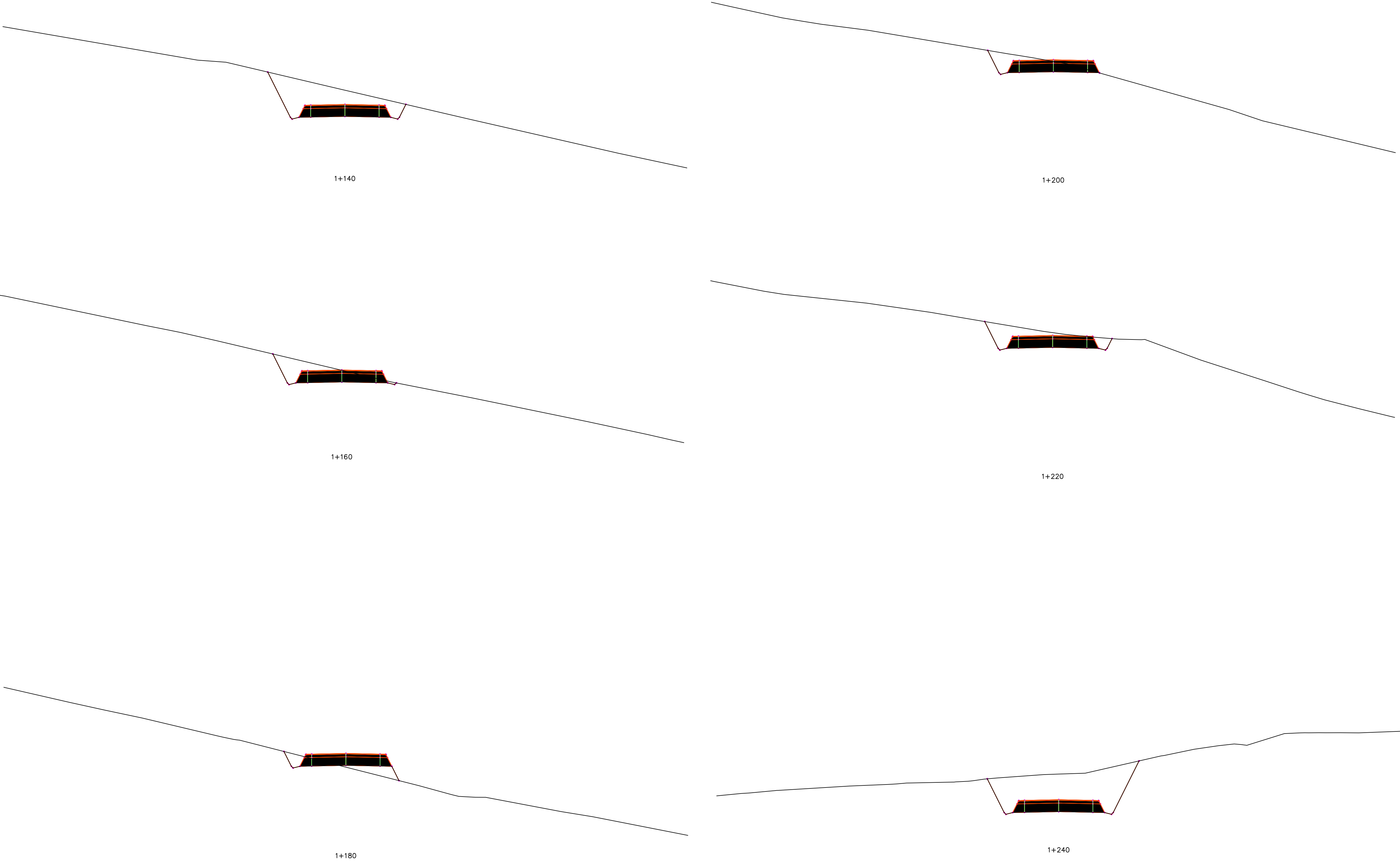
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SANTOS
DIEGO CRUZ

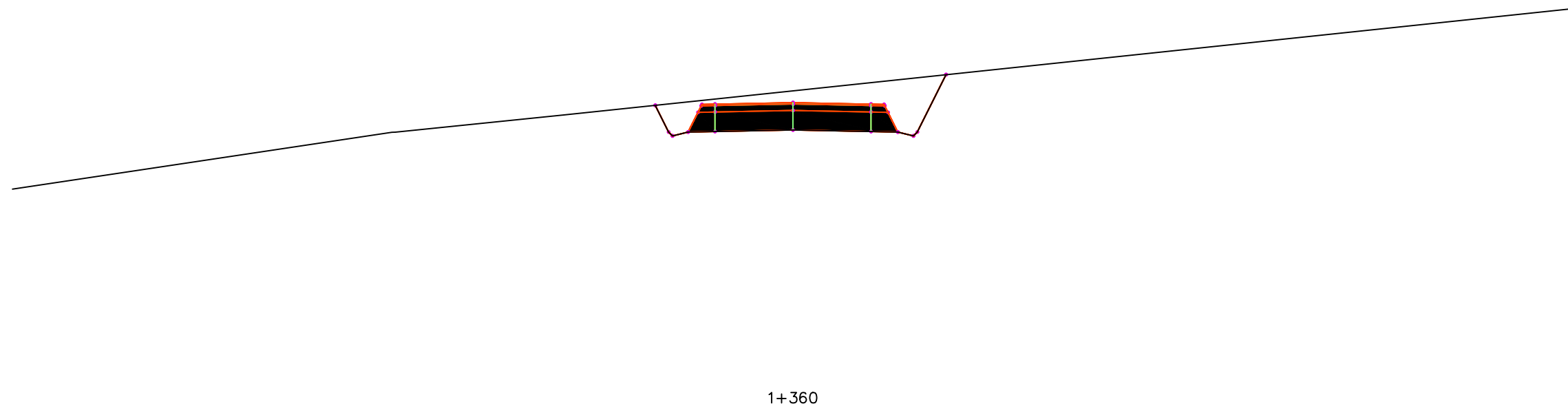
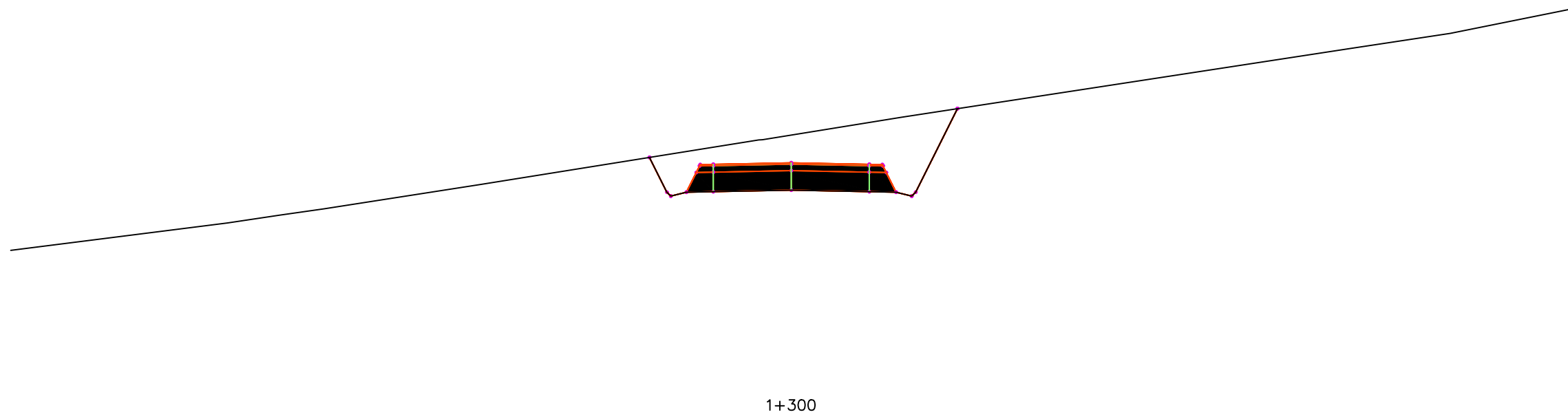
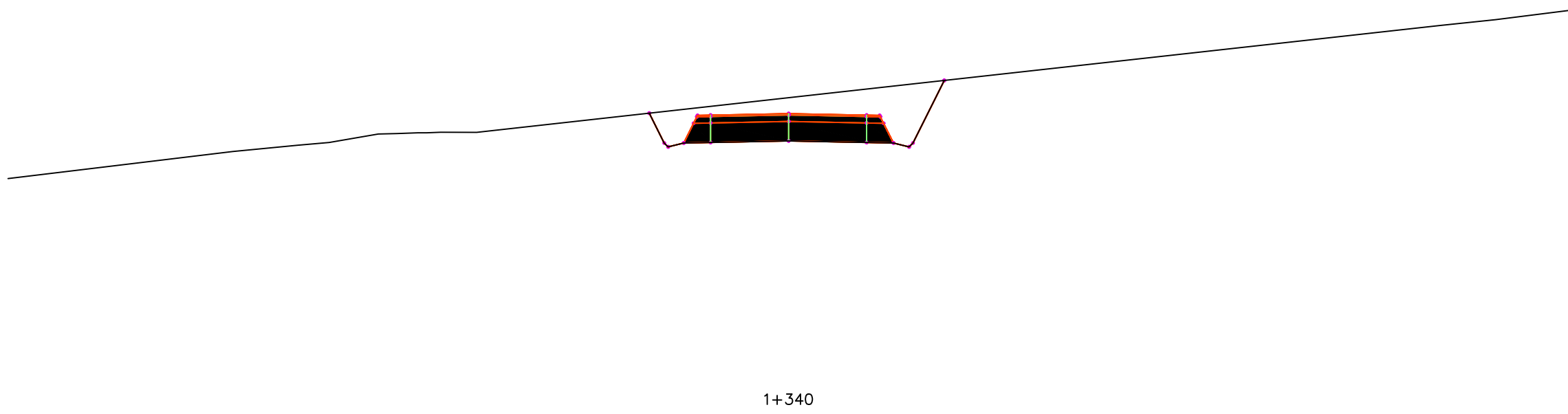
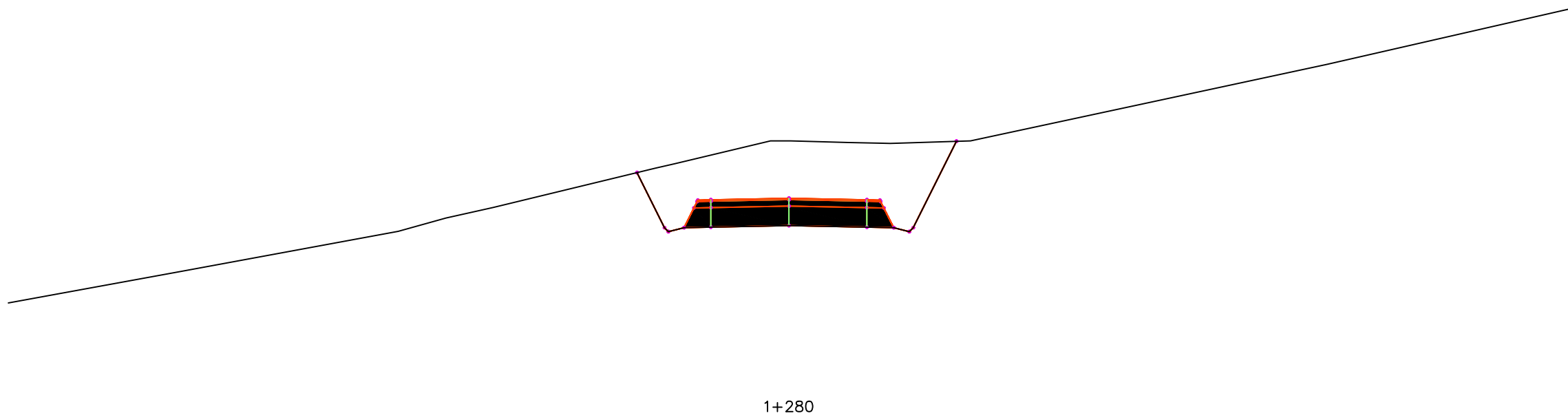
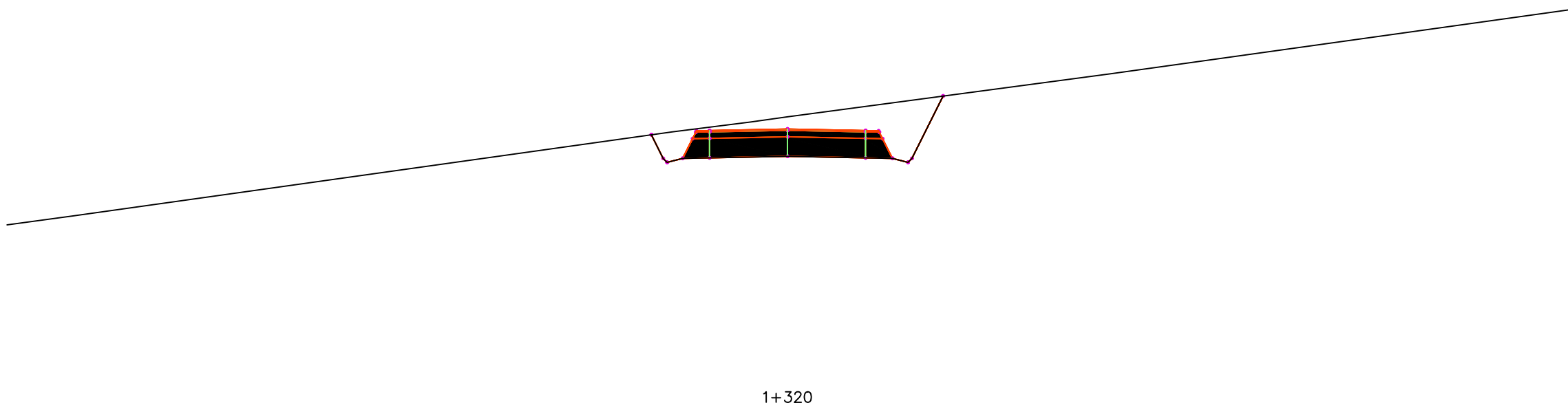
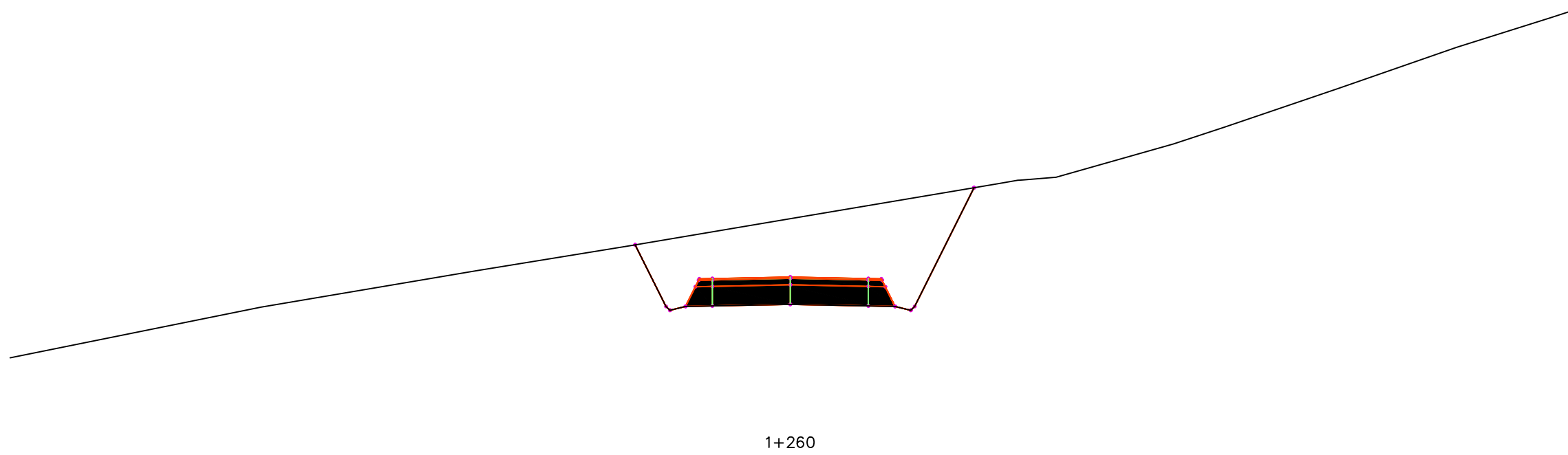


SCALE
1/200

DATE
SEPTEMBER 2025

DRAWING 3.2
SHEET 10 OF 18





ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

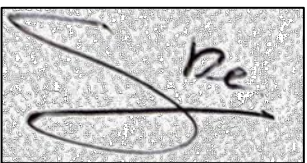
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TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
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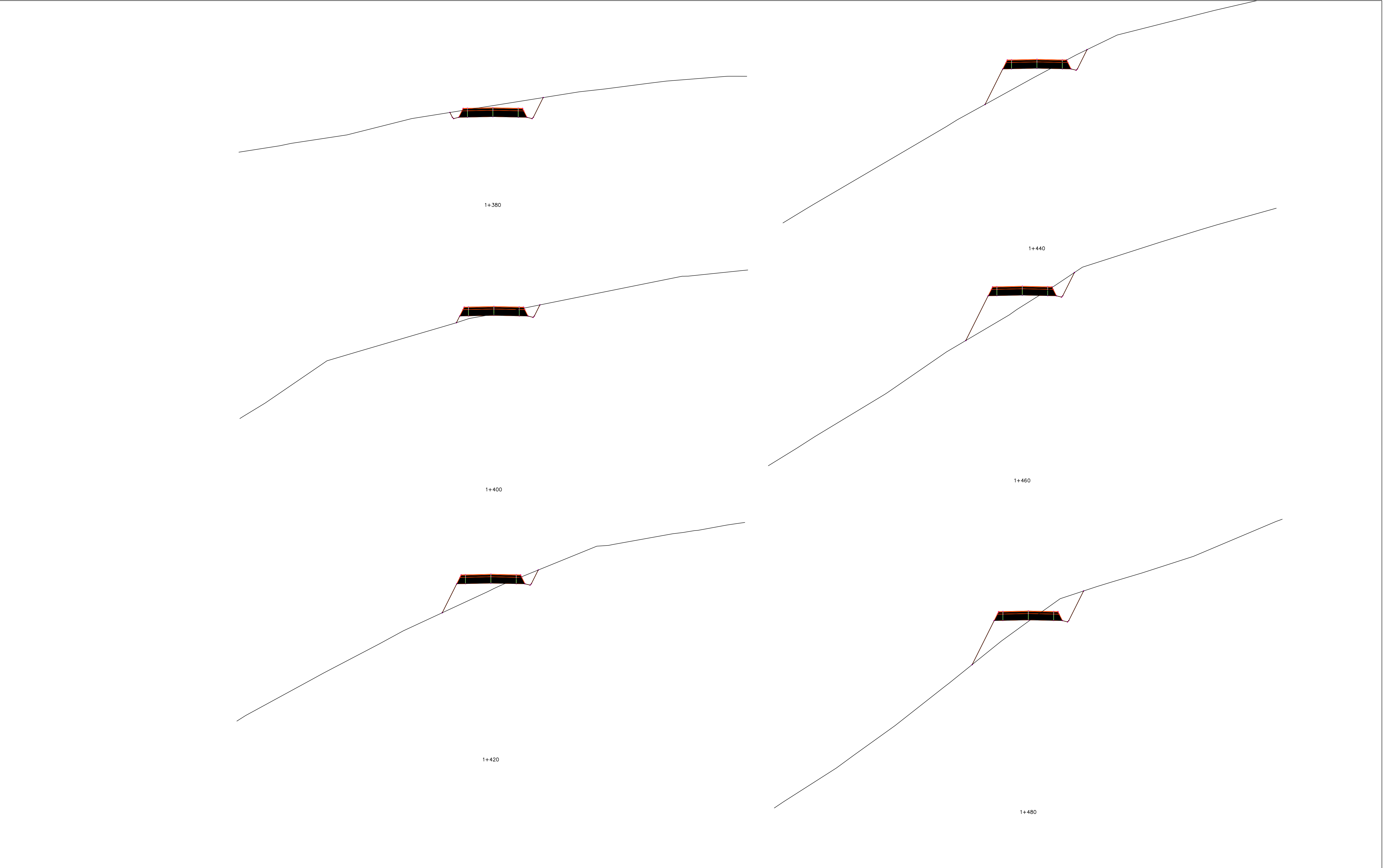
AUTHOR
SANTOS
DIEGO CRUZ

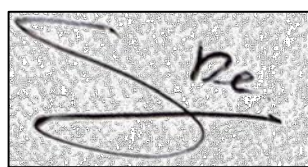


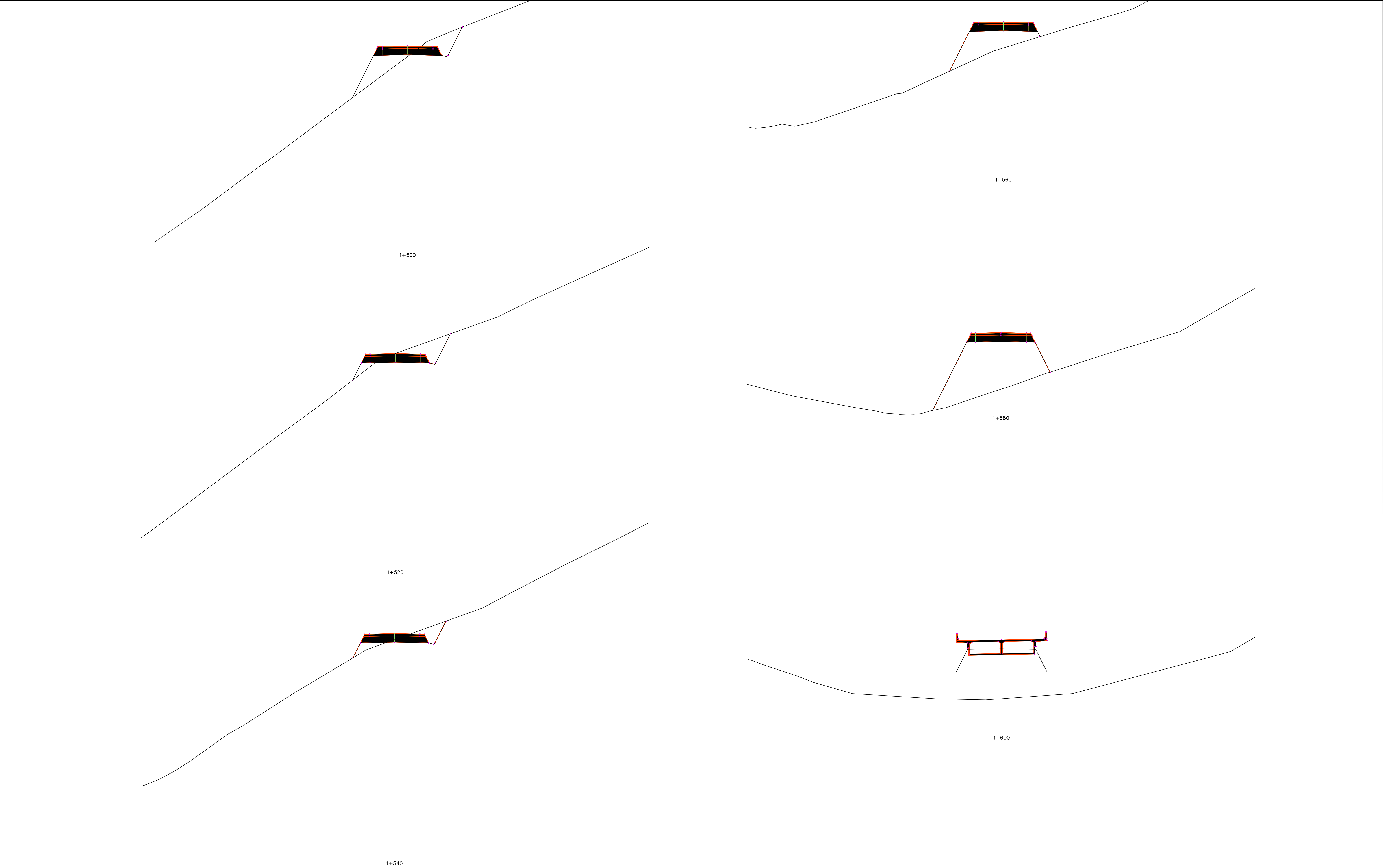
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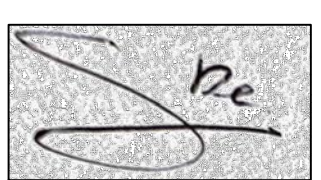
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SEPTEMBER 2025

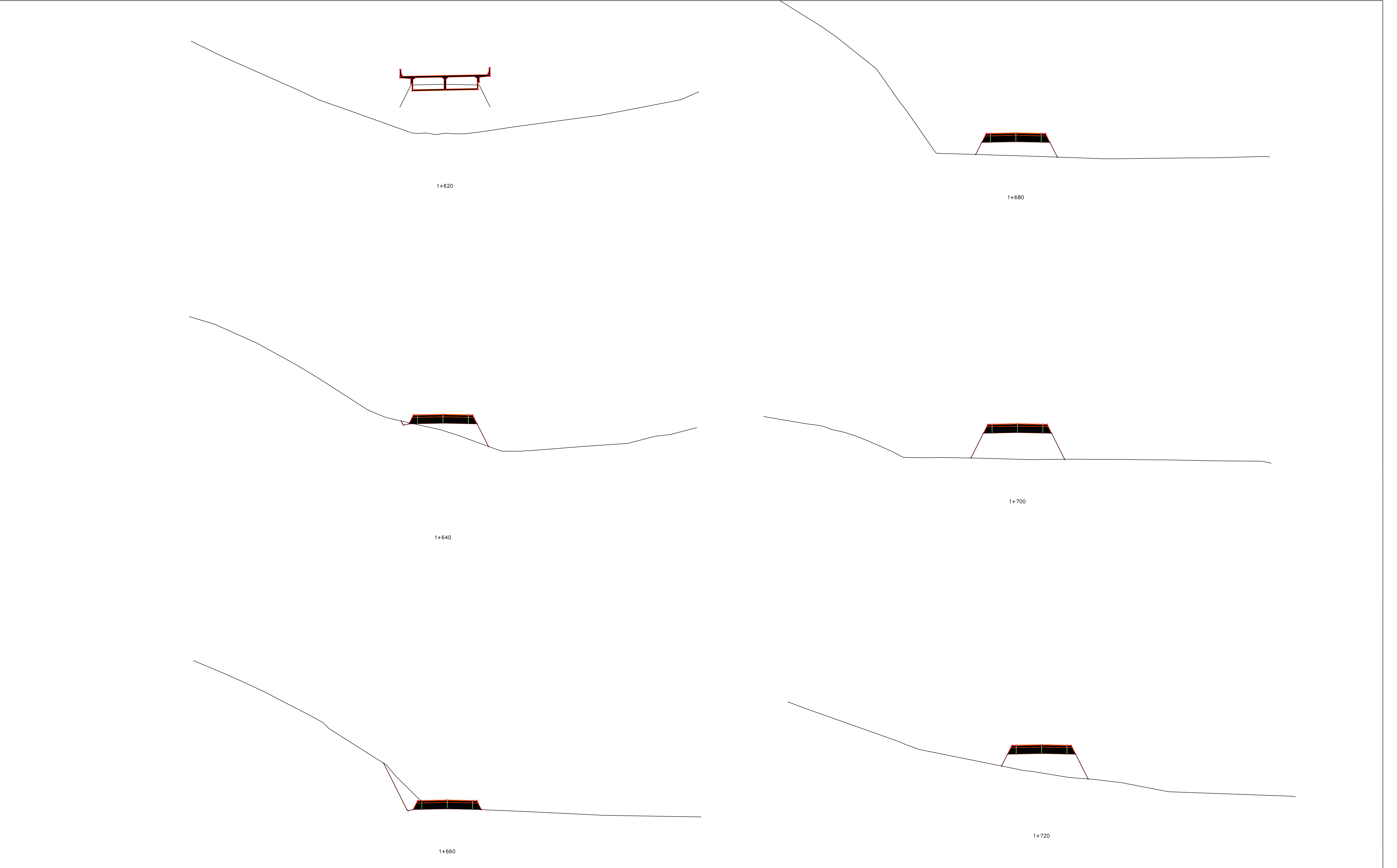
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SHEET 12 OF 18

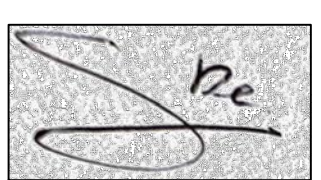


	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE TRANSVERSAL PROFILE	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/200	DATE SEPTEMBER 2025	DRAWING 3.2
				REGION CANTABRIA						SHEET 13 OF 18



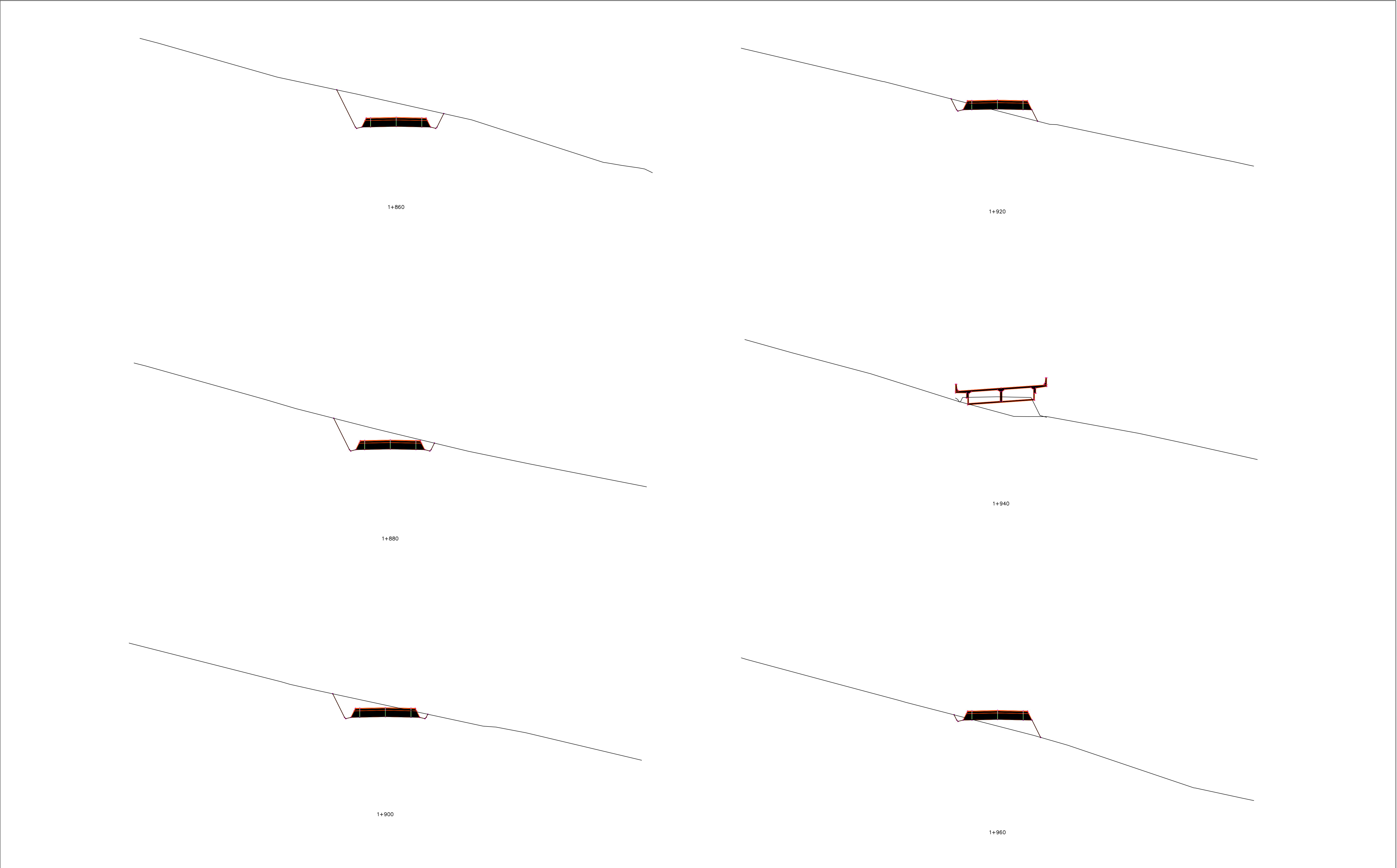
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				REGION CANTABRIA						SHEET 14 OF 18

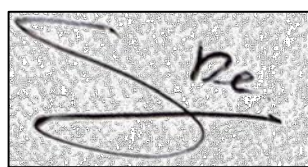


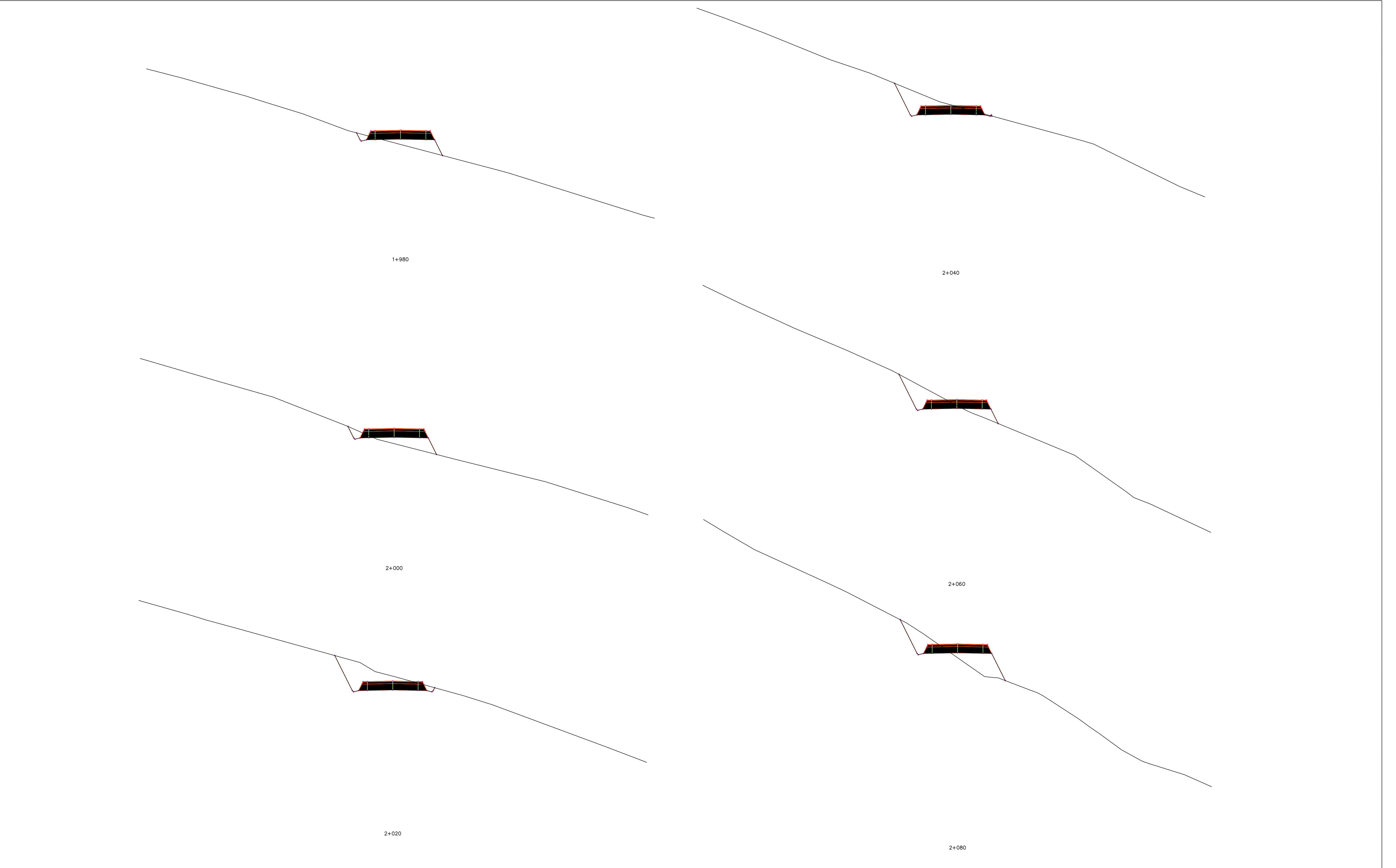
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				REGION CANTABRIA						SHEET 15 OF 18



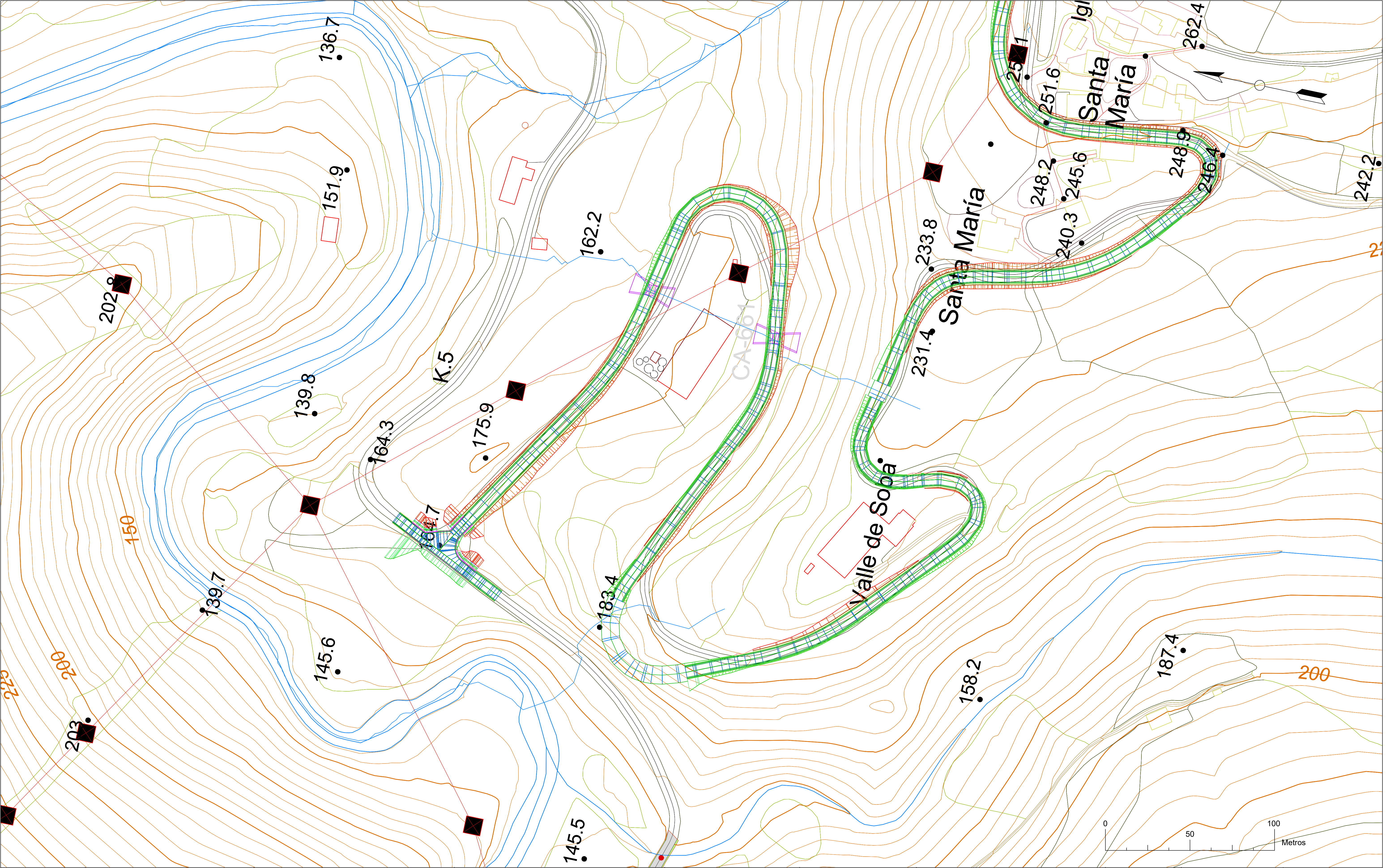
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				REGION CANTABRIA						SHEET 16 OF 18

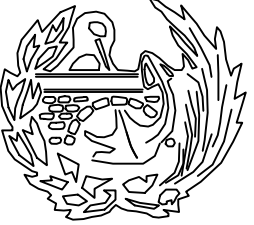
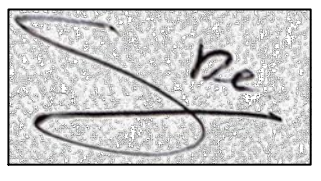


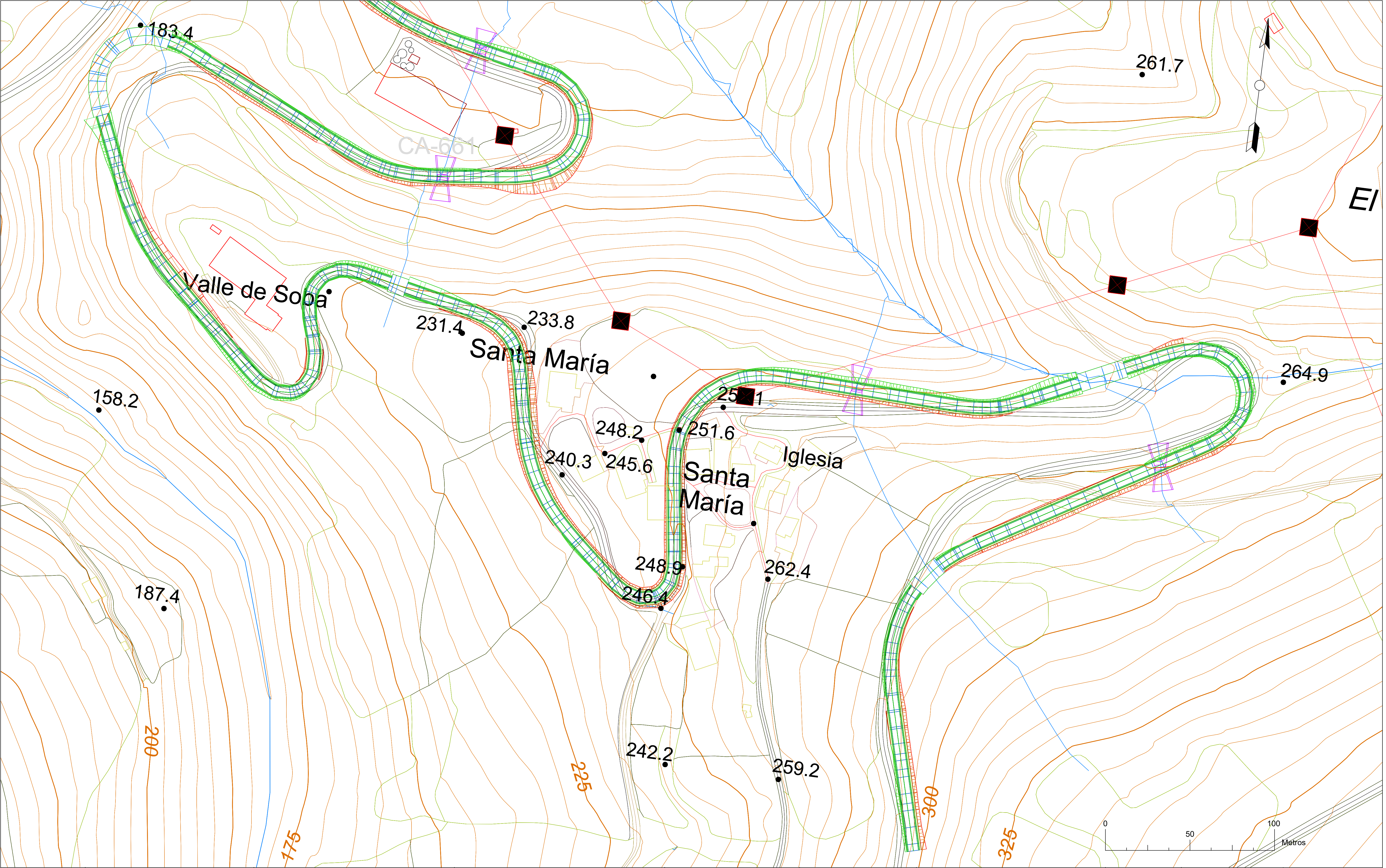
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				REGION CANTABRIA						SHEET 17 OF 18

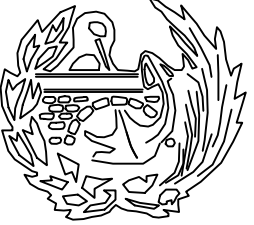
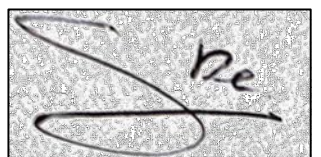


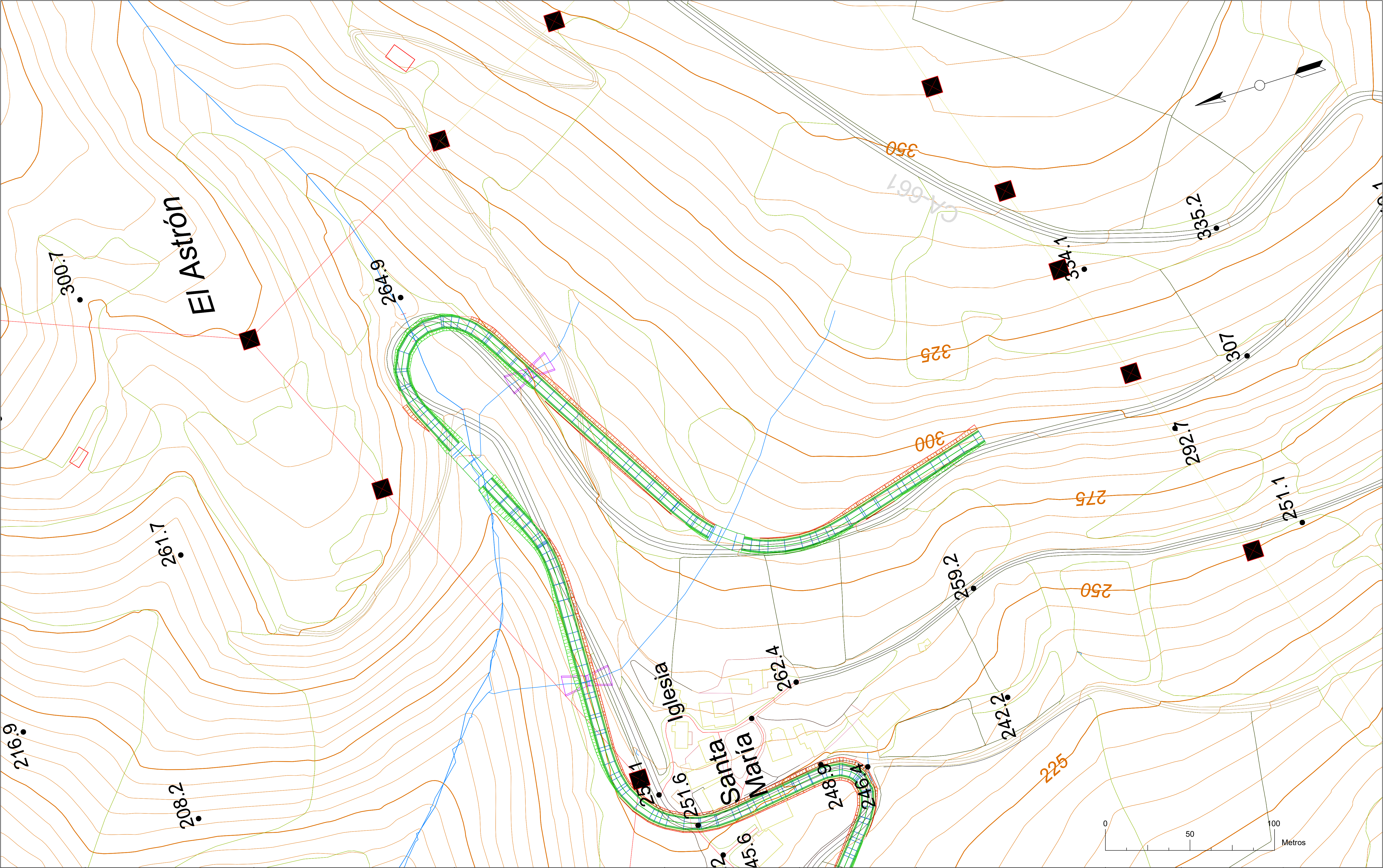
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				REGION CANTABRIA						SHEET 18 OF 18

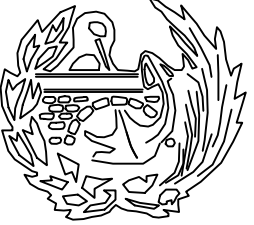
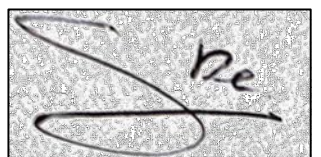


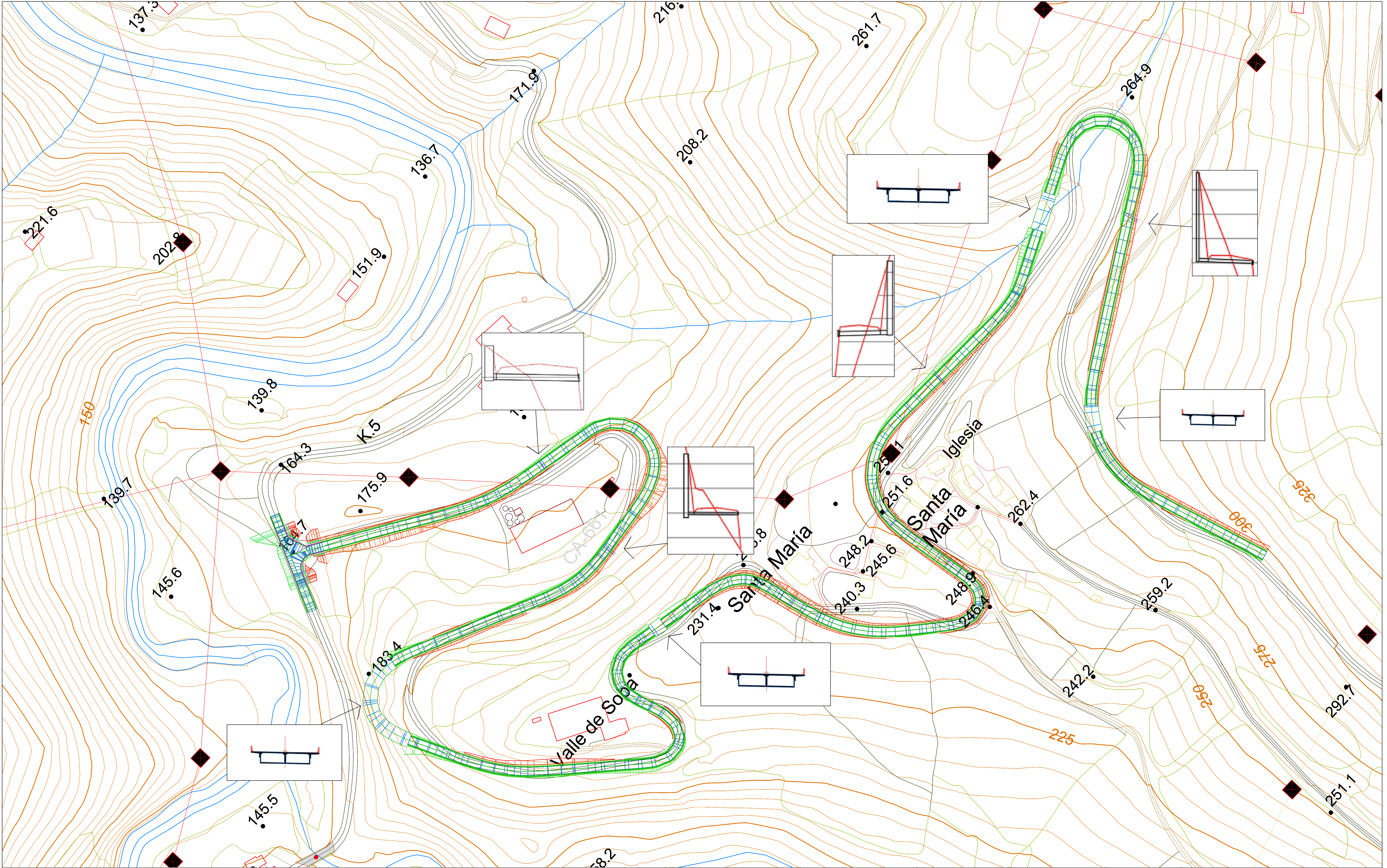
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				REGION CANTABRIA					SHEET 1 OF 3

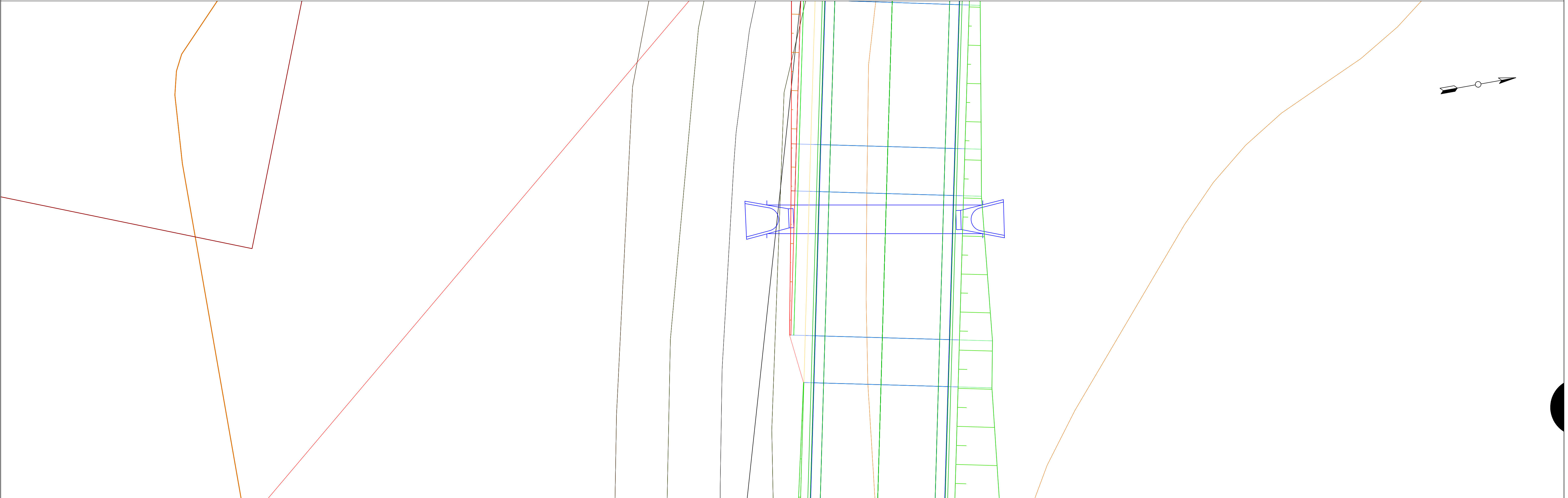
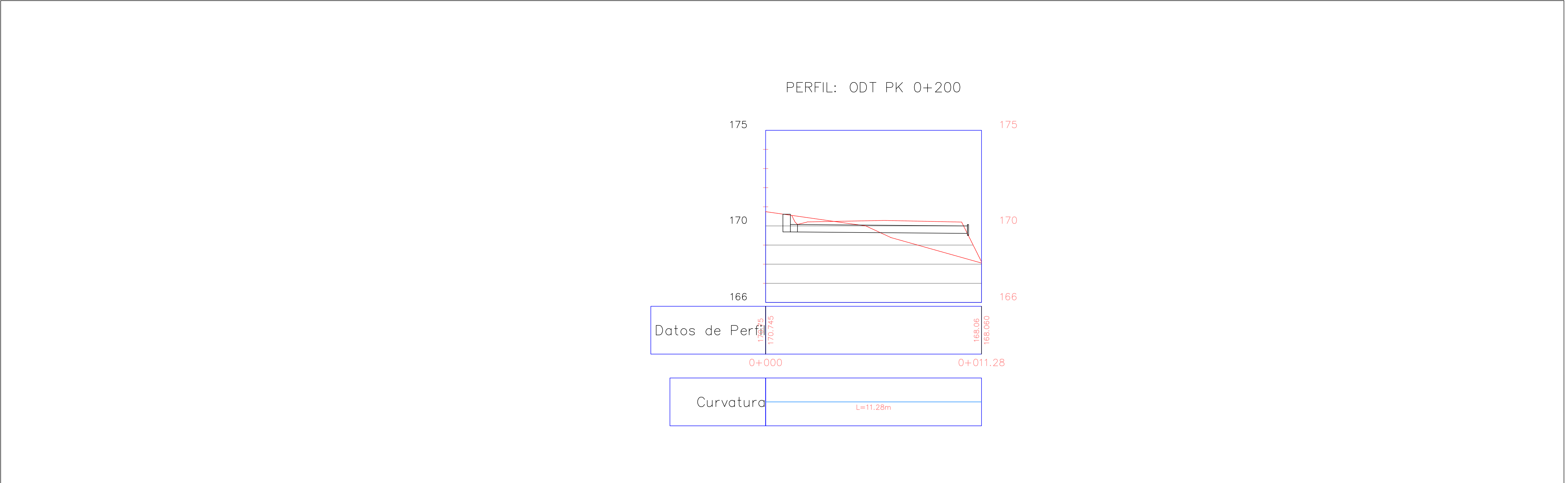


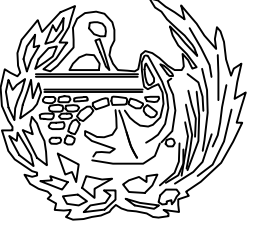
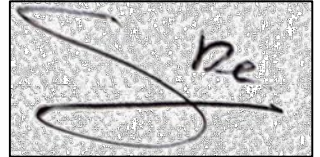
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				REGION CANTABRIA						SHEET 2 OF 3



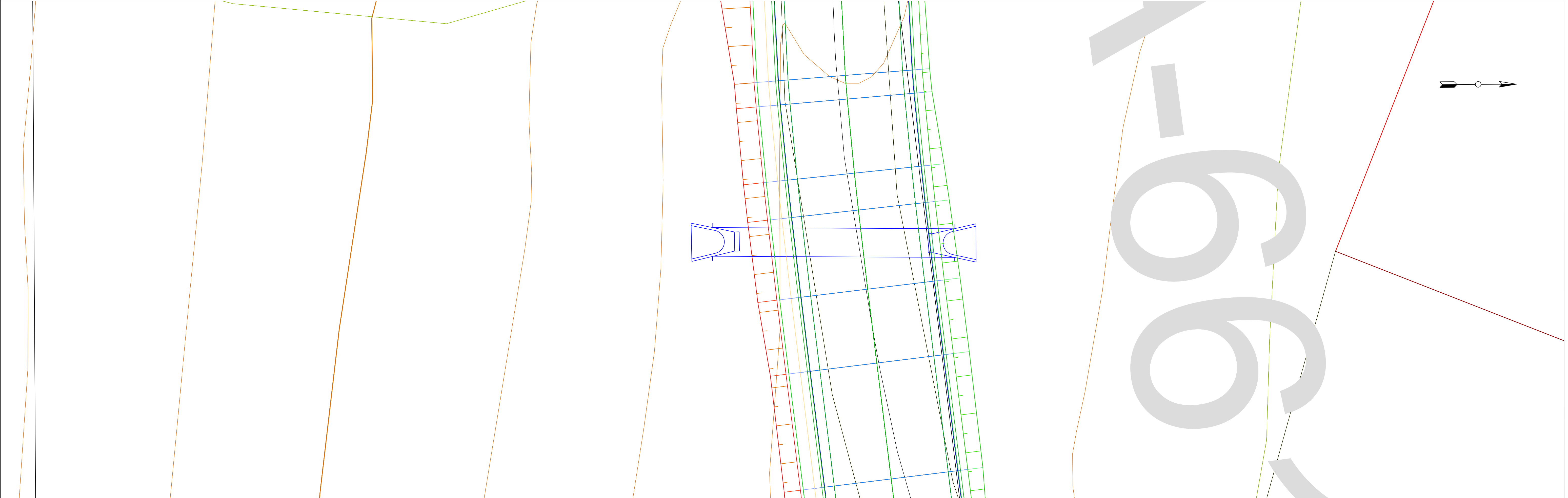
	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE DRAINAGE FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 4.1
				REGION CANTABRIA						SHEET 3 OF 3





	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE DETAIL ODT PK 0+200	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/100	DATE SEPTEMBER 2025	DRAWING 4.2.1
				REGION CANTABRIA						SHEET 1 OF 1

PERFIL: ODT PK 0+380



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

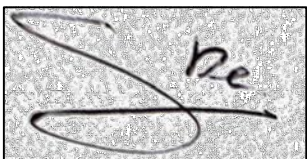
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CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
DETAIL ODT PK 0+380

AUTHOR
SANTOS
DIEGO CRUZ

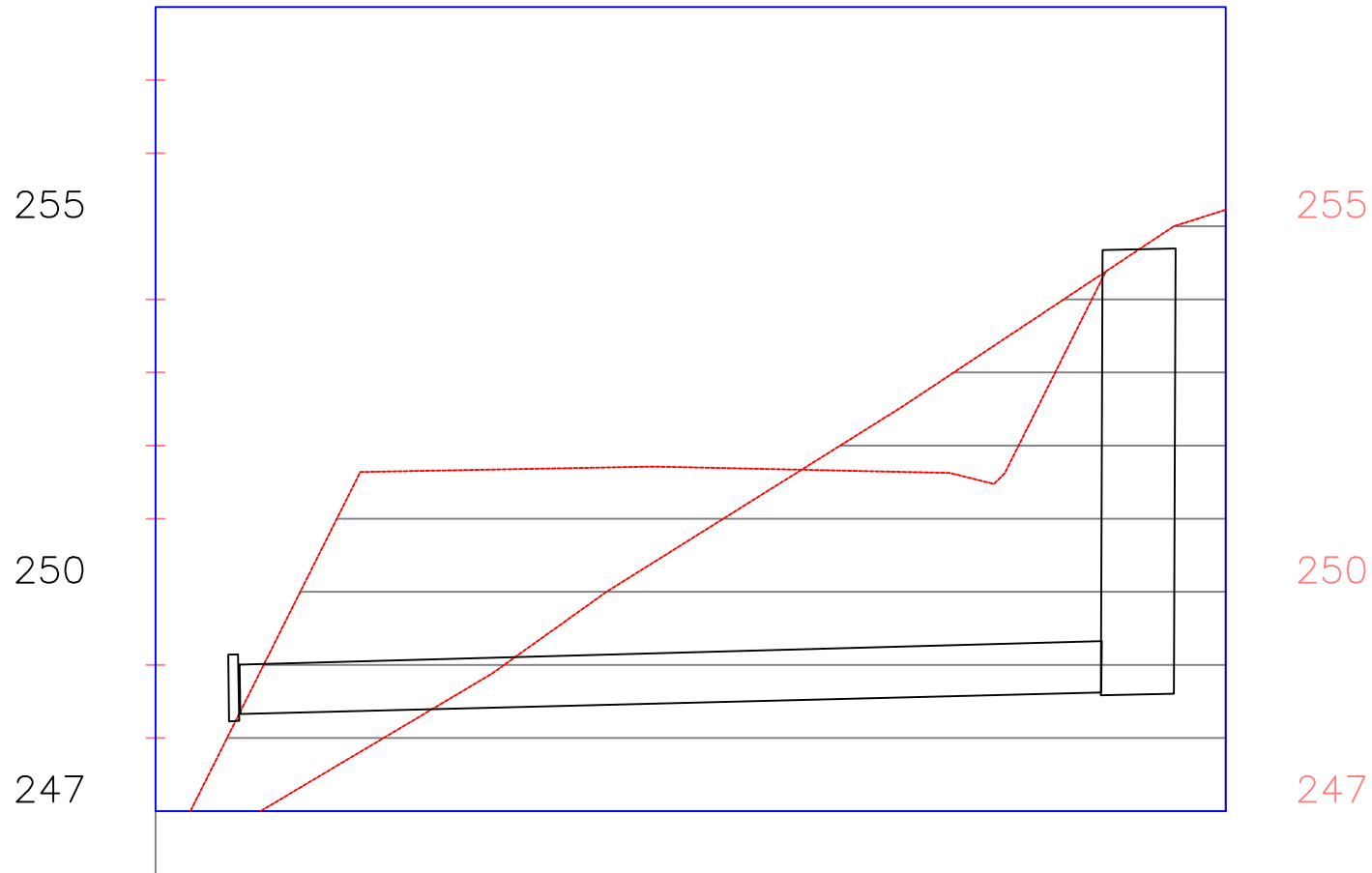


SCALE
1/100

DATE
SEPTEMBER 2025

DRAWING 4.2.1
SHEET 1 OF 1

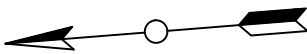
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Datos de Perfil	
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0+0000+014.64

Curvatura	L=14.64m
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ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

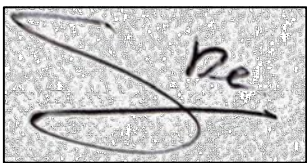
TYPE
CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
DETAIL ODT PK 1+460

AUTHOR
SANTOS
DIEGO CRUZ

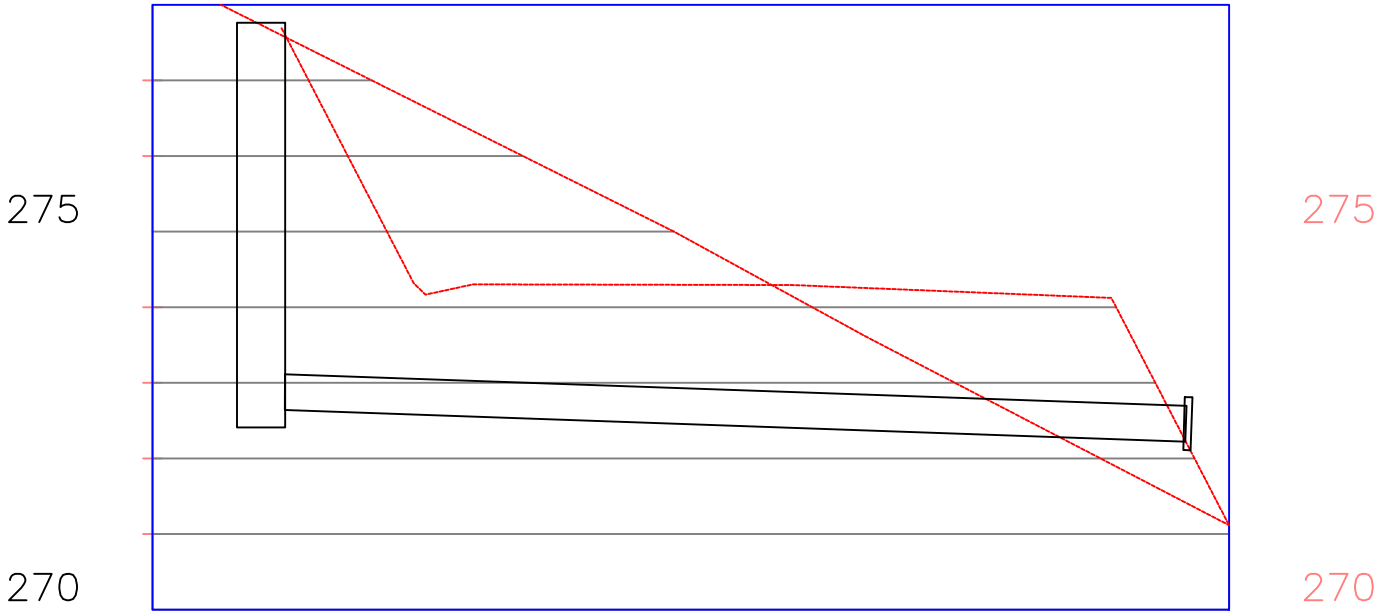


SCALE
1/100

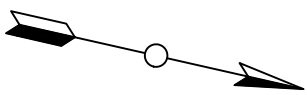
DATE
SEPTEMBER 2025

DRAWING 4.2.1
SHEET 1 OF 1

PERFIL: ODT PK 1+780



Datos de Perfil	
Curvatura	L=14.24m



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

TYPE
CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
DETAIL ODT PK 1+780

AUTHOR
SANTOS
DIEGO CRUZ



SCALE
1/100

DATE
SEPTEMBER 2025

DRAWING 4.2.1
SHEET 1 OF 1

Technical drawing of a concrete structure (HORMIGÓN H-150) showing dimensions and a cross-section. The structure has a horizontal top edge with a total length of 1.00 and a vertical edge of 0.50. The bottom edge is sloped, with a vertical height of 0.33 and a horizontal projection of 0.10. The material is labeled HORMIGÓN H-150.

Technical drawing of a square fireproof safe, showing front and top views with dimensions and material specifications.

Front View (Top):

- Overall width: 0.60
- Overall height: $H = \text{VARIABLE}$
- Top flange thickness: 0.075
- Bottom base thickness: 0.15
- Side wall thickness: 0.12
- Internal circular opening diameter: $\varnothing 20$
- Minimum clearance from bottom: 0.10 Min.
- Material: FCA, LADRILLO MACIZO ENLUCIDO CON M-300
- Top cover: TAPA H-175 // $\varnothing 6/0.10$ CANTOS Y ASIENTO L80x80

Top View (Bottom):

- Overall width: 0.60
- Overall depth: 0.60
- Side wall thickness: 0.12
- Internal rectangular opening dimensions: 0.40 x 0.40
- Internal circular opening diameter: $\varnothing 20$

[illegible]

Technical drawing of a road cross-section showing a curve with radius $R=18$, a 0.20m offset, and a 1.10m width, with a label HM-15.

DESAGÜE DE BAJANTE A CUNETA DE PIE DE TERRAPLEN

CUNETA DE PIE DE TERRAPLEN

(ANCLAR LA BAJANTE CADA 6m.)

$R=18$

3.1

$R=18$

0.10

HM-15

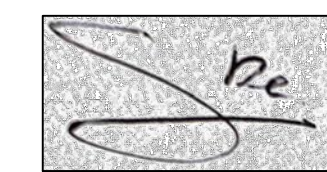
CUNETA O ZANJA

TYPE

CONSTRUCTION PROJECT

MUNICIPALITY
SOBA
REGION
CANTABRIA

AUTHOR
SANTOS
DIEGO CRUZ

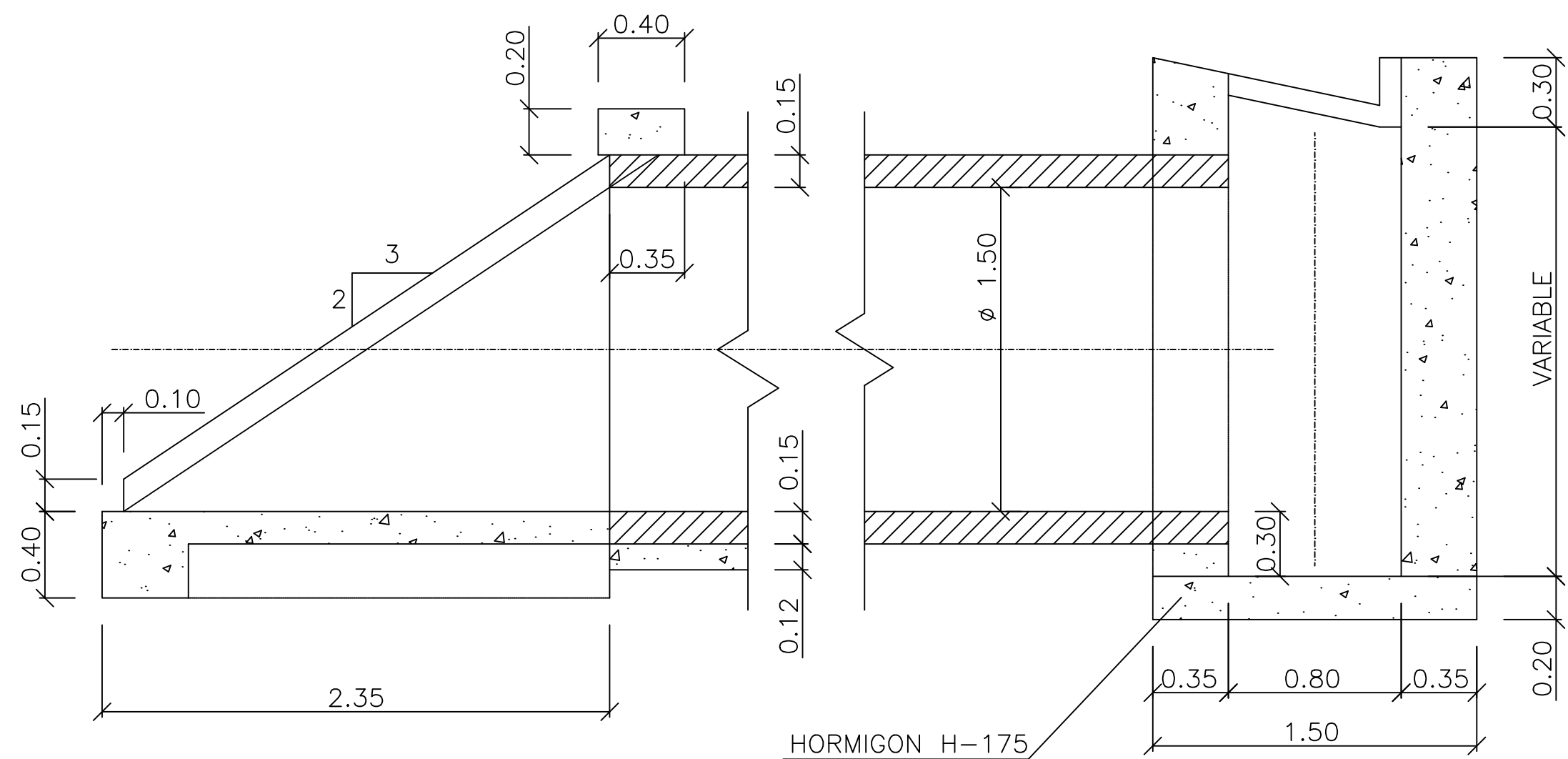


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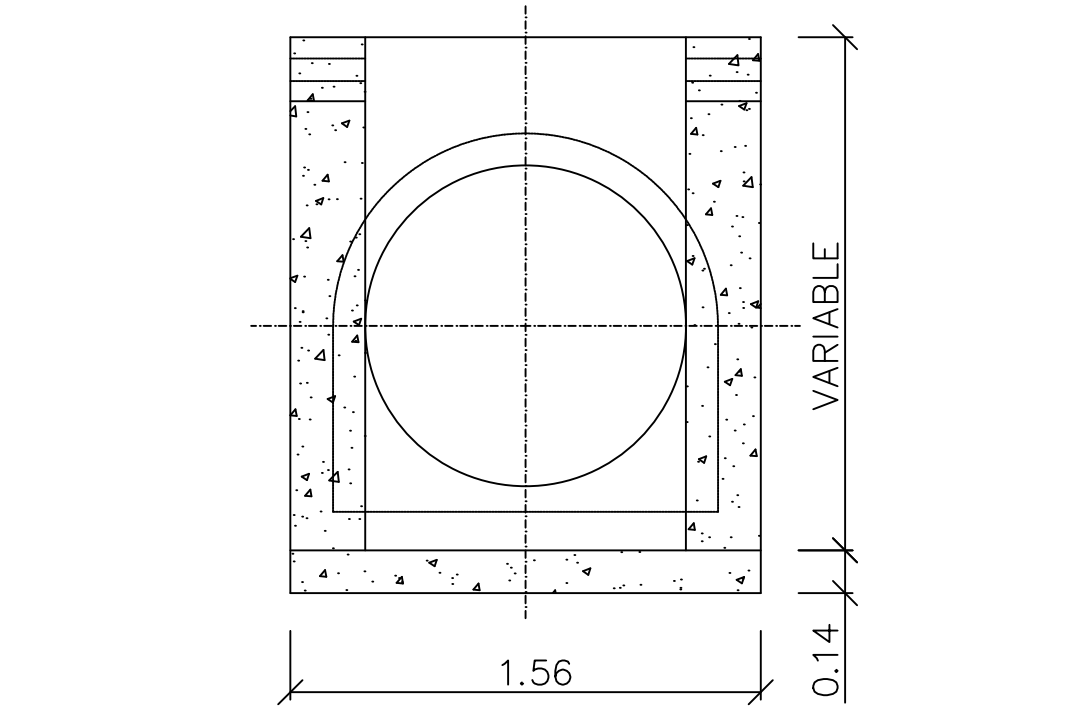
SEPTEMBER 2025

DRAWING 4.2.2

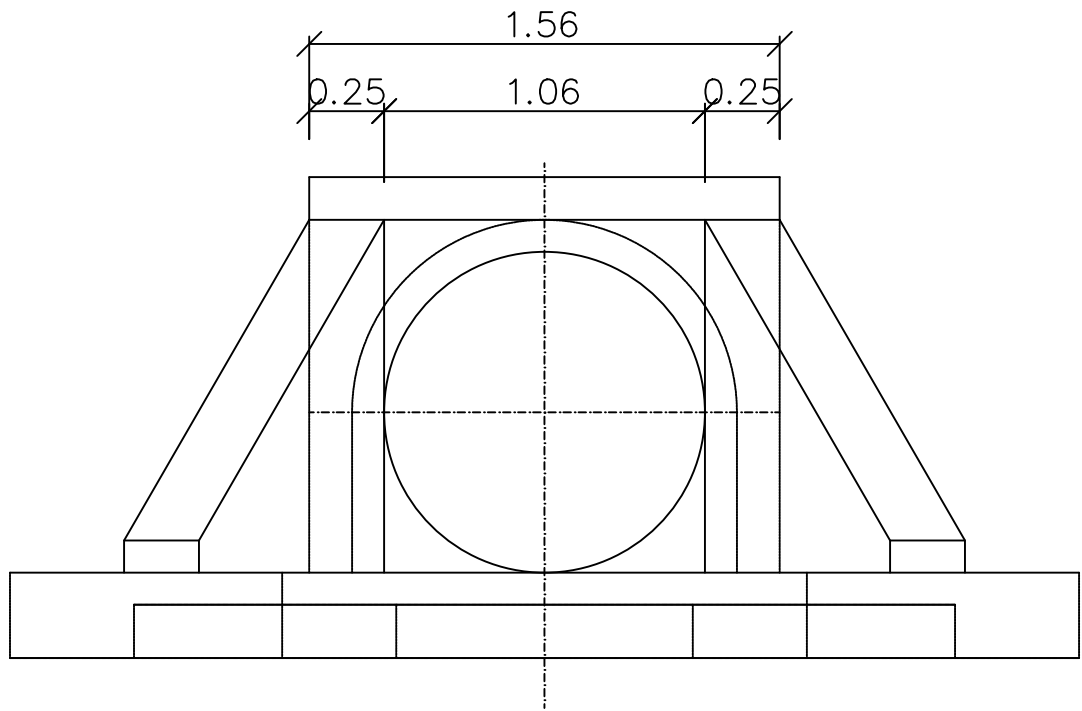
SHEET 1 OF 2



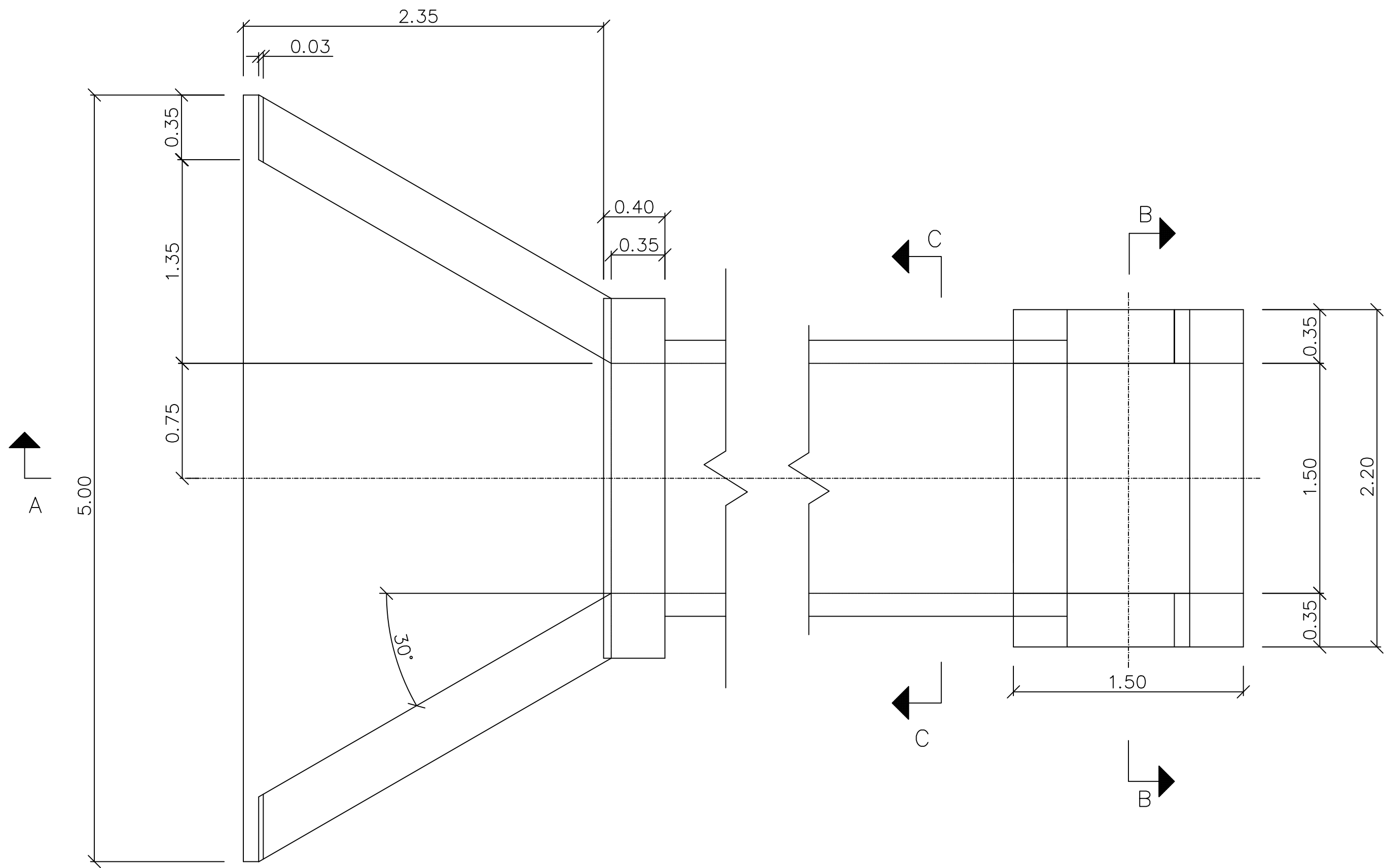
SECCION A-A
ESCALA 1:25



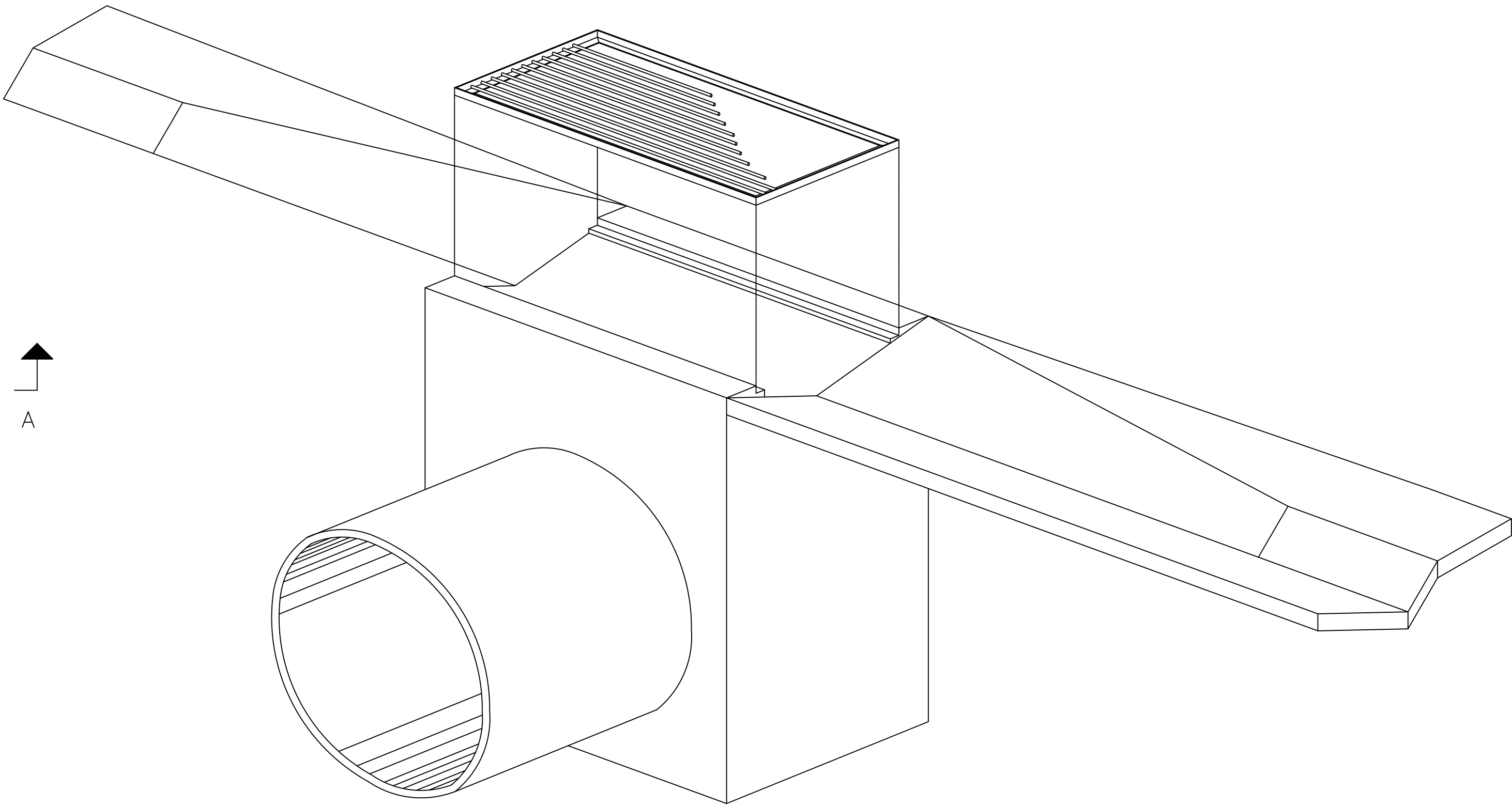
SECCION B-B
ESCALA 1:25



ALZADO BOQUILLA
ESCALA 1:25

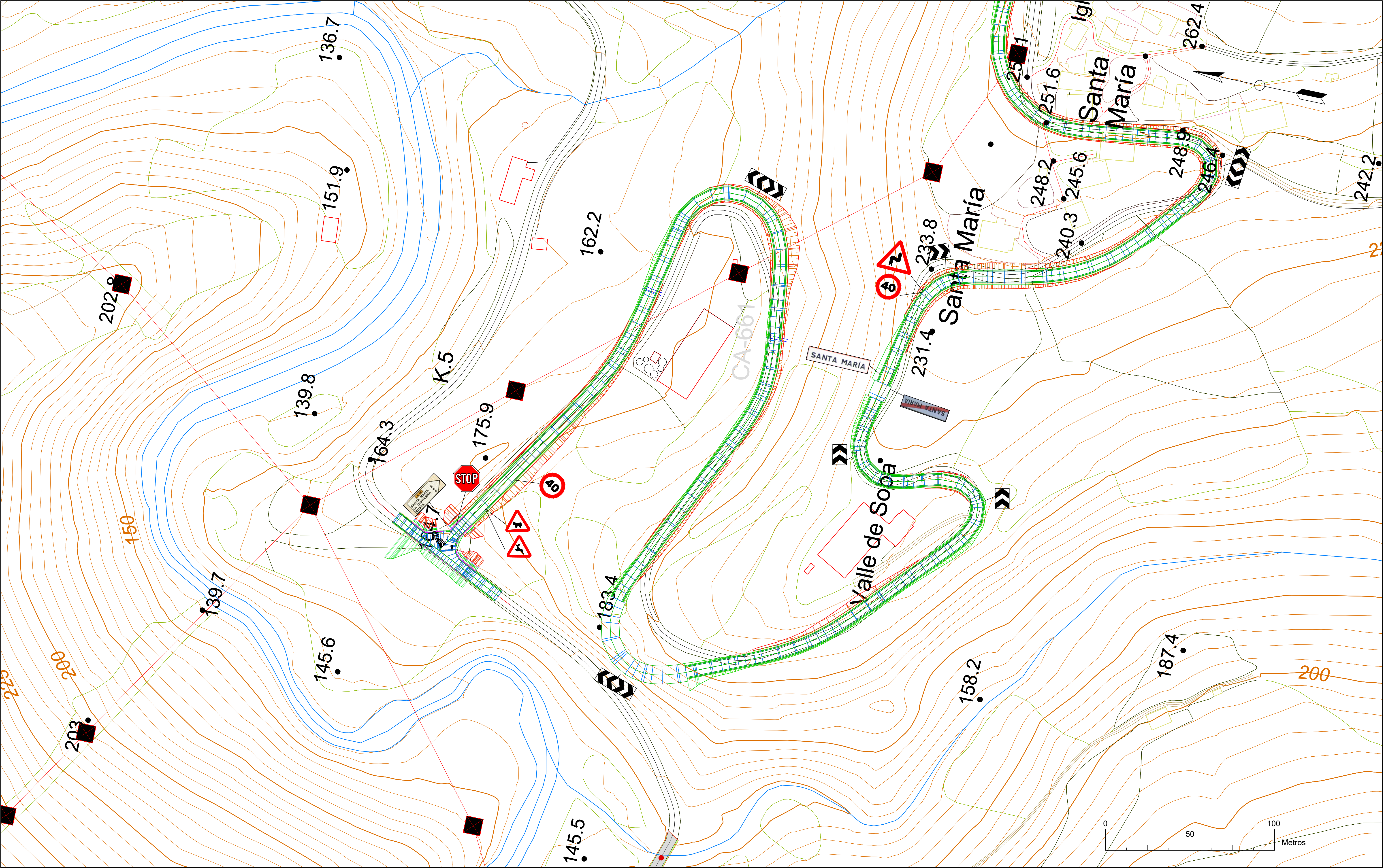


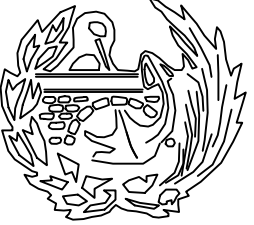
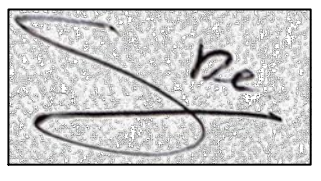
PLANTA
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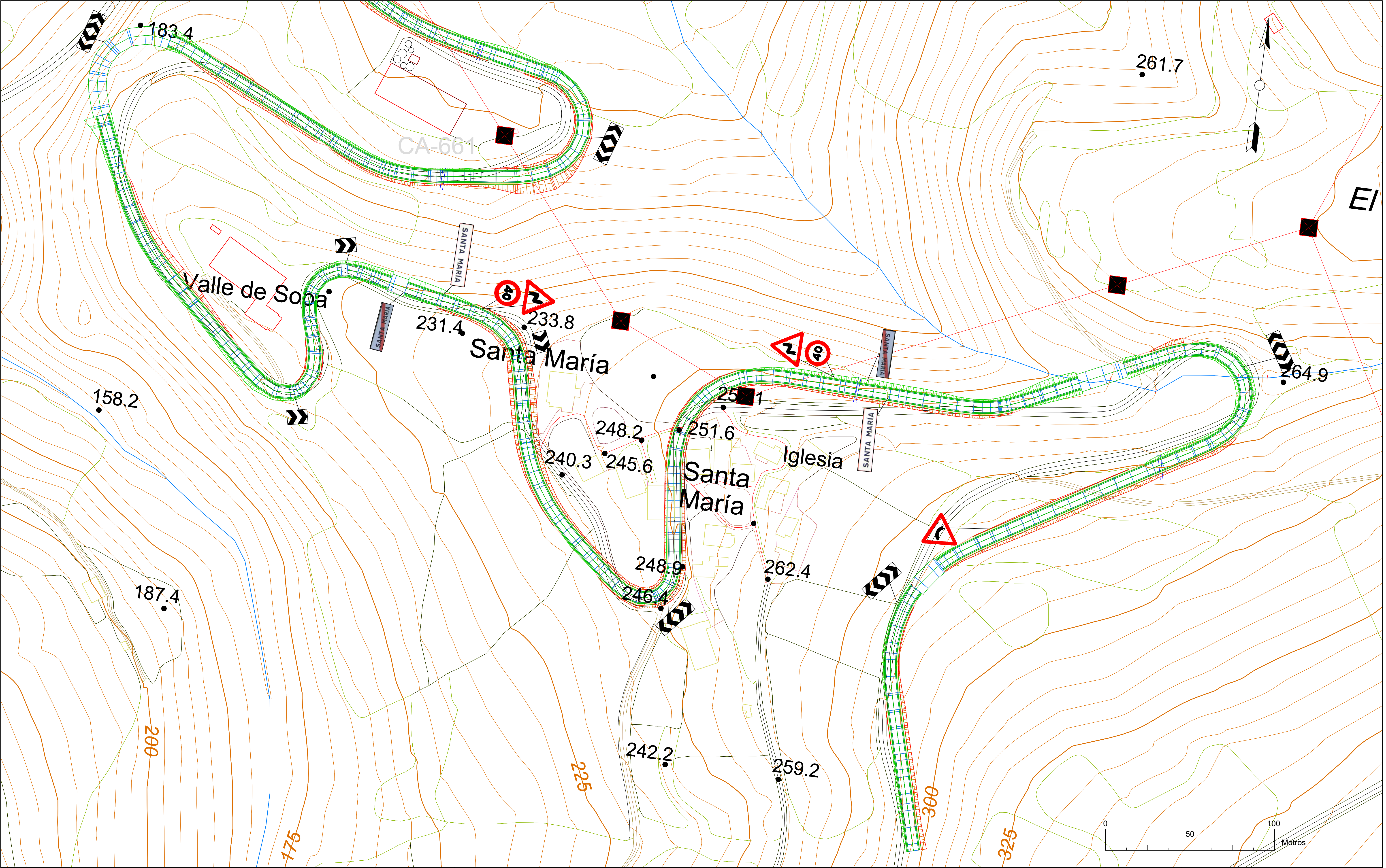


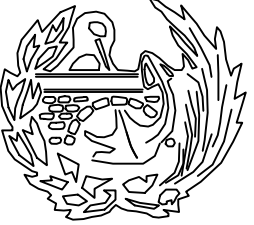
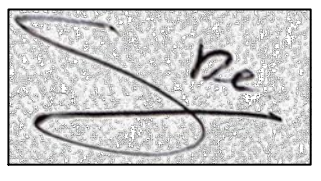
DETALLE DE TRANSICION DE CUNETA A ARQUETA . PERSPECTIVA

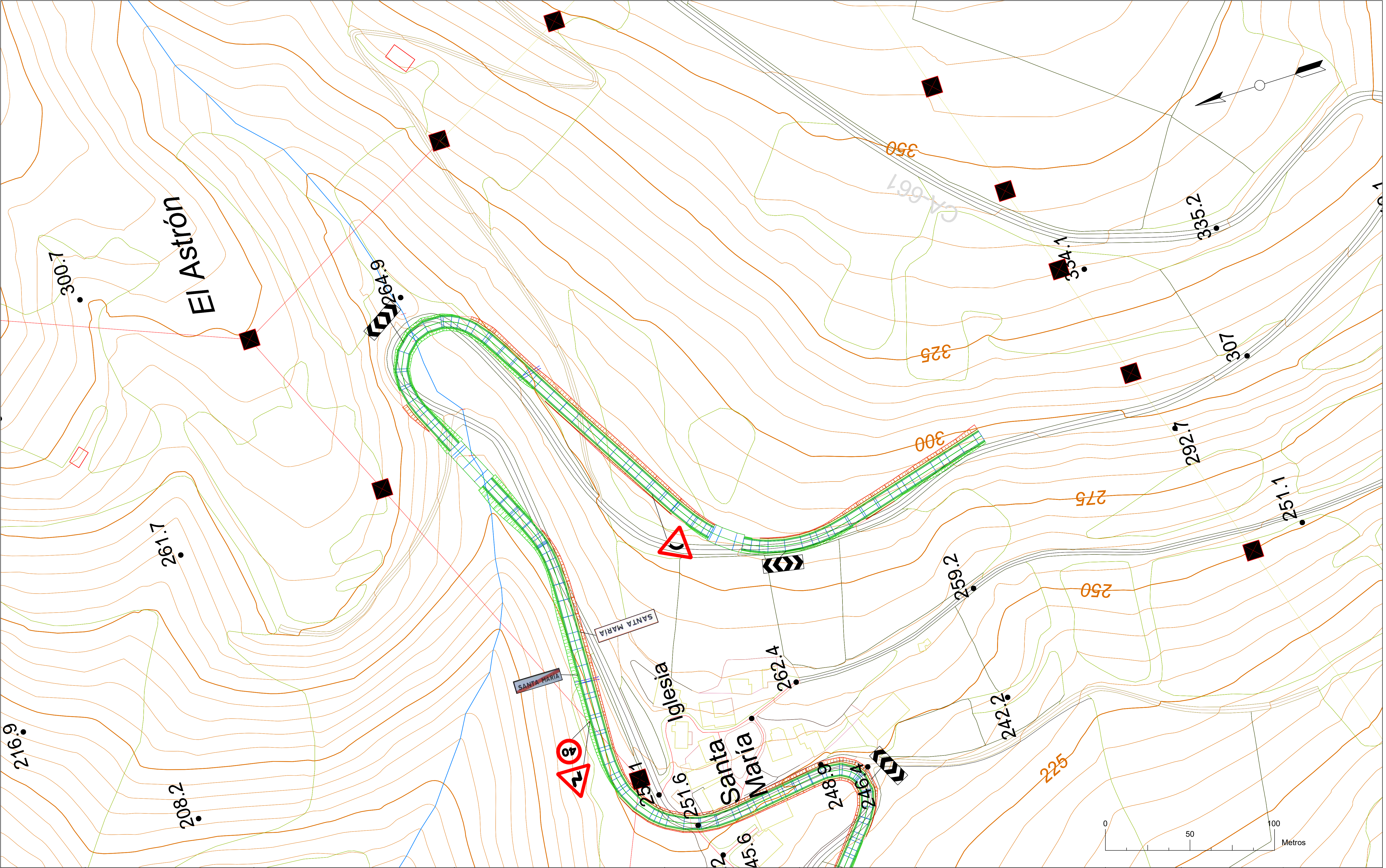
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CAÑALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCESS TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE DRAINAGE DETAIL	AUTHOR SANTOS DIEGO CRUZ	SCALE N/S	DATE SEPTEMBER 2025	DRAWING 4.2.2
				REGION CANTABRIA					SHEET 2 OF 2



	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE SIGNALING FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 5.1
				REGION CANTABRIA						SHEET 1 OF 3



	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE SIGNALING FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 5.1
				REGION CANTABRIA						SHEET 2 OF 3



	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE SIGNALING FLOOR PLAN	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 5.1
				REGION CANTABRIA						SHEET 3 OF 3

COTAS EN MILÍMETROS (mm)

3550



1400

1950



700

1950

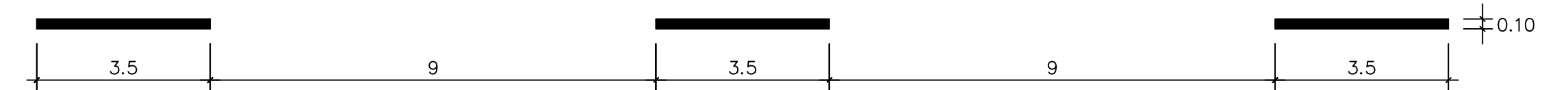


750

MARCAS LONGITUDINALES DISCONTINUAS

VIAS CON $60 \text{ Km/h} < VM \leq 100 \text{ Km/h}$
PARA SEPARACION DE CARRILES NORMALES

M-1.2



VIAS CON VM $\leq$ 60Km/h

PARA SEPARACION DE CARRIL ESPECIAL O CARRIL DE ENTRADA O DE SALIDA

M-1.7



MARCAS LONGITUDINALES CONTINUAS

VIAS CON VM. < 100 Km/h.

PARA SEPARACION DE SENTIDOS EN CALZADA DE DOS O TRES CARRILES

M-2.2

PARA SEPARACION DE SENTIDOS EN CALZADA DE CUATRO O MAS CARRILES

M-2.3



PARA SEPARACION DE CARRILES ESPECIALES O DE ENTRADA Y SALIDA

M-2.4



PARA BORDE DE CALZADA

M-2.6



MARCAS TRANSVERSALES CONTINUAS

LINEA DE DETENCION



MARCAS TRANSVERSALES DISCONTINUAS

LINEA DE CEDA EL PASO



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

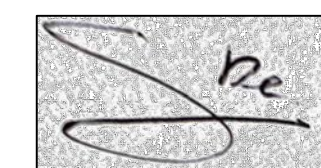
CONSTRUCTION PROJECT

TITLE
PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA"

MUNICIPALITY
SOBA
REGION
CANTABRIA

DRAWING TITLE
SIGNALING DETAILS

AUTHOR
SANTOS
DIEGO CRUZ



SCALE

N/S

DATE

SEPTEMBER 2025

DRAWING 5.2.1

SHEET 1 OF 1

FLECHAS DE DIRECCION O DE SELECCION DE CARRILES

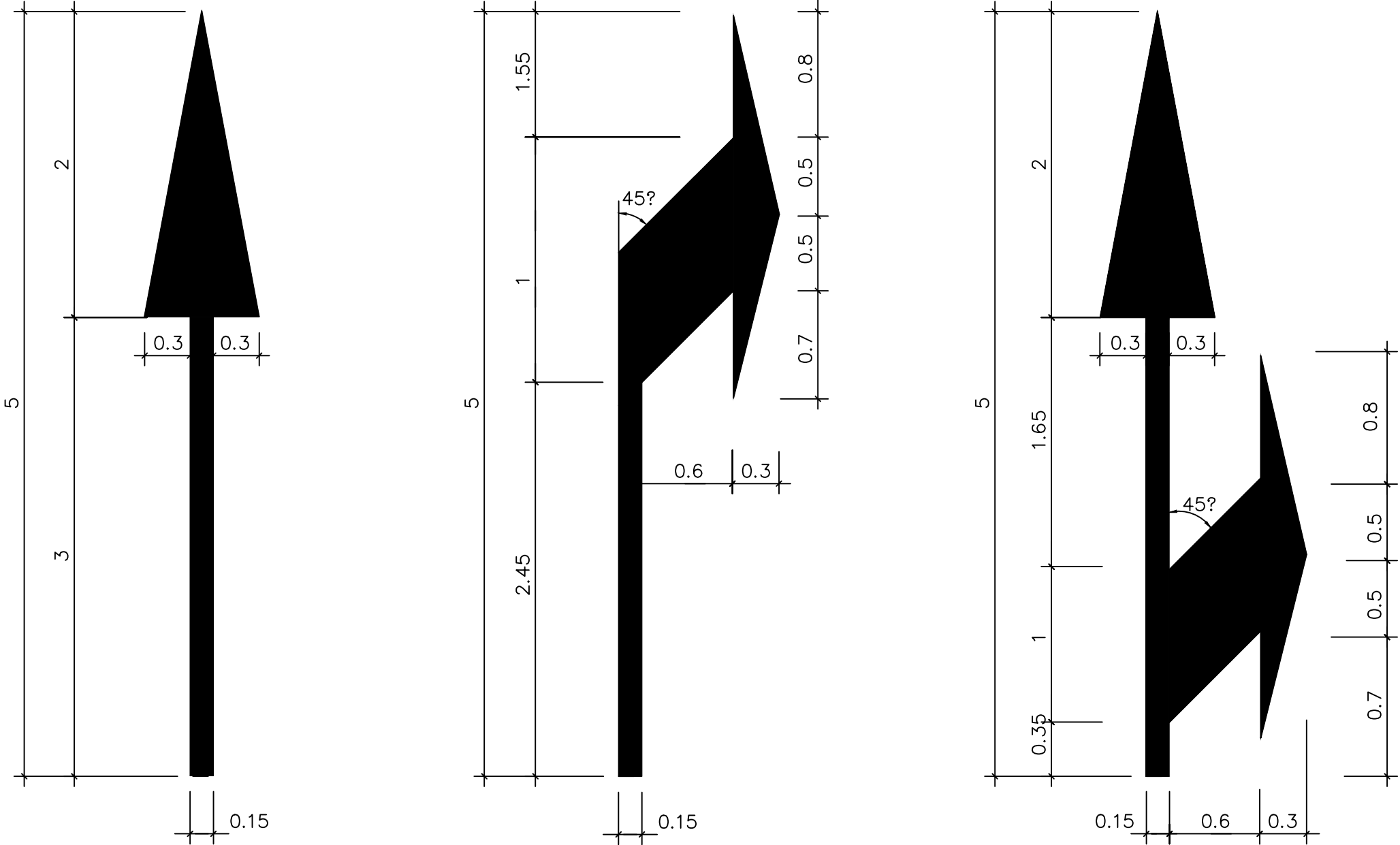
VIA CON VM 60 Km/h.

M-5.2

1. DE FRENTE

2. A LA DERECHA

3. DE FRENTE O A LA DERECHA



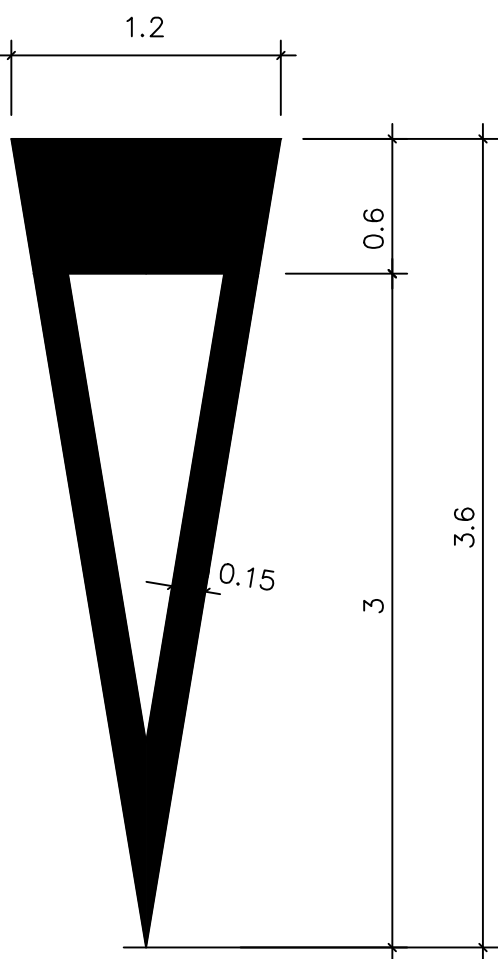
M-6.3

SEYAL HORIZONTAL DE STOP



M-6.5

MARCA DE CEDA EL PASC

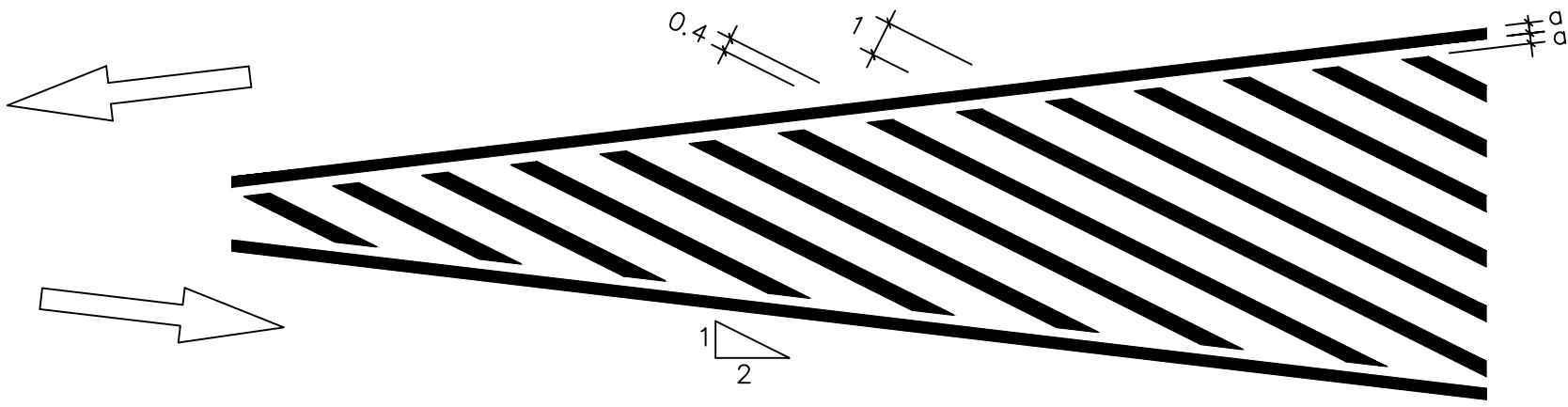


MARCAS DE CEBREADO

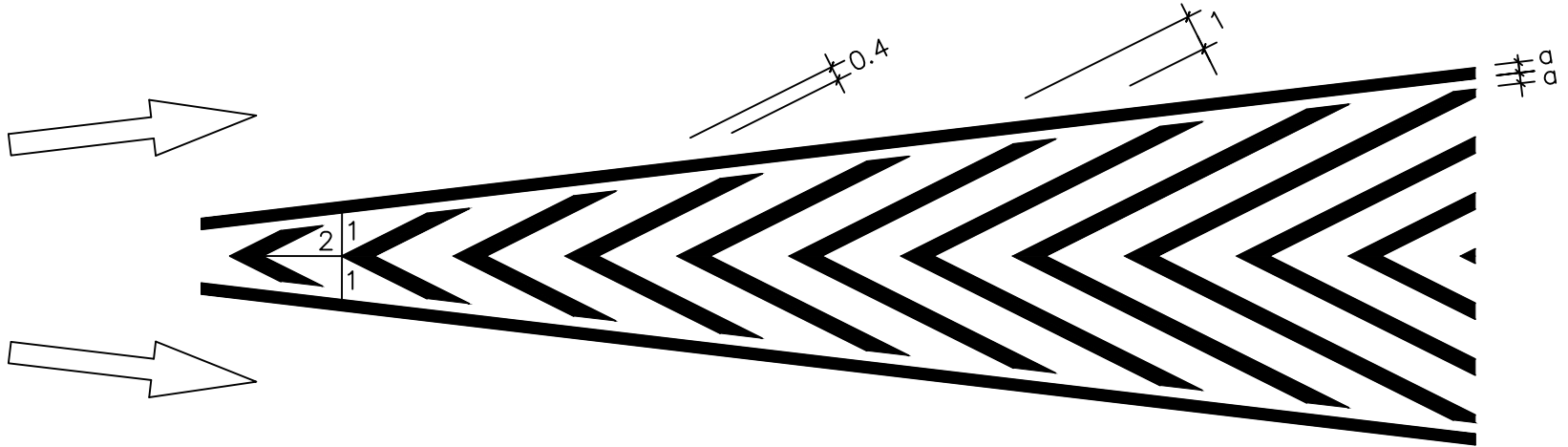
VIA CON $V_M \leq 60 \text{ Km/h.}$

M-7.2

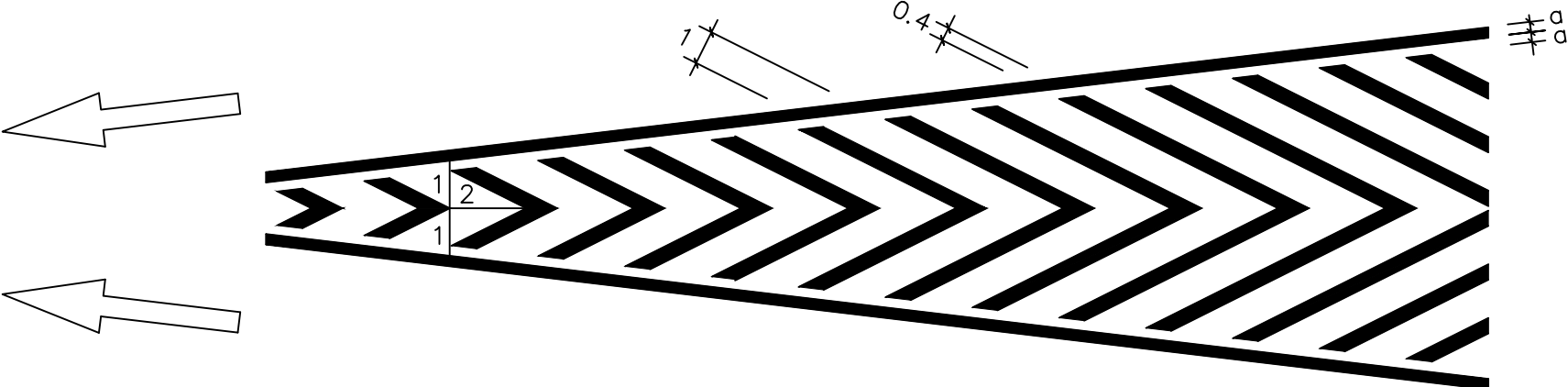
A. CIRCULACION EN DOBLE SENTIDO



B. CIRCULACION EN SENTIDO UNICO (DIVERGENTE)



C. CIRCULACION EN SENTIDO UNICO (CONVERGENTE)

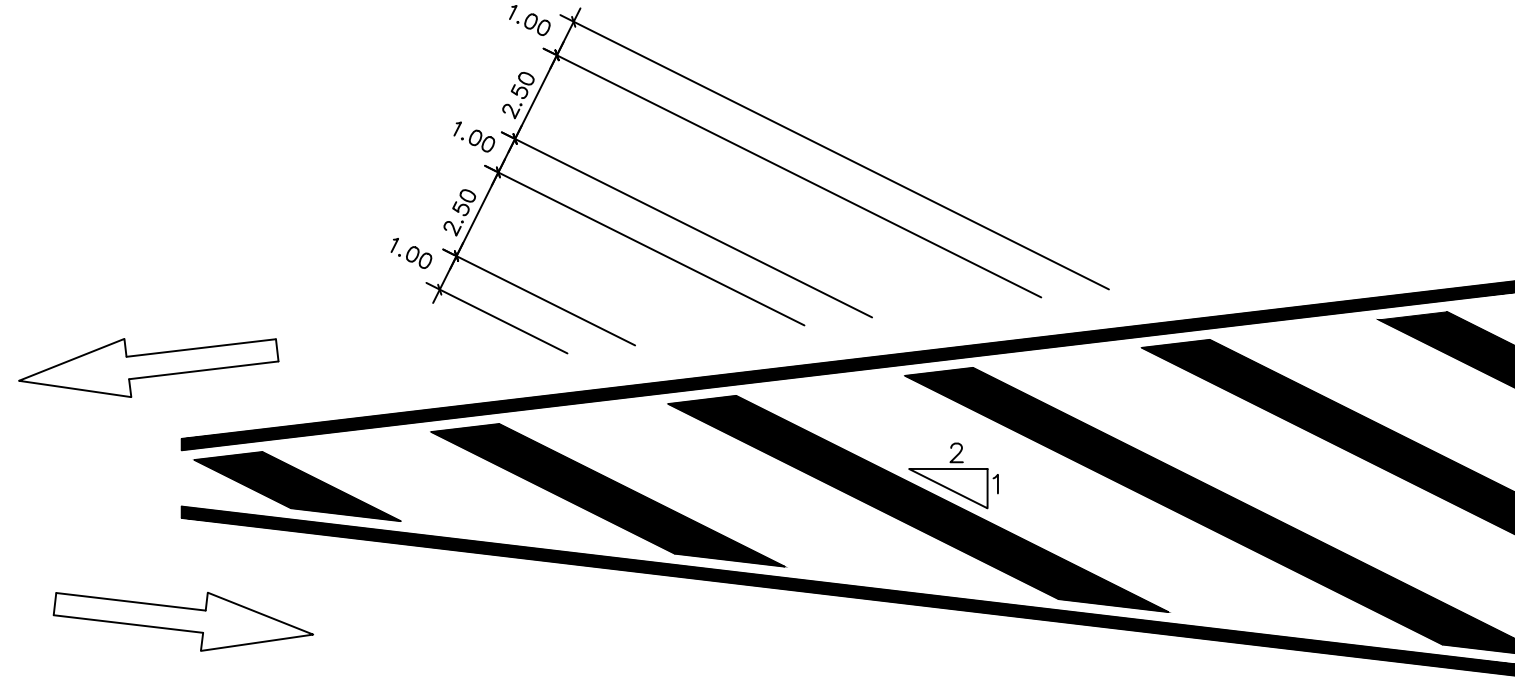


MARCAS DE CEBREADO

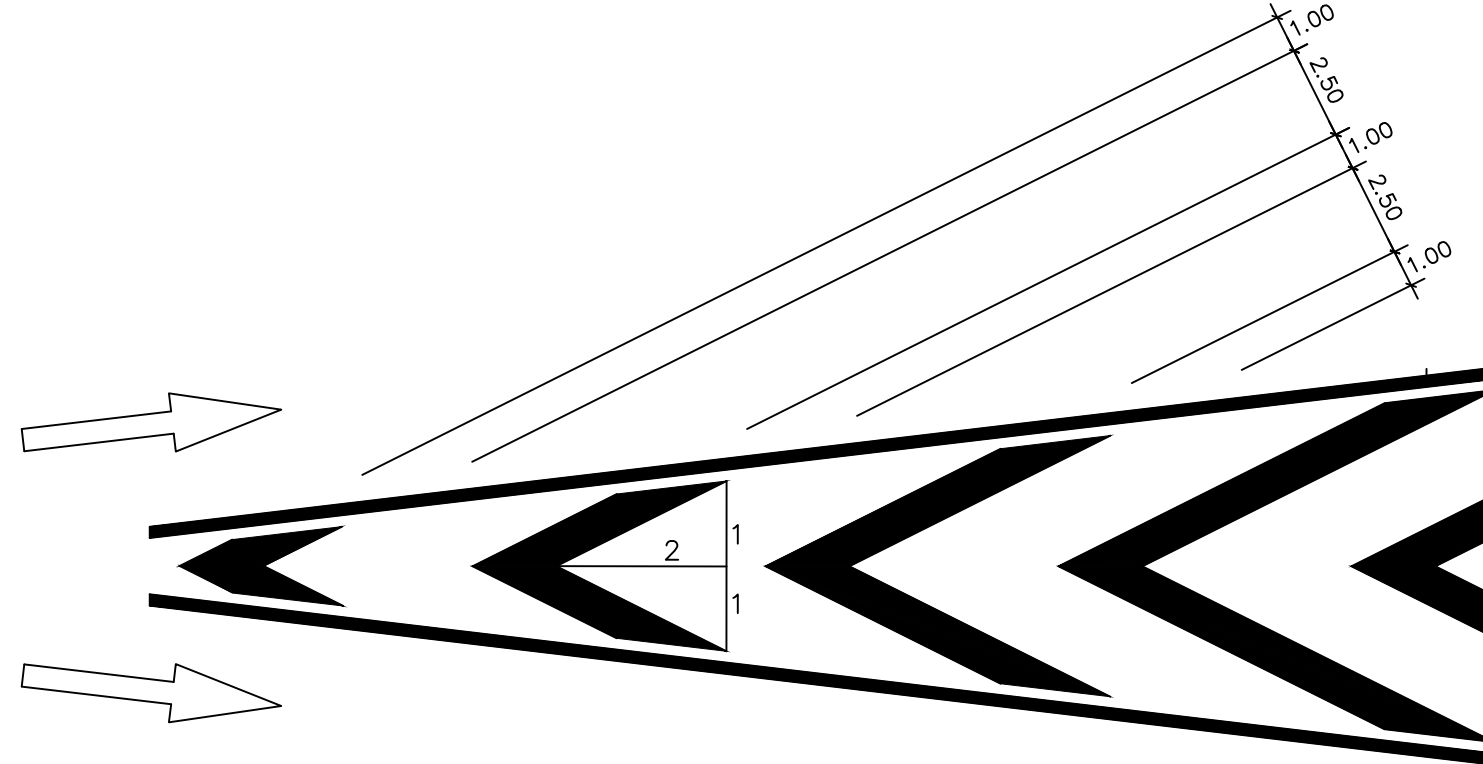
VIA CON $VM > 60 \text{ Km/h.}$

M-7.1

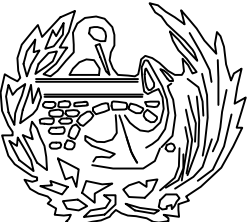
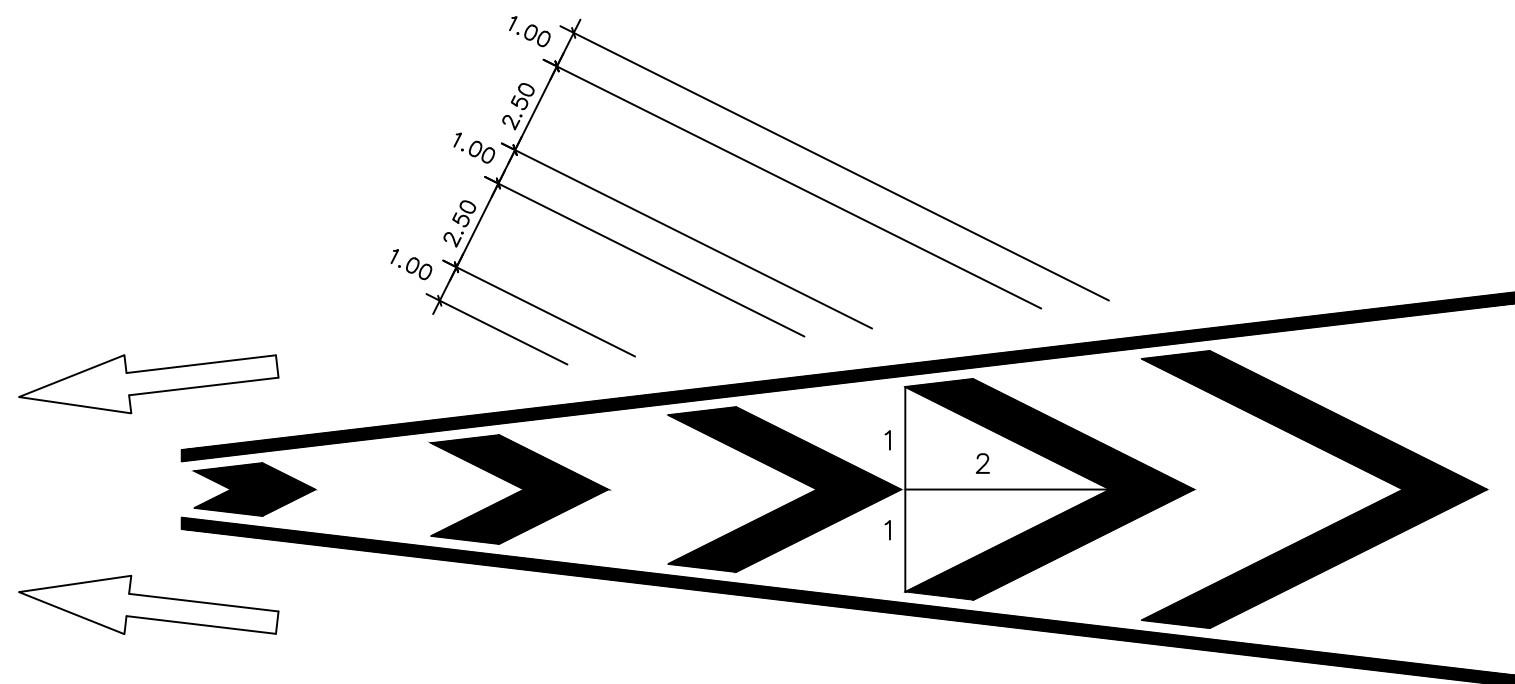
A. CIRCULACION EN DOBLE SENTIDO



B. CIRCULACION EN SENTIDO UNICO (DIVERGENTE)



C. CIRCULACION EN SENTIDO UNICO (CONVERGENTE)



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

TYPE

CONSTRUCTION PROJECT

TITL

PLATFORM IMPROVEMENT
ROAD CA-661, ACCESS TO "LA BUSTA

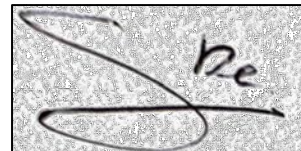
MUNICIPALITY
SOBA

REGION
CANTABRIA

DRAWING TITLE

SIGNALING DETAILS

AUTHOR
SANTOS
DIEGO CRUZ



SCALI

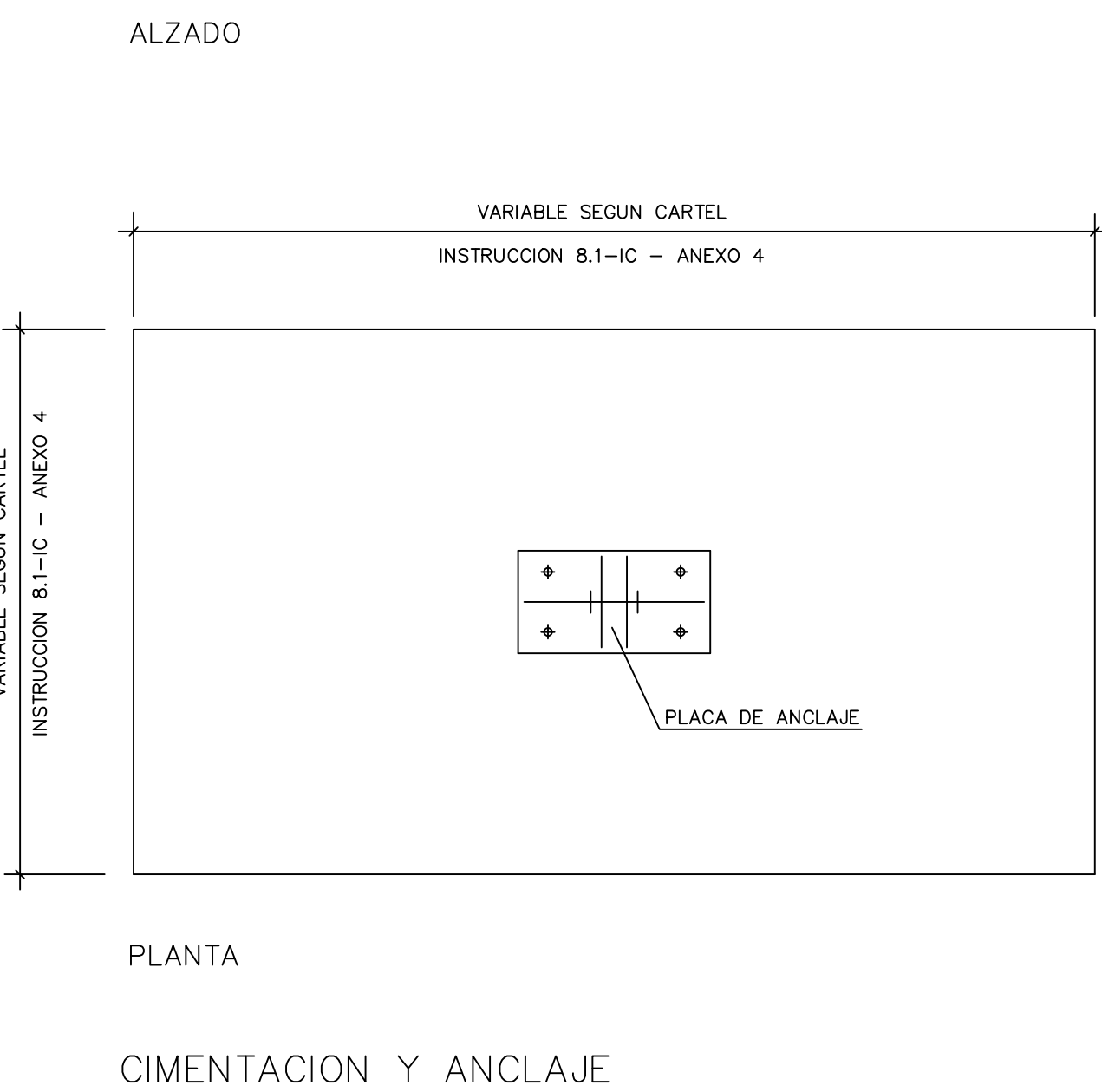
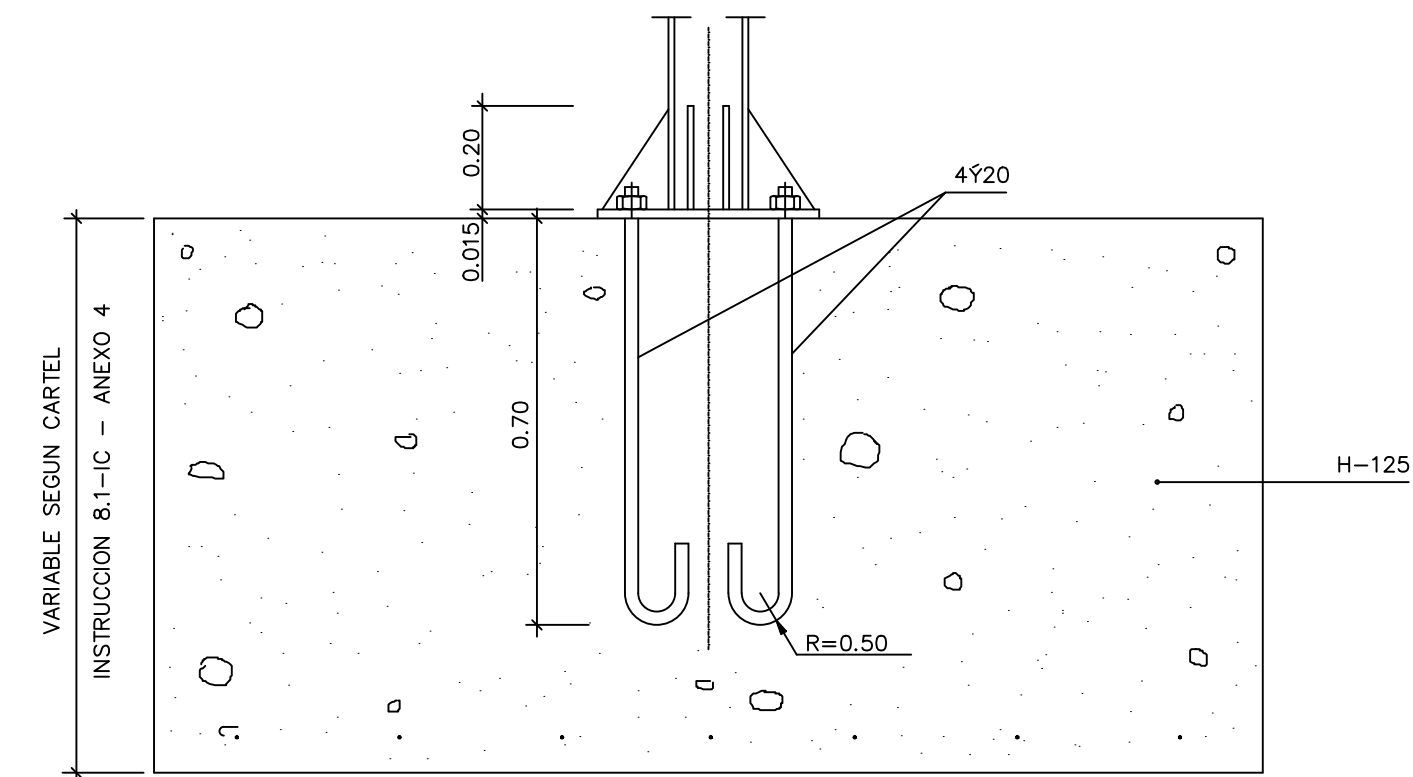
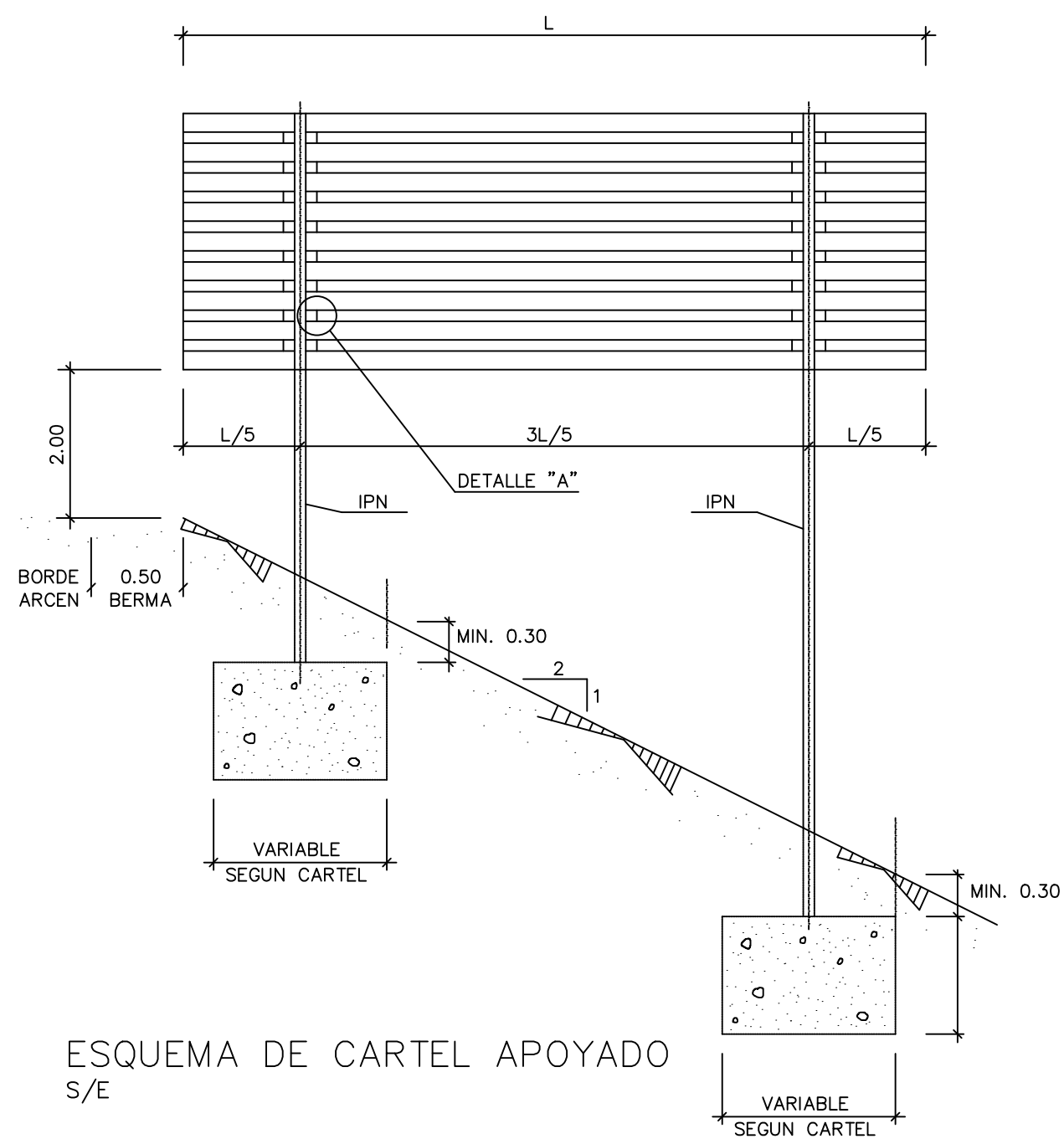
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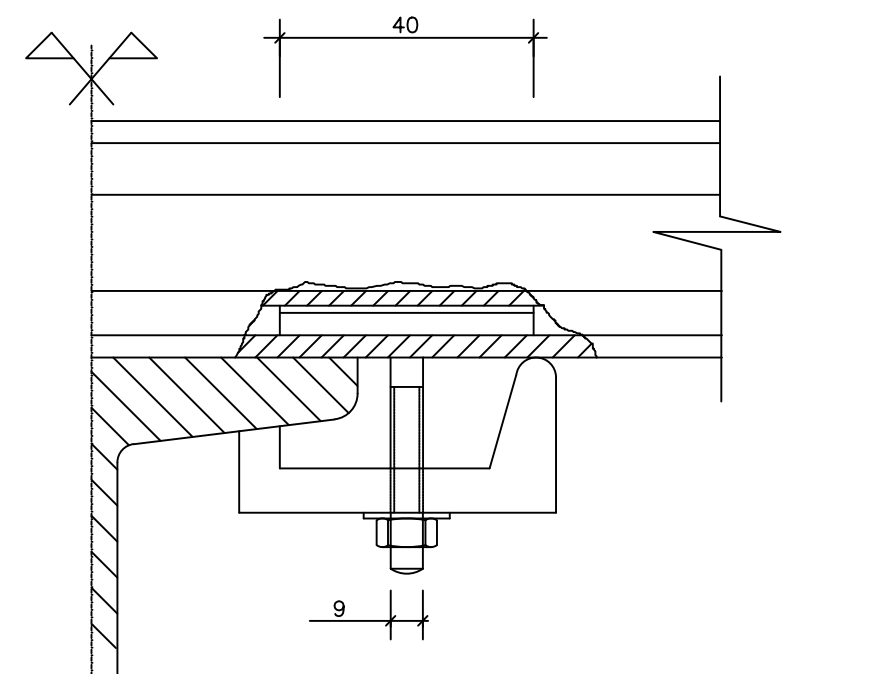
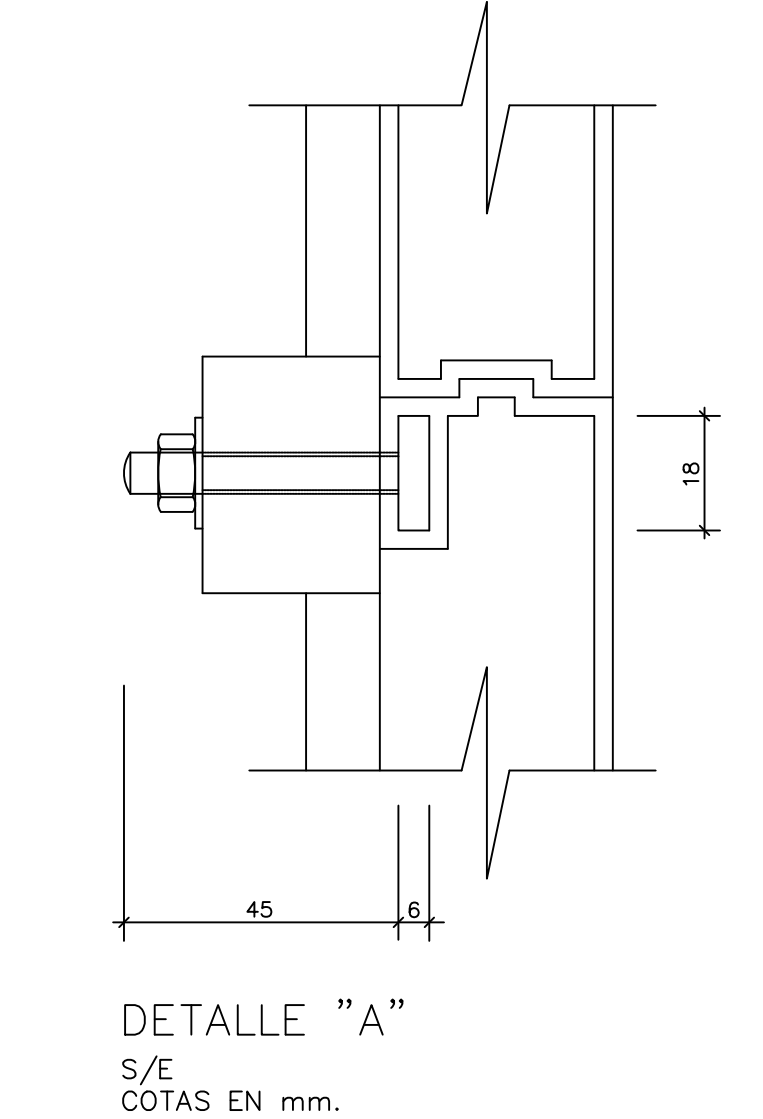
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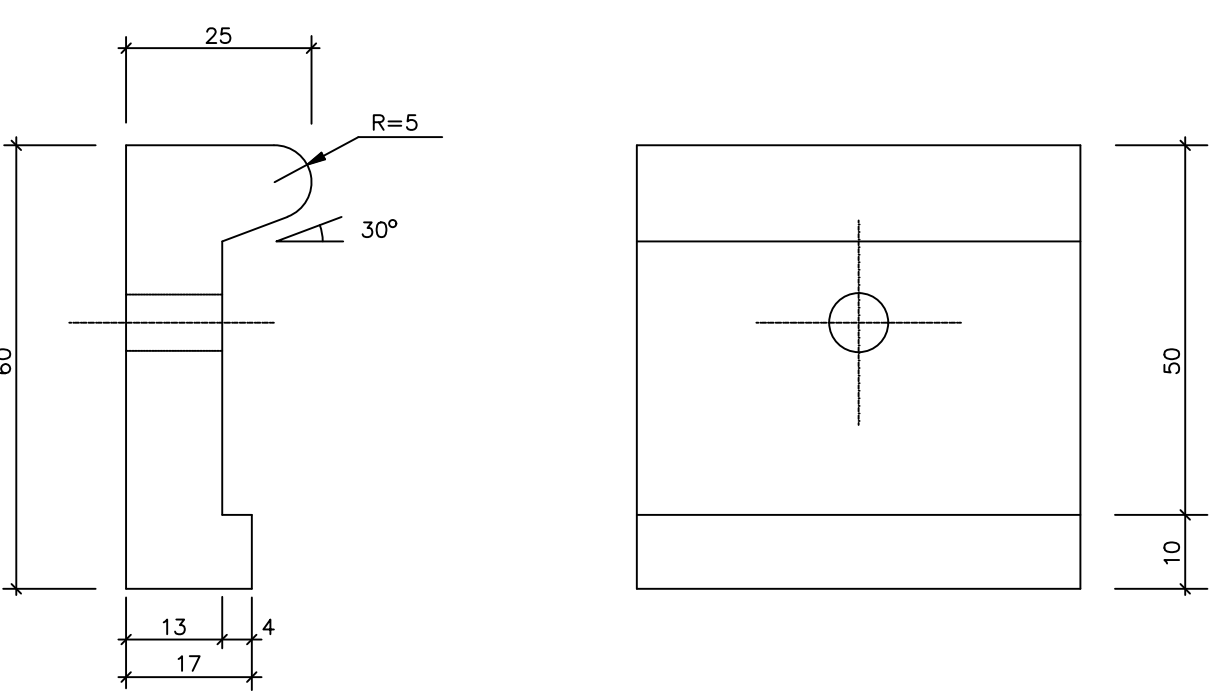
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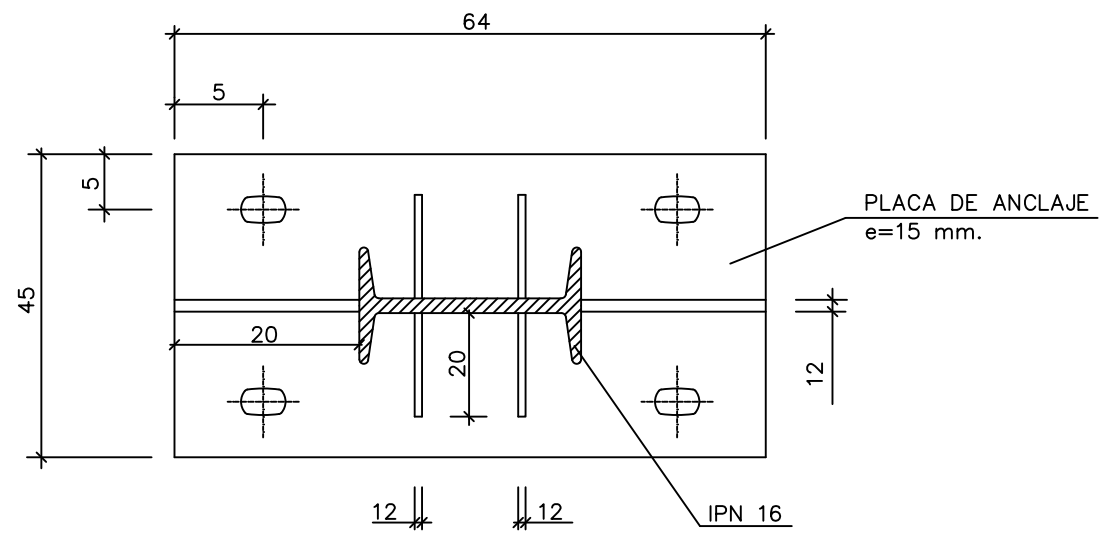
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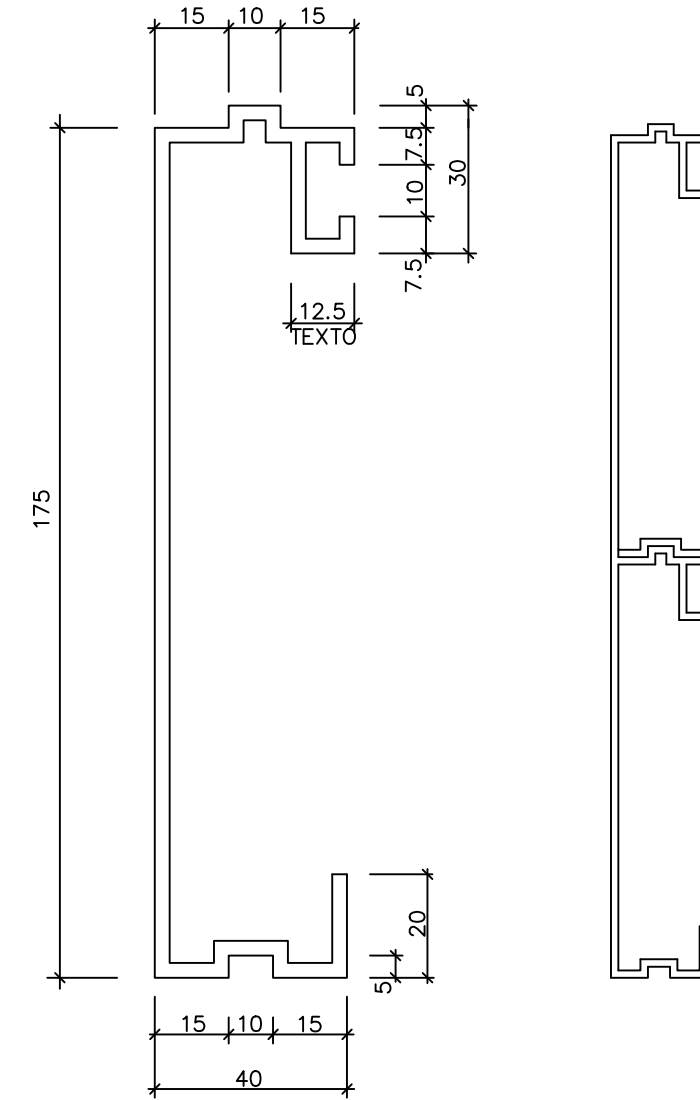
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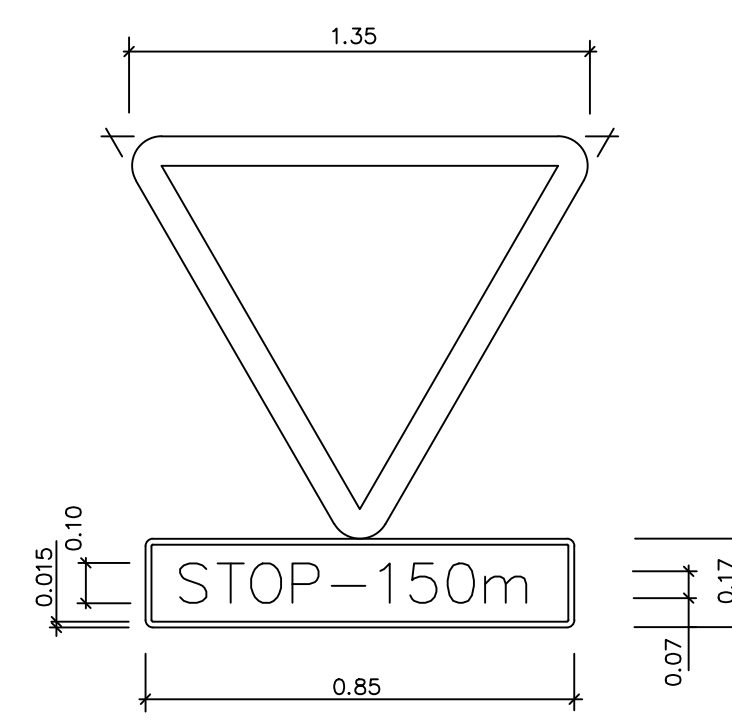
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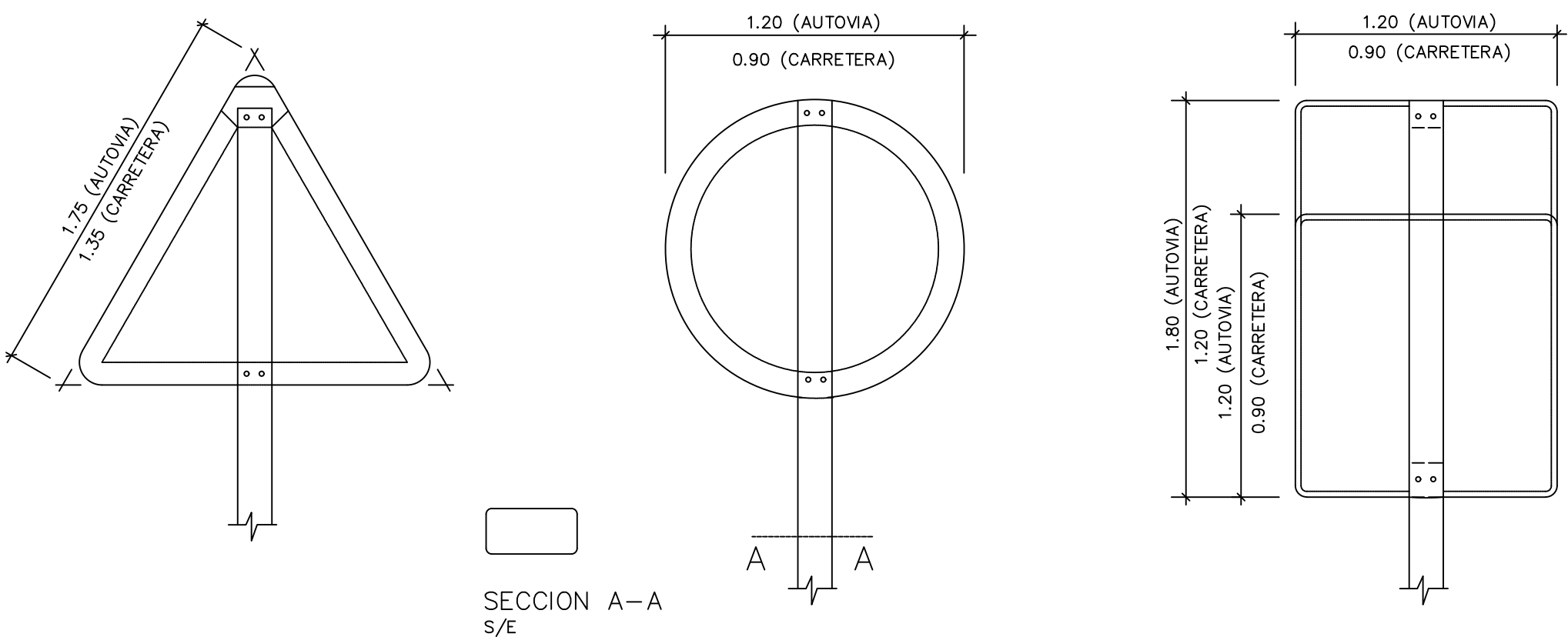
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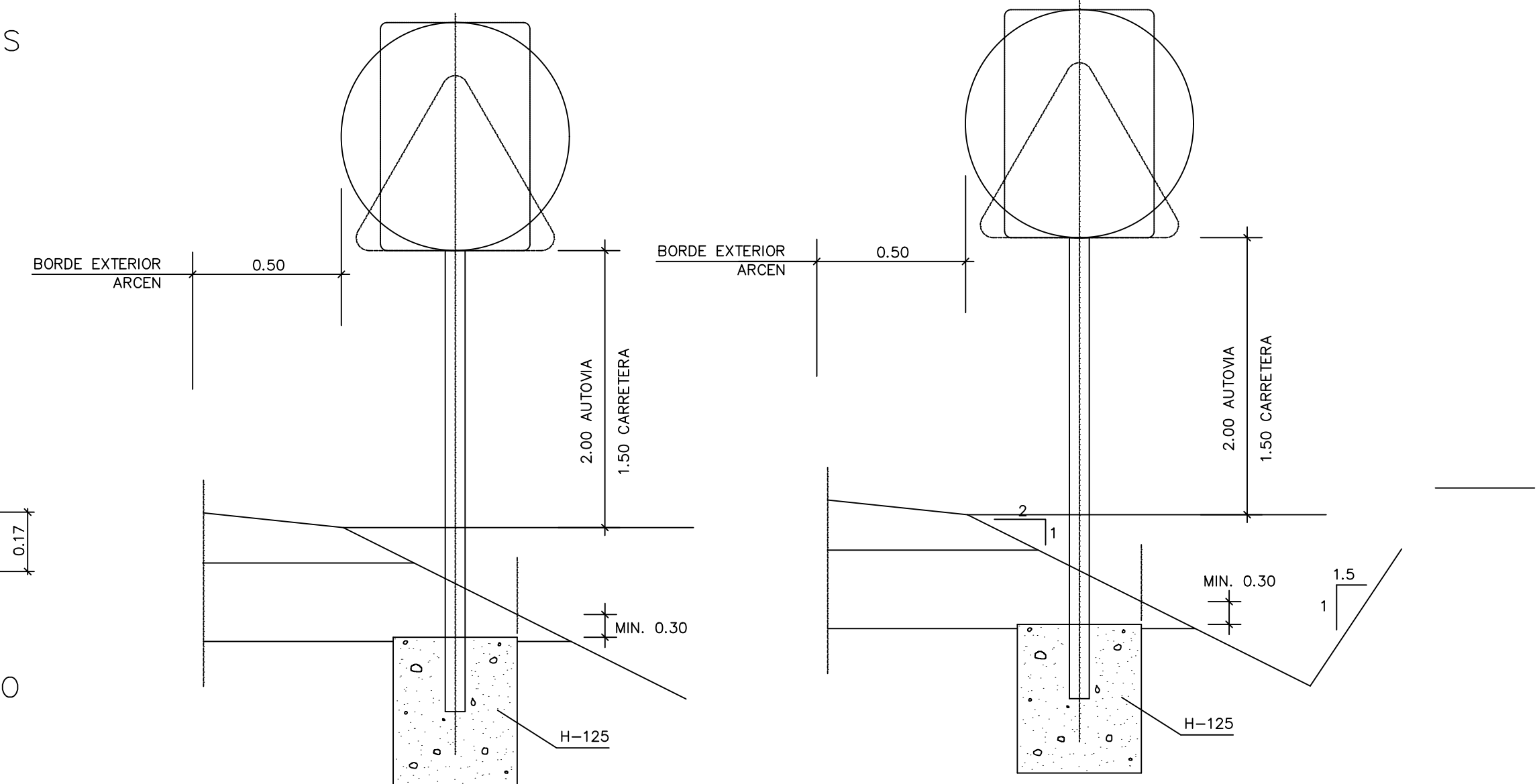
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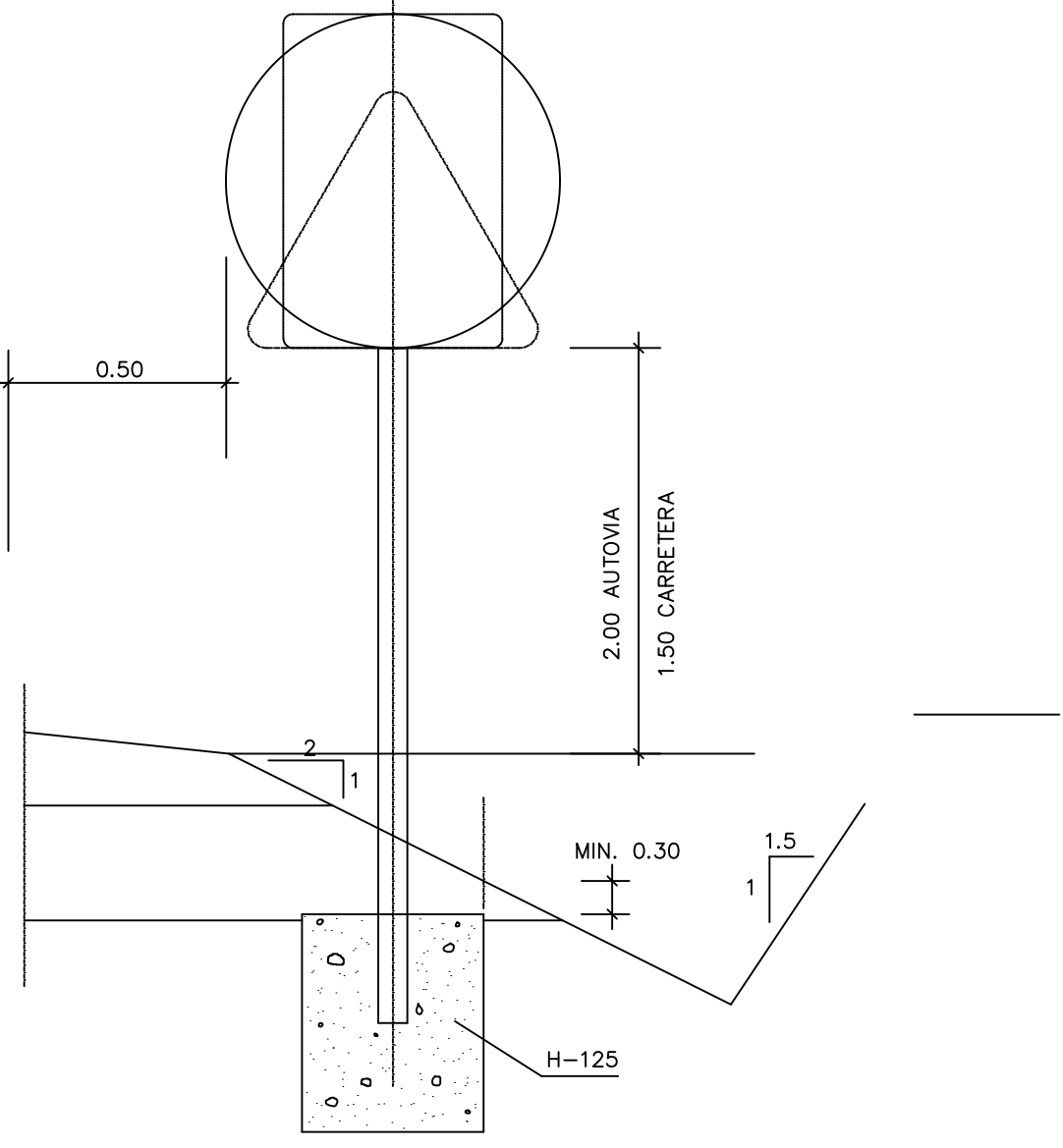
CARTEL COMPLEMENTARIO DE SEÑAL S/E



DETALLES DE SEÑALES DE CODIGO S/E



EMPLAZAMIENTO Y CIMENTACION DE SEÑALES EN TERRAPLEN E. 1:20



EMPLAZAMIENTO Y CIMENTACION DE SEÑALES EN DESMONTE E. 1:20

NOTAS :

LOS POSTES DE SUJECION DE LAS SEÑALES SERAN DE ACERO GALVANIZADO

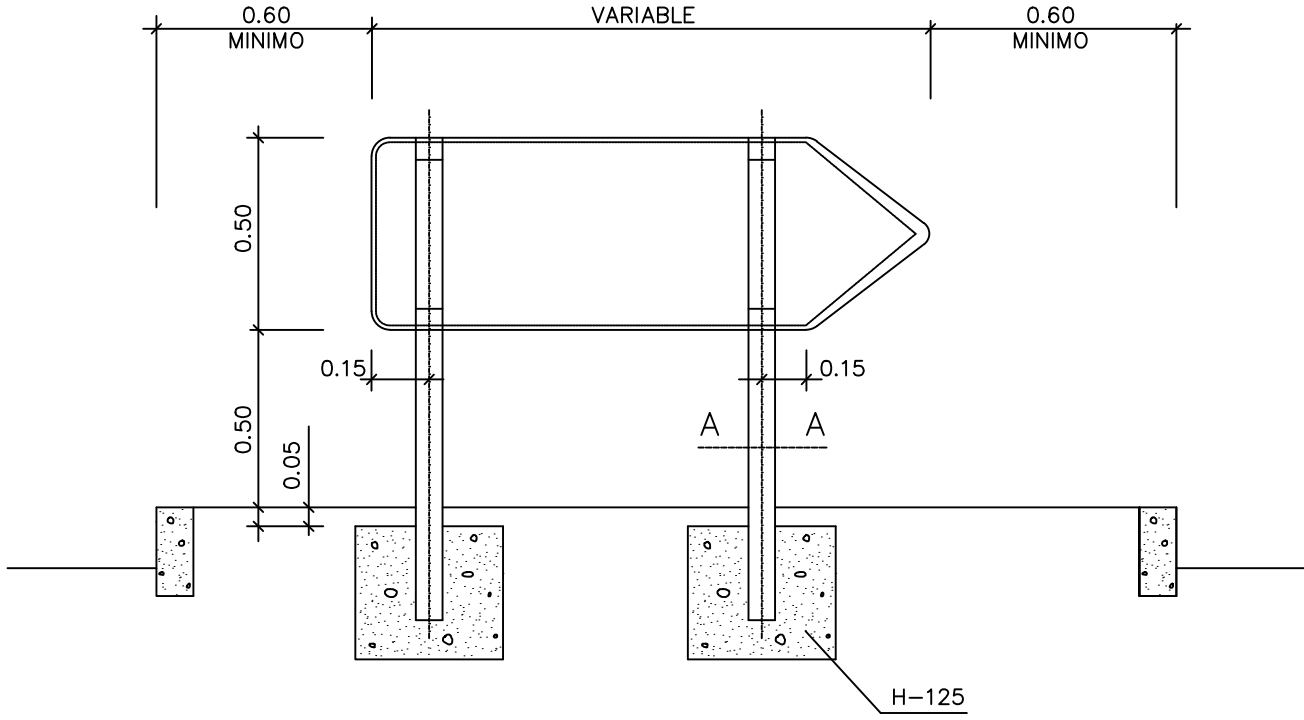
EN EL CASO DE QUE LA LONGITUD L DE UN CARTEL C-750 SEA MAYOR DE 3 m, SE DISPONDRA DE UN TERCER POSTE DE SUJECION A LA DISTANCIA DE L/2, CON LA MISMA CIMENTACION QUE LAS ANTERIORES

EL REVERSO DE LAS SEÑALES SERA DE COLOR NEUTRO

TODOS LOS ELEMENTOS DE SUJECION, PLACAS Y CIMENTACIONES CUMPLIRAN LO ESPECIFICADO EN EL PLIEGO DE PRESCRIPCIONES TECNICAS.

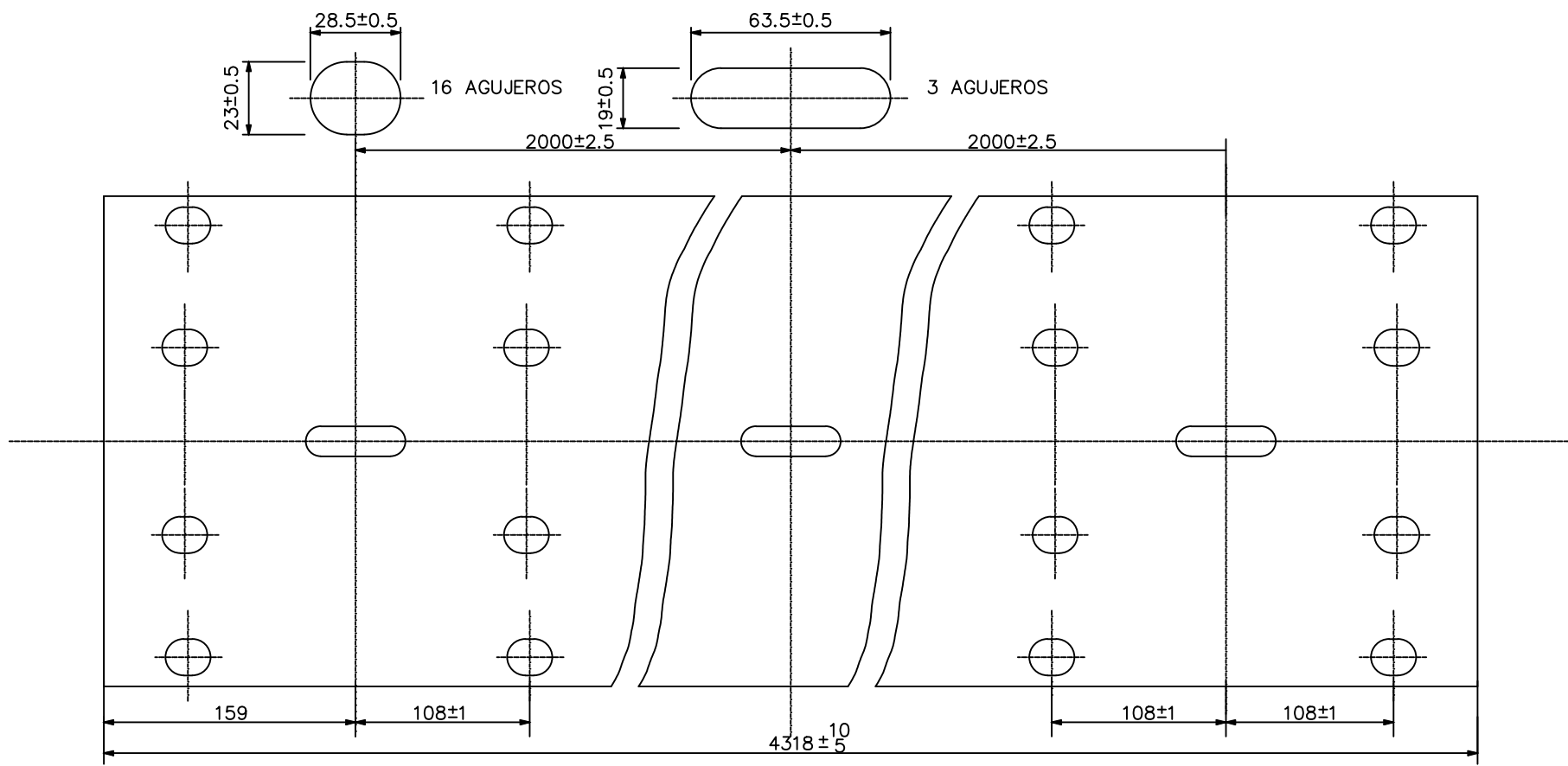
LOS DATOS DE CIMENTACION, DE HORMIGON H-125 TENDRAN LAS DIMENSIONES QUE INDICA EL ANEXO 4 DE LA NORMA 8.1-IC PROVISIONAL DE JULIO DE 1990

LOS POSTES DE SUSTENTACION TENDRAN LAS DIMENSIONES Y ESPESORES QUE ESTABLECE REFERIDA NORMA 8.1-IC

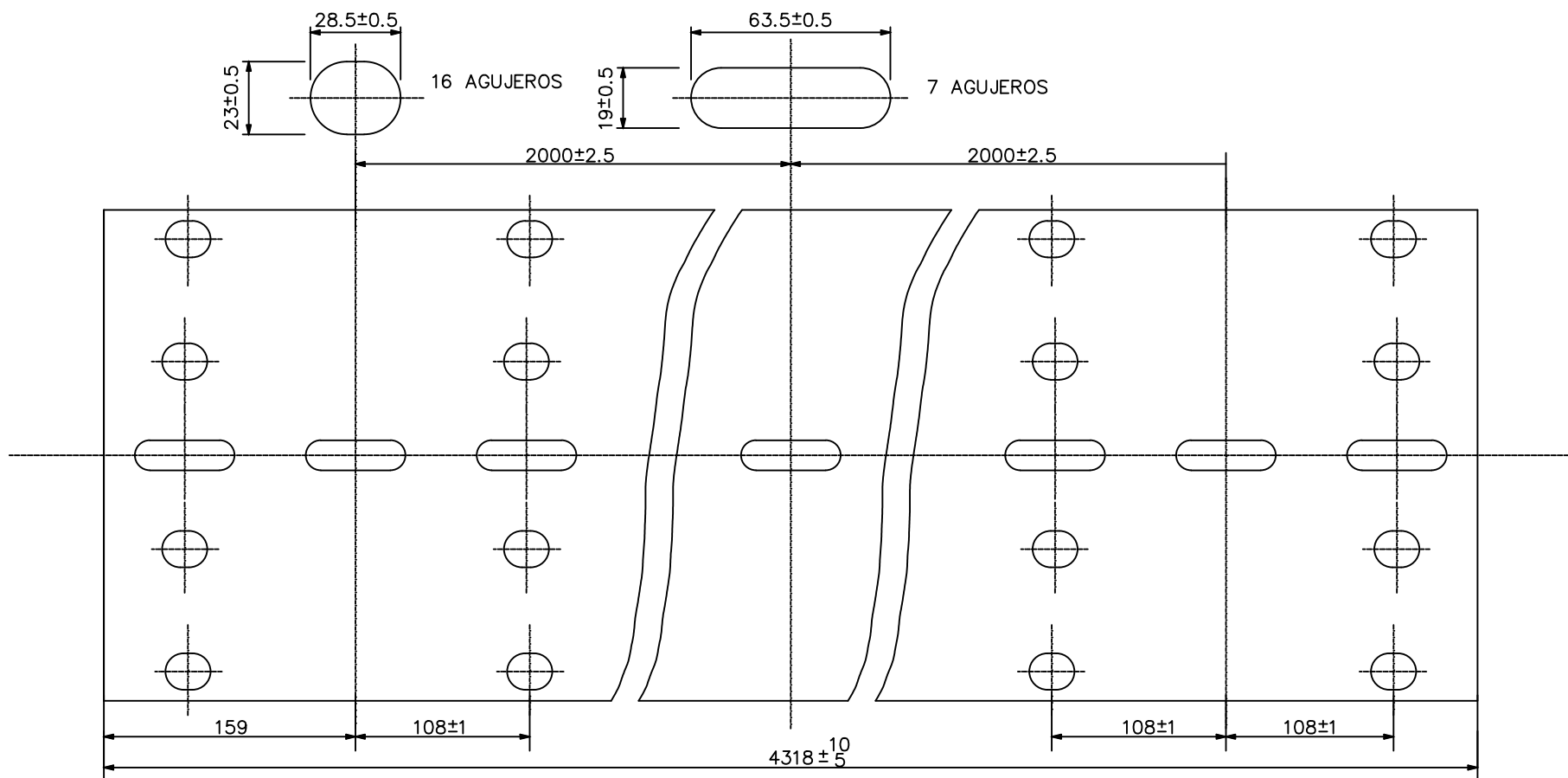


EMPLAZAMIENTO Y CIMENTACION DE FLECHAS DE DIRECCION EN ISLETAS

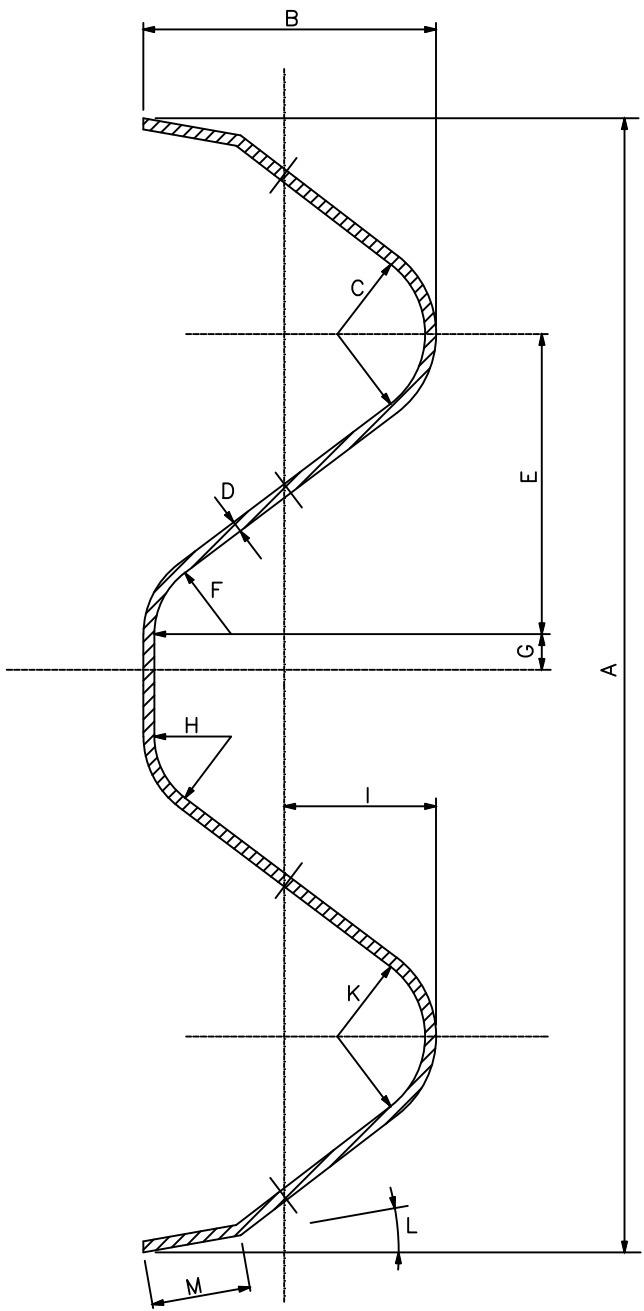
VALLA RECTA ESTANDAR
E. 1:40



VALLA RECTA DESMONTABLE
E. 1:40

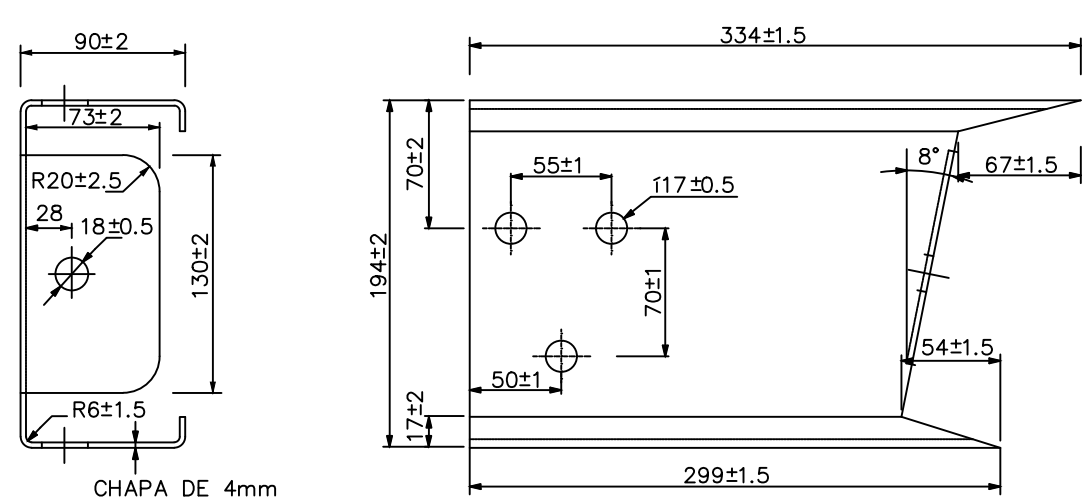


PERFIL BIONDA
E. 1:20

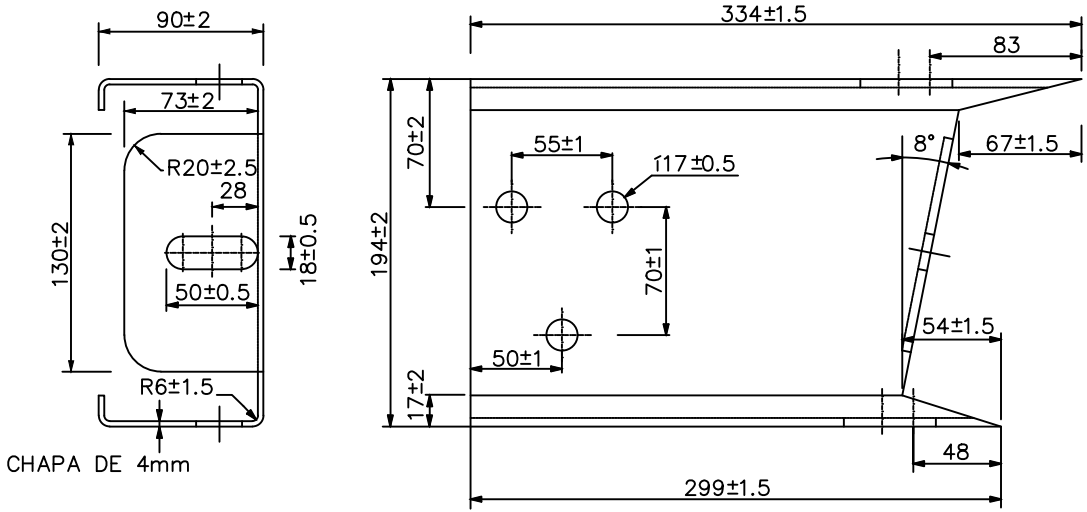


	NOMINAL	TOLER. -	TOLER. +
A	310	0	6
B	80	0	6
C	24	-2	2
D	3	-	-
E	82	-1	2
F	24	-2	2
G	14	-0.5	1
H	24	-2	2
I	39	-2	3
J	81	0	5
K	24	-2	2
L	10°	-3°	3°
M	27	-1	1

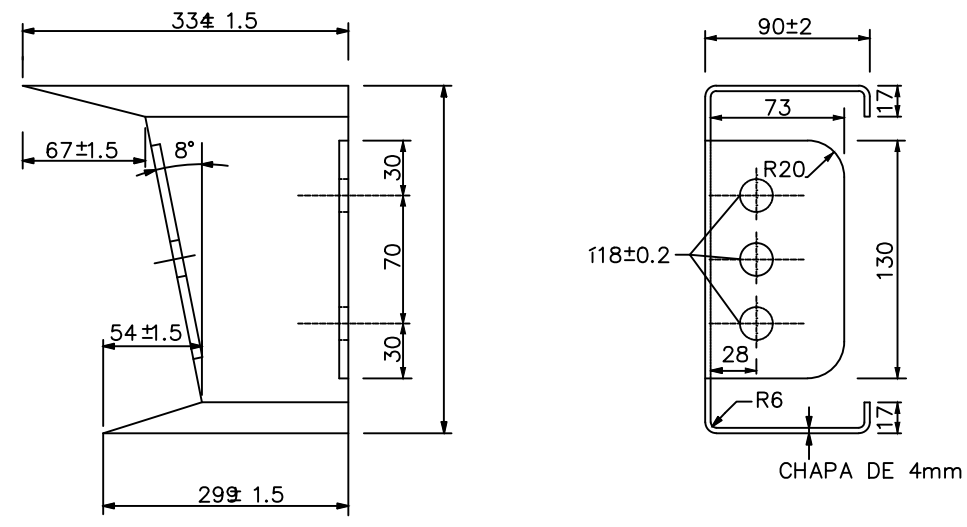
SEPARADOR ESTANDAR
E. 1:4



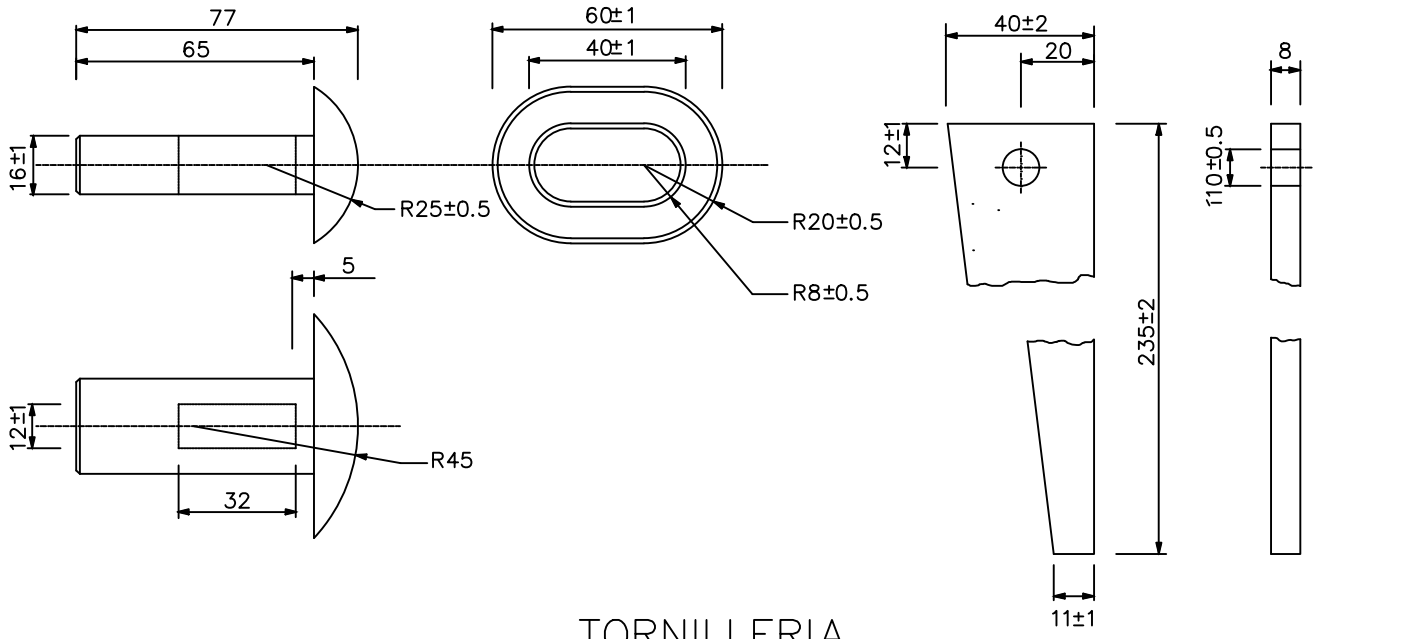
SEPARADOR BARRERA ABATIBLE
E. 1:4



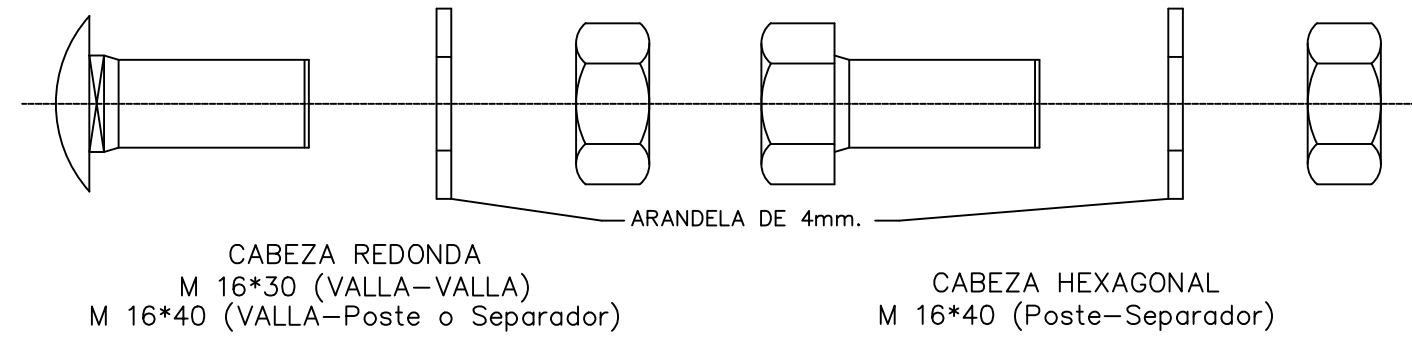
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BULON Y CLAVIJA
E. 1:2

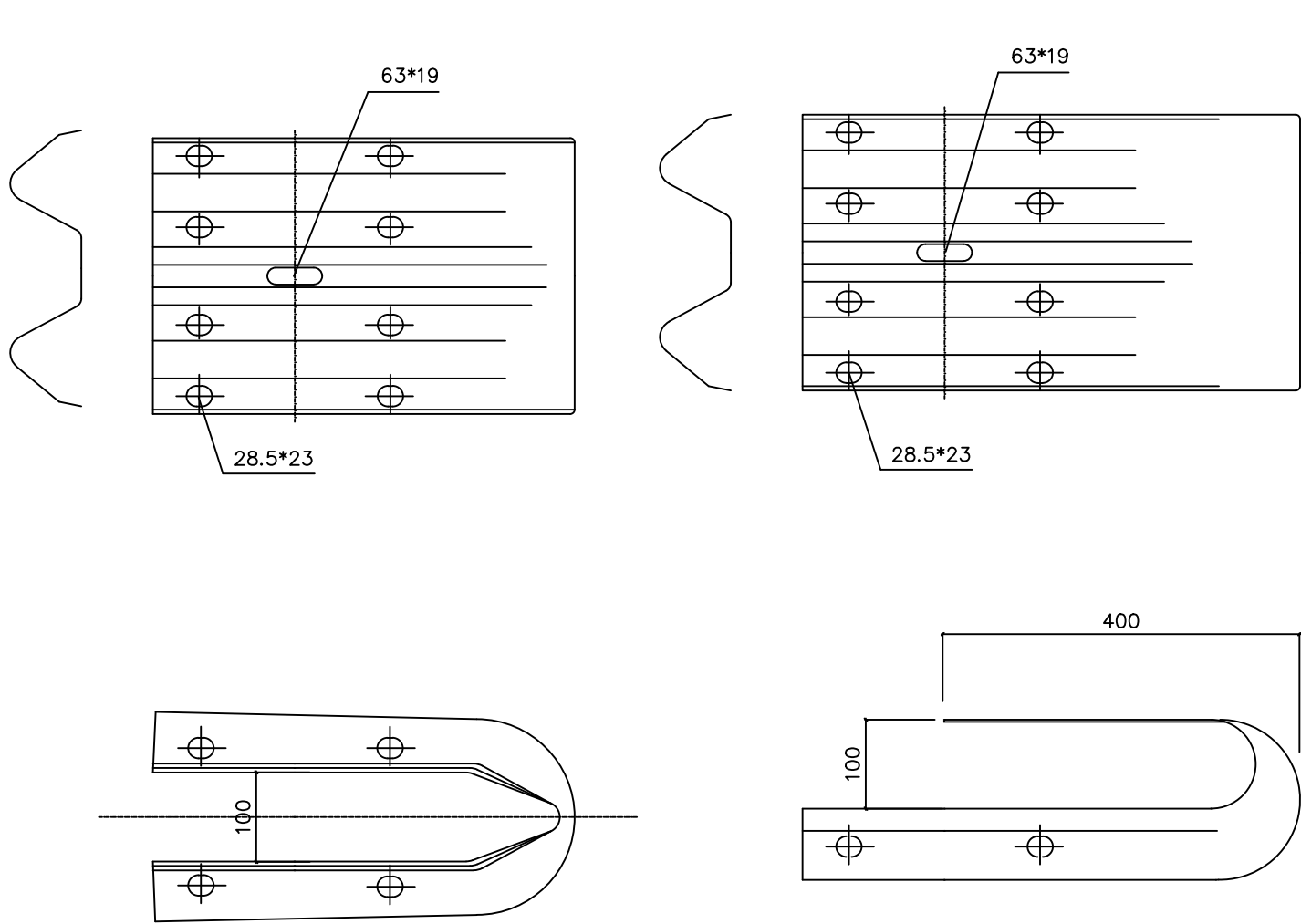


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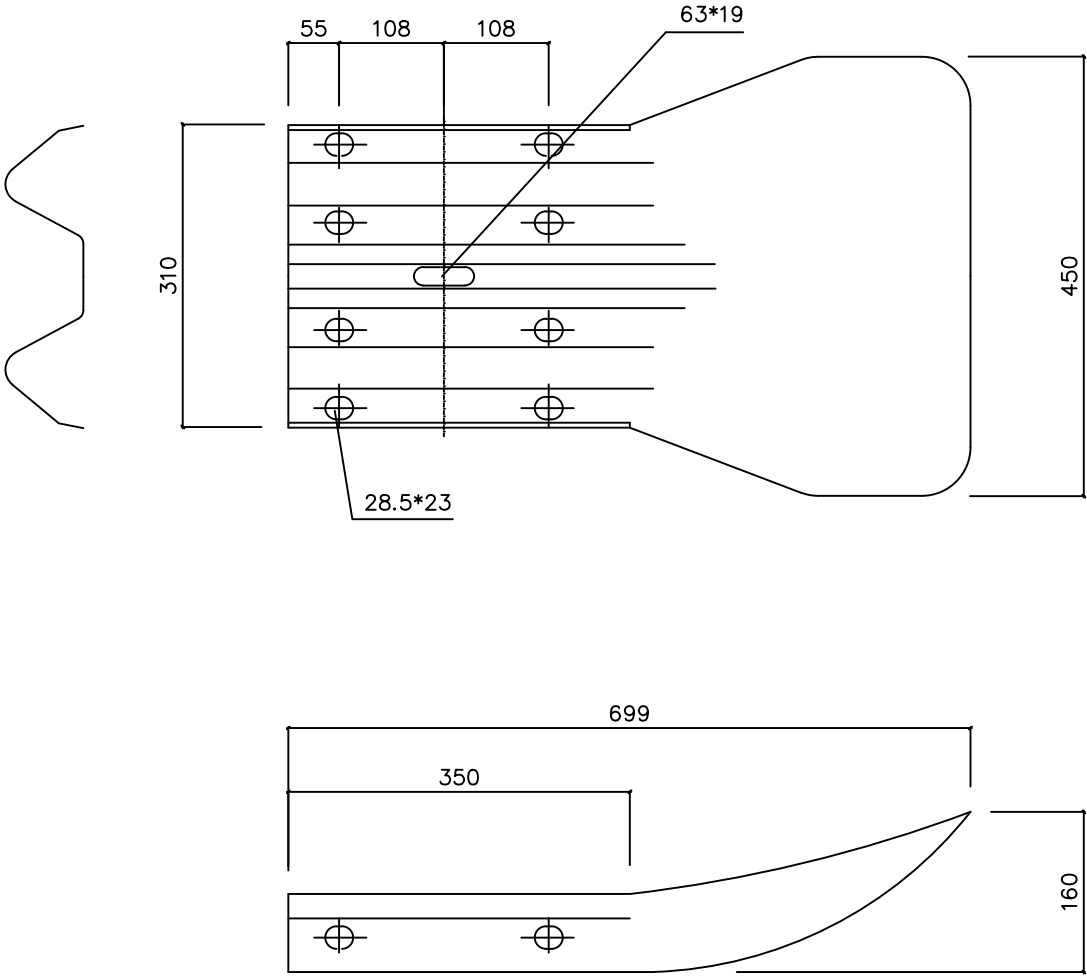


TERMINALES Y PIEZAS ESPECIALES

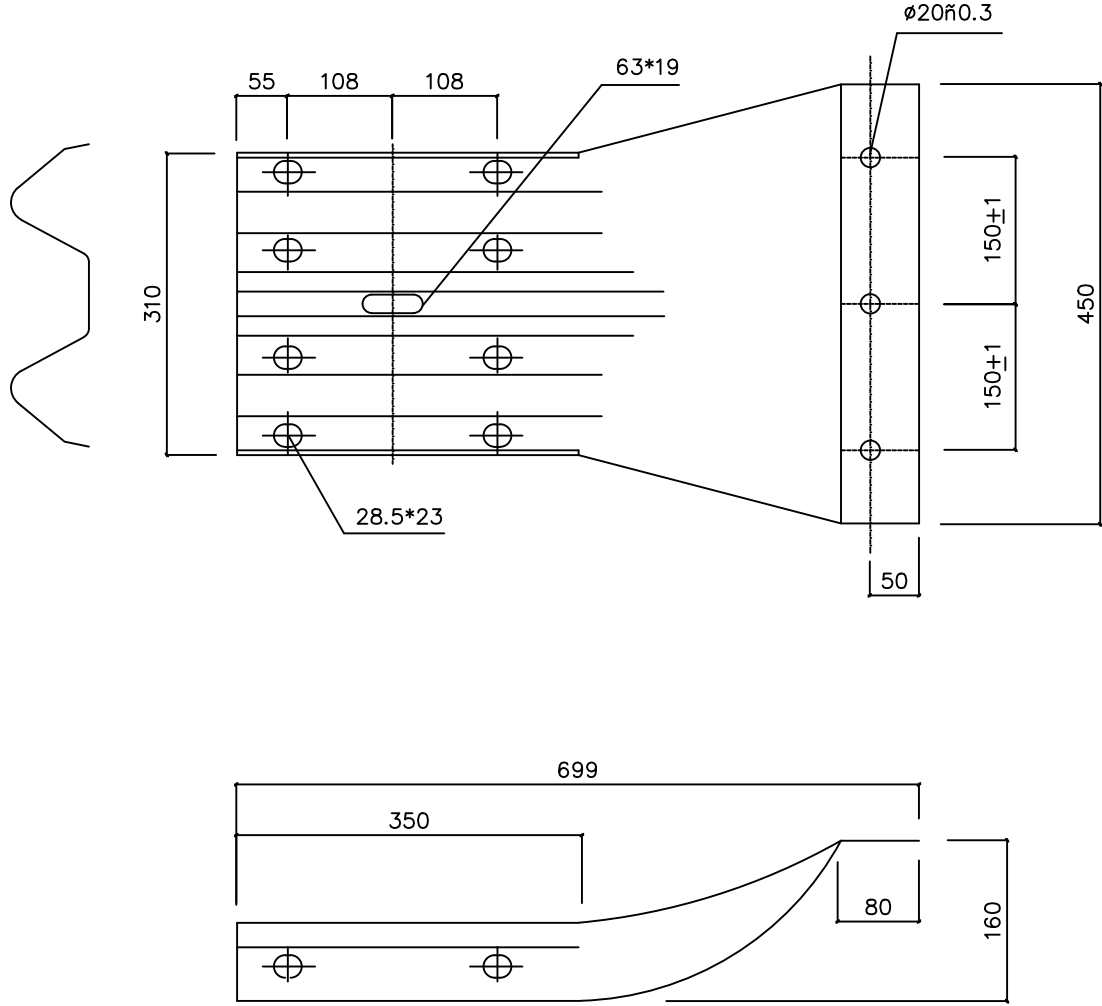
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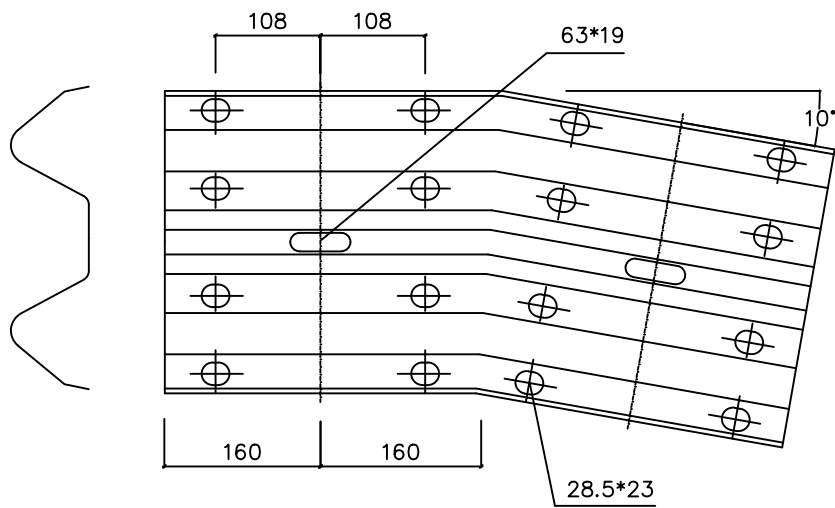
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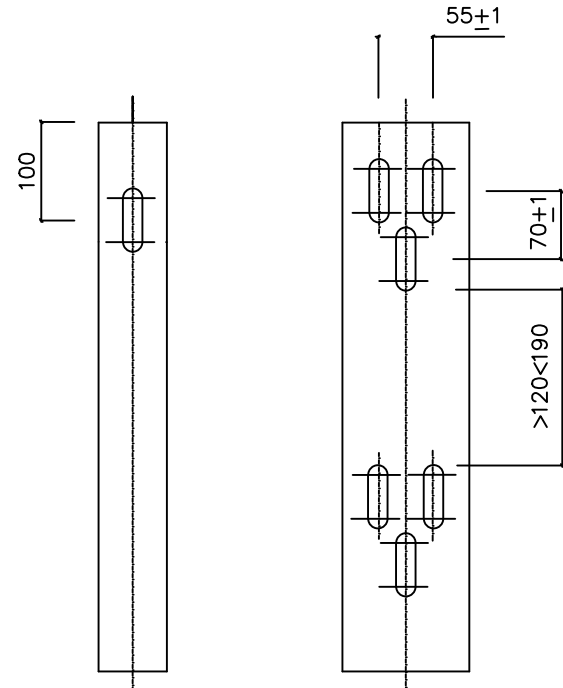
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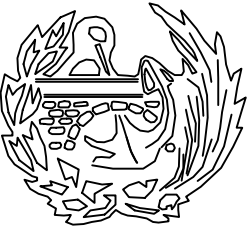
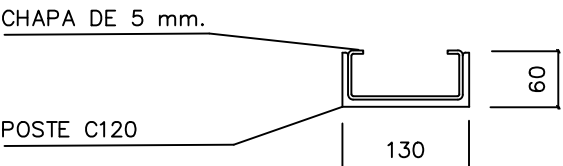
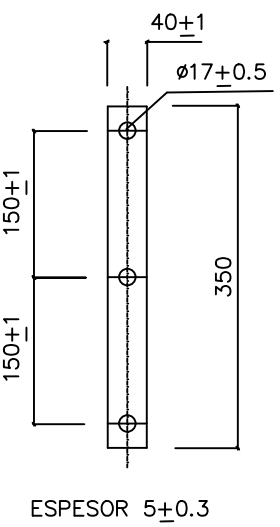
PIEZA ANGULAR



PIEZA DE RECRECIDO



PLETINA DE FIJACION



ESCUELA TECNICA SUPERIOR DE INGENIEROS
DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA

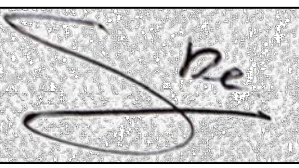
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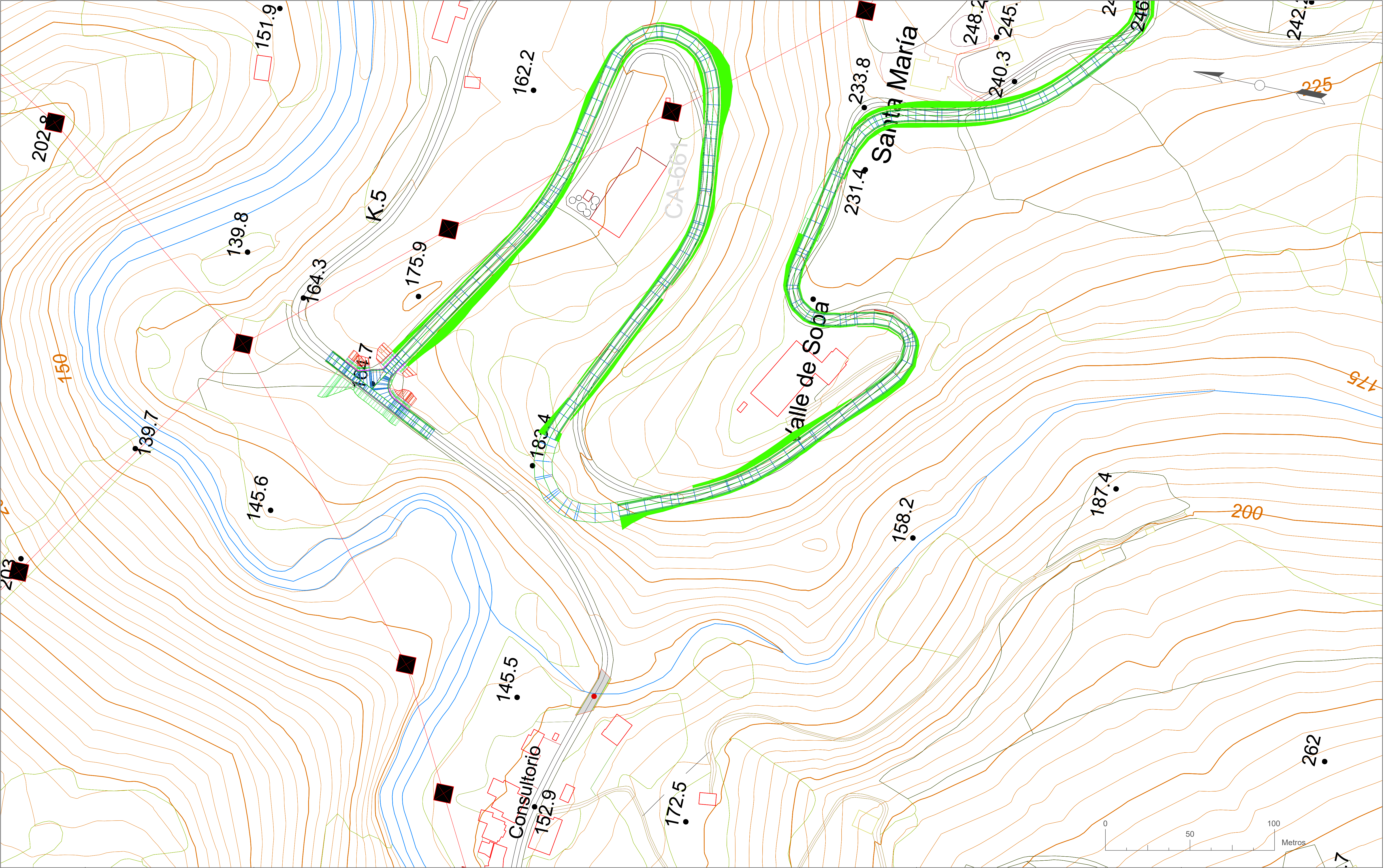
AUTHOR
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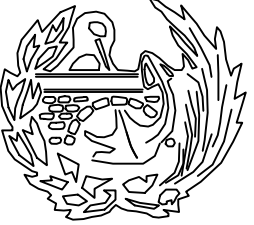
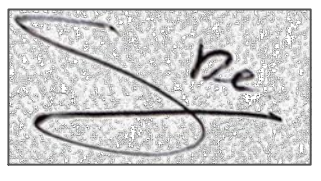


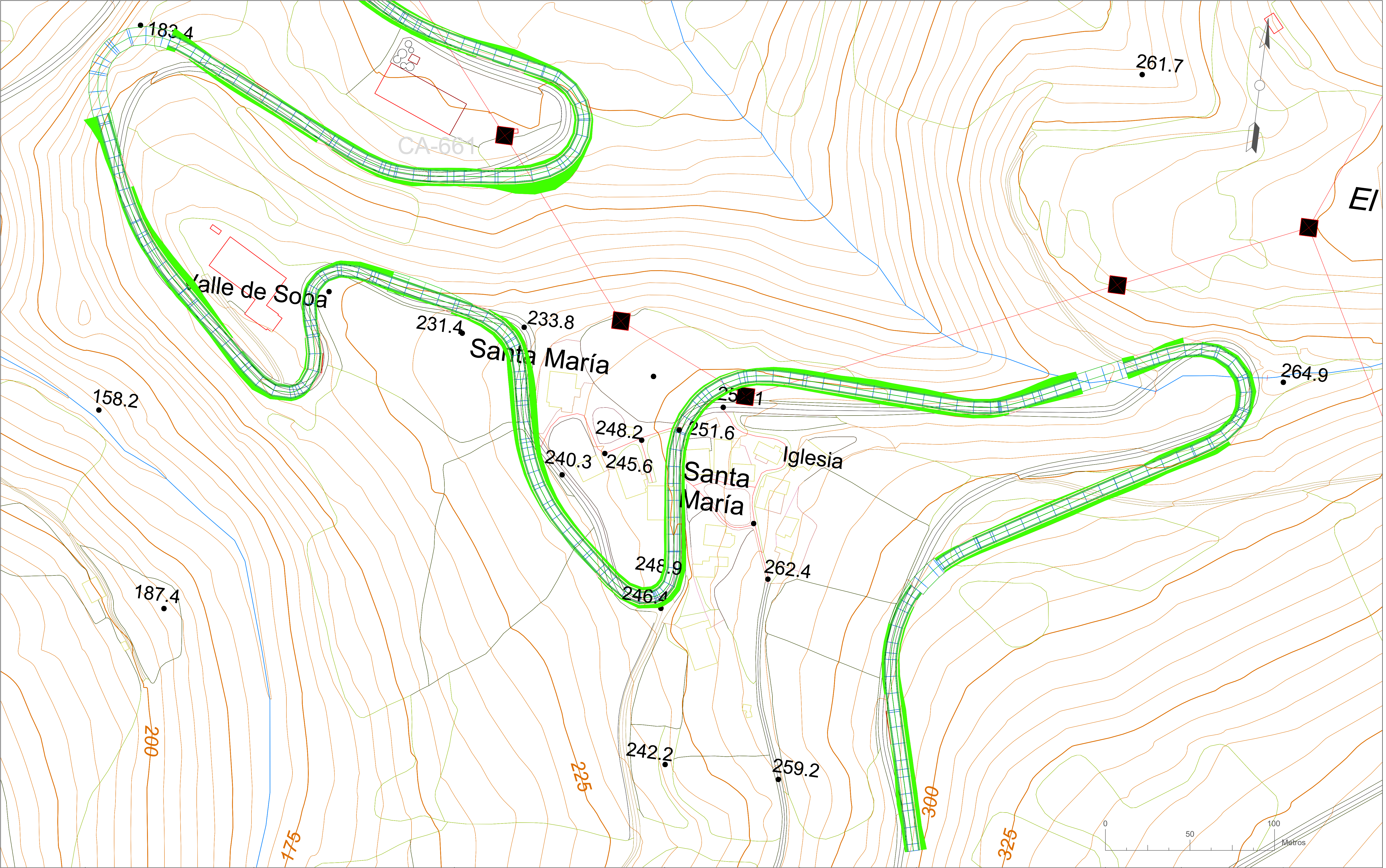
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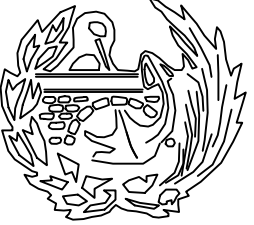
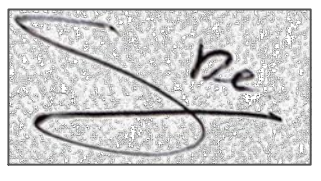
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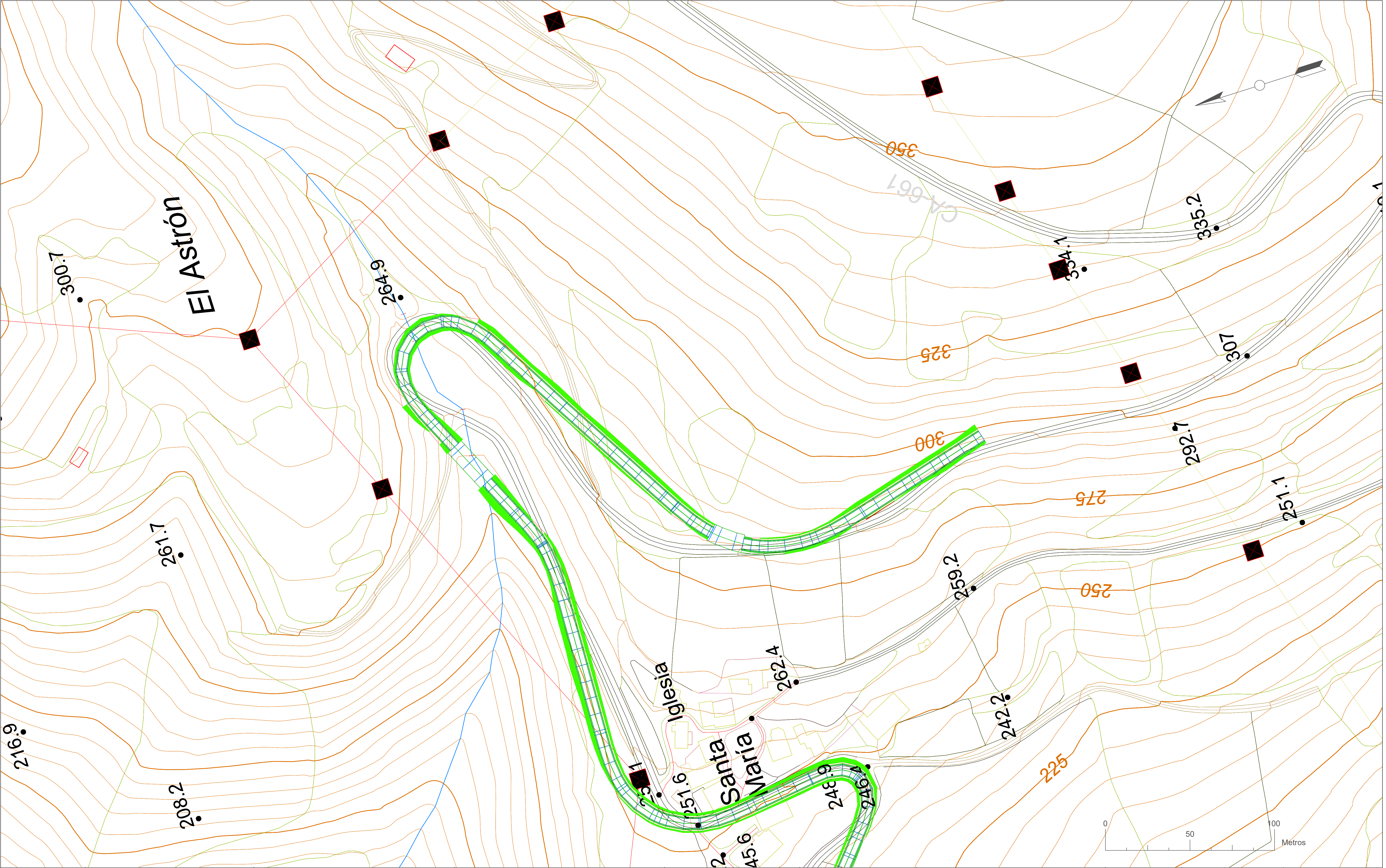
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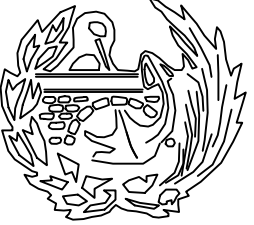
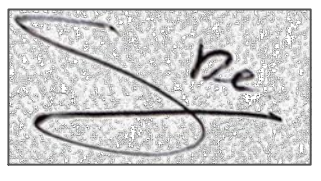


	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE ENVIRONMENTAL INTEGRATION	AUTHOR SANTOS DIEGO CRUZ 	SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 6
				REGION CANTABRIA					SHEET 1 OF 3



	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE ENVIRONMENTAL INTEGRATION	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 6
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	ESCUOLA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA	TYPE CONSTRUCTION PROJECT	TITLE PLATFORM IMPROVEMENT ROAD CA-661, ACCES TO "LA BUSTA"	MUNICIPALITY SOBA	DRAWING TITLE ENVIRONMENTAL INTEGRATION	AUTHOR SANTOS DIEGO CRUZ		SCALE 1/1000	DATE SEPTEMBER 2025	DRAWING 6
				REGION CANTABRIA						SHEET 3 OF 3



DOCUMENT N.º2 – ADDITIONAL DOCUMENTATION



DOCUMENT Nº2 – WORKPLACE DESCRIPTION



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1. INTRODUCTION

The project's highway, CA-661, is in the autonomous community of Cantabria, in northern Spain. This community is bordered by the Principality of Asturias to the west, the Basque Country to the east, Castile and León to the south, and the Bay of Biscay to the north.

This appendix describes the geographical context of the study area and its defining characteristics, such as the municipal economy and demographic development.

2. WORKPLACE STUDY

2.1. REGIONAL FRAMEWORK

The Community of Cantabria has a population of 590,851 inhabitants (INE, January 2024), making it the sixteenth most populous community in Spain. Most of the population is distributed in the northern part of the region, with the city of Santander being the most populated municipality, with 173,635 inhabitants, followed by Torrelavega and Castro-Urdiales, with 51,466 and 33,365 inhabitants, respectively (INE 2024).



Figure 1: Location of Cantabria in the Iberian Peninsula.

2.2. MUNICIPAL AND COMARCAL FRAMEWORK

The CA-661 highway, which provides access to the town of San Juan de la Cistierna, is in the municipality of Soba, in southeastern Cantabria. Soba, a valley and municipality in the autonomous community of Cantabria, is bordered by the following: to the north, Ramales de la Victoria, Arredondo, and the Ruesga Valley; to the south,

La Merindad de Montija and Espinosa de los Monteros, region in the province of Burgos; to the east, Lanestosa and Carranza, region in the province of Vizcaya; and to the west, San Roque de Riomiera.

The municipality of Soba is the third largest in the community of Cantabria, covering an area of 214.16 square kilometers covered with extensive oak, beech, and holm oak forests. The main rivers flowing through the municipality are the Asón River and the Gándara River, the former flowing into the Cantabrian Sea and the latter flowing west to east, towards the Basque Country. Within the municipality of Soba, there are a total of 27 towns or population centers, which are: Aja, Asón, Astrana, Bustancillés, Cañedo, Fresnedo, Hazas, Herada, Incedo, Lavín, Pilas, El Prado, Quintana, Regules, Rehoyos, La Revilla, Rozas, San Juan, San Martín, San Pedro, Sangas, Santayana, Valcaba, Valdició, Veguilla, Villar, and Villaverde. Of these, Veguilla is the capital, with a population of 44 (INE, 2024) and is 65.5 kilometers from Santander, the capital of the community.

Soba, in turn, is part of the Asón-Agüera region, which is rural and has a population of just over 14,000. The regional capital is Ramales de la Victoria, with a population of 3,055 (INE, 2024). The other areas that define the regional framework of Cantabria are: Besaya, Campoo-Los Valles, Costa Occidental, Costa Oriental, Liébana, Saja-Nansa, Santander, Trasmiera, and Valles Pasiegos.

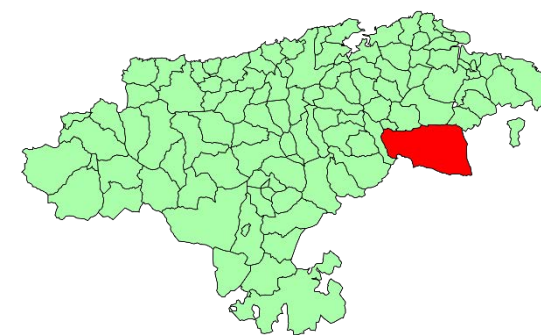


Figure 2.1: Location of Soba.

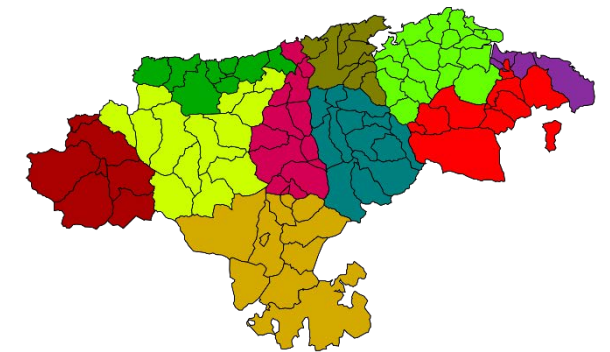


Figure 2.2: Regions of Cantabria. In red, the Asón-Agüera region.



3. DEMOGRAPHICS

According to INE reports, the municipality of Soba has a population of 1,076. The municipality's population, which grew steadily until the beginning of the 20th century, has been declining since then.

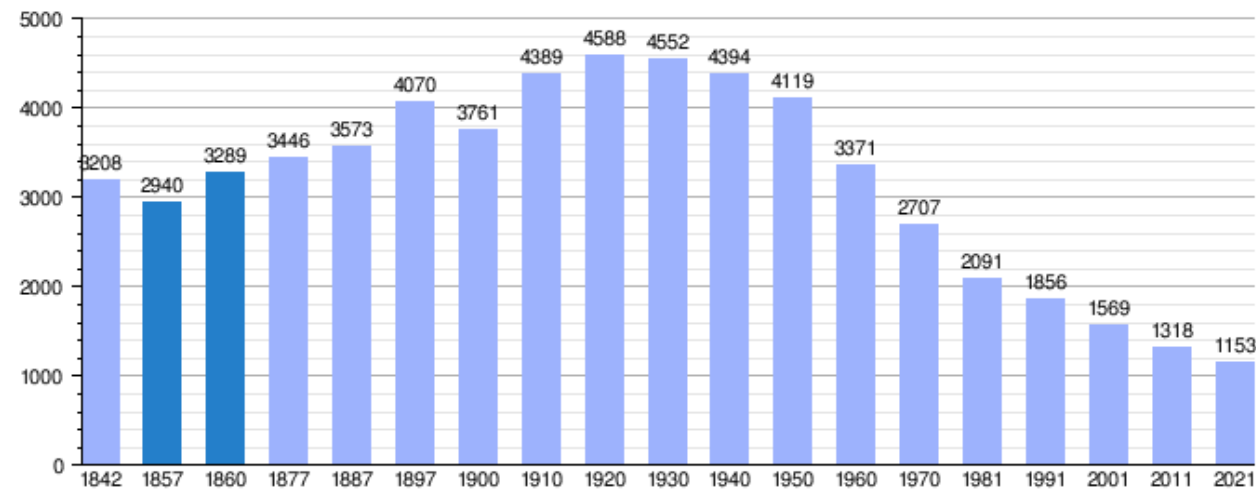


Figure 3.1: Demographical evolution of Soba between 1842 and 2021.

Superficie Construida			
Decada	% Total	Top Provincial	Top Nacional*
<1900	0.19%	<- 25° ->	<- 4291° ->
1900-1909	63.82%	<- 4° ->	<- 147° ->
1910-1919	3.22%	<- 31° ->	<- 757° ->
1920-1929	9.83%	<- 38° ->	<- 627° ->
1930-1939	2.72%	<- 51° ->	<- 2190° ->
1940-1949	2.58%	<- 64° ->	<- 3054° ->
1950-1959	1.06%	<- 84° ->	<- 4552° ->
1960-1969	1.79%	<- 67° ->	<- 4027° ->
1970-1979	1.48%	<- 81° ->	<- 5126° ->
1980-1989	6.13%	<- 55° ->	<- 3328° ->
1990-1999	3.01%	<- 72° ->	<- 3884° ->
2000-2009	3.48%	<- 76° ->	<- 4099° ->
2010-2019	0.70%	<- 74° ->	<- 4106° ->

Figure 3.2: Square meters constructed, by decade, in Soba municipality.

As can be seen in the attached graphs, the population of Soba began to decline starting in 1920, leading to the current record lows. This figure, coupled with the decline in the municipality's built-up area from the same period onward, explains the growth in the cities and the rural exodus, with the population moving from rural areas to the region's main urban centers.

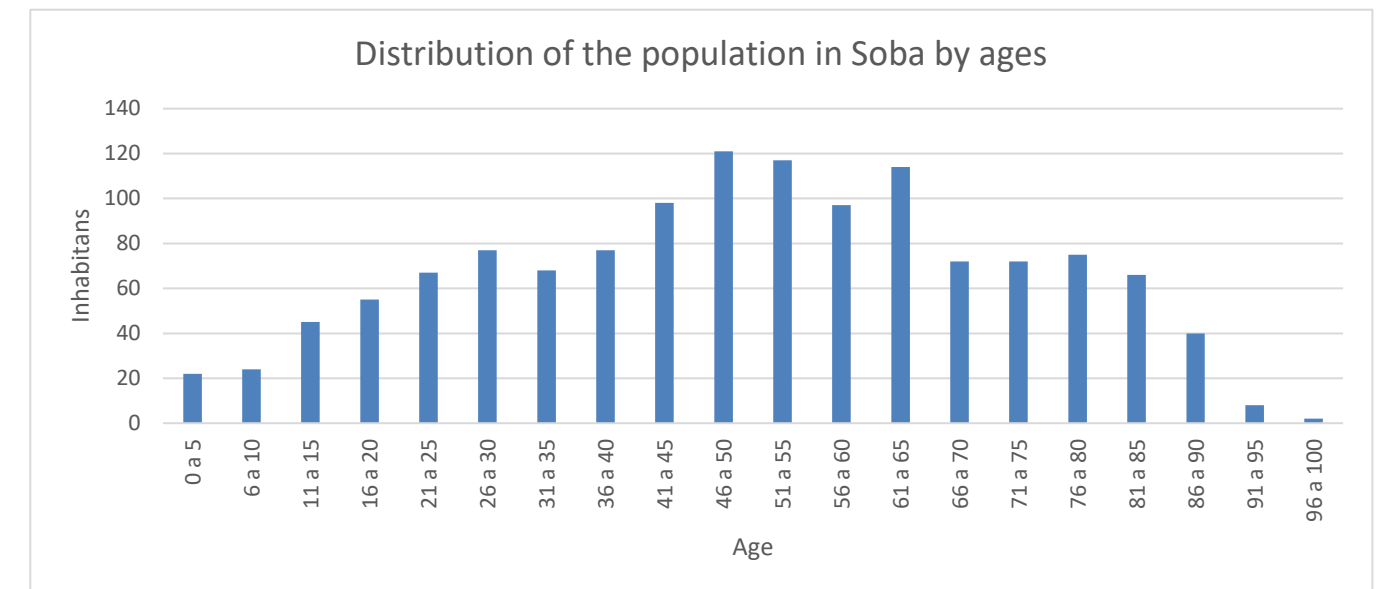


Figure 3.3: Distribution of the population in Soba by ages.

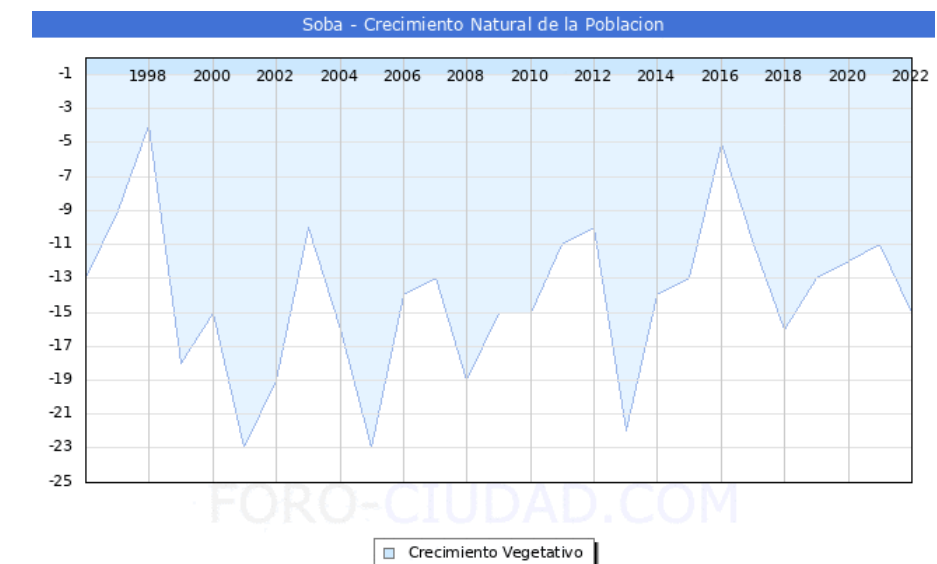


Figure 3.4: Natural, or vegetative, growth of the population in Soba.



As of today, Soba's population is predominantly adult, growing older with age. At the same time, the municipality's consistently negative annual natural population growth rates, which indicate a greater number of deaths than births, are indicative of its declining population.

4. ECONOMY

The main economic sector in Soba is the primary sector. Livestock farming is the basis of the municipality's economy, employing 59% of its working population. The next largest contributors are the service sector, with 21.1%, and construction, with 10.8%.

Agricultural activities play a predominant role in Soba's economy. According to the 1999 Agricultural Census, out of a total area of 20,966 hectares, 12,357 hectares are used for permanent pasture and 6,522 hectares for forest trees; 7 hectares are used for cultivating herbaceous species. Regarding livestock, according to data collected during the 2002 livestock sanitation campaign and presented by the Ministry of Livestock, Agriculture and Fisheries of the Government of Cantabria, Soba is home to the largest number of cattle in the region, with 10,948 heads. Also significant is the number of sheep (2,291) and goats (720).

	Municipio	Cantabria
Sector primario	59.0	6.0
Construcción	10.8	13.5
Industria	9.0	18.9
Sector terciario	21.2	61.6
Tasa de actividad	46.6	52.5
Tasa de paro	11.9	14.2

Figure 4: Active population distribution by economic sectors.



DOCUMENT N.º2.2 – SIGNALING, BEACONING AND CONTAINMENT SYSTEMS

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1. INTRODUCTION

This annex sets out the signage, marking, and containment elements that must be implemented or placed along the roadway to ensure its proper operation. These elements are:

- Horizontal markings.
- Vertical markings.
- Markings.
- Vehicle containment systems.

2. HORIZONTAL SIGNALING

The horizontal signage, or road markings, to be installed on the projected roadway have been designated by Standard 8.2 I.C. on road markings, approved by the ministerial order of July 16, 1987.

According to Standard 8.2 I.C., road markings are those lines or figures applied to the pavement whose purpose is to fulfill one of the following functions:

- Delimit traffic lanes.
- Separate traffic directions.
- Indicate the edge of the roadway.
- Delimit areas excluded from regular vehicle traffic.
- Regulate traffic, especially overtaking, stopping, and parking.
- Complete or clarify the meaning of vertical signs and traffic lights.
- Repeat or remind road users of vertical signs.
- Permit indicated movements and announce, guide, and direct road users.

All inscriptions and markings that form part of the horizontal road signage shall be made in white, with the reference B-118 marked by the UNE 48 103 standard.

2.1. LONGITUDINAL MARKS

The longitudinal markings placed on the road will serve to delimit the carriageway and, therefore, the length of the lanes. Depending on the continuity of these markings, overtaking and/or access to and from other roads or paths and adjacent properties will be permitted, or none at all.

2.1.1. CONTINUOUS LONGITUDINAL MARKS

The continuous longitudinal marks to be used are:

Road marking M-2.2: For separating lanes in opposite directions on two-lane roads. This marking will be used as the line delimiting the two lanes that make up the road. This marking indicates that passing is prohibited due to insufficient visibility to complete the crossing or once started, to abandon it. As this is a winding road with many curves, this marking will be present along almost the entire route of the section comprising the project.



Figure 1: Road marking M-2.2.

Road marking M-2.6: For the edge of the roadway. Marking that delimits the outer edge of the roadway, of both lanes. Since this is a road with a design speed of 40 km/h, it is less than 100 km/h, and the two road markings referring to this situation, the M-2.5 and the M-2.6, we will choose the second one.

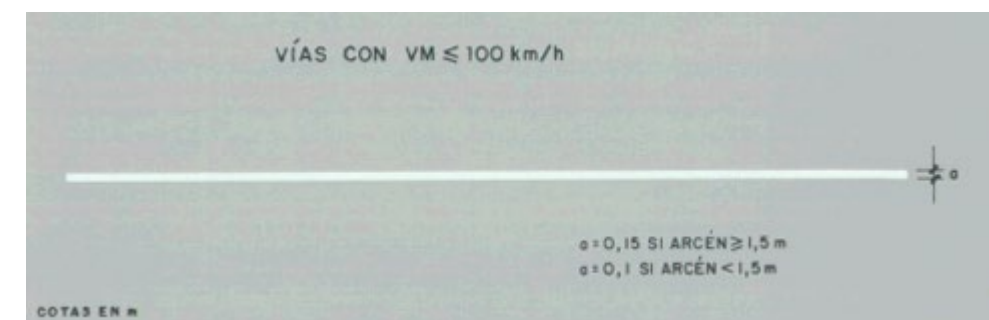


Figure 2: Road Marking M-2.6.

**2.1.2. DISCONTINUOUS LONGITUDINAL MARKS**

The discontinuous longitudinal marks to be used are:

Road marking M-1.3: For normal lane separation. It separates the two lanes that make up the road, with different directions of traffic. Since this is a road with a design speed of 40 km/h, this marking will be used, not the M-1.1 or M-1.2. Again, since the project road is winding and has sections unfavorable for overtaking, these road markings will be used to indicate the possibility of changing lanes to one adjacent to the opposite direction of traffic, either to access private property or to access a town.

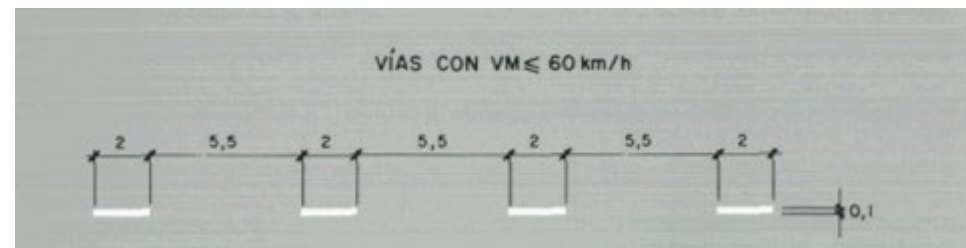


Figure 3: Road Mark M-1.3.

Road marking M-1.12: For the edge of the roadway. Demarcation of the edge of the roadway. It will be used on the outer edge of a special lane, entrance, or exit. That is, as with the previous marking, it will be used to indicate the entrance or exit access to private property or a road indicating access to a town. Since this is a road with a design speed of 40 km/h, the M-1.12 road marking will be used, not the M-1.11.

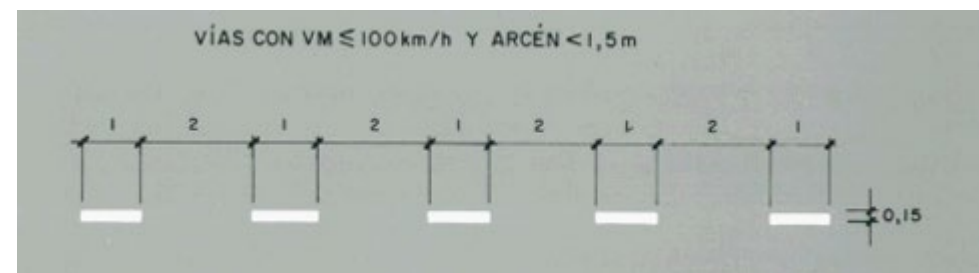


Figure 4: Road Mark M-1.12.

Road marking E-7: For a fork in the road. At the beginning of the road, which separates from the CA-256, a small fork in the road will be placed separating the outgoing direction of the road, i.e., the one that accesses CA-256 in two; each one permitting access to each one of the road directions in this other road.

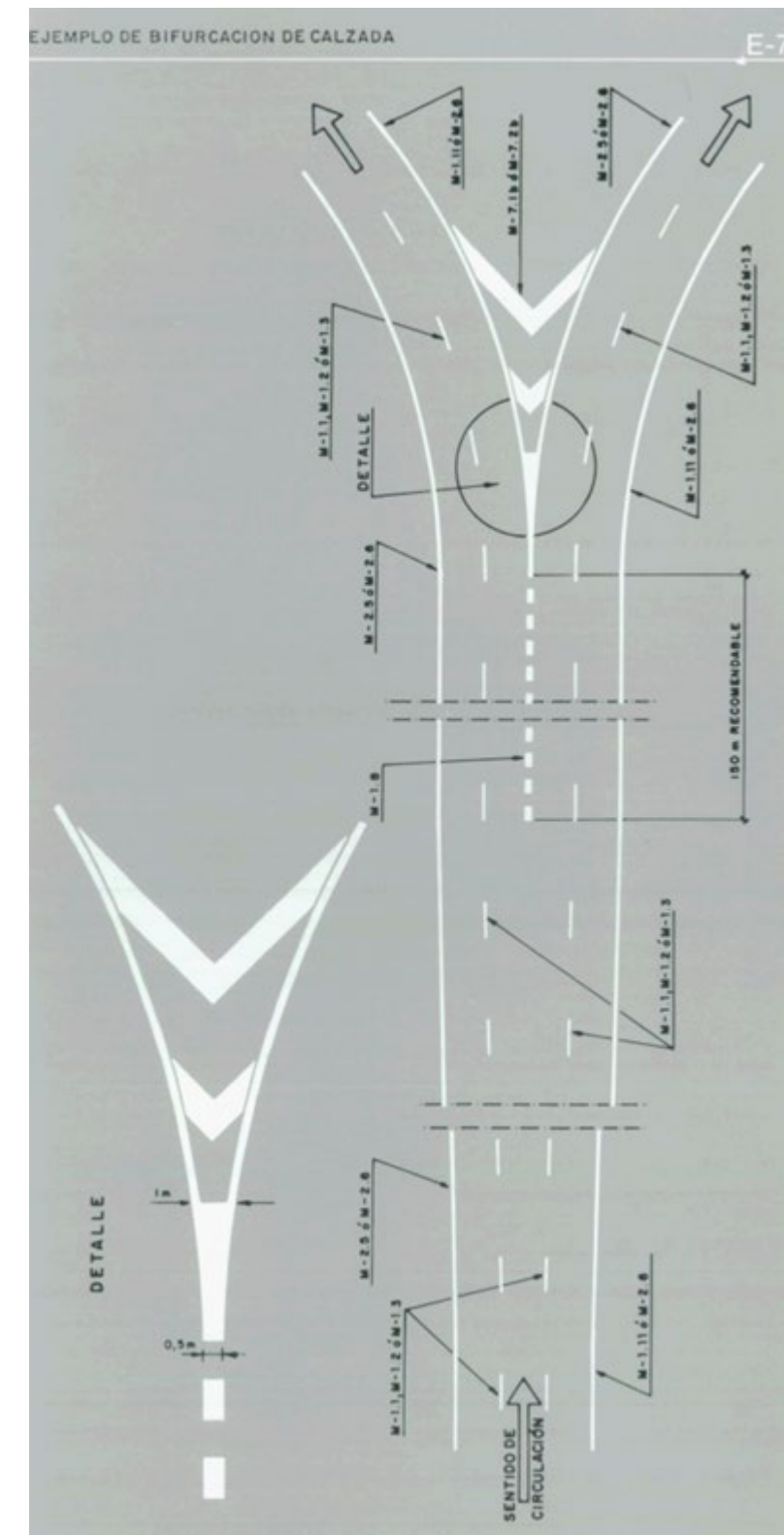


Figure 5: Road Mark E-7.



2.2. TRANSVERSAL MARKS

2.2.1. CONTINUOUS TRANSVERSAL MARKS- DETENTION LINE

continuous box arranged along the width of the lane indicating that no vehicle should cross it, in compliance with the obligation imposed by a mandatory stop sign.

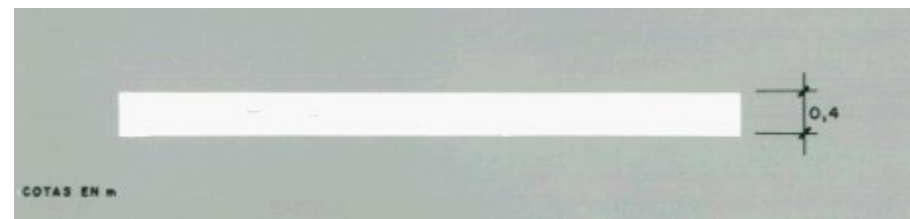


Figure 6: Road Mark M-4.1, Detention Line.

2.2.2. DISCONTINUOUS TRANSVERSAL MARKS- YIELDING LINE

A discontinuous line across the width of the lane that no vehicle must cross when it must yield the right of way in compliance with the obligation imposed by a yield sign.

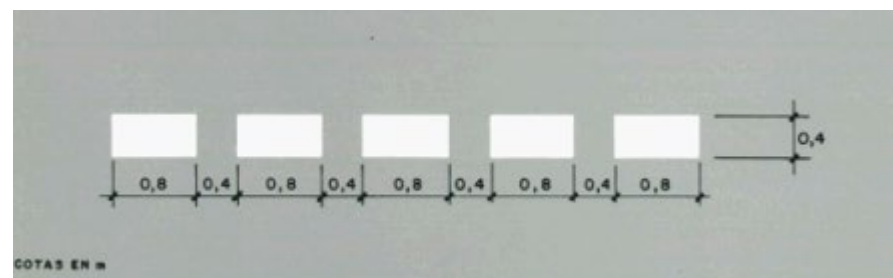


Figure 7: Road Mark M-4.2, Yielding Line..

2.3. INSCRIPTIONS

2.3.1. STOP INSCRIPTIONS

Painted in white and with the same meaning as its vertical counterpart, it indicates the obligation to stop the vehicle before the next stop line or, if there is no stop line, immediately before the approaching carriageway. Since this is a road with a design speed of 40 km/h, sign M-6.4 will be used instead of M-6.3.

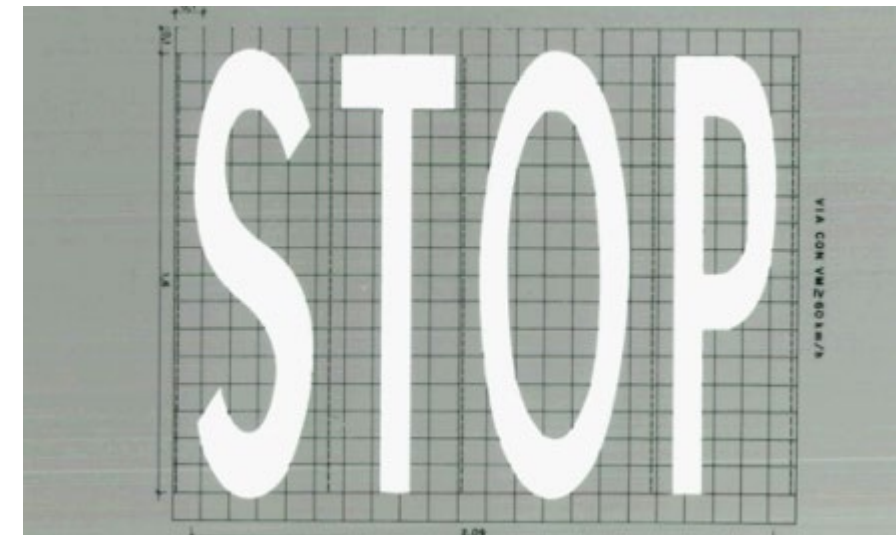


Figure 8: Road Mark M-6.4, Stop horizontal sign.

2.3.2. YIELDING INSCRIPTIONS

Also painted in white and with the same meaning as its vertical counterpart, it indicates the obligation to stop and yield to vehicles traveling on the approaching road.

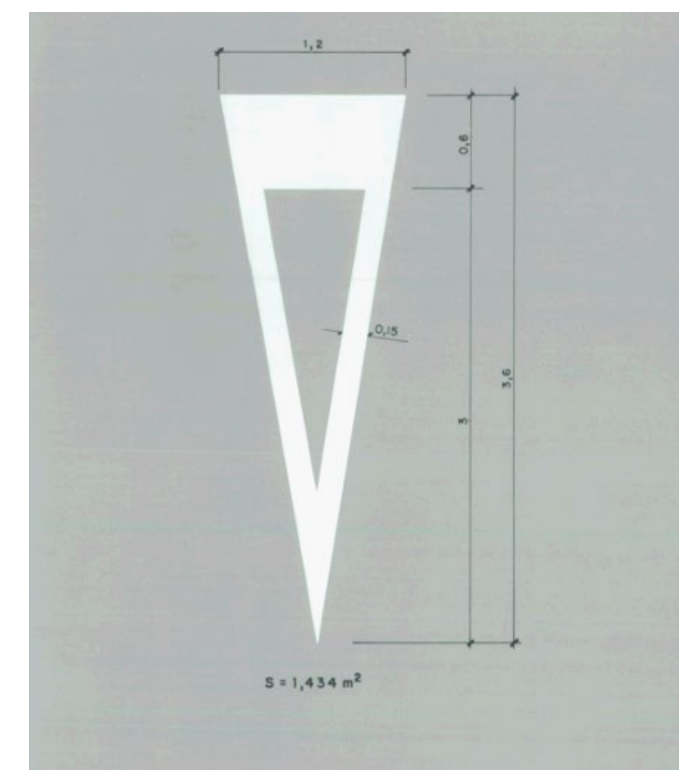


Figure 9: Road Mark M-6.5, Yielding inscription.



2.4. ARROWS

At the intersection where the road begins, the T between the CA-256 and the CA-661, an arrow will be placed pointing toward the CA-256, dividing the lane in two depending on which direction the CA-256 is needed to proceed. To this end, this sign will be placed before the stop signs. As this is a road with a design speed of 40 km/h, the sign to be used will be the M-5.2.

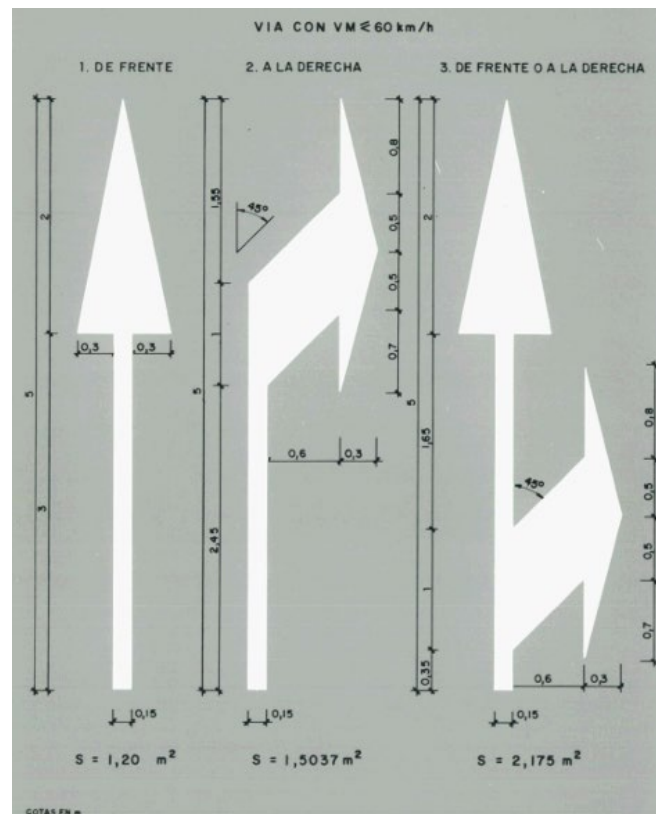


Figure 10: Road Mark M-5.2, Directional arrow or lane selection.

2.5. OTHER MARKS –ZEBRA LINES

Road markings delimit a zone that vehicles may not enter. Their purpose is to indicate to vehicles which zones are impassable and prohibited to traffic, and at the same time, through the inclination of the strips inside, to indicate which side vehicles should deviate to perform the corresponding merging or diverging maneuver. As this is a road with a design speed of 40 km/h, sign M-7.2 will be used.

They will be situated at the aforementioned T where the CA-256 and CA-661 highways meet.

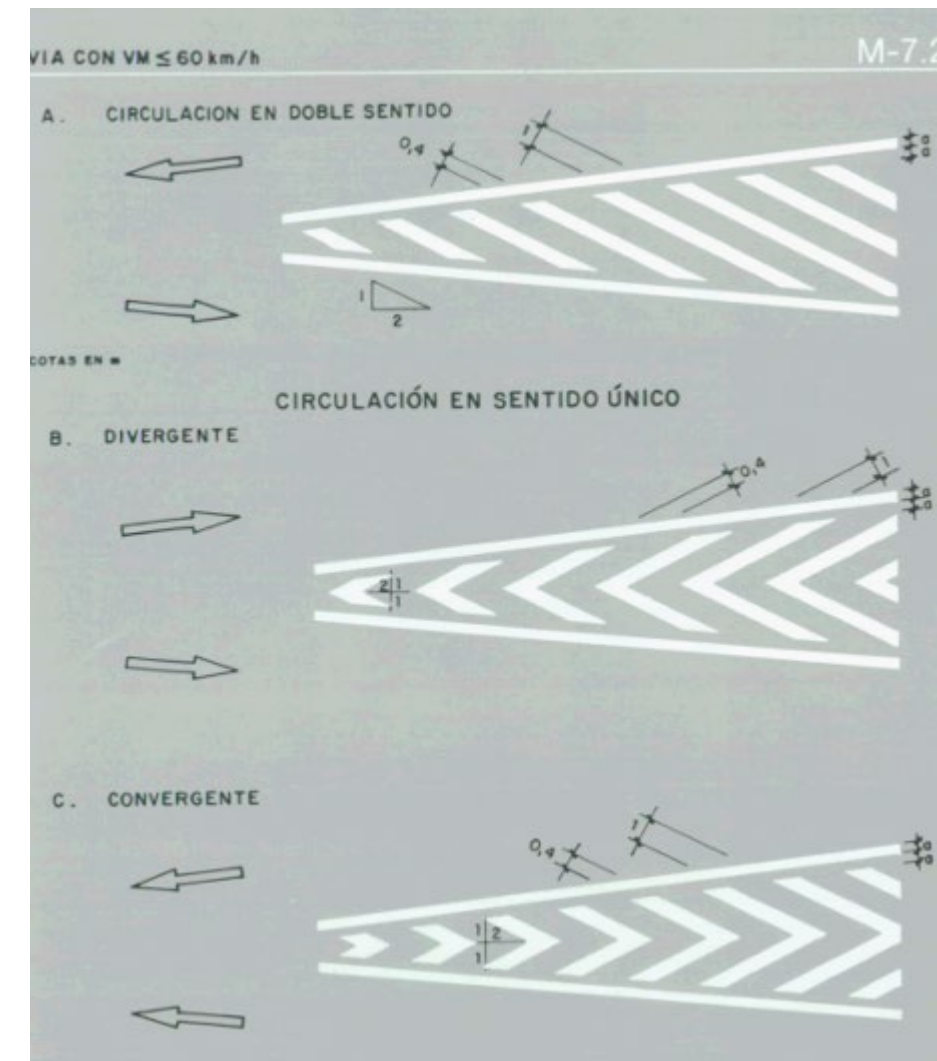


Figure 11: Road Mark M-7.2, Zebra lines.

3. VERTICAL SIGNALING

The vertical signage to be placed along the road will be all that, while meeting the traffic needs of the project road, complies with standard 8.1 I.C., vertical signage of the Highway Instruction, approved on December 28, 1999.

3.1. VERTICAL SIGNALING TYPOLOGY

According to the catalogue of vertical traffic signs and depending on their functionality, the signs are classified into:



- Hazard warning signs: Generally triangular in shape. They are designated by the letter "P" followed by a number between 1 and 99.
- Regulatory signs: Generally circular in shape. They are designated by the letter "R" followed by a number.

They are further classified as

- o Priority (number less than 100).
 - o Prohibition of entry (number between 100 and 199).
 - o Restriction of passage (number between 200 and 299).
 - o Other prohibition or restriction (number between 300 and 399).
 - o Mandatory (number between 400 and 499).
 - o End of prohibition or restriction (number greater than 500).
- Directional signs: Generally rectangular in shape. They are designated by the letter "S" followed by a number. They are further classified as
 - o General indications (numbers less than 50).
 - o Lane-related signs (numbers between 50 and 99).
 - o Service signs (numbers between 100 and 199).
 - o Other signs (numbers greater than 200).
 - o Orientation signs, which can also be:
 - Pre-signaling signs (numbers between 200 and 299).
 - Direction signs (numbers between 300 and 399).
 - Road identification signs (numbers between 400 and 499).
 - Location signs (numbers between 500 and 599).
 - Confirmation signs (numbers between 600 and 699).
 - For specific use in urban areas (numbers between 700 and 799).
 - o Supplementary panels (numbers between 800 and 899).

3.2. RETROREFLECTANCE

For vertical signs to always be visible, all their constituent elements must be retroreflective, i.e., the background, characters, borders, arrows, symbols, etc., except for black, blue, or dark gray pictograms.

There are three types of retroreflectance: classes RA1, RA2, and RA3. Depending on the type of road or sign we are facing, the type of retroreflectance to be used will vary. In our case, since it is a conventional road, we will use class RA2 retroreflectance.

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

Figure 12: Minimum retroreflection classes on signs and posters.

3.3. SIGNALING WITH VERTICAL ELEMENTS

3.3.1. TYPE OF ROAD SIGNAL

The start of a conventional road, such as the project road, will be indicated by a sign with the road numbering box and its name. 100 meters from the start, a R-301 sign will be placed on the right side with the road's generic speed limit.

A sign will then indicate that it is a road within the Cantabria Regional Road Network and that it is the CA-661 road. Further down, the speed limit of 40 km/h will be indicated.

3.3.2. DESTINATION SIGNAL

Destinations that fall into one of the following categories will be marked:

- Towns and other areas included in the catalog of primary and secondary names.
- Towns accessed by roads are not part of the State Road Network.
- Locations of tourist interest.
- Service facilities intended to meet the needs of road users.

Therefore, the following signs will be included:



Figure 13.1: Destination signage.



Figure 13.2: Destination signage.

Other destinations, in this case services, that will be indicated are the presence of a restaurant and a service station.

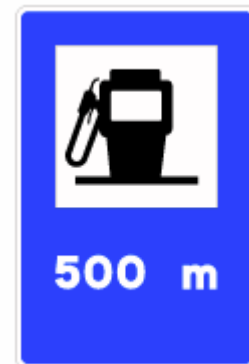


Figure 14: Service station signage.

A sign indicating the same will also be posted at the exit of each settlement in the town of San Juan de la Cistierna (S-510). Furthermore, due to the presence of animals in the project area, signs indicating the presence of wildlife (free-roaming animals) and the passage of domestic animals will be posted.



Figure 15: Animal crossing sign.

3.4. ELEMENTS CHARACTERISTICS

The vertical signs used must comply, again, with standard 8.1- I.C. as regards dimensions and colour.

The dimensions of the signs to be seen from the road will comply with the following dimensions:

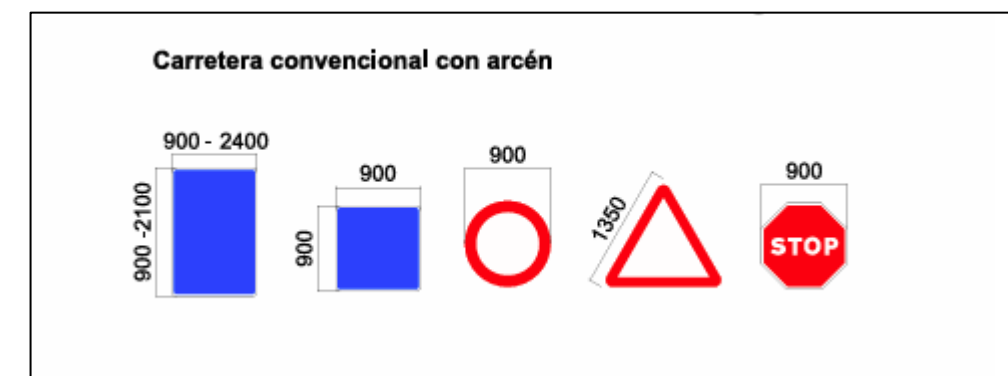


Figure 16: Dimensions of fixed content signs.

Regarding color, road signs for conventional roads will generally have black letters on a white background. Town location signs will have black capital letters on a white background, and the town start sign will have a red border, while the town end sign will have a black border and a red stripe across it.



4. ROAD CURVES BEACONING

Curve marking panels will be used to help drivers identify the curve path. Depending on the vehicle's approach speed and the speed to be reached through the curve, one, two, or three panels will be used, as shown in the table below:

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

Figure 18: Criteria for selecting beaconing on curves.

Since these are very tight curves and several of them are located consecutively, in addition to the small development radius they have, they will all be accompanied by a simple panel.

5. VEHICLES CONTAINMENT SYSTEMS

For the installation of vehicle restraint systems, the recommendations of Circular Order 35/2014 on Criteria for the Application of Vehicle Restraint Systems will be followed:

Safety barriers will be installed in the following cases:

- Poles or similar elements at the edge of the roadway when their diameter is greater than 15 cm.
- Embankments greater than 3 meters high and side walls.
- Existence of buildings or enclosures.
- Buildings near the road.
- Existence of ditches.



DOCUMENT N°2.3 – ROAD LIGHTNING



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2. CRITERIA FOR LIGHTNING A SECTION OF THE ROAD	2
3. CONCLUSIONS	2



1. INTRODUCTION

This annex will justify the lighting systems installed, as well as their distribution along the road layout in accordance with the technical regulations corresponding to the Ministry of Public Works.

The lighting systems aim to improve driver comfort and safety by increasing their ability to see details and objects and locate them appropriately in advance, enabling them to react effectively and in a timely manner without causing sudden and unpredictable maneuvers. Furthermore, they reduce glare caused by vehicles by increasing the background luminance of the visual field.

The regulations used as a basis are as follows:

- Energy efficiency regulations for outdoor lighting installations (RD 1890/2008).
- Circular Order 36/2015 of February 24, on criteria to be applied to the lighting of open-air roads and tunnels. Volume I.
- Circular Order 36/2015, of February 24, on criteria to be applied to the lighting of open-air roads and tunnels. Volume II.

2. CRITERIA FOR LIGHTNING A SECTION OF THE ROAD

As set out in the International Recommendations drawn up by world lighting experts (CIE, International Commission on Illumination) and which have served as the basis for European Standards (EN), the decision-making criteria on which roads to illuminate or not correspond to the Sovereign States of the European Union. The EN Standards serve solely and exclusively to ensure that, once the decision has been made to illuminate a road, the parameters of the lighting installation are established based on the levels and qualitative criteria established therein, with the aim of achieving uniformity between the different countries of the European Union. For the Spanish State Road Network, the criteria that must be considered when making the decision on whether to illuminate a section of road are:

- HIGHWAYS AND MOTORWAYS: Lighting them is justified when they run through urban land (both sides) and any of the following circumstances occur:
 - The average vehicle traffic intensity is equal to or greater than 80,000 vehicles per day (ADD $\geq$ 80,000 vehicles/day).

- The average vehicle traffic intensity is equal to or greater than 60,000 vehicles per day (ADD $\geq$ 60,000 vehicles/day) and there are more than 120 rainy days per year.
- CONVENTIONAL ROADS: Generally, they will not be illuminated, although their illumination may be justified if the section is a TCA (Accident Concentration Section) and more than 50% of accidents have occurred at night in the last two years.
- SINGULAR POINTS: Illumination of singular points will be justified in the following cases:
 - Roundabouts located on conventional roads where, due to high traffic volume or danger, proper signage and markings are not sufficient.
 - Interchanges located in interurban areas where the average vehicle traffic volume is equal to or greater than 80,000 vehicles per day (ADD $\geq$ 80,000 vehicles/day).
 - Interchanges located in interurban areas where the average vehicle traffic volume is equal to or greater than 60,000 vehicles per day (ADD $\geq$ 60,000 vehicles/day) and where there are more than 120 rainy days per year.
 - Intersections with roundabouts and at-grade intersections, provided that the secondary road has more than 10,000 vehicles per day, or where the traffic volume is greater than 50% of the total accidents in the last two years.

3. CONCLUSIONS

According to Circular Order 36/2015 of February 24, lighting is not required on conventional roads in general cases, unless it is an Accident Concentration Section and in the last two years more than 50% of accidents have occurred at night.

Since the road under study is a conventional road that does not meet extraordinary conditions, it is determined that lighting is not necessary. The only lighting along the road layout will be in the sections that run through the urban centers that make up the town of San Juan de la Cistierna, that is, San Juan or Santa María, La Cistierna, and La Busta.



DOCUMENT N.º2.4 –TRAFFIC MEASURES DURING CONSTRUCTION

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1. INTRODUCTION

This annex outlines the actions planned to ensure the proper circulation and flow of vehicles despite any traffic disruptions that may occur as a result of the construction work. These measures will be carried out under health and safety conditions, following the guidelines of Standard 8.3-IC, "Signage of Works," published by the Directorate General of Roads in 1989, and the "Manual of Examples of Signage for Fixed Works," published by the same entity in 1997.

2. GENERAL PRINCIPLES OF CONSTRUCTION SIGNALING

2.1. OBJECTIVES

Construction signage must be posted when, on or near a roadbed, there are circumstances related to the execution of permanent works in these areas that may pose a risk or danger to traffic, interfering with the normal flow of traffic.

In these cases, the objectives of the signage are as follows:

- To inform users of the presence of construction work.
- To regulate traffic in the area affected by the work.
- To modify traffic behavior, adapting it to the unusual situation represented by the construction work and its specific circumstances.

Compliance with construction signage will achieve greater safety for both road users and construction workers, limiting the reduction in the level of service on the affected road.

2.2. SIGNALING

Road users should not be exposed to unexpected or difficult-to-understand situations, which could lead to an accident. Therefore, both signage and markings must:

- Be justified and credible, without being excessive.
- Monitor the progress of the work in space and time.
- Permanent signage that conflicts with them must be removed.

They must be removed as soon as they are no longer essential.

2.3. TYPE OF SIGNALING AND APPLICABLE STANDARDS

There are two types of signage depending on the task being performed.

- Signage for fixed works carried out within a specific area of the construction site, such as structures, excavations, etc.
- Signage carried out in sections, such as road maintenance.

The signage for fixed works is regulated by Highway Standard 8.3-IC, Signage for Works, approved by Ministerial Order of August 31, 1987, and amended by Royal Decree 208/1989. It outlines the measures to be adopted for signage for road works that impede vehicle traffic.

The standard distinguishes three basic concepts:

- The type of road.
- The different levels of road occupancy.
- Duration of the work.

Similarly, it is included in the publications of the General Directorate of Roads of MITMA, the Manual of example of signaling of fixed works and Mobile signaling of works, both of the monograph series (1997).

3. SOLUTIONS TO TRAFFIC

In the common case of traffic diversions required due to roadway narrowing caused by roadworks, depending on visibility, one or two signalers will be used, and a decision must be made as to whether the duration of the narrowing justifies the use of traffic signals for alternating traffic. Whenever possible, adequate and sufficiently wide passageways will be maintained for traffic in both directions. Alternating traffic in a single lane may be used through the use of traffic signals that properly regulate traffic in both directions.

These will be required if the narrowing continues outside of working hours, but they must be supervised, as vandalism or theft of the traffic lights or batteries is common, which can pose a serious risk to users. The greatest problems will arise during the excavation.



Special attention will also be paid to the marking of all interferences to traffic and third parties resulting from the works in general. Access routes for traffic in both directions must be permanently maintained, with adequate road surface and sufficient width, at the discretion of the construction manager.

Occasionally, complete traffic closures may be necessary, which will not last more than 15 minutes.

The Contractor will provide appropriate protective measures to prevent the projection and/or fall of stones from the slopes onto the roadway, both during work hours and during non-working hours. If it is necessary to close the road for periods longer than this, the relevant authorization from the Administration will be obtained, and alternative routes will be established and properly marked in the manner specified by the Administration.

4. CONSTRUCTION SIGNALS

The following elements and devices will be provided:

- Danger signs (TP).
- Regulatory and priority signs (TR).
- Indication signs (TS).
- Manual signals and devices (TM).
- Reflective beacons (TB).
- Luminous elements (TL).
- Defense elements (TD).

4.1. VERTICAL SIGNALING

4.1.1. DANGER/HAZARD SIGNALS

- Traffic light danger (TP-3).

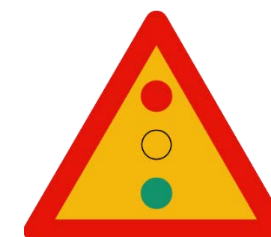


Figure 1: TP-3 signal, traffic light.

- Road narrowing danger (TP-17a/TP-17b).



Figure 2: TP-17 a) and b) signals, lane narrowing.

- Dangerous curve to the left/right (TP-13a/TP-13b).



Figure 3: TP-13 a) and b) signals, dangerous curve.



- Construction danger (TP-18).



Figure 4:TP-18 signal, works in progress.

- Traffic on both sides danger (TP-25).



Figure 5:TP-25 signal, traffic on both sides.

- Gravel screening danger (TP-28).



Figure 6:TP-28 signal, gravel screening.

- Other dangers (TP-50).



Figure 7:TP-50 signal, other dangers.

4.1.2. REGULATION AND PRIORITY SIGNALS

- Maximum speed (TR-301).



Figure 8:TR-301 signal, maximum speed.

- Mandatory way (TR-401a/TR-401b).

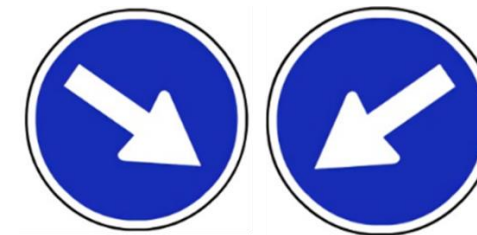


Figure 9:TR-401 a) and b) signals, mandatory way.

- Overtaking prohibition (TR-305).



Figure 10: TR-305 signal, overtaking prohibition.

- End of prohibitions (TR-500).

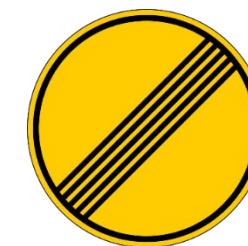


Figure 11:TR-500 signal, end of prohibitions.



4.1.3. INDICATIVE SIGNALS

- Forbidden entry to anyone not form the work.



Figure 12: "Prohibido el paso" signal.

- "SALIDA DE CAMIONES" (T-431) panel.



Figure 13: T-431 signal, "Salida de camiones".

4.1.4. INDICATION SIGNALS

- Manual signals: Permitted and forbidden entry (TM-2/TM-3)

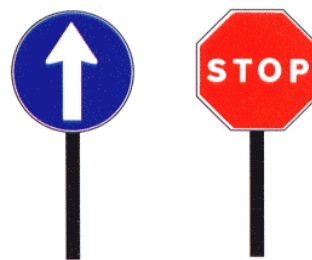


Figure 14: TM-2 y TM-3 signals, forbidden or permitted entry.

4.2. HORIZONTAL SIGNALING

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

- Yellow road sign (TB-12).



Figure 15: TB-12 signal, yellow or orange road sign.

- Headlights (TB-10).



Figure 16: TB-10 signal, headlight

4.3. LIGHTNING ELEMENTS

Lighting elements will be used, if necessary, either to mark the road or to regulate traffic.

- Three coloured traffic lights (TL-1).



Figure 17: TL-1 signal, Three colored traffic light.



4.4. REFLECTIVE MARKING ELEMENTS

- Narrow directional panel (TB-2).



Figure 18:TB-2 signal, narrow directional panel.

- Beaconing cone (TB-6).



Figure 19:TB-6 signal, beaconing cone.

- Left/right Edge beacons (TB-8/TB-9).

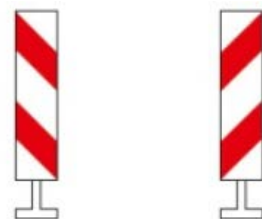


Figure 20:TB-8 and TB-9 signals, edge beacons.

5. CONSTRUCTION SIGNALING PROCEDURE

5.1. ROADSIDE WORKS

Temporary laneS will be implemented, with consideration being given to occupying the shoulder opposite the construction site, even widening it. For the foreseeable narrow sections, the following signage will be installed:

- TP-18 Construction Indication.
- TP-301 Speed Limit.
- TR-305 No Overtaking.

- TP-17 Narrowing Schedule.

5.2. WORKS OUTSIDE THE TRACK PLATFORM

There are no traffic problems as long as the construction site is 10 meters or more from the edge of the lane used by vehicles. Warning by sign TP-18 is sufficient for vehicles traveling in lanes near the construction site.

5.3. WORKS IN ONE LANE

Alternative traffic control will be implemented during the day using traffic lights or officers who will cut off and open traffic, and at night using traffic lights.

The traffic delay will be 7 minutes but may be extended on special dates. Signage will be identical to the previous rule and will include markers indicating the distance to the stop line.

5.4. WORKS IN THE WHOLE TRACK

Traffic regulation will be carried out alternatively, using signage with the same characteristics as in the previous cases.

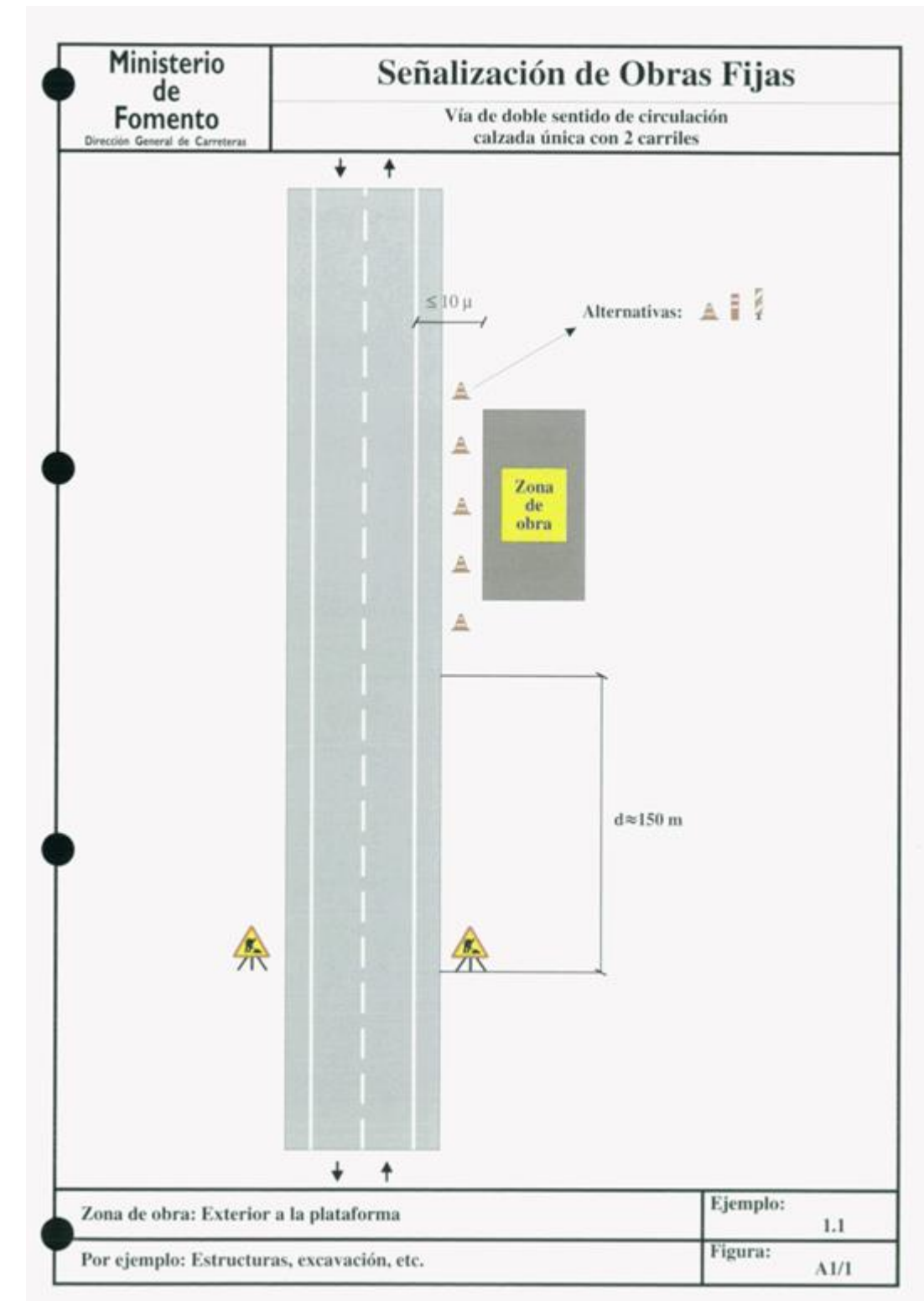
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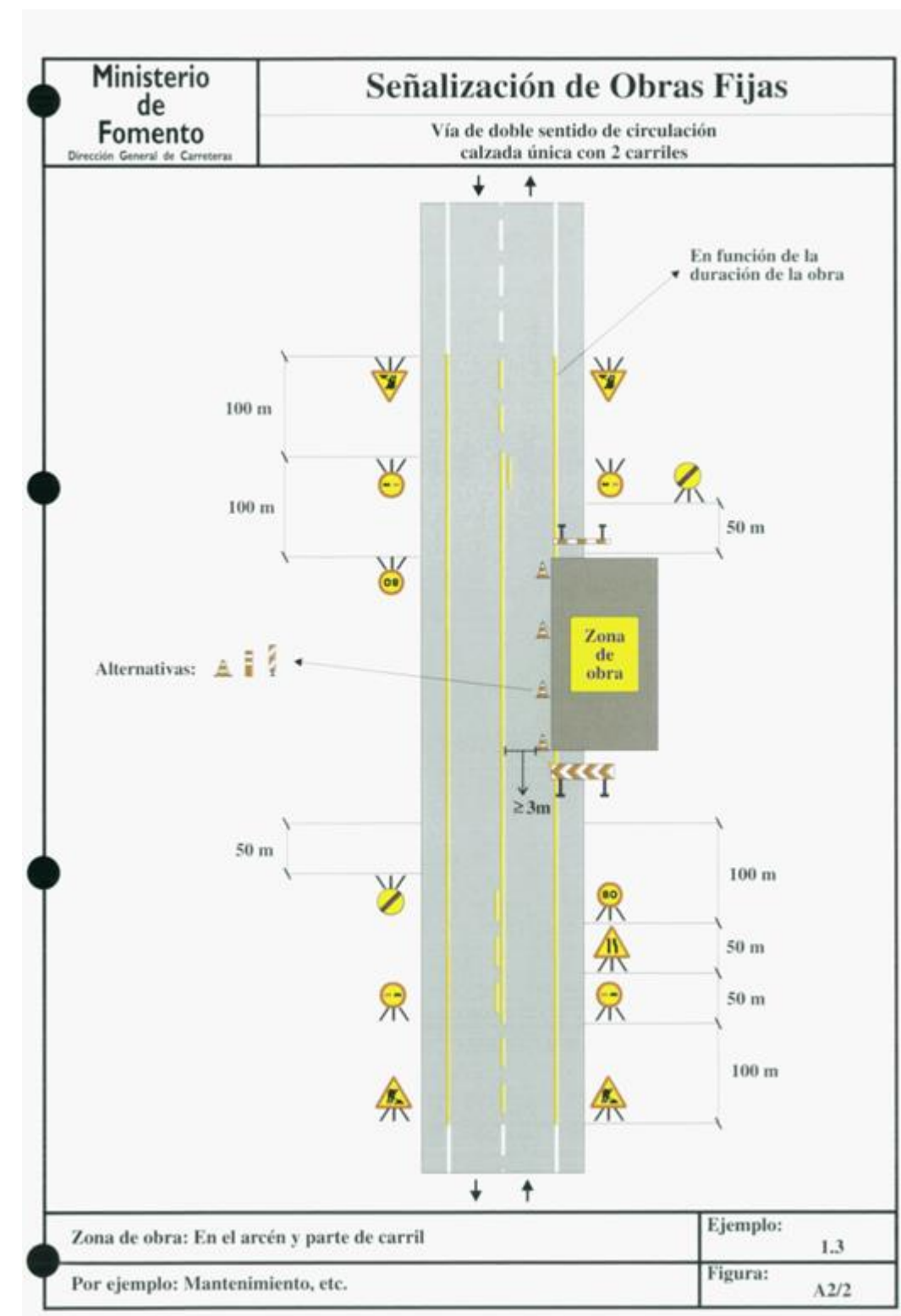
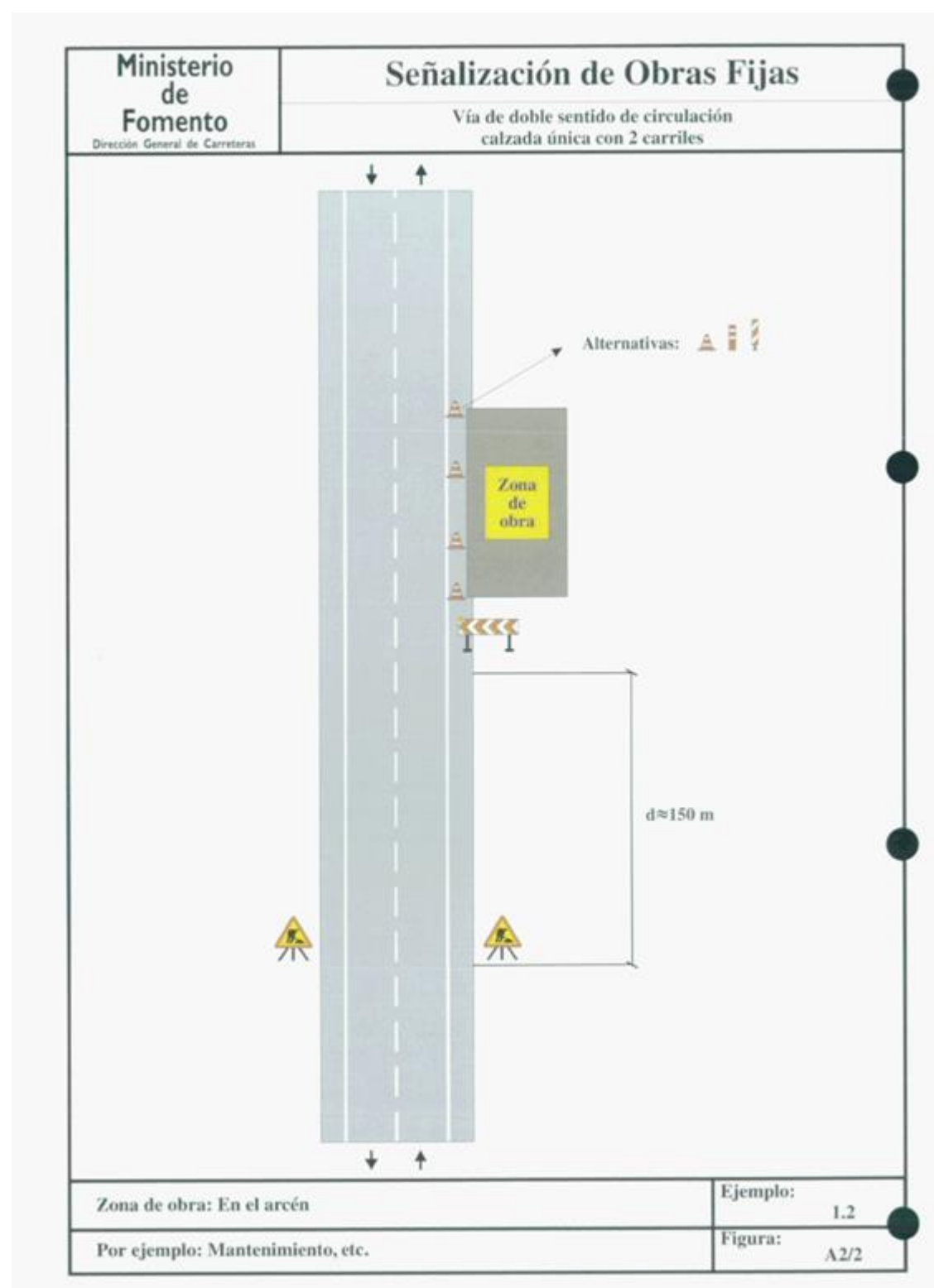
When the reason for their implementation changes or disappears, the signage, markings, and protection of the works must be modified or removed. Provided their condition permits and the project management authorizes it, these elements may be used in other areas.

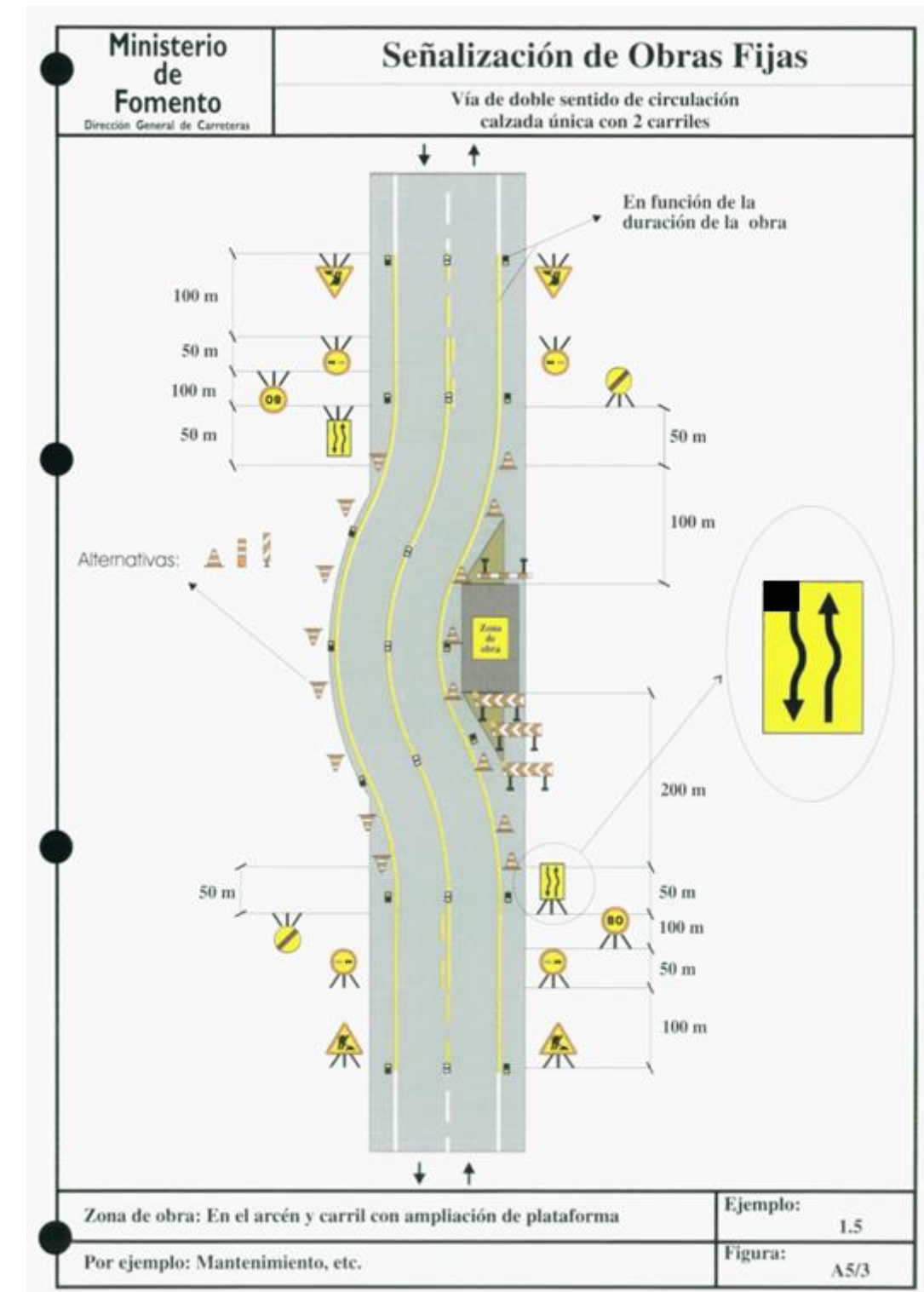
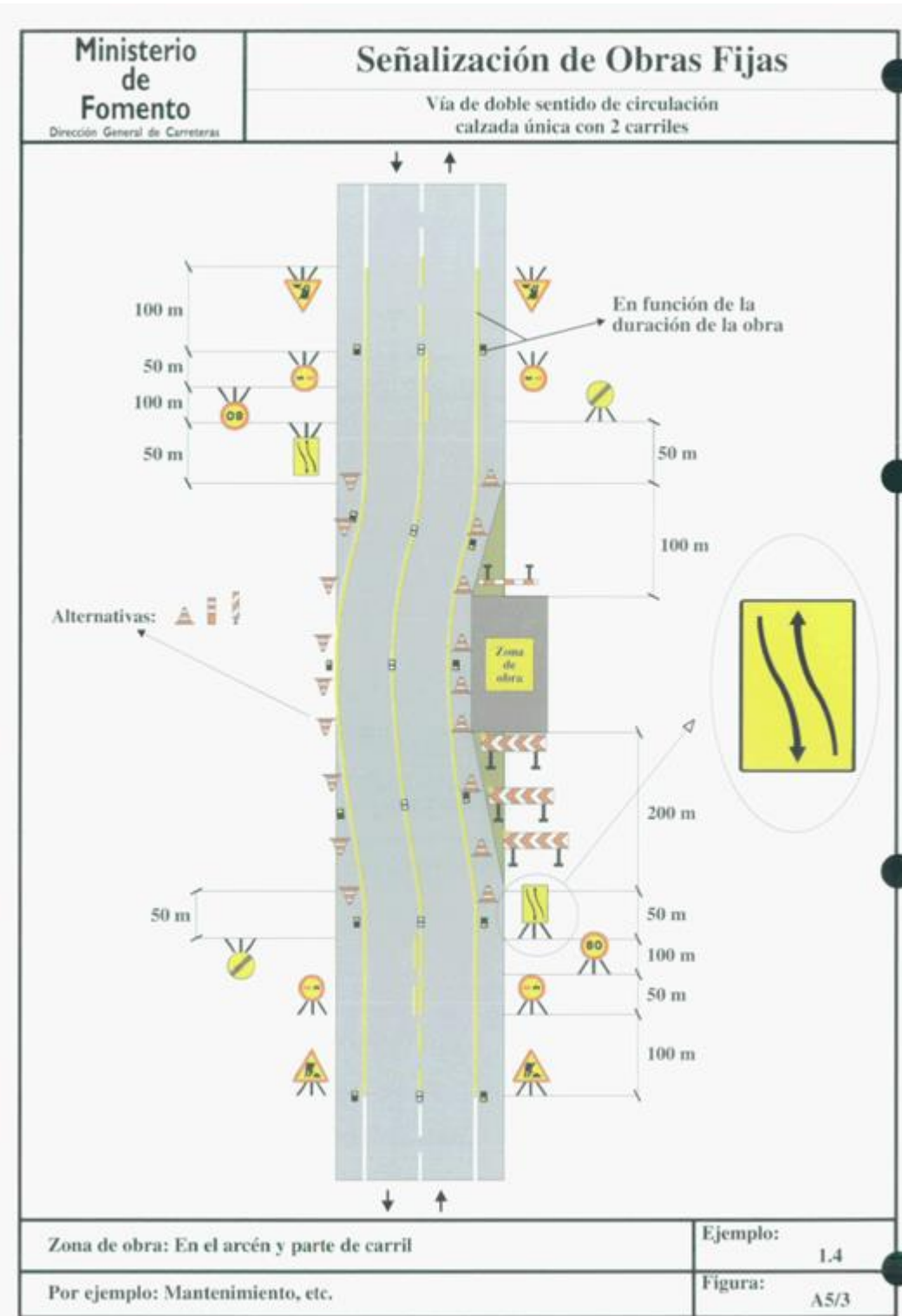


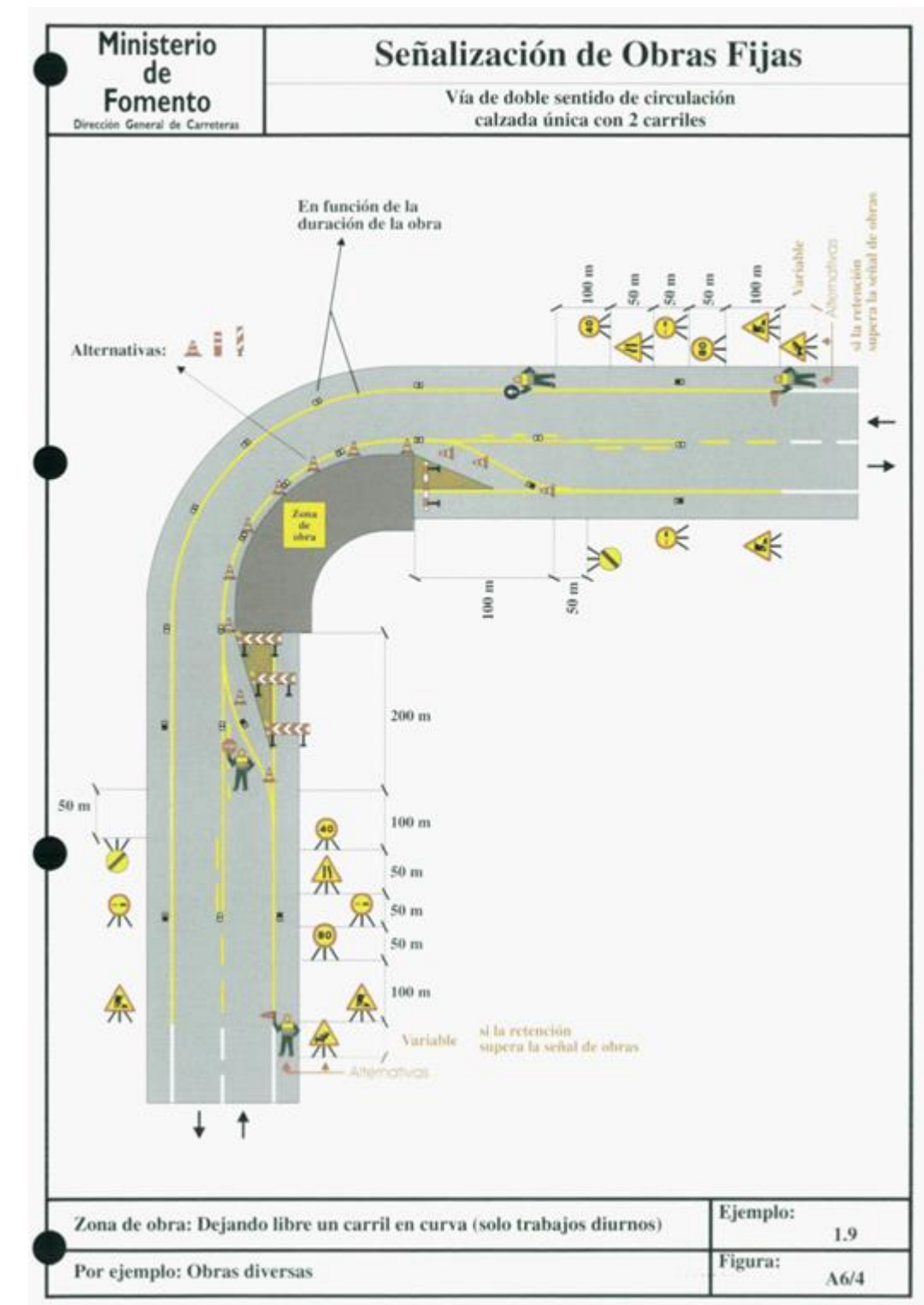
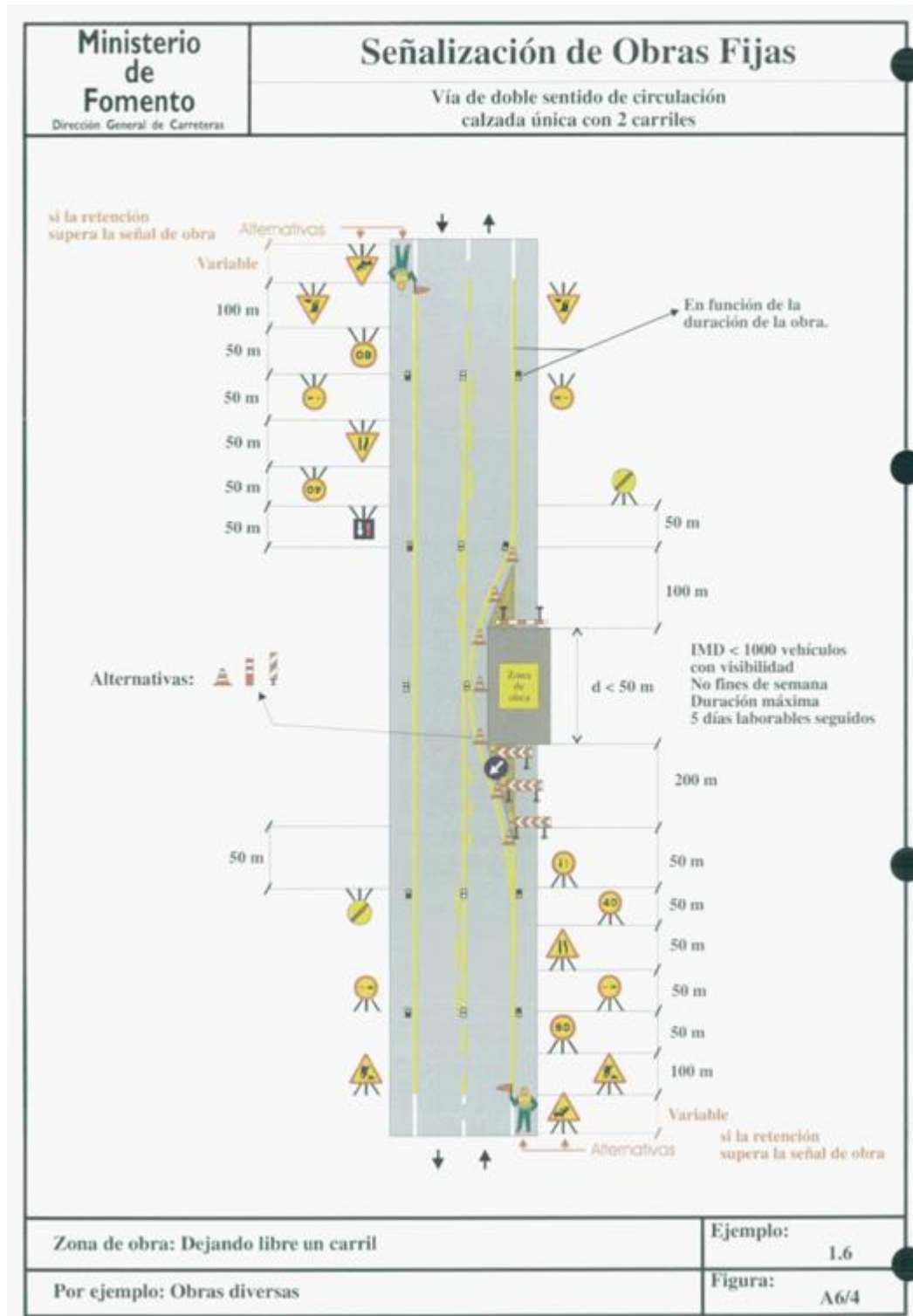
7. SKETCHES

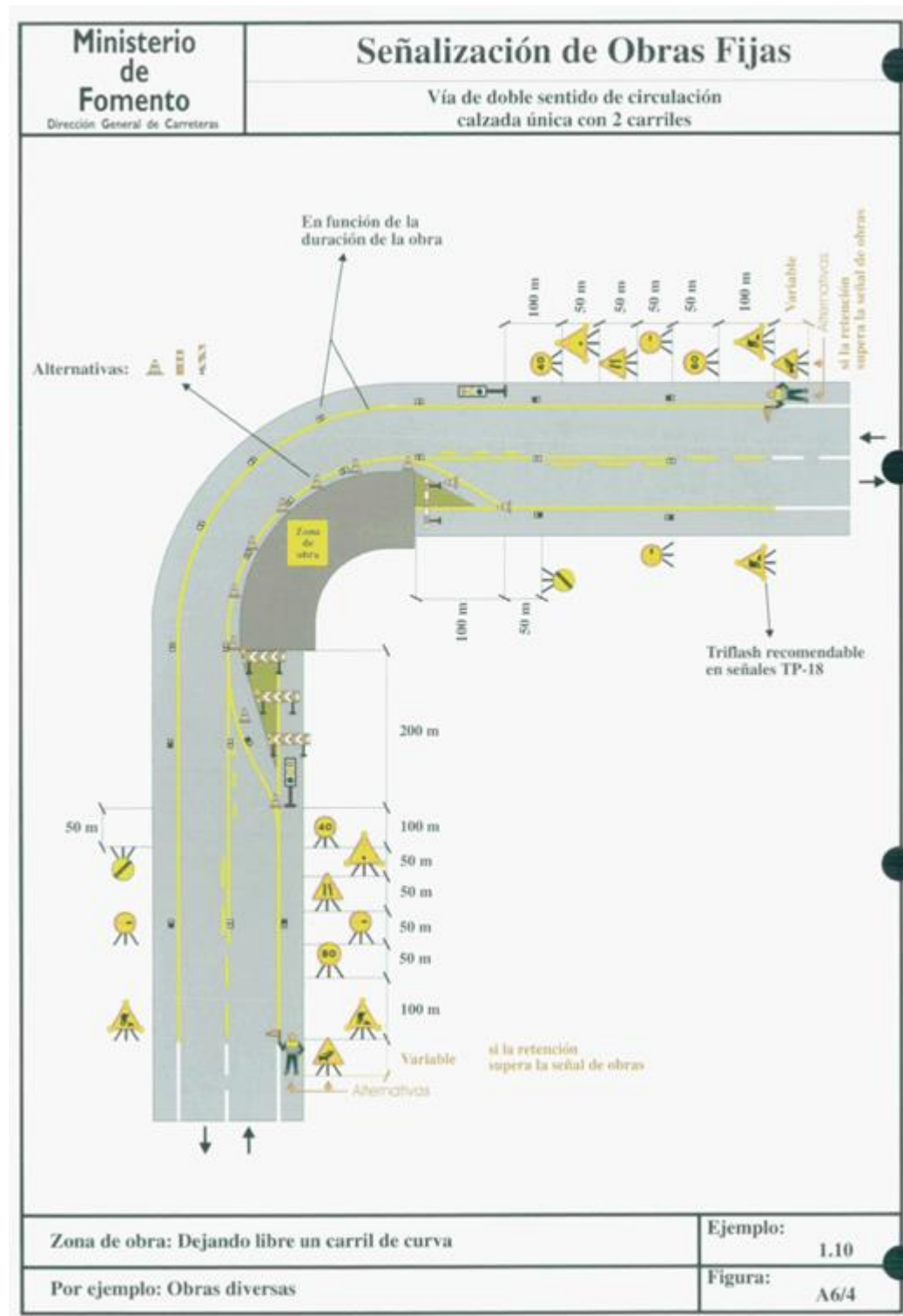
Below are several signage diagrams that should be applied on single-carriageway roads with two-way traffic, depending on the location of the construction area (off the platform, on the shoulder, on the shoulder and part of the lane, leaving one lane free, etc.). These diagrams have been taken from the Manual of Examples of Signage for Fixed Works.













DOCUMENT Nº2.5 – ACCESIBILITY



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1. INTRODUCTION

An accessible environment is one that is designed in such a way that it can be used safely and effectively by as many people as possible, whether they have disabilities or not. This concept implies that the term “standard,” used in design in general, must be broadened to include the diversity of people who inhabit or use a given environment. The Standard Rules on the Equalization of Opportunities for Persons with Disabilities, adopted by the United Nations General Assembly at its 48th session, through Resolution 48/96 of December 20, 1993, includes in section II. Areas for Equal Participation.

Art. 5. Accessibility states should recognize the overall importance of accessibility in the process of achieving equal opportunities in all spheres of society. For persons with disabilities of any kind, States should: a) establish action programs to make the physical environment accessible, and b) take measures to ensure access to information and communication.

a) Access to the physical environment

1. States should take steps to remove barriers to participation in the physical environment. These steps could include developing standards and guidelines and looking into laws to make sure people can get around in different parts of society, like housing, buildings, public transportation and other transportation, streets, and other outdoor places.
2. States should ensure that architects, construction technicians, and other professionals involved in the design and construction of the physical environment have access to adequate information on disability policy and measures to ensure accessibility.
3. Measures to ensure accessibility should be included from the outset in the design and construction of the physical environment.
4. Organizations of people with disabilities should be consulted when developing standards and provisions to ensure accessibility. Such organizations should also be involved at the local level, from the initial planning stage, when designing public works projects, in order to maximize accessibility.

b) Access to information and communication

1. People with disabilities and, where appropriate, their families and advocates should have access throughout their lives to comprehensive information about their diagnosis, rights, and available services and programs. This information should be presented in a manner that is accessible to people with disabilities.
2. States should develop strategies to make information and documentation services accessible to different groups of people with disabilities. In order to provide access to written information and documentation for people with visual impairments, Braille, tape recordings, large print, and other appropriate technologies should be used. Similarly, appropriate technologies should be used to provide access to oral information for people with hearing impairments or comprehension difficulties.
3. The use of sign language should be considered in the education of deaf children, as well as their families and communities. Sign language interpretation services should also be provided to facilitate communication between deaf people and others.
4. The needs of people with other communication disabilities should also be taken into account.
5. States should encourage the media, especially television, radio, and newspapers, to make their services accessible.
6. States should ensure that new computerized services and data systems offered to the general public are accessible to people with disabilities from the outset or are adapted to make them accessible to them.
7. Organizations of people with disabilities should be consulted when developing measures to provide such people with access to information services.



2. CHARACTERISTICS OF AN ACCESIBLE WORKPLACE

2.1. ACESIBILITY IN SIGNALS AND EXTERIOR INFORMATIVE PANELS

2.1.1. GENERAL DESCRIPTION

Outdoor signs and information panels provide information, guidance, recommendations, advice, or warnings about various specific features of a given urban area. This information may relate to the location of specific points or places, address tracking, accident prevention, building identification, tourist information, etc. The goal is to ensure that any citizen or visitor can navigate and understand the urban area in a logical, safe, and simple way.

When this information is not available in different formats, some people, due to various types of functional limitations, will not be able to easily and independently access it, potentially becoming disoriented or even endangered.

2.1.2. ELEMENTS THAT GUARANTEE INTEGRAL ACCESIBILITY

Below, we'll discuss the various elements that contribute to ensuring comprehensive accessibility in outdoor signs and information panels:

Support

It should not pose an obstacle or risk, meaning it should not have any elements or protrusions without a base on the ground, and its design should not feature corners or edges.

- Location:
 - Vertical signs: They should be signs or banners with a minimum clearance height of 2.20 m from the bottom. They should be installed next to the wall, on narrow sidewalks, or next to the curb on sidewalks wider than 1.50 m.
 - Informative panels: Their location or visibility must not interrupt pedestrian traffic. They must be easily located and allow pedestrians to approach them at a suitable reading distance. On wide sidewalks, the panel may have one or more display sides, as long as it leaves a clear width for pedestrian traffic of at least 1.50 m on each side. On narrow sidewalks, it will have only one side. In any case, there must always be sufficient space for pedestrian traffic.

A All information can be read up to a distance of 5.00 m. As a general rule, the panel or sign should be placed at a height between 1.45 and 1.75 m, centered at 1.60 m (including signs and panels with tactile information). In addition, it is advisable to have double tactile signage at a height between 95 and 125 cm, centered at 1.10 m, in specific areas where children are frequently present.

Directional signs should be placed along routes at the beginning, end, and at intermediate changes in direction. If the route is very long, signs or location maps should appear more frequently to reinforce the message. The language and nomenclature used on these signs should be clear, easy to understand, and consistent throughout the entire route.

Panel

A It must have a clear outline. The information contained on the sign must be simple and easy to understand. The font used must be easily perceptible (for example, Verdana, Arial, Helvetica, or Universal). The spacing between characters must be proportionate. The character strokes must be clear and simple, and the stroke width uniform. Regarding color, the highest contrast colors must be used. The legend color must contrast with the sign color, which, in turn, must contrast with the background where it is located:

- A dark brick or stone wall or a background with green vegetation requires a panel with a white background and a dark legend (black, green, or blue).
- A light brick or stone wall or a light-colored wall requires a panel in black, blue, or other dark colors, with a white or yellow legend.

It is advisable to use creamy white to pure white to avoid glare. Also, avoid using too many colors.

Regarding the materials used for the sign, surfaces that produce shine and sparkles should be avoided, and if the sign uses glass, frosted glass should be used.

- Sensory modality of the message: Information may be presented through visual, acoustic and/or tactile signage.
- Maps and plans: They should be reproduced, at least, visually and tactilely. Under tactile mode, different textures can be used to represent different types of information.
- Electronic informative points: Electronic information points may be located on public streets, but their design and height must be appropriate for use by anyone. They must allow frontal approach by a wheelchair user. Their construction materials must be resistant to weather and other potentially aggressive elements, and proper maintenance must be planned.



- Environmental conditions. An adequate level of lighting must be guaranteed both during the day and at night. Reflections and glare from sunlight and artificial light must be avoided. To this end, awnings or other appropriate protection must be provided, or the panels must be located in areas where sunlight does not obscure the screen images or cause glare in the case of an interactive panel. Artificial lighting must always be located on the outside of the panel.
- Other aspects of interest. Any work or alteration to public roads must be prevented from becoming a danger to a person with a disability, especially a person with a visual impairment.

Parking lots, buildings, exterior elevators, and other accessible elements will be marked with the International Symbol of Accessibility (ISSA) or other symbols specific to other types of activity limitations.

2.2. PAVEMENT ACCESIBILITY

2.2.1. GENERAL DESCRIPTION

Pavement is one of the most important components of pedestrian routes due to its functions as:

- Support and connection to the ground.
- Aesthetic covering.
- Continuous channel of information and guidance.

One of the most notable aspects of pavement's informational and guidance function is that it offers the possibility of establishing a clear and effective language to send and receive messages through its texture, sound, and color to people with visual impairments and people with reduced mobility.

For people with reduced mobility or visual impairments, the choice of pavement can be decisive in achieving a greater degree of personal autonomy. The condition and type of pavement they walk on can be very important in accidents involving falls for older adults.

2.2.2. REQUIRED CHARACTERISTICS TO AN ACCESIBLE PAVEMENT

The main characteristics required of pavements are their hardness, slip resistance in both dry and wet conditions, and the absence of any roughness other than the pavement itself. In general, we can say that pavement must be:

- Stable, such as hydraulic tiles, stones, etc., avoiding loose soil, gravel, sand, and the like. In parks and gardens, paths can be made of clay, which must be compacted.
- Non-slip, both dry and wet, for which appropriate on-site testing must be carried out, simulating the most slip-prone situations, such as dust accumulation and irrigation, and verifying that it is not slippery even in these conditions.
- No roughness other than the pavement itself, which requires a perfectly laid pavement and, above all, proper maintenance.

Furthermore, in urban spaces, elements such as manholes, grates, and tree pits must be perfectly flush with the pavement. Joints must have a strength similar to that of the pavement, and their thickness must not exceed 10 mm. The maximum height of the reliefs and studs will not exceed 7 mm to avoid tripping.

2.3. ACCESSIBILITY IN AN OPEN SPACE WORKPLACE

2.3.1. GENERAL DESCRIPTION

In a city, regardless of its size, we frequently encounter roadworks that affect sidewalk maintenance, opening up the ground to maintain pipes or lay various types of cables, refurbishing facades, or constructing new buildings or public road facilities.

In all cases, the usual routes of traffic and pedestrians are affected, rectifying the safety systems implemented under normal conditions of urban space use. Consequently, these roadworks pose a serious risk of accidents for citizens who use the streets, especially for those with some type of activity limitation, whether physical, intellectual, or sensory.

It is necessary to raise awareness of the need for construction companies and city councils to eliminate or reduce the risks and discomfort for residents from the moment the work begins. To this end, we believe that action should be taken at three key stages, taking into account the special requirements of people with disabilities: (a) In the safety design of the work; (b) At the time of signaling the work; and (c) At the time of enabling alternative routes.



2.3.2. ACTS THAT GUARANTEE INTEGRAL ACCESIBILITY

Below, we will propose a series of criteria to use in each of these three important moments:

a) Workplace safety design

- o Scaffolding: The scaffolding legs must be placed next to the facade, leaving a clear path wide enough to allow horizontal pedestrian movement on the sidewalk (at least 90 cm). The scaffolding design must comply with the HD-1000 safety standard and be free of sharp objects.
- o Stiffening diagonals must be marked with easily detectable horizontal bars, and vertical supports must be marked in a way that is easily detectable by anyone. Horizontal members in passageways must be at least 2.20 m high.
- o Work and storage areas: These will preferably be located on the roadway and not on the sidewalk.

b) Work signaling

- o Fencing: The perimeter of the construction site must be fenced with stable markers, positioned in a manner that is difficult to move and without leaving any gaps, enclosing all materials and tools used. Trenches must be covered with steel sheets when not being worked on. Cables, ropes, or similar devices must never be used to mark construction sites.
- o Obstacle perception: Beacons must be visually signaled with flashing lights. Proper fencing makes acoustic signaling unnecessary. Protective and signaling elements must be detectable by a blind or visually impaired person before reaching the obstacle or hazard. The lighting level in the construction area must be adequate.

c) Alternative itineraries

- o If scaffolding has been installed for the purpose of carrying out the work and obstructs pedestrian traffic routes, alternative routes must be provided that are free of obstacles, properly marked, and at least 1.5 m wide and 2.2 m high. These routes must be protected against falling materials, tools, or debris.
- o If avoiding the obstacle requires stepping from the sidewalk to the roadway, the designated route will be fenced on both sides, with the outer side (the side that borders the roadway) properly marked with illuminated and audible beacons and vertical signage. This will make it easily visible to both road users and drivers. It is also advisable to equalize the height of the sidewalk and

roadway using a non-slip surface that allows water to flow through to the drains. This element should contrast in texture and color with the surrounding elements.

- o In the case of ditches that must be crossed, metal pedestrian crossing structures with a width of approximately 1.00 m will be installed, with railings, skirting boards and non-slip flooring.

d) Other precautions

- o Collect leftover material and construction waste to keep the pedestrian traffic area clean at all times.



DOCUMENT N.º2.6 –EXPROPRIATIONS AND AFFECTED SERVICES



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1. INTRODUCTION

This annex establishes the lands that will be included in the expropriation file that the Government of Cantabria must open in order to appropriate the land necessary to carry out the improvements to the CA-661 highway platform.

The assessment of the expropriations will be carried out in accordance with the provisions set forth in Service Note 4/2010, of July 7, on the study of expropriations in the Layout Projects of the General Directorate of Roads, in addition to Law 5/1996, of December 17, on Roads in Cantabria. The current Forced Expropriation Law of December 16, 1954, and its Implementing Regulations approved by Decree of April 26, 1957, will also be used.

Therefore, this annex will be used to define and value all assets and rights affected by the execution of the works and that must be expropriated from private individuals because they are not municipal property.

2. EVALUATION CRITERIA

The expropriation limit has been set based on the provisions of Article 18 of Law 5/1996, of December 17, on roads in Cantabria: "The public domain zone consists of the land occupied by roads and their functional elements, and a complementary strip of land on each side three meters wide, measured horizontally and perpendicular to the axis of the road, from the outer edge of the leveling."

The valuation is made taking into account the land classification characteristics and, therefore, taking into account market prices and municipal indices. According to cadastral data, the project is located primarily on non-developable rural land, in accordance with the data in the Municipal Urban Development Plan.

The prices used for the land valuation are as follows:

- Rural land: €5/m2.
- Urban land: €75/m2.
- Single-family home: €1,200/m2.

3. EXPROIATIONS

The expropriations will be carried out along the road's route. Since this is an existing road, only the land located within what will become the public domain of the sections where the road's route changes will be expropriated.

The plots that will be affected are the following, obtained from the Cadaster Map of the Ministry of Finance:

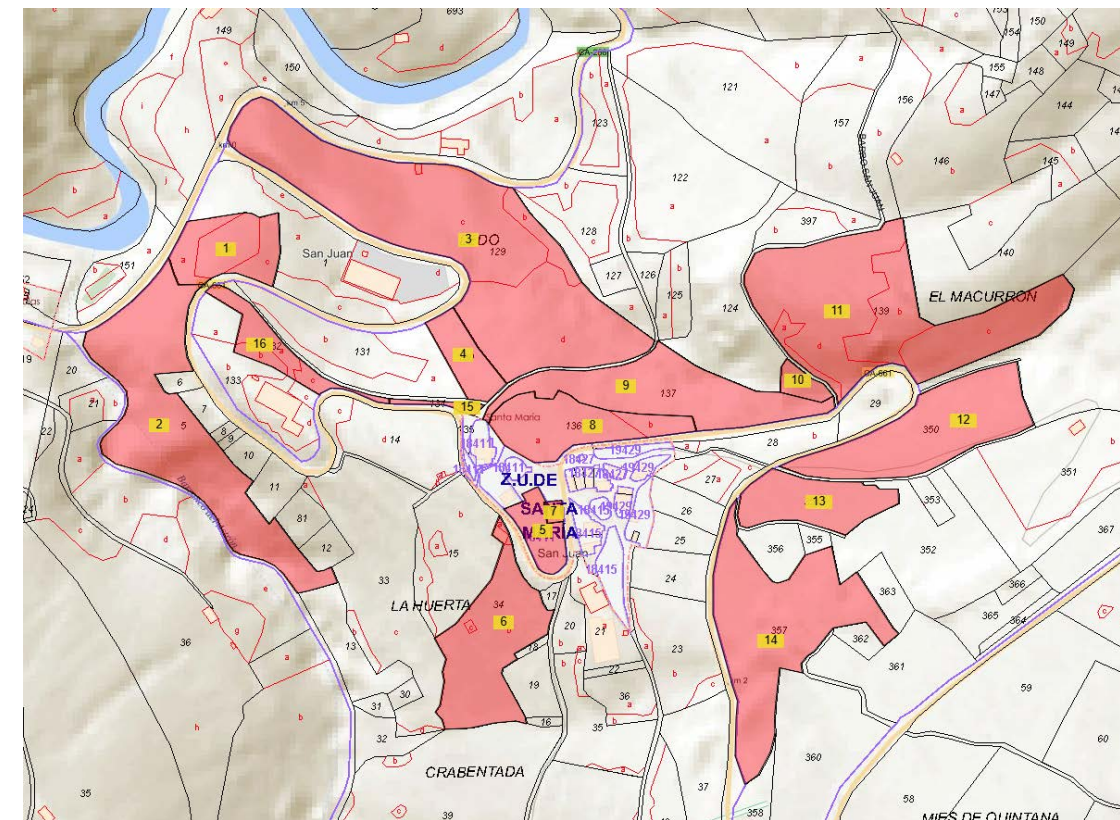


Figure 1: Cadaster map, affected plots.



In those plots, the following expropriations will be made:

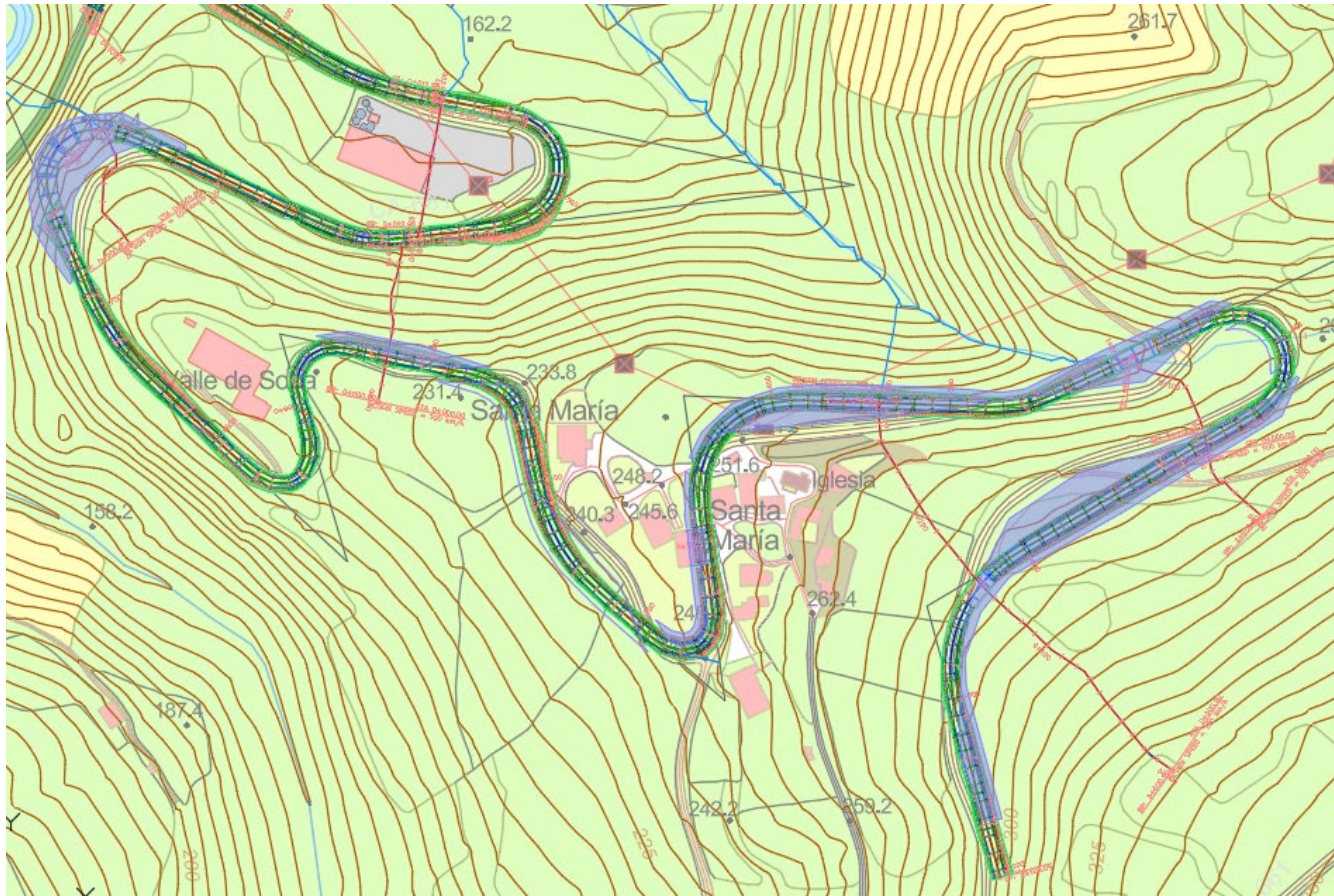


Figure 2: Expropriations conducted.

The total expropriated area will be:

SUELO	AREA (M2)	€/M2	VALUE (€)
RUSTIC	15.591	5	77.955
URBAN	515	75	38.625
SINGLE-FAMILY HOME	120	1.400	168.000
TOTAL VALUE OF EXPROPRIATIONS			284.580

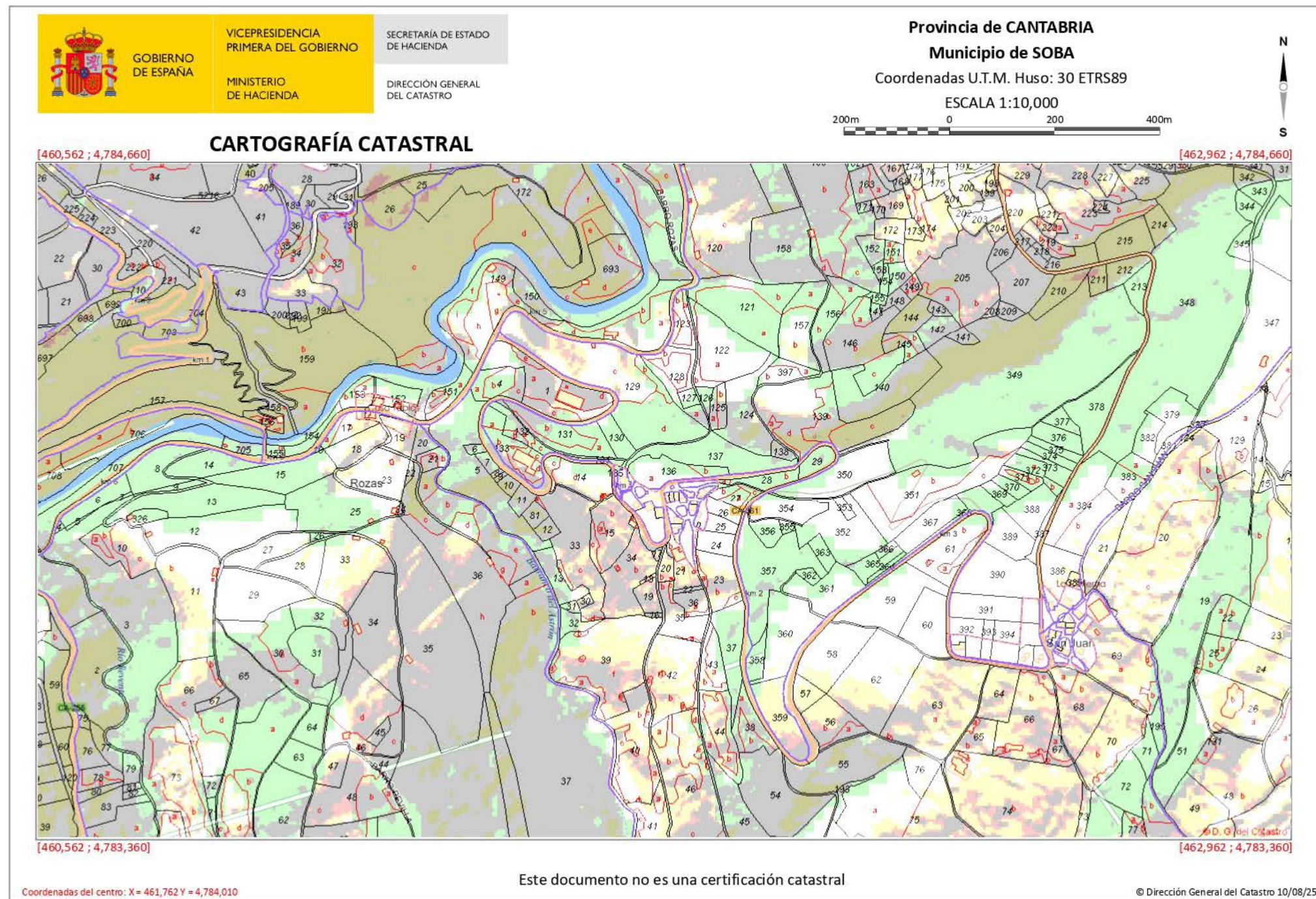
4. AFFECTED SERVICES

It has been confirmed that modifying several sections of the road, as is the case with the works described in the project, will impact various services.

Since it is not possible to determine exactly which services will be affected by the project due to the lack of specific location data, the approximate cost of the works required to divert services without impacting the municipality has been estimated at €20,000.

5. TOTAL VALUE OF EXPROPRIATIONS AND AFFECTED SERVICES

Taking into account the expropriations carried out, both on rural and urban land, and any affected services, the monetary value of this section amounts to €304,580.

**6. CADASTRAL MAP OF THE WORKPLACE**



DOCUMENT N°2.7 – CONSTRUCTION WASTE



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1. INTRODUCTION

This annex establishes the various procedures used to ensure proper waste management, based on Royal Decree 105/2008 of February 1, which regulates the production and management of construction and demolition waste; and Decree 72/2010 of October 28, which regulates the production and management of construction and demolition waste in the Autonomous Community of Cantabria.

2. SCOPE OF THE STUDY

The generation of waste from both the construction of infrastructure and new buildings, as well as the demolition of old buildings, or from new residential developments and renovations of existing ones, has caused widespread environmental impacts such as landscape deterioration, soil contamination in uncontrolled landfills, and the disposal of this waste without utilizing its recoverable resources.

By establishing guidelines for the management of construction and demolition waste (CDW), the aim is to minimize and control these environmental impacts. In accordance with Article 4 of Royal Decree 105/2008, which regulates the production and management of construction and demolition waste, the Construction and Demolition Waste Management Study consists of the following sections:

- Identification of the waste to be generated, according to Order MAM/304/2002.
- Estimated quantity of each type of waste that will be generated on site, in tons and m3.
- Measures for the prevention of construction waste.
- Planned on-site segregation measures.
- Planned reuse operations at the site itself or at other off-site locations.
- Planned on-site recovery operations for the waste generated.
- Planned destination for waste that cannot be reused or recovered on-site.
- Facilities for storage, handling, or other management operations.
- Requirements regarding handling and separation.

3. DEFINITIONS

- Demolition waste: Any substance or object that, meeting the definition of “Waste” included in article 3.a) of Law 10/1998, of April 21, is generated in a construction or demolition work.
- Inert waste: Non-hazardous waste that does not undergo significant physical, chemical, or biological transformations, is neither soluble nor combustible, and does not react physically, chemically, or in any other way. It is not biodegradable and does not adversely affect other materials with which it comes into contact in a way that could lead to environmental contamination or harm human health. The total leachability, contaminant content of the waste, and ecotoxicity of the leachate must be negligible, and in particular, they must not pose a risk to the quality of surface or groundwater.
- Demolition and construction waste producer: The natural or legal person holding the planning permit for a construction or demolition project; for projects not requiring a planning permit, the waste producer shall be the natural or legal person holding the property subject to construction or demolition. The natural or legal person carrying out processing, mixing, or other operations that result in a change in the nature or composition of the waste. The importer or purchaser of construction and demolition waste in any Member State of the European Union.
- Demolition and construction waste holder: The natural or legal person who holds the construction and demolition waste and who is not a waste manager. In any case, the natural or legal person who carries out the construction or demolition work, such as the builder, subcontractors, or self-employed workers, will be considered the holder. In any case, employees will not be considered holders of construction and demolition waste.
- Manager: It is the one that ultimately keeps records of this waste and the one that must provide the holder of the waste with a certificate accrediting its management.



4. IDENTIFICATION OF THE PRODUCER / CDWS HOLDER AND OBLIGATIONS

4.1. IDENTIFICATION OF THE PRODUCER AND THE HOLDER

The waste producer will be the owner of the license or the property holding the final decision to build or demolish, that is, the developer of the works, whether public or private.

The waste holder is the natural person or legal entity in possession of the construction or demolition waste who is not a waste manager; in all cases, the construction company will be the natural person or legal entity carrying out the construction or demolition work.

4.2. PRODUCER'S OBLIGATION

Their main obligation is to prepare a Construction and Demolition Waste Management Study (C&DMS, hereafter). This may be prepared by the designer or another competent technician and must be approved along with the technical project. The content of this C&DMS must comply with that regulated in Article 4 of Royal Decree 105/2008.

These obligations include:

- Estimating the quantity of C&D waste that will be generated at the project site, coded according to the European Waste List.
- Implementing waste prevention measures at the project site.
- The reuse, recovery, or disposal operations for which the waste generated at the project will be used.
- Measures for separating waste on site.
- Plans of the facilities planned for the storage, handling, and separation of waste.

4.3. HOLDER'S OBLIGATION

The holder is forced to:

- Draft and submit to the owner (producer) a plan reflecting how they will carry out their obligations regarding the construction site's CDW/Waste Management. This plan, once approved by project management and accepted by the owner, will become part of the contract documents for the project.
- When it is not appropriate to manage the CDW/Waste Management itself, hand it over to a waste manager, or participate in a voluntary agreement or collaborative arrangement for its management, the CDW/Waste Management will preferably be used for reuse, recycling, or other forms of recovery.
- The delivery of the CDW/Waste Management must be documented in a document that includes the identification of the holder and producer, the construction site of origin, the quantity, the type of waste delivered (coded in accordance with Order MAM/304/2002), and the identification of the manager of the destination operations.
- Keep them in adequate hygiene and safety conditions, and avoid mixing previously sorted fractions that could impede or hinder their subsequent recovery or disposal.
- Separate at source when the following quantities are exceeded: Concrete: 80 tons; bricks, tiles, ceramics: 40 tons; metal: 2 tons; wood: 1 tons; glass: 1 tons; plastic: 0.5 tons; paper and cardboard: 0.5 tons (Article 5.5 of Royal Decree 105/2008).
- Cover management costs and provide the producer with certificates and other documentation proving waste management.
- Have documentation proving that the construction and demolition waste actually produced has been managed, where appropriate, on-site or delivered to a recovery or disposal facility for treatment by an authorized waste manager, and maintain it for at least five years.

5. WASTE IDENTIFICATION

According to the European Waste List published by Order MAM/304/2002 of February 8, construction and demolition waste (CDW) is classified into the following categories:

- Level I CDW: Waste generated during the development of infrastructure works at the local or supra-municipal level, including surplus excavation and earthworks. This waste is primarily uncontaminated earth and stone materials.
- Level II CDW: Waste originating from construction, demolition, home repairs, and service provision activities. This waste includes materials such as concrete, wood, plastic, bituminous mixtures, and metals.

**6. WASTE ESTIMATION**

The volume of waste in cubic meters (m³) is estimated at 10% of the construction site's surface area in square meters (m²). Assuming an average density of 0.5 t/m³, the mass of waste generated is also deducted.

Therefore, for a surface of **14.700 m²** we get **1.470 m³** of waste, equivalent to **735 tones** of waste

Theorical evaluation of waste according to type of CDW	Tn	D	V
	Tones of each type of CDW	Density type (between 1,5 and 0,5)	Volume of waste (m3)
LANDS AND PETROLS FROM EXCAVATION			
Soil and petrol from excavation estimated directly from project data	7500	0,5	15000,0

Theorical evaluation of waste according to type of CDW	%	Tn	D	V
	% of weight (according to CCAA de Madrid)	Tones of each type of CDW	Density type (between 1,5 and 0,5)	Volume of waste (m3)
CDW: Non-stony nature				
1. Asphalt	0,050	36,750	1,300	28,269
2. Wood	0,040	29,400	0,600	49,000
4. Paper	0,000	0,000	0,900	0,000
5. Plastics	0,015	11,025	0,900	12,250
6. Glass	0,000	0,000	1,500	0,000
7. Plaster	0,000	0,000	1,200	0,000
TOTAL	0,105	77,175	6,400	89,519
CDW: Stony nature				
1. Sand, gravel and other materials	0,000	0,000	1,500	0,000
2. Concrete	0,120	88,200	1,500	58,800
3. Bricks, tiles and other ceramics	0,000	0,000	1,500	0,000
4. Stone	0,000	0,000	1,500	0,000
TOTAL	0,120	88,200	6,000	58,800

WASTE CATEGORY	NAME	DESCRIPTION	CODE
CDWs LEVEL I	Earth/Land waste	Excess soil from excavation or that cannot be reused for embankment formation due to its characteristics.	17 05 04
	Concrete	Excess concrete in the concrete mixer truck from the power plant.	17 01 01
	Wood	From pallets, non-reusable formwork or others.	17 02 01
	Plastic	From pallet wrappers or others.	17 02 03
	Bituminous Mixture	Excess bituminous mix in the truck coming from the power plant or at the asphalt plant.	17 03 02
CDWs LEVEL II	Metals	Removal of vertical signs or other metal elements, excess reinforcement or others.	17 04



A - Estimación del coste de tratamiento de los RCDs (sin fianza incluida)			
Type of CDW	Estimation(m3)	Price for management at the Plant/Landfill/Quarry/Manager (€/m3)	Price (€)
A1 CDWs Level I			
Land and petrol from excavation	15000,0	4	60000
A2 CDWs Level II			
CDWs Stony nature	58,800	10	588
CDWs Non-stony nature	89,519	10	895,19
CDWs of potential hazard	0	100	0
B – Other management costs			
B3- %Construction Budget for management costs, rentals, etc.			2000
TOTAL COST OF CDW MANAGEMENT			63483,19

7. WASTE PREVENTIVE MEASURES ON SITE

The following measures should be implemented at the construction site to minimize waste generation. These guidelines should be viewed by the waste holder as key recommendations for developing their own Waste Management Plan, tailored to the specific conditions of the site. The actions included under waste prevention cover all those that reduce the amount of construction and demolition waste (CDW) that would be produced without these measures, or that reduce the amount of hazardous substances in said waste, reducing its hazards and facilitating more efficient management later on.

7.1. GENERAL MEASURES

- The amount of raw materials used will be minimized, not only reducing the cost of the project but also reducing the amount of waste generated during construction.
- Materials will be stored outside the construction site's transit area and will be packaged and protected until ready for use to avoid waste due to broken parts.
- A storage point will be provided for reusable surplus products to encourage their reuse instead of disposal.

7.2. SPECIFIC MEASURES

The measures that will be adopted to prevent the generation of various construction and demolition waste expected at the project are detailed below:

7.2.1. LANDWASTE FROM EXCAVATION

- Excavated soil will be used as much as possible as material for filling.
- The topsoil layer will be set aside for later reuse (see Annex 16 – Environmental Integration).
- The use of inert materials and waste from construction and demolition activities will be encouraged in the restoration of environmentally degraded areas, remediation works, or filling.
- Specific areas for soil storage and machinery movement will be defined to avoid excessive soil compaction.

7.2.2. CONCRETE

- The arrival of concrete trucks will be efficiently scheduled to avoid the start of setting and, consequently, the need to return them to the plant, which generates waste.
- Surplus fresh concrete will be utilized whenever possible.

7.2.3. WOOD

- Wood will be cut with the necessary precision to optimize its use, always meeting the required specifications.
- Waste will be collected separately; it will be recycled, reused, or disposed of in an authorized landfill.

7.2.4. PLASTICS

- Unnecessary packaging will be avoided.
- Preference will be given to suppliers who package their products in a way that minimizes waste.
- Preference will also be given to suppliers who use packaging made from recycled/recyclable or biodegradable materials.

**7.2.5. BITUMINOUS MIXTURE**

- The arrival of bituminous mix trucks will be efficiently scheduled, and the mix will be covered with tarps to prevent cooling or contamination, which would result in the need to return it to the plant, which would generate waste.
- Surpluses will be avoided by placing orders accurately.

7.2.6. SCRAP AND REINFORCEMENT WASTE

- Materials will be stored protected from weather conditions to prevent corrosion.
- Surplus materials will be reused, and recycling will be encouraged for items that can be recovered.

8. AUTHORIZED MANAGERS IN CANTABRIA**RELACIÓN DE PLANTAS DE RECICLAJE DE DE RESIDUOS DE CONSTRUCCIÓN Y DEMOLICIÓN AUTORIZADAS EN CANTABRIA****> RECICLAJES CAMARGO, S.L.**

Bº de la Llosuca nº 2. 39600 Revilla de Camargo (Cantabria)

N.I.F.: B-39692892  (942) 25 14 08

Gestor autorizado para la gestión de residuos no peligrosos consistente en el reciclaje de residuos de construcción y demolición.

Códigos según la Lista Europea de Residuos (LER) admisibles: 17 01 01, 17 01 02, 17 01 03, 17 01 07, 17 03 02, 17 05 04, 17 06 04, 17 08 02, 17 09 04 y 20 02 02.

Nº de Gestor: VRCD/CN/179/2009.

> GRUPO EMPRESARIAL SADISA, S.L

Complejo Medioambiental de Meruelo (Cantabria)

N.I.F.: B-39036744  (942) 58 08 61

Gestor autorizado para la gestión de residuos no peligrosos consistente en el reciclaje de residuos de construcción y demolición.

Códigos según la Lista Europea de Residuos (LER) admisibles: 17 01 01, 17 01 02, 17 01 03, 17 01 07, 17 02 01, 17 02 02, 17 02 03, 17 03 02, 17 05 04, 17 06 04, 17 08 02 y 17 09 04.

Nº de Gestor: VRCD/CN/190/2010.

> PARQUE VERDE CANTABRIA, S.L

C/ Antigua Carretera de Burgos, s/n. 39608 Cacicedo de Camargo (Cantabria)

N.I.F.: B-39722780  (942) 26 65 83

Gestor autorizado para la gestión de residuos no peligrosos consistente en el reciclaje de residuos de construcción y demolición.

Códigos según la Lista Europea de Residuos (LER) admisibles: 17 01 01, 17 01 02, 17 01 03, 17 01 07, 17 03 02, 17 05 04, 17 05 06, 17 05 08, 17 06 04, 17 08 02 y 17 09 04.

Nº de Gestor: VRCD/CN/194/2011.

28/02/11

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DOCUMENT N°2.8 – LANDSCAPE RESTORATION



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1. INTRODUCTION

This appendix explains the works and actions to be carried out once the project is completed to restore vegetation and repopulate the natural landscape in the project area, thus restoring the landscape that existed prior to the commencement of the road improvement works.

To carry out the landscape restoration of the project area, the recommendations and guidelines specified in the "Roadside Plantation Manual," published by the General Directorate of Roads in 1992, will be followed.

2. CORRECTIVE MEASURES

The main objective of corrective measures is to provide vegetation cover to the newly created bare surfaces resulting from the construction of the works, the primary objective of which is to protect them from erosion.

In some sections of cuts or embankments, larger earthworks devoid of vegetation can cause erosion processes caused by atmospheric agents such as rain, wind, sudden temperature changes, among other causes.

As described, the main objective is to halt or mitigate these effects by implementing a vegetation treatment technique for these lands. This consists of plantings (sub-shrub, shrub, or tree species) or by sowing species (usually herbaceous) that produce a vegetation cover that acts as a protective layer.

The plantations to be placed as a corrective measure can serve two types of functions and meet different needs. Depending on their purpose, they can be functional or aesthetic.

Functional plantings are those whose objective is to technically complement the quality of existing or existing works. They can include:

- Erosion protection.
- Protection from atmospheric agents, such as sun, wind, snow, and so on.
- Traffic safety.
- Complementing road markings for convenience and optical orientation.
- Glare protection.
- Acoustic protection.
- Protection from dust and exhaust fumes.

Plantings with an aesthetic purpose are those that improve the visual quality of the road and its integration into the landscape. The aesthetic aspects they can fulfill are:

- Mass balance.
- Restoration of the surrounding landscape.
- Landscape screening.
- Creation of new landscapes.

3. PLANTING RECOMENDATIONS FOR ROAD SAFETY

Because the route of the projected road, the CA-661, is winding and steep on its approach to La Busta, precautions must be taken regarding planting, especially slender trees.

First, at changes in grade, the plantings must be placed before reaching the highest points, thus avoiding the creation of sharp contrasts and indicating that the road continues after the change in grade, whether straight or curved. Furthermore, as the change in grade progresses, the height of the plantings will decrease to minimize visibility.

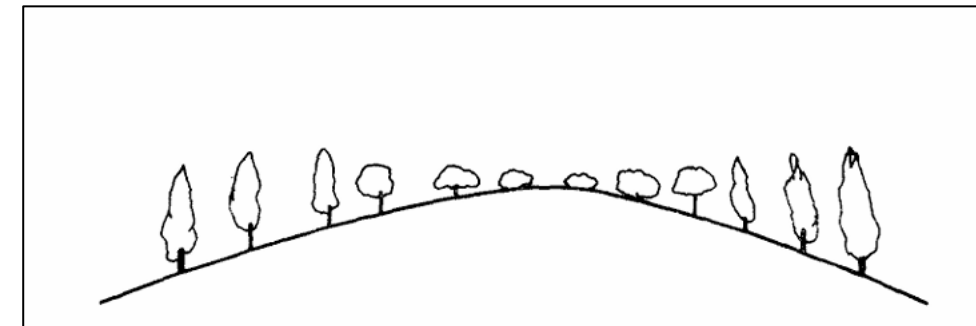


Figure 1.1: Plantations in change of slope.

On curved sections, whether to the left or right, plantings should be placed on the outside of the curve. Furthermore, the sharper the curve, the denser the vegetation surrounding it.



Finally, on problematic sections, that is, when two straight stretches are interrupted by a double curve, vegetation will be planted to separate the two opposing directions of traffic at points that could cause confusion for drivers. This will make driving more comfortable and safer, especially at night.

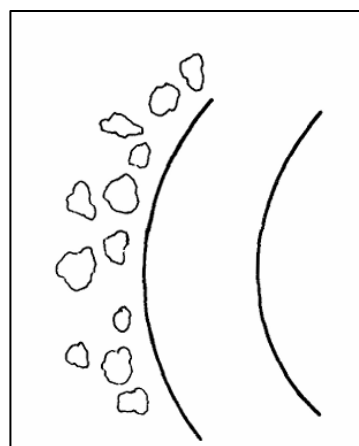


Figure 1.2: Plantation in curves.

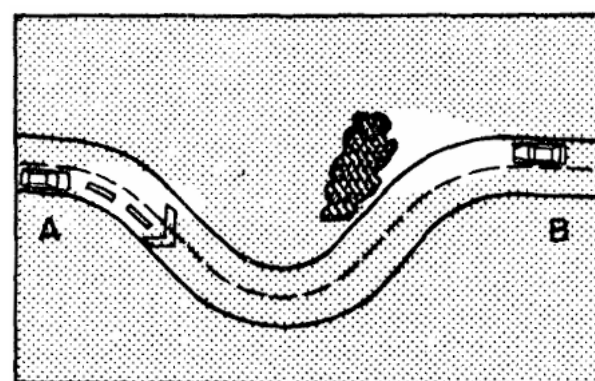


Figure 1.3: Plantation in a conflictive section.

4. REMOVAL OF VEGETABLE SOIL

The first step in the landscape restoration of the project area is the removal of topsoil from the affected area. This soil will be stored and preserved so it can be reused when the areas requiring replanting need to be covered.

- The procedure to be followed with the removed topsoil is as follows:
- Selective removal and storage.
- Maintenance of the topsoil (irrigation, planting of legumes, etc.)
- Once the work is completed, the material is spread over the area to be restored.

Since this is uncultivated land (or uncultivated land) but with significant spontaneous vegetation, and as indicated in the roadside planting manual, what is known as "head soil" will be used, that is, from the surface to a depth of 15 or 20 centimeters.

5. HYDROSEEDING

The technique applied for landscape restoration is hydroseeding, commonly used in the restoration of cuts and embankments. Its basic purpose is to halt erosion processes as quickly as possible in areas without vegetation or that do not meet the appropriate conditions for establishing natural vegetation in the short term.

Hydroseeding is composed of several basic components: water, mulch, stabilizers, fertilizers, and seeds of grass and legume species. Since hydroseeding aims to adapt the soil to facilitate the future incorporation of plant species into the environment, seeds from shrubs native to the area are usually incorporated into the aforementioned basic components.

The stages of the hydroseeding process are:

1. Soil preparation: Furrows and rills are eliminated to prevent washout by water circulating through these terrain features. Furthermore, if the soil is long and eroded, it is recommended to break the surface crust and remove the top 5 centimeters.
2. Sowing: The seeds are spread using the hydroseeding machine. The seeds are fixed with the appropriate amount of mulch and stabilizers.
3. Covering: This is done immediately after sowing. Another layer of mulch is applied, this time without seeds or stabilizers.

5.1. CONSERVATION AND MAINTENANCE

Maintenance and conservation of plantings and vegetation are essential for the following reasons:

- Control slope erosion through a continuous vegetation cover.
- Prevent vegetation from encroaching on drainage structures and hindering their operation.
- Maintain visibility at curves and intersections.
- Maintain the visibility of vertical signage.

These are the main incentives for maintaining and conserving vegetation, as far as it is present in the project area is concerned. In other areas with greater atmospheric inconvenience, stricter and more effective measures should be employed to preserve vegetation and maintain the roadway in good condition.



5.2. PLANTATIONS

The plantations that can be planted around the project area are primarily oak and beech trees, the latter of which are very common in the mountainous areas of the municipality.

To maintain the plantations, the following tasks must be carried out:

5.2.1. IRRIGATION

Irrigation is the addition of water to plants. Except in areas where other irrigation systems are available, such as hydrants or sprinklers, irrigation should be carried out using cisterns. Care must be taken to avoid dislodging plants and to avoid washing away or eroding the soil.

5.2.2. PRUNING

A fundamental operation involving plantation maintenance. Tree and shrub branches are cleared to give them a specific shape and, more importantly, to limit their growth and even prevent road blockages, whether visual or physical.

5.2.3. WEEDING AND HARROWING

Harrowing is the process of breaking up the surface crust of the soil at the beginning of the dry season to prevent excessive water evaporation. Weeding involves removing the vegetation and plants that should be removed to prevent competition between plants.

5.2.4. TREE PITS MAINTENANCE

Tree pits are hollows dug at the base of trees and plants to store irrigation water. As this is a remote and difficult-to-maintain area, it is advisable to create tree pits large enough and well-sized in the project area so that the plantations can efficiently utilize both rainwater and irrigation water. Furthermore, as this is an area of constant slope, the embankment and excavation pits will facilitate the absorption and retention of surface runoff water.

5.2.5. FERTILIZERS

It is advisable to do this at least two years after planting in the project area. Since the physicochemical characteristics of the soil are generally insufficient, it must be nourished and prepared for the proper growth and development of the planted vegetation and trees.



DOCUMENT N°2.9 – ENVIRONMENTAL RESPONSIBILITY

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1. INTRODUCTION

Royal Decree 2090/2008, which approves the Regulations for the partial implementation of Law 26/2007 on Environmental Liability, regulates the responsibility of operators to prevent, avoid, and repair environmental damage, as well as to return damaged natural resources to the state they were in before the damage occurred.

Law 26/2007 reflects the mandate of Article 45 of the Constitution and incorporates Directive 2004/35/EC of the European Parliament and of the Council of April 21, 2004, into domestic law. It establishes an objective and unlimited administrative regime for environmental liability, based on the principles of "damage prevention" and "the polluter pays."

This Law has been amended by Law 11/2014, of July 3, and Law 33/2015, of September 21.

This annex sets forth, through Law 26/2007, October 23, on Environmental Liability, the regulation of the responsibilities that operators have to prevent, avoid, and repair environmental damage, in accordance with Article 45 of the Constitution and the principles of prevention.

1.1. DEFINITIONS

1.1.1. ENVIRONMENTAL DAMAGE

Damage to wild species and habitats, that is, any damage that produces significant adverse effects on the possibility of achieving or maintaining the favorable conservation status of those habitats or species.

Damage to species and habitats will not include previously identified adverse effects resulting from an act by an operator expressly authorized in accordance with the provisions of the following regulations:

Articles 6.3 and 4 or Article 13 of Royal Decree 1997/1995, of December 7, establishing measures to contribute to ensuring biodiversity through the conservation of natural habitats and wild fauna and flora.

State or regional regulations on forests, hunting, and inland fishing, within the framework of the provisions of Article 28 of Law 4/1989, of March 27, on the conservation of natural areas and wild flora and fauna.

Water damage, understood as any damage that produces significant adverse effects on the ecological, chemical, and quantitative status of surface or groundwater bodies, as well as on the ecological potential of artificial and heavily modified water bodies.

For these purposes, the definitions established by water legislation shall apply.

Adverse effects covered by Article 4.7 of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy shall not be considered water damage.

Damage to seashores and estuaries, understood as any damage that produces significant adverse effects on their physical integrity and proper conservation, as well as any damage that makes it difficult to achieve or maintain an adequate level of quality.

Soil damage, i.e., any soil contamination that poses a significant risk of adverse effects on human health or the environment due to the direct or indirect deposit, discharge, or introduction of substances, preparations, organisms, or microorganisms into or subsurface of the soil.

1.1.2. DAMAGES

The measurable adverse change in a natural resource or the impairment of a natural resource service, whether occurring directly or indirectly.

Environmental damage caused by airborne elements is included within the concept of damage.

1.1.3. RISK

Function of the probability of occurrence of an event and the amount of damage it can cause.

1.1.4. WILD SPECIES

Species of flora and fauna mentioned in Article 2.3a of Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, or protected by Community, state, or regional legislation, as well as by international treaties to which Spain is a party, that are found in the wild in Spanish territory, whether permanently or



seasonally. In particular, species included in the National Catalogue of Endangered Species or in the catalogs of endangered species established by the autonomous communities in their respective territorial areas.

Excluded from the above definition are invasive alien species, understood as those introduced deliberately or accidentally outside their natural range and that pose a threat to native habitats or wild species.

1.1.5. HABITAT

Terrestrial or aquatic areas differentiated by their geographical, abiotic and biotic characteristics, and which are mentioned in article 2.3.b of Directive 2004/35/EC of the European Parliament and of the Council, of 21 April 2004, on environmental liability with regard to the prevention and remedying of environmental damage, or which are protected by other Community regulations, by state or regional legislation, or by International Treaties to which Spain is a party.

1.1.6. CONSERVATION STATE

With respect to a habitat, the sum of the influences acting on it and its typical species that may affect its natural distribution, structure, and functions in the long term, as well as the long-term survival of its typical species within that habitat's natural distribution area within Spanish territory.

The conservation status of a habitat shall be considered favorable when all of the following conditions are met:

- Its natural distribution area and the areas within that area are stable or growing.
- The specific structure and functions necessary for its long-term maintenance are present and are likely to continue to be present in the foreseeable future.
- The conservation status of its typical species is favorable, as defined in letter b.

The conservation status of a species will be considered favorable when all of the following conditions are met:

- Population dynamics data for the specified species indicate that it is being maintained long-term as a viable component of its habitat.
- The natural range of that species is not shrinking and is not likely to shrink in the foreseeable future.
- There is sufficiently extensive habitat to support its populations long-term and is likely to continue to exist.

1.1.7. WATERS

All continental waters, both surface and underground, coastal and transitional, as defined in the consolidated text of the Water Law, approved by Royal Legislative Decree 1/2001, of July 20, as well as the remaining elements that form part of the public hydraulic domain.

1.1.8. SEASIDE AND MOUNTAIN BANK

The public maritime-terrestrial domain assets regulated in article 3.1 of Law 22/1988, of July 28, on Coasts.

1.1.9. SOIL

The upper layer of the Earth's crust, located between bedrock and the surface, composed of mineral particles, organic matter, water, air, and living organisms. It constitutes the interface between land, air, and water, giving it the capacity to perform both natural and human functions. Those permanently covered by a layer of surface water are not considered such.

1.1.10. OPERATOR

Any natural or legal person, public or private, who carries out an economic or professional activity or who, by virtue of any title, controls said activity or has decisive economic power over its technical operation. For this determination, the provisions of sectoral, state, or regional legislation for each activity regarding the holders of permits or authorizations, registrations, or communications to the Administration shall be taken into account.

Without prejudice to the provisions of Article 14.1.b, contracting bodies of public administrations are not included in this concept when exercising the prerogatives granted to them by public procurement legislation in relation to administrative or other contracts they have signed with any type of contractor, which shall be the operator for the purposes of this Law.

1.1.11. PROFESIONAL OR ECONOMIC ACTIVITY

Any activity carried out in connection with an economic activity, business or company, regardless of whether it is public or private and whether or not it is for profit.

**1.1.12. EMISSION**

The release into the environment, resulting from human activities, of substances, preparations, organisms or microorganisms.

1.1.13. IMMINENT DAMAGE THREAT

A sufficient probability that environmental damage will occur in the near future.

1.1.14. PREVENTIVE MEASURE

Adopted in response to an event, act or omission that has posed an imminent threat of environmental damage, with the aim of preventing its occurrence or minimising such damage.

1.1.15. DAMAGE ELUDING MEASURE

That which, once environmental damage has occurred, aims to limit or prevent further environmental damage by controlling, containing or eliminating the factors that caused the damage, or by addressing them in any other way.

1.1.16. REPAIRING MEASURE

Any action or set of actions, including those of a provisional nature, that aims to repair, restore or replace damaged natural resources and natural resource services, or to provide an equivalent alternative to them.

1.1.17. NATURAL RESOURCE

Wild species and habitats, water, sea and estuary shores, and soil.

1.1.18. NATURAL RESOURCE SERVICES

The functions that a natural resource performs for the benefit of another natural resource or the public.

1.1.19. BASIC STATE

The state in which, had the environmental damage not occurred, natural resources and natural resource services would have been present at the time they suffered the damage, considered on the basis of the best information available.

1.1.20. RECOVERY, INCLUDING NATURAL RECOVERY

In the case of waters and wildlife and habitats, the return of damaged natural resources and natural resource services to their baseline state; in the case of soil damage, the elimination of any significant risk of adverse effects on human health.

1.1.21. COSTS

Any expense justified by the need to ensure proper and effective application of this Law in the event of environmental damage or threat of environmental damage, regardless of the amount. In particular, this includes all expenses incurred in the proper implementation of preventive measures, measures to prevent further damage, and measures to repair it; expenses for assessing environmental damage and the imminent threat of such damage occurring; expenses aimed at establishing possible action options and selecting the most appropriate ones; expenses generated to obtain all relevant data; and expenses aimed at ensuring monitoring and supervision. Such expenses include administrative, legal, and material and technical costs necessary for carrying out the aforementioned actions.

1.1.22. COMPETENT AUTHORITY

The entity responsible for carrying out the duties provided for in this Law, designated within their respective areas of competence by the General State Administration, the autonomous communities, and the cities of Ceuta and Melilla for the implementation of this Law.

1.1.23. PUBLIC

Any natural or legal person, as well as their associations, organizations and groups established in accordance with the regulations applicable to them.

2. SCOPE OF APPLICATION

Law 26/2007 will apply in the following cases:

- Environmental damage and imminent threats of such damage occurring, even without intent, negligence, or fault.



- It is presumed, unless proven otherwise, that an economic or professional activity has caused the damage or the imminent threat of such damage occurring when, given its intrinsic nature or the way in which it was carried out, it is appropriate to cause it.
- Environmental damage and imminent threats of such damage occurring, when caused by economic or professional activities under the following terms:
 - When there is intent, negligence, or fault, prevention, avoidance, and repair measures will be enforceable.
 - When there is no intent, negligence, or fault, prevention and avoidance measures will be enforceable.

This Law shall only apply to environmental damage or the imminent threat of such damage caused by diffuse pollution, when a causal link can be established between the damage and the activities of specific operators.

This Law shall not apply to the following damage:

- Environmental damage or the imminent threat of such damage when it originates from an event whose consequences in terms of liability or compensation are established by any of the international conventions, including any future amendments, in force in Spain.
- Nuclear risks, environmental damage, or the imminent threat of such damage caused by activities employing materials whose use is regulated by regulations derived from the Treaty establishing the European Atomic Energy Community, or incidents or activities whose liability regime is established by any of the international conventions, including any future amendments, in force in Spain.

3. PRESCRIPTION OF ENVIRONMENTAL RESPONSIBILITY

Environmental Liability will expire if more than thirty years have passed since the emission, event, or incident that caused it occurred. The period will be calculated from the day on which the emission, event, or incident causing the damage completely ceased or occurred for the last time.

4. DAMAGES TO PRIVATE PARTIES

This Law does not cover the exercise of legal actions for personal injury, damage to private property, or any type of economic loss, nor does it affect any rights relating to this type of damage or any other property damage that is not considered environmental damage, even if it results from the same events that give rise to environmental liability. Such actions shall be governed by the regulations applicable in each case.

5. ADMINISTRATIVE COMPETENCES

Administrative powers shall be governed by the following guidelines:

- The legislative development and enforcement of this Law correspond to the autonomous communities in whose territory the damage caused or the imminent threat is located.
- If the damage or threat affects state-managed river basins or state-owned public domain assets, a report from the competent state body shall be mandatory and binding exclusively on prevention, avoidance, or repair measures.
- When, pursuant to the provisions of water and coastal legislation, it is the responsibility of the General State Administration to ensure the protection of state-owned public domain assets and determine the measures to prevent, avoid, and repair damage, it shall apply this Law within its scope of powers.
- Exceptionally, and when required for reasons of extraordinary gravity or urgency, the General State Administration may promote, coordinate, or adopt any measures necessary to avoid irreparable environmental damage or to protect human health.

6. ENVIRONMENTAL DAMAGES REPAIR

The operator of any economic or professional activity that causes environmental damage as a result of such activities is obliged to immediately notify the competent authority and adopt appropriate remedial measures, even if there has been no intent, negligence, or fault.

When environmental damage has occurred, the operator, without delay and without prior warning, request, or administrative action, shall:



- Adopt all necessary provisional measures to immediately repair, restore, or replace the damaged natural resources and natural resource services and shall inform the competent authority of such provisional measures.
- Submit a proposal for measures to remediate the environmental damage caused for the competent authority's approval.

When multiple environmental damages have occurred, such that it is impossible to adopt all the remedial measures simultaneously, the competent authority shall establish the order of priority, taking into account the nature, scope, and severity of each environmental damage, as well as the possibilities for natural recovery. In all cases, measures aimed at eliminating risks to human health shall be given priority.

7. VIOLATIONS AND PENALTIES

Individuals and private legal entities that operate economic or professional activities and are responsible for them may be sanctioned for acts constituting the administrative infractions regulated in this chapter. The infractions classified in this law are classified as follows:

Very Serious Infractions:

- Failure to adopt the preventive or avoidance measures required by the competent authority.
- Failure to comply with the instructions received from the competent authority when implementing the preventive or avoidance measures to which the operator is obliged, when this results in the damage intended to be avoided.
- Failure to adopt the remedial measures required of the operator, when this results in a detrimental effect on the remedial effectiveness of such measures.
- Failure to comply with the instructions received from the competent authority when implementing the remedial measures to which the operator is obliged, when this results in a detrimental effect on the remedial effectiveness of such measures.
- Failure to inform the competent authority of the existence of environmental damage or an imminent threat of damage caused or likely to be caused by the operator and of which the operator is aware, or doing so with unjustified delay, when this would result in its effects worsening or actually occurring.
- Failure to comply with the obligation to arrange, in the established terms, the financial guarantees to which the operator is obliged.

Serious Infractions:

- Failure to adopt the preventive or avoidance measures required by the competent authority of the operator, when this does not constitute a very serious infringement.
- Failure to comply with the instructions received from the competent authority when implementing the preventive or avoidance measures required by the operator, when this does not constitute a very serious infringement.
- Failure to adopt the remedial measures required by the operator by the competent authority, when this does not constitute a very serious infringement.
- Failure to comply with the instructions received from the competent authority when implementing the remedial measures required by the operator, when this does not constitute a very serious infringement.
- Failure to inform the competent authority of the existence of environmental damage or an imminent threat of damage caused or likely to be caused by the operator and of which the operator is aware, or doing so with unjustified delay, when this does not constitute a very serious infringement.
- Failure to provide the information required by the competent authority to the operator, or doing so with delay.
- Failure by the affected operator to provide the assistance required by the competent authority for the implementation of corrective, preventive, or avoidance measures.
- Failure to comply with, resisting, or obstructing mandatory actions.

These classified violations may result in the following sanctions:

Very Serious Infractions:

- A fine of €50,001 to €2,000,000.
- Termination of the authorization or suspension of it for a minimum period of one year and a maximum of two years.

Serious Infractions:

- A fine of €10,001 to €50,000.
- Suspension of the authorization for a maximum period of one year.



8. BREACH OF OBLIGATIONS

The competent authority shall ensure that the operator adopts measures to prevent, avoid, or repair environmental damage, and that it complies with the obligations of this Law. To this end, it shall exercise the powers conferred upon it by this Law and any other provision of the legal system.

In the event of total or partial noncompliance by operators with their obligations to carry out measures to prevent, avoid, or repair environmental damage, the competent authority shall issue a reasoned resolution (as established in Chapter VI), requiring the operator to comply. This action is independent of the application of the corresponding sanctioning regime resulting from the aforementioned noncompliance.



DOCUMENT N.º2.10 – PHOTOGRAPHICAL INFORMATION



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1. INTRODUCTION

This appendix contains a series of photographs of the project area where the CA-661 highway improvement will be carried out. This will help to understand the need for the project and to provide a firsthand view of its current conditions.

2. PHOTOGRAPHICAL REPORT

Some of the present problems are:



Figure 1: Entrance to the road with poor signaling.



Figure 2: Absence of longitudinal drainage.



Figure 3: Absence of containment systems along the road.

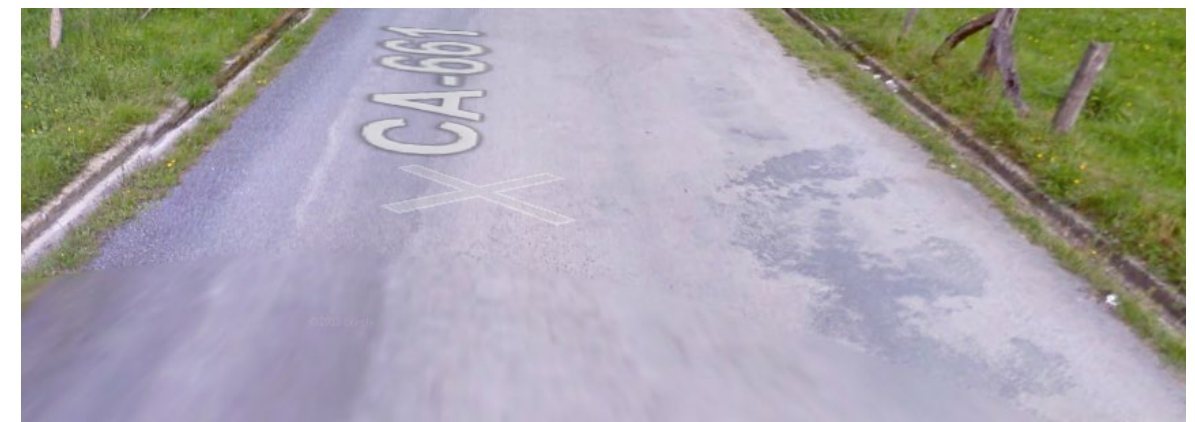


Figure 4: Areas with longitudinal drainage blocked by vegetation and trash.



Figure 5.1: Absence of beaconing in curves.



Figure 5.2: Absence of beaconing in curves



Figure 6: Absence of longitudinal road markings. No lane separation and no hard shoulders.



Figure 7: Road in poor condition and narrow for two-way traffic.



Figure 8: Access to and from homes is unmarked and has poor visibility.



Figure 9: Absence of vertical signage along the entire route.



DOCUMENT N°2.11 – JUSTIFICATION FOR THE CHOSEN PROCEDURE



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1. INTRODUCTION

This appendix will explain the reasons and justification for why the solution adopted for the reform of the CA-661 highway is the optimal among the possible options.

2. JUSTIFICATION FOR THE CHOSEN PROCEDURE

The main objective of the project is to find a solution to the poor condition of the CA-661 highway, doing so in the most economical and appropriate way possible. Therefore, based on the search criteria, the most appropriate solution is to widen the platform on both sides and replace the existing one with a suitable one, without having to modify the layout.

The main reasons for the aforementioned improvements are:

- Narrow platform with no signage.
- Poor condition of the pavement, with cracks and breaks.
- Blockage of the longitudinal drainage system due to overgrown vegetation in the area.
- Lack of shoulders on the sides of the road.

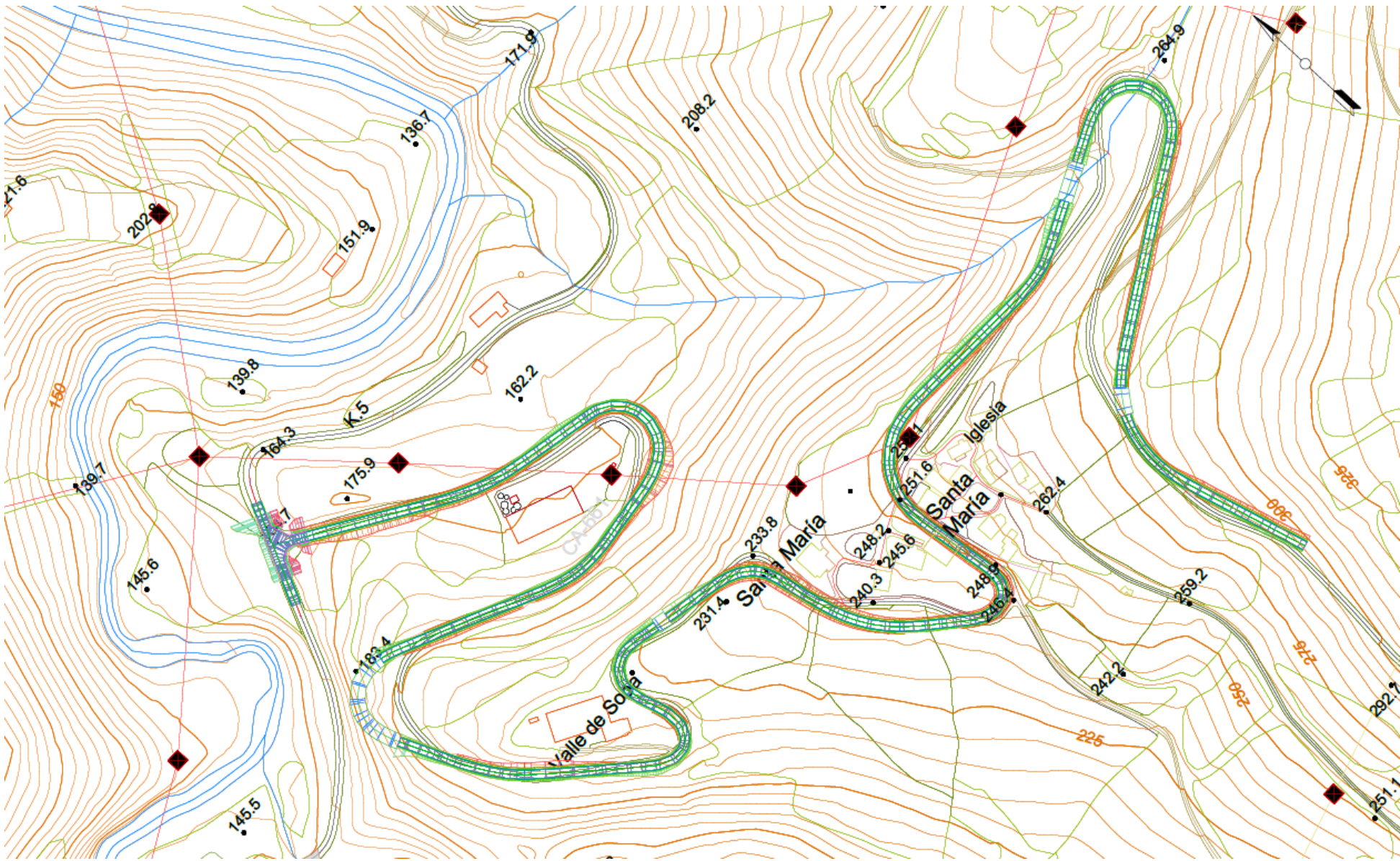
In addition to expanding the width of the platform on both sides of the road and creating hard shoulders, the decision was also made to implement an optimal cross-drainage system based on the strategic placement of bridge sections in areas where the land elevation is significantly below the road. This will eliminate the need to create more complex cross-drainage structures to drain into the surrounding land; instead, the water itself will fall through these bridge sections into the land itself, flowing downslope to the river.

The renovation of the CA-661 highway will reduce the risk of traffic accidents and improve accessibility for the population of San Juan de la Cistierna to its last neighborhood, La Busta. The projected speed limit of 40 km/h will be met thanks to the improved condition of the road surface, and heavy vehicles such as large trucks or tractors, typical in rural areas like the project area, will be able to circulate safely.

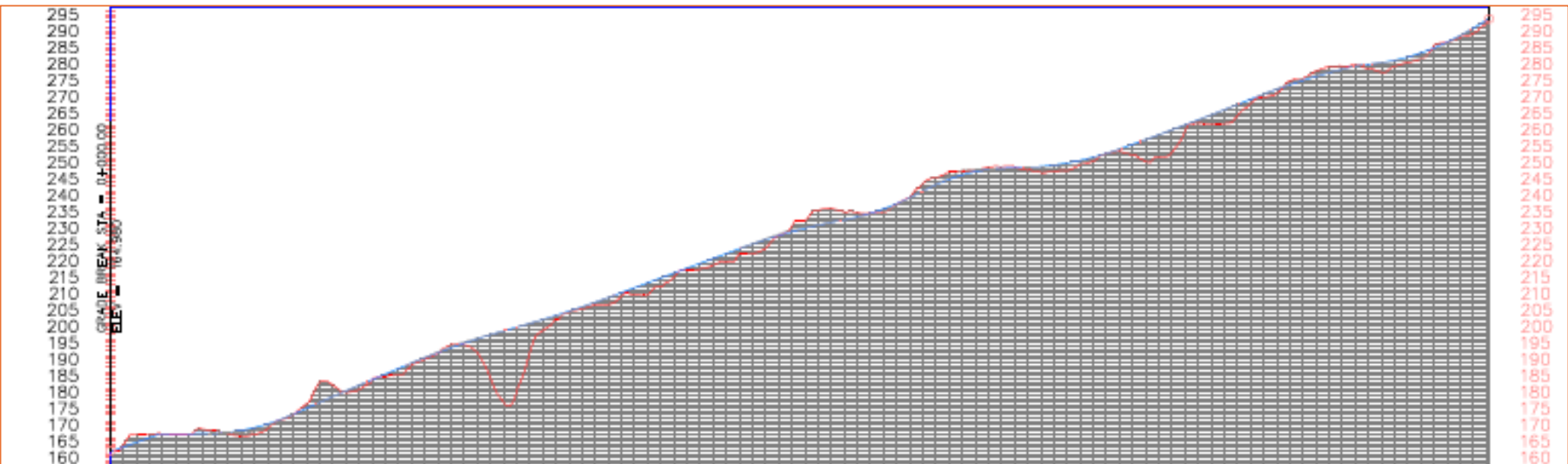
PROJECT FOR THE PLATFORM IMPROVEMENT OF ROAD CA-661, ACCESS TO “LA BUSTA”

Project by: Santos Diego Cruz.
Directed by: María Antonia Pérez Hernando.

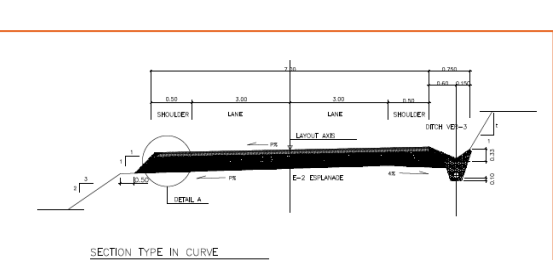
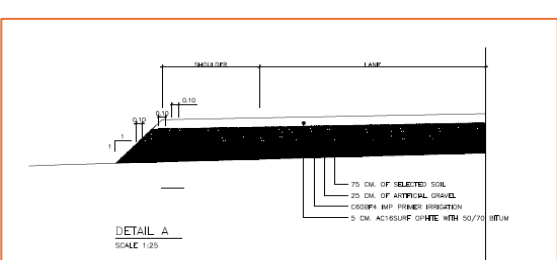
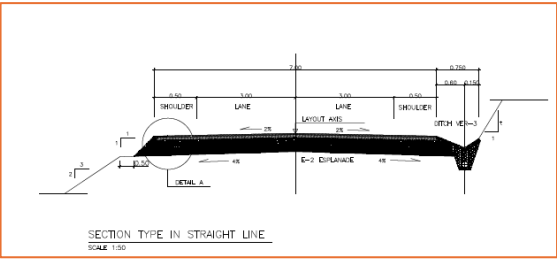
September 2025



Longitudinal Profile:



Section type of the road:



Road characteristics:

- 2.100m of Project length.
- 2 lanes, 3m each.
- 0,5,m shoulders.
- Ditches on embankments.
- 130 m of road steepnes between start and finish.

Drainage system:

- Longitudinal drainage system with ditches, manholes and pvc tubes.
- Transversal drainage solved with ODTs and bridges.

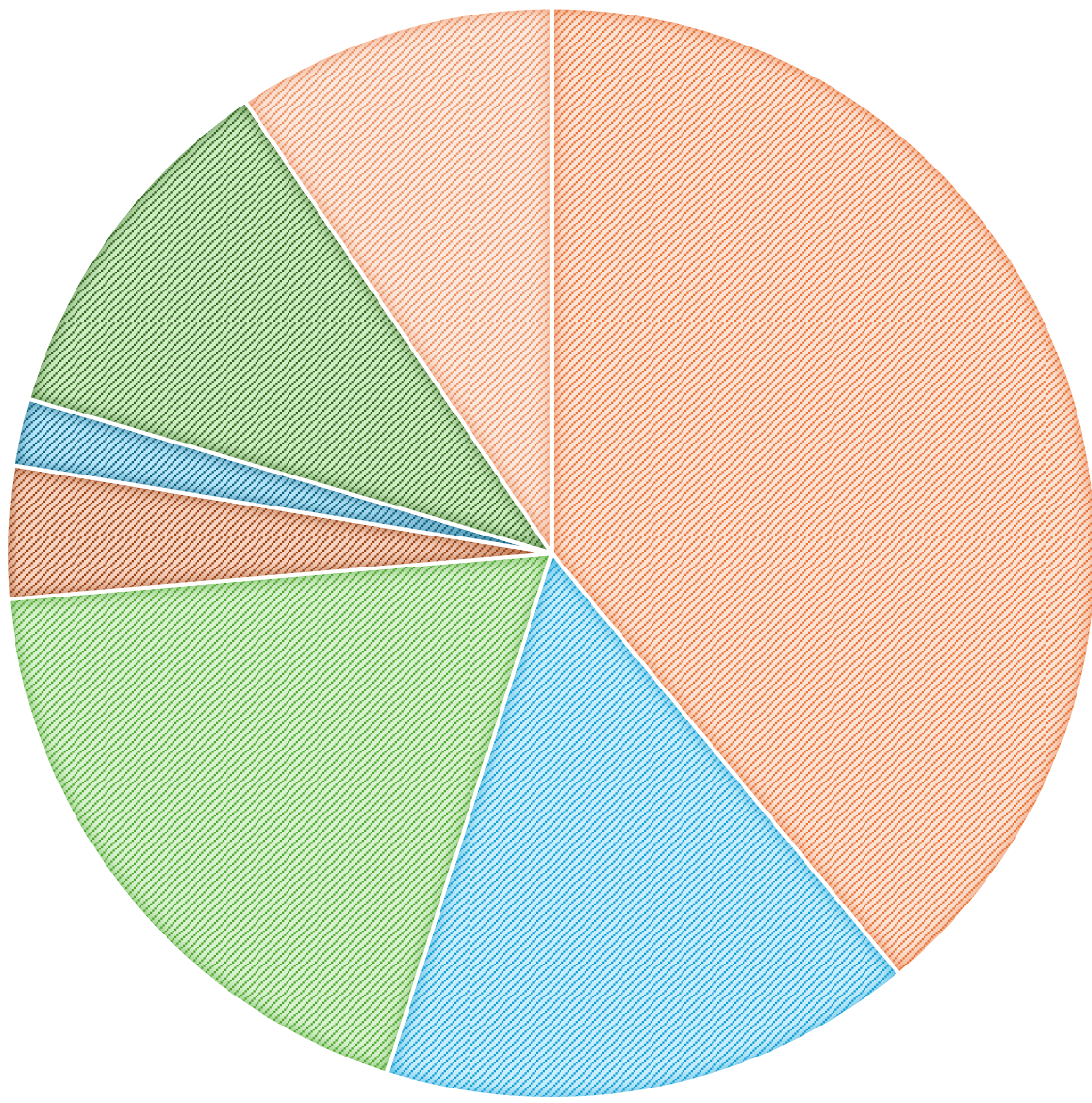
Budget of the Project:

- Material Execution Budget: 580.252,54€.
- PBL: 835.505,63€.
- Exporpiations and Affected Services: 304.580€.

TOTAL BUDGET: 1.140.085,63€.

BUDGET OF THE PROJECT

- EARTHWORKS
- DRAINAGE
- ROAD STRUCTURE
- SIGNALING
- ENVIRONMENTAL INTEGRATION
- WASTE MANAGEMENT
- RISK MANAGEMENT, HEALTH AND SAFETY



DRAINAGE SYSTEM:

