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

VARIANTE DE LANESTOSA

TRABAJO FIN DE GRADO

Trabajo realizado por:
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Dirigido:
MARIA ANTONIA PÉREZ HERNANDO

Titulación:
Grado en Ingeniería Civil

Santander, julio de 2025

TÍTULO: PROYECTO DE CONSTRUCCION DE LA VARIANTE DE LANESTOSA

AUTOR: DIEGO GARCÍA ABRIL

SUPERVISORES: MARÍA ANTONIA PÉREZ HERNANDO

FECHA DE PRESENTACIÓN: JULIO 2025

1. RESUMEN

Este proyecto tiene como objetivo identificar la ruta más adecuada para una circunvalación en la carretera N-629 cerca de Lanestosa, con el objetivo de redirigir el tráfico fuera del centro de la ciudad para mejorar tanto la comodidad del conductor como el bienestar de los residentes locales.

El trazado propuesto atraviesa una región con topografía compleja, caracterizada por pendientes pronunciadas y una geología predominantemente caliza. En función de estas condiciones, se ha abordado la estabilidad de taludes con pendientes de diseño de 1H:2V para los tramos de corte y 3H:2V para los terraplenes.

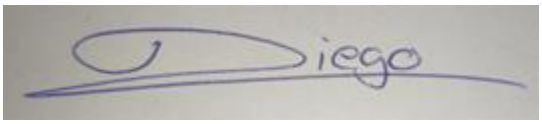
Tras evaluar diversas alternativas con criterios económicos, ambientales y sociales, la solución seleccionada consiste en desviar el tráfico de la N-629 antes de llegar a Lanestosa desde el oeste. Este nuevo tramo se reconecta con la carretera principal mediante una intersección.

Para gestionar los cambios de elevación a lo largo de la ruta, el diseño prioriza los movimientos de tierra (excavaciones y terraplenes) en lugar de estructuras más complejas como túneles o grandes puentes. Dos de los principales desafíos identificados son las condiciones geológicas y el clima húmedo invernal de la región, que pueden dificultar las operaciones de excavación y pavimentación.

2. ESPECIFICACIONES TÉCNICAS

- **Diseño Velocidad :** 90 km/h
- **Tráfico Clasificación :** T31
- **Tipo de carretera:** Calzada única de dos carriles (3,5 m por carril)
- **Hombro Ancho:** 1,5 m
- **Longitud total:** 2.788 metros
- **Sección de la carretera:**
    - 5 cm de mezcla bituminosa AC16 surf D 50/70 en la capa de rodadura.
    - Capa de adherencia
    - 10 cm de mezcla bituminosa AC22 bin S 50/70
    - Capa de imprimación
    - Grava de 40 cm 32020
- **Drenaje Sistema :**
    - Zanjas longitudinales para superficie escorrentía
- En cuanto al Presupuesto, el presupuesto de ejecución material es: 20.174.221,14 €

Santander, Julio de 2025



Firmado: Diego García Abril

TITLE: LANESTOSA BY-PASS CONSTRUCTION PROYECT

AUTHOR: DIEGO GARCÍA ABRIL

SUPERVISORS: MARÍA ANTONIA PÉREZ HERNANDO

SUBMISSION DATE: JULY 2025

1. SUMMARY

This project aims to identify the most suitable route for a bypass on the N-629 road near Lanestosa, with the goal of redirecting traffic away from the town center to enhance both driver convenience and local resident well-being.

The proposed alignment traverses a region with challenging topography, characterized by steep gradients and predominantly limestone geology. Based on these conditions, slope stability has been addressed with design gradients of 1H:2V for cut sections and 3H:2V for embankments.

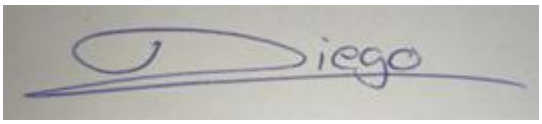
After evaluating several alternatives using economic, environmental, and social criteria, the selected solution involves diverting traffic from the N-629 before it reaches Lanestosa from the west. This new segment reconnects with the main road via an intersection.

To manage elevation changes along the route, the design favors earthworks—excavations and embankments—over more complex structures like tunnels or large bridges. Two major challenges identified are the geological conditions and the region's wet winter climate, which can hinder excavation and paving operations.

2. TECHNICAL SPECIFICATIONS

- **Design Speed:** 90 km/h
- **Traffic Classification:** T31
- **Road Type:** Two-lane single carriageway (3.5 m per lane)
- **Shoulder Width:** 1.5 m
- **Total Length:** 2.788 meters
- **Typical Pavement Structure:**
    - 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
    - Tack coat
    - 10 cm of AC22 bin S 50/70 bituminous mix
    - Prime coat
    - 40 cm gravel 32020
- **Drainage System:**
    - Longitudinal ditches for surface runoff
- Regarding the Budget, the material budget execution is: 20.174.221,14 €

Santander, July 2025



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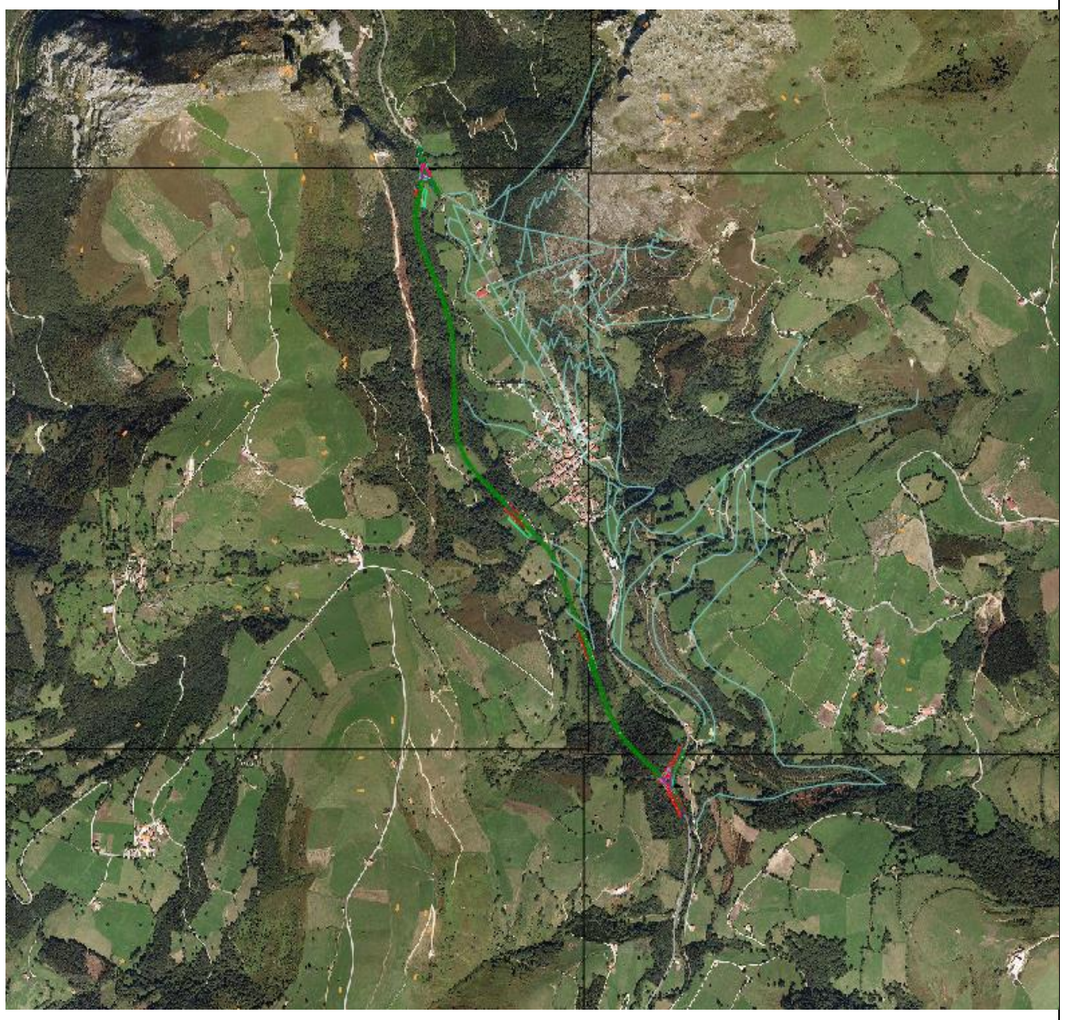

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

ÁREA DE PROYECTOS DE INGENIERÍA

UNIVERSIDAD DE CANTABRIA

TIPO	**PROYECTO FIN DE CARRERA**
TÍTULO	**PROYECTO DE CONSTRUCCIÓN DE LA VARIANTE DE LANESTOSA**
	LANESTOSA BY-PASS CONSTRUCTION PROJECT
PROVINCIA	**BIZKAIA**
TÉRMINO MUNICIPAL	**LANESTOSA**
TOMO	**I (Y UNICO)**
DOCUMENTOS	**1- INTRODUCTION** **2- PRELIMINARY STUDIES** **3- PROJECT DESIGN** **4- TECHNICAL SPECIFICATION** **5- BUDGET** **6- EXECUTION PLAN** **7- APPENDICES**
GRUPO	**CARRETERAS**
AUTORES	**DIEGO GARCÍA ABRIL**
PRESUPUESTO **P.B.L : 20.174.221,14 €**	**FECHA** **JULIO 2025**

ANNEX Nº. 0 DESCRIPTIVE MEMORY

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1. INTRODUCTION

The purpose of this document is to present the project for the construction of an alternative route on the N-629 highway near the municipality of Lanestosa. This road connects Cantabria and Burgos, crossing the territory of Bizkaia. The project involves creating a bypass that will divert traffic from the town center, thus improving traffic flow and avoiding the need to pass through the town's interior, which until now has not had such a solution.

The Lanestosa Bypass proposal aims to eliminate traffic through the town center, which currently experiences significant slowdowns. This new infrastructure is also expected to attract drivers who currently opt for alternative routes.

To evaluate the route options, an initial inspection of the site was carried out to study the various alternatives and their feasibility. A first possibility contemplated developing the bypass on the eastern side of Lanestosa. However, a visit to the area identified the presence of caves of heritage value, which forced this option to be ruled out.

Consequently, it was decided to plan the route through the west of the municipality, trying to use wide radii of curvature and minimizing crossings over the river that runs through the area, in order to minimize the environmental impact.

The route of the bypass extends from the point of origin to kilometer point 3+543, connecting at its northern end to the N-629 via a roundabout. Given the small town and its low Average Daily Intensity (ADI), it is not considered necessary to create an additional interchange at the southern end, which also avoids left turns when leaving Lanestosa.

The new road will have a two-lane carriageway, each 3.50 meters wide, and 1.5- meter shoulders . The typical section of the bypass consists of:

- 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
- Accession irrigation
- 10 cm of AC22 bin S 50/70 bituminous mix
- First irrigation on gravel
- 40 cm gravel 32020

2. PURPOSE OF THE PROJECT

The purpose of this document is to serve as a Final Degree Project in Civil Engineering, developed within the academic framework of the University of Cantabria.

The project under analysis was assigned by the Projects Department of the Higher Technical School of Civil Engineering at the same university. This proposal was approved by the school's corresponding committee, which approved its development.

The preparation of this work has been carried out by the student Diego García Abril.

3. PROJECT DESCRIPTION

3.1. SOCIOECONOMIC STUDY

Lanestosa is a town located in the province of Bizkaia, within the Autonomous Community of the Basque Country, Spain. It is located at the western end of the Encartaciones region, making it one of the westernmost points of the Basque Country. It is one of the first towns founded in Bizkaia and, furthermore, the smallest municipality in the entire province, at just 1.31 km².

The town is located in a valley surrounded by steep slopes descending from the La Mortera and Peña del Moro mountains, and is crossed by the Calera River. Its average altitude is 298 meters above sea level. It borders the Biscayan municipality of Carranza and the Cantabrian municipalities of Soba and Ramales de la Victoria.

3.2. GEOLOGY AND GEOTECHNICS

The proposed route crosses Lower Cretaceous terrain, specifically the Aptian -Albian interval, easily identifiable by the abundance of outcrops.

Aptian -Middle Albian materials are composed of Urgonian limestones . Above these are the Upper Bedouin - Gargassian and Clansayan deposits , known as the Paraurgonian , characterized by the presence of sandstones and calcareous sandstones.

Above these strata is the Lower Albian marly series, composed of alternating marls and clayey-sandy limestones, with some interbedded banks of quartzite sandstones.

Regarding geotechnics, in the absence of specific studies such as boreholes or test pits, the decision was made to adopt a cut slope with a gradient of 1H:2V. Furthermore, a lump sum has been included in the budget for possible stabilization works using bolting , shotcrete, and other materials.

For the fillings, a slope of 3H:2V has been considered, applicable to both causeways and embankments.

3.3. SEISMIC EFFECTS

Throughout the Autonomous Community of the Basque Country, the value of horizontal seismic acceleration is less than 0.04 × g.

Given this very low level of seismic activity, it is not considered necessary to incorporate seismic actions into the design or structural calculations of the works contemplated in this project.

3.4. CLIMATOLOGY AND HYDROLOGY

Papadakis classification was used , which indicates that the area has a "Citrus" type winter and a "Rice" type summer.

In the appendix on climatology and hydrology, the maximum daily rainfall has been determined following the procedure established by the Ministry of Public Works in its document "Maximum daily rainfall in mainland Spain."

These precipitation values are used to calculate flood flows in the vicinity of the bypass, which is essential for the design and sizing of the necessary drainage infrastructure.

3.5. TRAFFIC

This part of the project carries out a traffic analysis, considering both the road's commissioning scenario in 2029 and a 20-year projection, that is, up to 2045.

The current traffic situation is being studied, and, based on available historical data, the line's capacity and service level are being calculated. Station S-62-3 is located near the planned section.

Currently, the N-629 highway through Lanestosa is not widely used, mainly due to the delays involved in crossing the town center. The new bypass aims to eliminate this route and attract more users to the new route.

The project's operational start date has been estimated to be 2029, with one year for project approval, another for awarding, and two more for execution.

The IMD (Average Daily Intensity) has been calculated with the formula:

IMD (2029) = 1483 × (1 + 0.0144) ^4 = 1570 vehicles/day

For a percentage of 5.525% of heavy vehicles: $IMD_p(2029) = 86$ .Therefore, the road would fall into category T32.

This classifies the road as a **T32 road** . However, demand is expected to increase by 2045:

IMD(2045) = 2090 vehicles/day → IMDp = 115 → category T31

3.6. LAYOUT AND LAYOUT

The following criteria have been followed to define the layout:

- Design speed: 90 km/h
- Application of Standard 3.1 – IC
- Minimizing the impact on historical heritage through corrective measures.
- Reduction of the visual impact of the layout.

The entire length of the road centerline must be staked out, as well as the lateral points off that centerline. UTM coordinates are included every 20 meters to facilitate stakeout.

The adopted typical section is:

- Single carriageway with two-way traffic
- Two 3.5 m lanes
- m shoulders
- 2% cross slope to facilitate drainage

3.7. DRAINAGE

The objective of the drainage study is to calculate the water flows that will affect the route, in order to appropriately size the longitudinal drainage works.

The calculations have been carried out in accordance with Instruction 5.2-IC “Surface drainage”.

The area features complex topography, with uneven terrain and multiple watersheds. Digital mapping and Civil 3D software were used to identify watersheds and simulate the path of water across the terrain.

The variant intercepts part of the flow from these basins, while the remainder is channeled through longitudinal drainage works.

3.8. ROADS AND PAVEMENTS

According to the “Traffic” Annex, the heavy traffic category for this section is **T31** .

The key parameter for characterizing the esplanade is the compressibility modulus EV2, obtained through the plate loading test. A category **E2 esplanade has been defined** , with EV2 ≥ 120 MPa, suitable for the soils in the area.

The selected road section is **3121** , consisting of:

- 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
- Accession irrigation
- 10 cm of AC22 bin S 50/70 bituminous mix
- First irrigation on gravel
- 40 cm gravel 32020

3.9. SIGNAGE AND MARKING

This section contains the current regulations regarding signage and markings applicable at the national level. This regulation establishes the necessary guidelines to guarantee adequate signage that ensures road safety for all users.

The regulations used in this project are as follows:

- Norma 8.2 I.C. “Marcas viales”, publicada en marzo de 1987 por la Dirección General de Carreteras.

3.9.1. HORIZONTAL SIGNAGE

For horizontal signage, Standard 8.2 IC was followed, which details all aspects related to road markings. These perform various functions, including:

- Delimit the traffic lanes.
- Separate the directions of traffic.
- Indicate the edges of the roadway.
- Indicate areas not authorized for circulation.
- Regulate maneuvers such as overtaking, stopping and parking.
- Complement or reinforce the meaning of vertical signs and traffic lights.
- Repeat or remember vertical signals.
- Guide and orient drivers.

All road markings shall be reflective and white, in accordance with the specifications of the UNE 48 103 standard. Their shape and arrangement are detailed in the project plans.

3.9.2. VERTICAL SIGNAGE

Vertical signage is governed by Standard 8.1 IC "Vertical Signage." First, the road is classified as a conventional highway with a single carriageway and one lane in each direction (including sections with additional lanes).

Based on this classification, the criteria established in the regulations are applied to define the location and characteristics of vertical signs along the route.

3.10. PRICE JUSTIFICATION

The purpose of the corresponding annex is to justify to the Administration the unit prices included in Table No. 1 and their breakdown in Table No. 2, both belonging to Document No. 4 “Budget”.

These tables are the only ones valid for payment of work units, whether complete or partial. It should be noted that this annex is not contractual.

3.11. JUSTIFICATION OF THE ADOPTED SOLUTION

This section summarizes the various alternatives considered to define the most appropriate route, taking into account both adaptation to the terrain and road safety criteria.

Economic aspects were also considered. Among the main challenges encountered were the steep terrain and the presence of caves with heritage value in the study area.

3.12. BUDGET FOR KNOWLEDGE OF THE ADMINISTRATION

The corresponding annex details the components that make up the budget allocated to the Administration.

This budget includes:

- The Base Tender Budget (PBL).
- Costs associated with expropriations and affected services.

In this specific case, since no services are affected, the budget consists solely of the PBL excluding VAT and the cost of the expropriations, calculated using the previously indicated unit price.

The total amount estimated for the Administration's knowledge amounts to **€ 24,007,323.16** (twenty-four million seven thousand three hundred twenty-three euros and sixteen cents).

3.13. CONSTRUCTION PLAN

The corresponding annex contains, for guidance purposes, a work schedule that includes the various activities to be carried out and their estimated duration.

This plan is developed in accordance with the provisions of the State procurement regulations. However, both the duration and start date of each activity may vary depending on multiple factors.

4. ENVIRONMENTAL IMPACT STUDY

The objective of this study is to analyze the effects that project execution may have on the natural environment, as well as to propose corrective measures and environmental recommendations appropriate to the nature of the works.

The main impact-generating actions have been identified during the construction and operation phases, including:

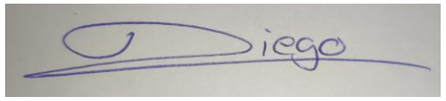
- Flatwork.
- Installation of drainage systems.
- Construction of walls and masonry elements.
- Extended firm.
- Slope stabilization.
- Signaling, marking and placement of defenses.
- Restitution or compensation actions (expropriations/repositions).
- Health and safety measures.
- Work activity and movement in the construction sector.

To mitigate these impacts, the following measures are proposed:

- Precise delimitation of the occupation zones.
- Proper management of topsoil.
- Control of the movement of machinery and earth.

- Covering trucks and stockpiling materials.
- Irrigation of roads and transit areas.
- Protection of the hydrological system.
- Prevention of oil and lubricant spills.
- Restoration of altered surfaces.
- Landscape integration and softening of forms.
- Measures to minimize ecological impact.

Santander, July 2025



Signed : Diego García Abril

5. SAFETY AND HEALTH

This health and safety study is drafted in compliance with Royal Decree 1627/1997, of October 24, which establishes the minimum health and safety provisions applicable to construction works.

The main objective is to prevent workplace accidents, occupational diseases, and any harm to third parties that could result from the activities and resources employed during the execution of the "Lanestosa Bypass" project.

Since the base tender budget exceeds the minimum threshold established in Article 4 of the aforementioned Royal Decree, this project must include a specific health and safety study. This study establishes the guidelines to be followed during the execution of the works to ensure the prevention of occupational hazards.

It also details the conditions that the well-being and health facilities and services provided to workers during the course of their work must meet.

The study includes a budget for all necessary health and safety elements, including price lists, measurements, and a specific specification sheet. The latter includes both the applicable legal regulations and other technical requirements that must be met.

With these guidelines, and any that the Project Management may add, the successful bidder will be able to fulfill its obligations regarding occupational risk prevention during the execution of the project.

ANNEX Nº. 1 – INTRODUCTION

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PROYECT OBJETIVES

1. INTRODUCTION

This construction project, entitled "Lanestosa Bypass Construction Project," was drafted for the purpose of completing the Final Degree Project in Civil Engineering at the University of Cantabria's School of Civil Engineering in Santander.

1.1. PROJECT OBJETIVES

The purpose of this construction project is to improve traffic conditions in the municipality of Lanestosa by proposing an alternative route to the current highway that runs through the town.

The construction of this new bypass will allow vehicles traveling on the N-629 highway whose final destination is not the town of Lanestosa to travel more quickly and smoothly. This will help reduce traffic within the municipality. It will also improve the quality of life for residents by reducing both noise and air pollution, and will contribute to greater road safety.

1.2. TECHNICAL CHARACTERISTICS

The technical characteristics of the planned work are as follows:

- Type: Construction project.
- Typical section: Single carriageway road with one lane in each direction of traffic.
- Design speed: 90 km/h.
- Roadway: 7 meters. Two lanes, 3.5 meters wide.
- Shoulders: 1.5 meters on each side

BACKGRAOUND AND JUSTIFICATION

2. INTRODUCTION

This appendix will analyze the alternatives that were studied at the beginning of the project to adapt the layout to the characteristics of the road and the terrain, as well as the cost of each of these.

3. PROPOSED ALTERNATIVE

Initially, the site was visited to conduct a visual survey of the area in order to find the best solution to adopt.

The alternative to the adopted solution would be to build the road through the east of the town of Lanestosa. However, our analysis revealed the presence of a cave, the Jews' Cave, which is part of the historical heritage, so this proposal could not be implemented.

We have also considered the presence of the Calera River, which runs parallel to the N-629, trying to prevent it from being affected by the construction of the road.

4. SOLUTION ADOPTED

Ultimately, the solution chosen was to pass through the western part of the town, designing it with turns with the largest possible radius, facilitating smooth and safe traffic for all drivers who choose to travel through it.

Furthermore, by choosing this alternative, we have managed to prevent the Calera River from being affected by the construction of the bypass.

ANNEX Nº. 2 – PRELIMINARY STUDIES

Index

GEOTECHNICAL STUDIES

1. GEOTECHNICAL STUDIES INTRODUCTION

This appendix will provide a detailed description of the geology and geotechnics of the municipality of Lanestosa, along with a geological analysis and a study of the provenance of materials from the project area. The main objective is to identify key geotechnical aspects, identify risk zones, and define the geological units and soil characteristics along the route, also taking into account the hydrological and geomorphological conditions of the surrounding area.

1.1. INFORMATION USED

The required information will be obtained from official sources, such as the Spanish Geological and Mining Institute (IGME) and the Cantabrian Government's geographic information viewer.

The necessary information will be obtained from the following sources:

- Geological Map of Spain, scale 1:50,000, sheet no. 60 Balmaseda.

- General Geotechnical Map, at a scale of 1:200,000, sheet no. 11 Reinosa.

2. GEOLOGY

2.1. GEOLOGICAL FRAMEWORK

The existing lithological base of the study area is composed of marine sediments from the Lower Cretaceous (Aptian-Albian) period. Sediments from the Quaternary period (Holocene and Pleistocene) are also found.

- Lower Cretaceous

Firstly, we can find clayey limestones and sandstone lenses belonging to Aptian origin (Bedouliense-Upper, Gargasian and Clansayense).

Above these, we find mainly leafy marls and clayey limestones interbedded with sandstone. These belong to the Lower Albian period.

- Quaternary

Finally, at the top we can see deposits of fluvial terraces belonging to the Pleistocene followed by alluvium and colluvium belonging to the Holocene period.

2.2. GEOLOGY OF THE LAYOUT

The layout of our project runs very noticeably through a series of deposits belonging to the Quaternary period.

2.3. MATERIALS

The materials that outcrop along our project route correspond to Quaternary soils formed by fluvial terraces, alluvium, and colluvium. These deposits play a fundamental role, significantly influencing the route of the bypass. They are characterized by being granular and heterometric, presenting a discordant shape.

2.3.1. PLEISTOCENE

2.3.1.1. RIVER TERRACES

These are alluvial deposits formed in the Calera River valley. They are composed of gravel and rounded boulders of calcareous and mostly quartzite composition, embedded in a yellowish-brown sandy-silty matrix.

2.3.2. HOLOCENE

2.3.2.1. FLOODS

The most recent alluvial deposits are found in areas corresponding to the main channels of the most important rivers and streams. These areas are often filled by floodwaters during frequent floods.

Lithologically, these deposits are mainly formed by rounded gravel and boulders, mainly siliceous in composition, accompanied by sand, silty sand and silt.

2.3.2.2. COLLUVIONS

Colluvial deposits are formations resulting from the action of gravity, which accumulate at the foot of slopes and form elongated bands that run parallel to them.

The composition of these deposits varies according to the lithological characteristics of their area of origin. In some areas, a mixture or alternation of alluvial and colluvial sandstone deposits can be observed, giving rise to highly heterometric and heteromorphic formations.

2.4. GEOMORPHOLOGY

The studied area displays a relief shaped by its geological structure, with outcrops of resistant rocks and slopes influenced by landslide deposits and colluvium. Terraces and alluvial plains are prominent in fluvial activity and extend on both sides of the Calera River, while fractures in the rock massifs contribute to slope features such as escarpments and weakened zones.

From a geomorphological perspective, karst activity is a prominent feature in the region. The Urgonian limestones exhibit exokarst formation, with sinkholes, caverns, and caves characteristic of this type of formation. The current valley, formed during the Pleistocene, includes a notable hanging terrace resulting from the narrowing of the river, whose channel has a gently winding course.

2.5. HYDROGEOLOGY

From a hydrogeological perspective, the Aptian-Middle Albian limestones stand out as the most significant formation due to the remarkable karst system they contain. This type of karst features a complex drainage network and extremely high permeability. Furthermore, it has the ability to respond rapidly to precipitation, converting rainfall into large volumes of water in a short period of time.

Such is the case of the Calera River, whose flow experiences a marked increase shortly after the heavy rains that pour into the valley, only to abruptly decline once the precipitation ceases. These sudden fluctuations generate a significant abrasive effect, which requires special attention, since in some sections, the road is very close to the river and, in some cases, crosses it. This aspect must also be taken into account when planning the river channeling.

2.6. NEEDS AND USE OF MATERIALS

Considering both the quality of the excavated material and its moisture content, this material cannot be used for our project. Therefore, it will be necessary to bring in materials from nearby borrow pits or quarries for the construction of the embankments.

On the other hand, the extracted material could be used if the construction of stone walls were necessary.

All surplus soil that will not be used must be taken to authorized landfills. In our case, the closest one would be the " Pico Carrasco Landfill," located 23 km away.

Another possible alternative would be to ask for permission to deposit it in a nearby inactive mine or reach an agreement with the owner of some land.

2.7. QUARRIES AND SEASONINGS

By searching for all quarries with crushing plants within a 50 km radius of the work site, we can find the following:

- Ventalaperra Quarry, Carranza, 16 km.
- Helguera Quarry, 15 km.
- Quintana SA Quarries and Concrete, Bárcena de Cicero, 35 km.

For the pavement, we will use ophitic aggregate obtained from the San Felices Quarry, located in Haro, La Rioja.

However, the contractor may use another quarry of its choice with the prior approval of the construction manager, provided that the aggregate meets the necessary requirements.

2.8. DUMP

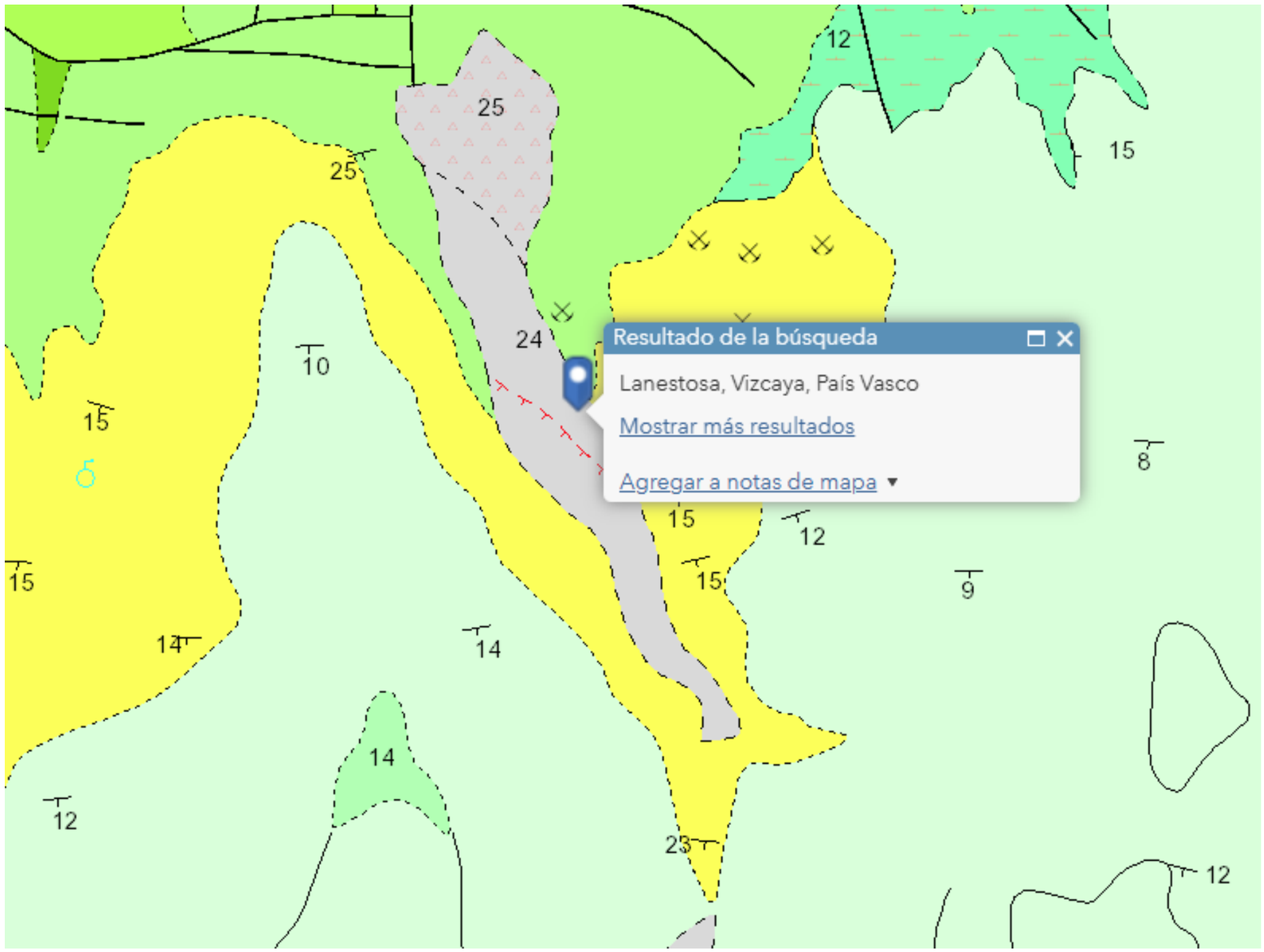
Any surplus soil not intended for reuse must be disposed of in authorized landfills. The authorized landfills near the work area are as follows:

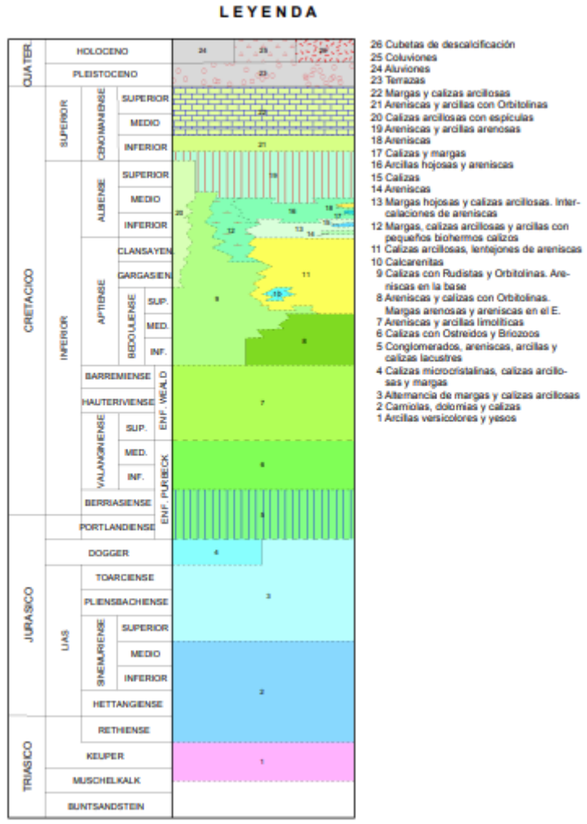
- Pico Carrasco Landfill, Voto, 20km.
- Meruelo landfill, San Bartolomé de Meruelo, 45 km.
- El Mazo landfill, Torrelavega, 85 km.

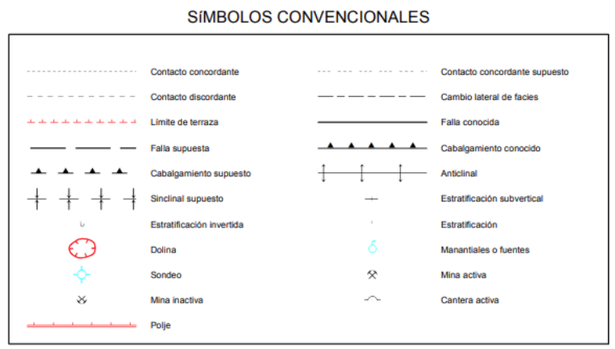
Such waste could also be dumped on inactive farms near the route with prior authorization from the owners of those farms.

3. GEOLOGICAL MAPS

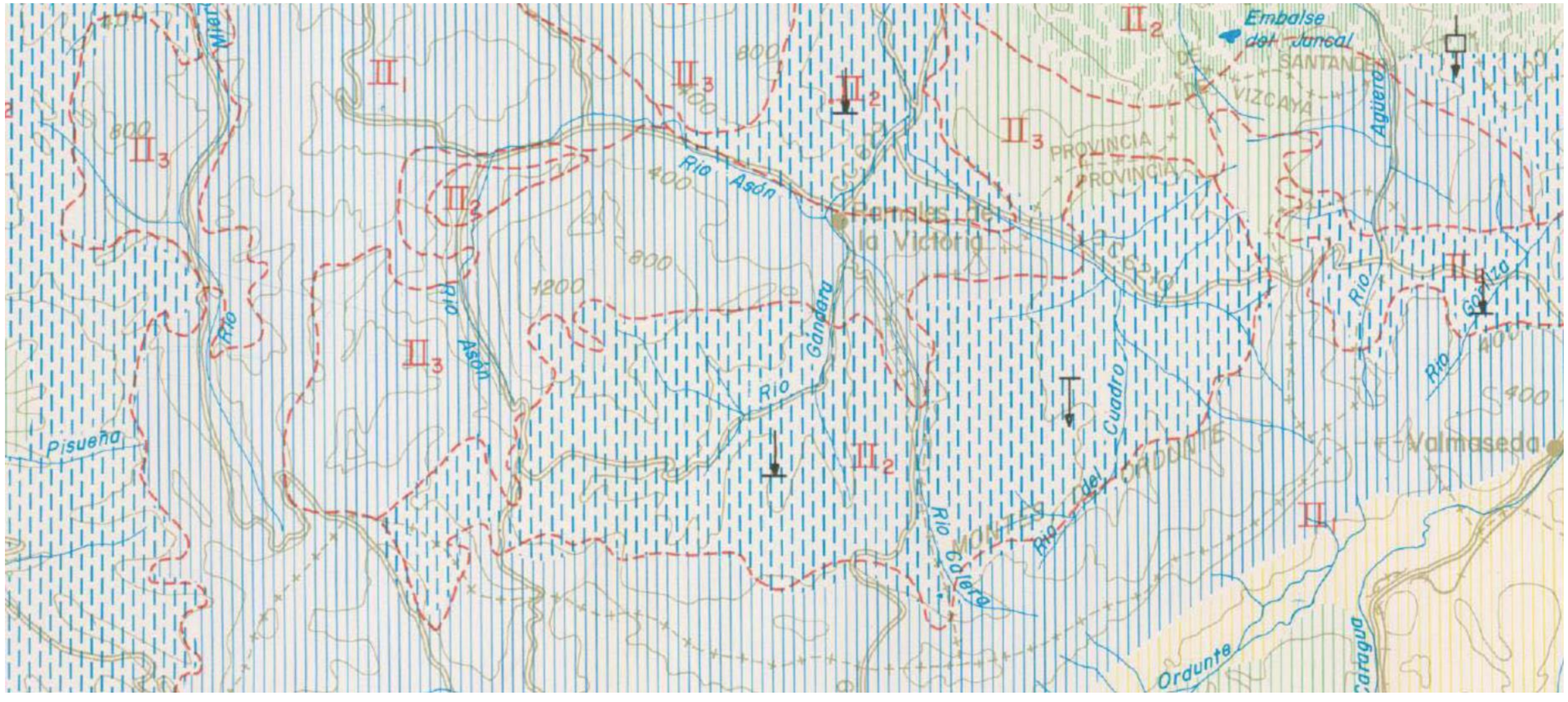
3.1. 1:50,000 SCALE GEOLOGICAL MAP OF THE IGME



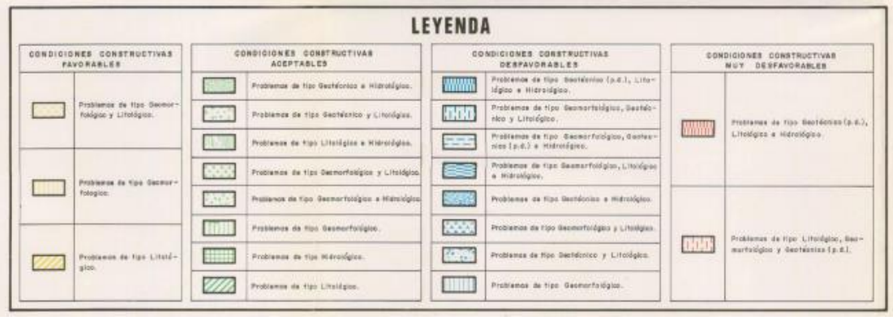




3.2. 1:200,000 SCALE GEOTECHNICAL MAP OF THE IGME



REGION	AREA	CRITERIOS DE DIVISION Y CARACTERISTICAS GENERALES
I MATERIALES RECIENTES HORIZONTALES O MUY POCO ALEADOS CONSOLIDADOS	1 ALUVIONES Y MANTOS TIPO HARAS	Gravas, arenas, limos y arcillas, bolos heterométricos en los montes tipo roña. Relieve totalmente llano o en ligera pendiente uniforme. Estabilidad alta. Materiales permeables. Nivel freático próximo. Drenaje fácil.Acuíferos superficiales. Capacidad de carga media (2-3 Kg./cm²) salvo pequeñas zonas. Asientos de tipo medio. Algún punto con socavación de ríos.
	2 CONGLOMERADOS TERCIARIOS.	Conglomerados de cemento calcáreo o arenáceos. Suelo escaso. Relieve suave con ligeras ondulaciones. Estabilidad alta. Materiales permeables con escorrentía alta. Drenaje fácil; nivel freático profundo. Cargas unitarias medias (2-4 Kg./cm²) y altas (>4Kg./cm²). Asientos nulos.Taludes fuertes.
	3 MATERIALES DETRITICOS TERCIARIOS.	Arenas arcillosas,arenáceas, margas y arcillas.Suelo arenoso-arcilloso de 0,5m. Relieve llano con pendientes menores del 5 %. Estabilidad buena , fácil erosión. Semipermeables en conjunto,con grandes variaciones locales. Drenaje bueno. Cargas unitarias medias (2-4 Kg./cm²). Asientos de tipo medio a largo plazo. Excavaciones fáciles.
II MATERIALES MEDIANAMENTE PLEGADOS Y FRACTURADOS EN GRADO MEDIO.	4 MATERIALES CON NIVELES HETEROGENEOS	Materiales rocosos en estratos de naturaleza calcárea dominante.Suelo débil. Morfología muy variada,desde llana a montañosa. Estabilidad alta. Problemas de deslizamiento en puntos aislados. Conjunto semipermeable.Drenaje fácil por escorrentía alta.Acuíferos de difícil explotación. Capacidad de carga alta (>4 Kg./cm²) o media,pasando a alta. Excavación variable.
	5 MATERIALES DETRITICOS MAS O MENOS FINOS MEZCLADOS	Materiales detríticos de arcillas y arenáceos en facies Wealdy Albense. Potente recubrimiento superficial. Relieve ondulado, con acumulaciones arcillosas. Inestabilidades frecuentes en algunas zonas. Conjunto impermeable o semipermeable. Alto escorrentía.Drenaje difícil en zonas. Cargas medias (0,5 Kg./cm²) y bajas (<2Kg/cm²).Asentamientos medios a largo plazo. Excavación fácil.
	6 ROCAS CALIZAS MASIVAS O EN BANCOS POTENTES	Rocas calizas potentes en bancos de dolomía ,calizas y carniolas. Relieve llano en las zonas "y" abrupto en el resto. Estabilidad alta con caída de bloques. Materiales permeables, drenaje fácil,posibles acuíferos importantes. Capacidad de carga alta (>4Kg./cm²).Excavaciones difíciles. Taludes casi verticales.
III MATERIALES TRIASICOS Y PERMO TRIASICOS DE FACIES WEALD.	7 MARGAS Y ARCILLAS YESIFERAS.	Margas y arcillas yesíferas y yesos del Keuper. Potente suelo arcilloso. Pobre escasamente vindulado. Inestabilidad general en presencia de agua. Materiales impermeables con drenaje difícil. Aguas agresivas al hormigón. Cargas unitarias medias (2-4 Kg/cm²) o bajas (1-2 Kg/cm²). Excavación fácil, con taludes tendidos.
	8 ARENISCAS Y ARCILLAS EN BANCOS POTENTES.	Areniscas en bancos potentes con intercalaciones de bancos de arcilla. Escaso suelo superficial. Morfología muy montañosa con fuertes pendientes. Estabilidad buena. Problemas puntuales por caída de bloques. Materiales semipermeables,con escorrentía muy alta. Drenaje fácil. Capacidad de carga alta (>4 Kg./cm²).Asientos nulos posibles descalzamientos de la arenisca. Excavación difícil.
IV MATERIALES ANTIGUOS MUY PLEGADOS Y FRACTURADOS SIN APENAS CARSTIFICACION.	9 PIZARRAS MUY FRACTURADAS ASOCIADAS CUARCITAS	Conjunto Paleozoico. Pizarras fracturadas con niveles cuarcíticos y potente nivel de conglomerado. Relieve montañoso. Estabilidad escasa en las pizarras y buena en el resto. Materiales impermeables o semipermeables con fuerte escorrentía. Drenaje fácil. Cargas medias (2-4 Kg/cm²) en las pizarras y altas (>4 Kg/cm²) en el resto.
	10 CALIZA DE MONTAÑA DURA CARSTIFICADA.	Calizas de montaña duras y compactas con zonas carstificadas. Morfología montañosa,con fuertes farallones.Estabilidad alta. Materiales permeables, drenaje fácil por escorrentía. Cargas unitarias altas (>4 Kg/cm²).Excavación difícil. Taludes muy fuertes.



TRAFFIC STUDIES

4. TRAFFIC STUDIES INTRODUCTION

In this annex, a traffic study is carried out in order to estimate the traffic intensity that the study road will have to accommodate, thus obtaining the necessary parameters for the subsequent design of the road surface structure.

5. TRAFFIC

5.1. TRAFFIC DATA

The information we have will be provided by the Ministry of Transport and Sustainable Mobility through the 2022 Traffic Map. For this, we will use data from coverage station S-62-3.

YEAR	IMD	%HEAVY	Growth rate
2022	1483	5.53	1.09
2021	1359	5.52	1.13
2020	1194	6.67	0.99
2019	1205	5.89	

As we can see, the average annual growth rate would be around 1.07%, a figure that may have been affected by traffic restrictions in 2020 due to COVID-19. Because the annual growth rate is lower than the 1.44% indicated in ORDER FOM/3317/2010, we will use the latter for our calculations.

6. TRAFFIC CATEGORY

According to instruction 6.1-IC “Road sections”, the heavy traffic category for road surface sizing is obtained based on the IMD of heavy vehicles in the project lane in the year in which the road is scheduled to be put into service.

We will consider 2029 as the year of commissioning for the project. This will allow one year for project approval, another year for contract award, and finally two years for execution.

$\mathrm{IMD}(2029) = \mathrm{IMD} * (1 + \mathrm{r})^{n}$= 1483 * $(1 + 0.0144)^{4}$= 1570 vehicles

For a percentage of 5.525% of heavy vehicles: $IMD_p(2029) = 86$ .Therefore, the road would fall into category T32.

However, an increase in traffic is expected in the future thanks to the construction of the bypass, which will attract drivers' attention. For this, we will consider a period of 20 years from its implementation, which leaves us with the year 2045.

IMD (2045) = 2090 vehicles

$IMD_p(2045) =$ 115 Heavy vehicles

Because the number of heavy vehicles would exceed 100, our traffic category would become T31.

ENVIRONMENTAL STUDIES

7. SEISMIC EFFECTS INTRODUCTION

This annex will study the seismic hazard of the area where the construction project is located, considering the following regulations in force:

- "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.

8. SEISMIC HAZARD IN THE PROJECT AREA

The regulations indicate that "it will not be necessary to consider seismic effects when the value of the basic horizontal seismic acceleration (a_b) does not exceed the value of 0.04g in the vicinity of the work, where g is the acceleration of gravity."

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

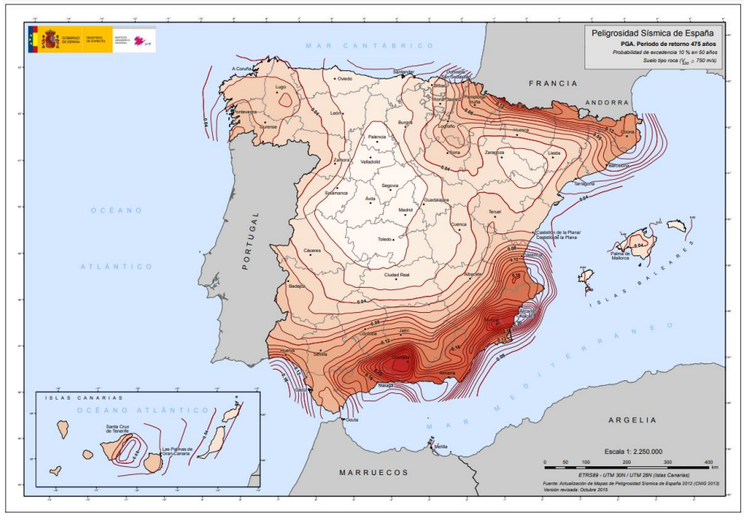


Figure 5.1. Seismic Hazard Map of Spain (NSCE-02).

9. CONCLUSIONS

Considering that the seismic acceleration in the project area corresponds to 0.03g, in accordance with the aforementioned regulations, it will not be necessary to consider seismic actions in the design and construction of the project.

CLIMATOLOGY AND HYDROLOGY

10. CLIMATOLOGY AND HYDROLOGY INTRODUCTION

This annex will compile data on the climatology and hydrology of the region where the project will be carried out. To this end, we will conduct a climate estimate by obtaining data from climate maps and rainfall estimates. We will also use temperature and precipitation values from nearby stations to assess the hydrology and river courses of the area.

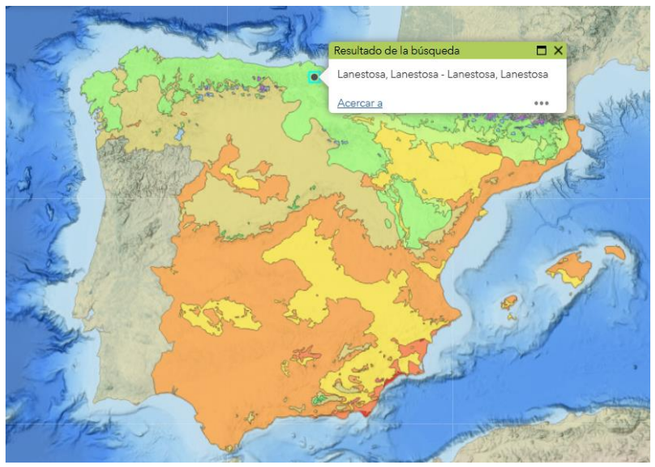
To obtain this data we will take into account the data from Bilbao airport

11. CLIMATOLOGY

11.1. CLIMATE

To obtain the data, we will use the information provided by AEMET in its "Iberian Climate Atlas" for Bilbao Airport. These maps contain information on temperatures and precipitation across the entire territory between 1971 and 2000.

Likewise, if we use the Köppen-Geiger climate classification, we find that the project area is classified as a Cfb climate , considered a temperate climate without a dry season and with a mild summer.



11.2. TEMPERATURE

Using the previously mentioned sources of information, we obtained the following data for the station located at Bilbao Airport:

- Average annual temperature: 14.3ºC
- Average annual minimum temperature: 9.5ºC
- Average annual maximum temperature: 19.1ºC

As we can see, the hottest months are July and August, with maximum temperatures around 25ºC, and the coldest months are January and February, with minimum temperatures around 5ºC.

As we can see, there is little variation in average temperatures throughout the year, due to the area's proximity to the sea.

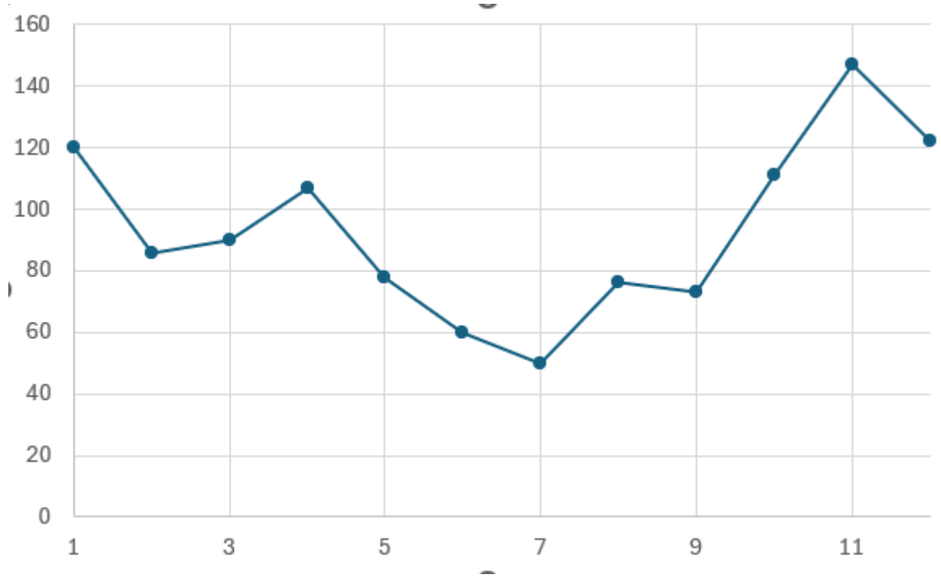
BILBAO/ AEROPUERTO, 1971-2000

	J	F	M	A	MY	JN	JL	AG	S	O	N	D
TA	13,3	14,4	15,9	16,8	20,1	22,5	25,2	25,5	24,3	20,9	16,4	14,0
TI	4,8	5,1	5,7	7,0	10,0	12,6	14,8	15,1	13,2	10,8	7,6	6,0

11.3. PRECIPITATION

To obtain precipitation data we will use data from 1981 to 2010. These data come from the Bilbao airport station located at a latitude of 43° 17' 53'' N and a longitude of 2° 54' 23'' W and an altitude of 42m.

We find that precipitation remains uniform throughout the year, with maximum values of around 140-120 mm in November and December and minimum values of 50-60 mm in June and July. This gives an average annual rainfall of 1,134 mm.

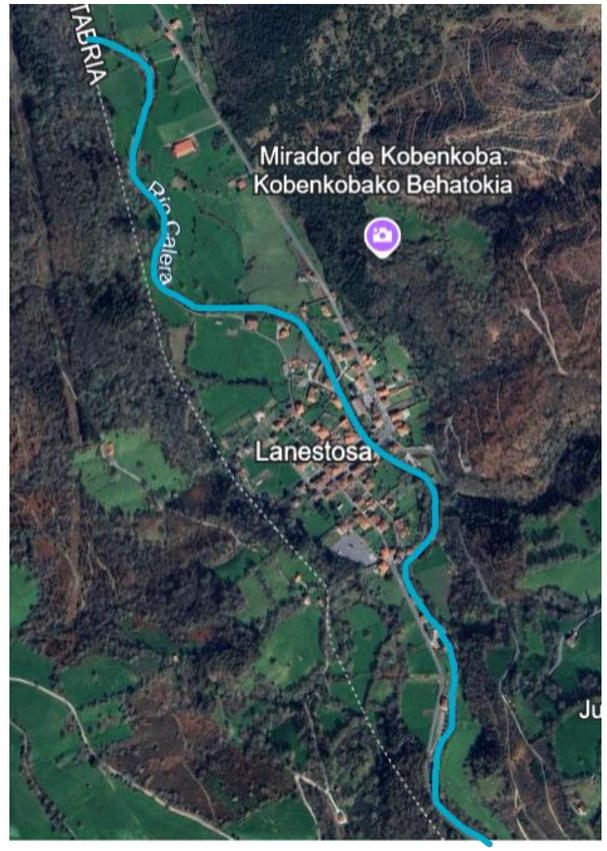


12. HYDROLOGY

12.1. RIVER COURSES

The presence of river courses in the study area means that we must take this into account so as not to alter their course.

The existing N-629 highway runs parallel to the Calera River, which belongs to the Asón River basin and flows into it. Its length is 16.178 kilometers, most of which runs underground.

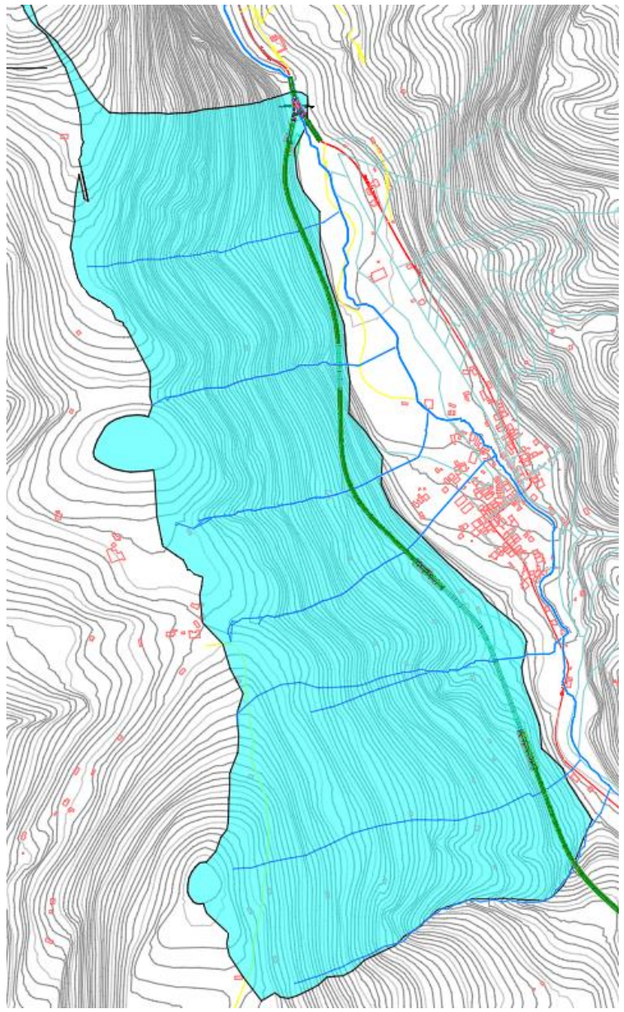


12.2. DEFINITION OF BASINS

The study area is located in a mountainous area, so we can easily identify a catchment area for our project. Furthermore, since our project runs either above or below ground, we contribute to minimally modifying the natural flow of water along the hillside.

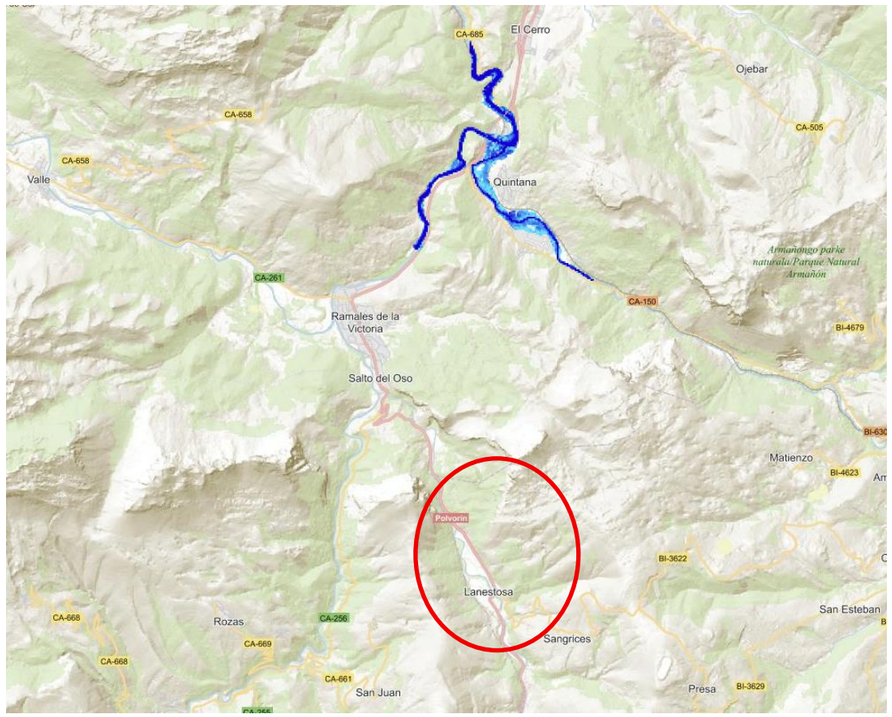
Basin data:

- Area (km2): 1999,173
- Average channel length: 987.39m
- Average height difference: 298.79m
- Average slope (%): 30.26%



12.3. FLOODABLE AREAS

The verifications are carried out using the interactive model provided by the National Flood Zone Mapping System, ensuring that the structure is safe for the 100- and 500-year return periods. In our case, the structure would be safe, so no action would be necessary to prevent flooding.



ENVIRONMENTAL IMPACT ASSESSMENT

13. RODUCTION

This annex will carry out an environmental impact assessment study for the road construction. Environmental recommendations will also be included to reduce the potential impact of the project on the land.

14. LEGISLATION

For the preparation of this study, we will be governed by the national legislation in force at the time of writing.

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

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

- Construction of highways and motorways.
- Construction of a new highway with four or more lanes, or realignment and/or widening of an existing highway with two or fewer lanes to provide four or more lanes, where such new highway or the realigned and/or widened section of highway reaches or exceeds 10 km in continuous length.

According to Annex II of Law 21/2013, the following road projects must be subject to Simplified Environmental Assessment:

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

Therefore, the work of this Project is subject to Simplified Environmental Assessment.

15. ENVIRONMENTAL CHARACTERISTICS OF THE AREA

15.1. GEOGRAPHIC LOCATION

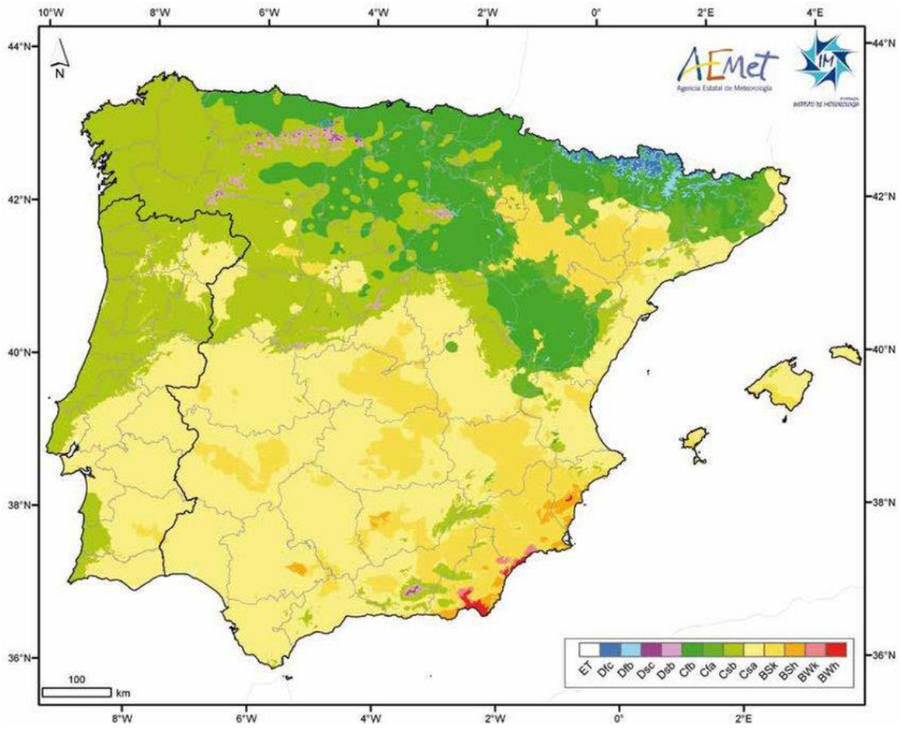
The study site is located in the west of the province of Bizkaia, bordering the province of Cantabria. The study area will be limited to the area adjacent to the town of Lanestosa.

15.2. PHYSICAL ENVIRONMENT

15.2.1. CLIMATE

The area where the study zone is located has a classic temperate climate (type C) according to the Köppen-Geiger climate classification. It has mild temperatures throughout the year, ranging from 5°C in the coldest months to 25°C in the summer.

Within this classification, we find that the area falls within the *Cfb* subtype, which corresponds to a temperate climate without a dry season, with a mild summer, and average annual temperatures around 14ºC .



15.2.2. VEGETATION

The Lanestosa area is primarily characterized by the presence of grasslands used for livestock grazing, and much of its land is made up of leafy forests. Among the species that make up these forests are oak, chestnut, beech, and birch trees, as well as various species of ferns and mosses. We can also find smaller species such as holly and blackthorn, and plants like gentian and foxglove.

15.2.3. FAUNA

Lanestosa is located in a transition zone between the Atlantic and mountainous climates, which contributes to the region's significant biodiversity. Below is a list of the most common species in the area:

- Mammals:
  - Deer " *Cervus elaphus* ".
  - Roe deer " *Capreolus capreolus* ".
  - Wild boar " *Sus scrofa* ".
  - Red fox " *Vulpes vulpes* ".
  - European hedgehog " *Erinaceus europaeus* ".
  - Common bat " *Pipistrellus pipistrellus* ".
- Birds:
  - Common blackbird " *Turdus merula* ".
  - European robin " *Erithacus rubecula* ".
  - Eagle owl " *Bubo bubo* ".
  - Red kite " *Milvus milvus* ".
  - Great Spotted Woodpecker " *Dendrocopos major* ".
- Reptiles and amphibians:
  - Western green lizard " *Lacerta bilineata* ".
  - Grass snake " *Natrix natrix* ".
  - Common salamander " *Salamandra salamandra* ".
  - Common frog " *Rana temporaria* ".
- Fish:
  - Common trout " *Salmo trutta* ".
  - European eel " *Anguilla anguilla* ".
  - Minnow " *Phoxinus phoxinus* ".
- Insects:
  - Stag beetle " *Papilio machaon* ".
  - European honeybee " *Apis mellifera* ".
  - Macaon butterfly " *Papilio machaon* ".
  - Red ant " *Formica rufa* ".

16. ENVIRONMENTAL ASSESSMENT

16.1. PROJECT DESCRIPTION

The purpose of the project is to build the N-629 bypass located in the municipality of Lanestosa. The purpose of this project is to reduce vehicle traffic within the town of Lanestosa, reducing environmental and noise pollution caused by traffic, and improving the safety of local residents.

16.2. IMPACT-GENERATING ACTIONS

Construction phase:

- Clearing and earthmoving.
- Construction of the esplanade.
- Construction of longitudinal drains.
- Tunnel excavation.
- Construction of viaducts.
- Creation of additional tracks and accesses.
- Transportation of materials.
- Movements of heavy machinery.
- Asphalting of surfaces.
- Deposition of materials.

Exploitation phase:

- Increase in road traffic.
- Maintenance machinery.
- Resurfacing of certain areas.
- Repainting of road markings.
- Increased emissions of gases produced by vehicles.

16.3. IDENTIFICATION OF IMPACTS

- Floor:
  - Washing of soil on slopes.
  - Soil loss due to erosion.
  - Loss of nutrients from topsoil.
- Fauna:
  - Increase in mortality due to being run over.
  - Annoyance from noise emissions from traffic.
  - Destruction of vegetation cover.
- Flora:
  - Fire risk.
  - Removal of existing native vegetation.
  - Introduction of invasive species.
- Landscape:
  - Alteration of the natural landscape due to the construction of slopes and placement of structures.
- Atmosphere:
  - Light pollution.
  - Greenhouse gas emissions.
  - Noise pollution.
- Hydrology:
  - Dumping of harmful materials into waterways (fuel, bitumen, concrete or other elements used during construction).
- Waste:
  - Poor management of CDW that could pose a risk to the health of the environment and people.

16.4. PREVENTIVE AND CORRECTIVE MEASURES

Below we list a series of measures we can take to prevent the impact of these actions on the environment and to try to reduce the impact as much as possible.

16.4.1. FLOOR

- Storing topsoil in thin layers, no more than 1.5 meters high, to prevent compaction and maintain its characteristics.
- Use only the area strictly necessary for the execution of the work.
- Removal and conservation of the top layer of fertile soil in order to use it for landscape restoration.

16.4.2. FAUNA

- Use of scaring measures to prevent wildlife from approaching the work area, which could cause an accident.
- Reduce the emission of noise and vibrations that may disturb wildlife.

16.4.3. FLORA

- Avoid unnecessarily damaging trees and shrubs by placing materials on them.
- Clear only the necessary area.
- Avoid the emission of heat sources or sparks that could cause a fire.
- Replant the affected areas once the work is completed.
- Avoid planting invasive species.
- Elimination of invasive species present in the area, replacing them with native species.
- Carry out clearing, sowing, and planting at the appropriate time, taking into account the characteristics of the species present in the area.
- If a tree is accidentally damaged, a healing agent will be applied to the affected area to prevent fungi and insects from attacking the tree and causing its death.

16.4.4. LANDSCAPE

- Restoration of the area to resemble its present state prior to the works.
- Transfer of surplus material from the excavation of the layout to an authorized landfill, avoiding alteration of the shape of the terrain.
- Avoid disposing of garbage that can accumulate and contaminate the soil.

16.4.5. ATMOSPHERE

- Reducing emissions by avoiding unnecessary maintenance of machinery, which increases both fuel consumption and the emission of polluting gases.
- Mitigate the production of dust curtains produced by certain activities, especially large-volume excavation and blasting.
- Perform the necessary maintenance to keep the machinery in optimal condition.
- Limit traffic speeds to reduce the amount of dust raised and fuel consumption.

16.4.6. HYDROLOGY

- Careful and controlled handling of hazardous substances that may spill or leak through the affected land into waterways.
- Proper management and location of both machinery and material stockpiles.
- Placement of sediment retention barriers in areas near watercourses.
- An Environmental Emergency Plan must be established containing procedures in the event of an accident. The corresponding hydrographic authority must also be notified immediately.

16.4.7. WASTE

- Carry out proper separation, storage and disposal of waste produced during the execution of the project.
- Strict compliance with current waste regulations.

16.5. ENVIRONMENTAL MONITORING PROGRAM

In order to ensure compliance with all of the above, we must implement an Environmental Monitoring Program that must be in place at all times during the execution of the works.

In this program we must include the following contents:

- Control of the management of waste generated during the works.
- Monitoring noise levels during the execution of the works.
- Control of dust emissions from the passage of vehicles and construction machinery.
- Drafting a simple and systematic method for environmental monitoring.
- Control and monitoring of waterways against actions that could affect the free flow of water.

ANNEX NO. 3 – PROYECT DESIGN

Index

GEOMETRIC DESIGN AND ROAD ALIGNMENT

1. STUDY OF THE LAYOUT

1.1. INTRODUCTION

This annex will study the layout, both in plan and elevation, of the roadway for the project to be executed. For this purpose, we will use the current regulations, Standard 3.1. – IC

The study road falls within Group 3 of the standard, as it is considered a conventional road with a design speed of 90 km/h.

1.2. PLAN LAYOUT

The parameters that have been used for the road plan design are the following:

- Design speed: 90 km/h.
- Standard 3.1 – IC
- Mitigate as much as possible the impact on the terrain, as well as the visual impact on the inhabitants of the area.

1.3. ELEVATION LAYOUT

For the design of the elevation layout we have used the cross-sectional profiles, as well as the ramp or slope gradients in order to comply with the maximum inclinations of 5% established by Standard 3.1 - IC

1.4. INFORMATION

Attached below are the results obtained from the reports on the Lanestosa Variant layout.

1.4.1. PLAN LAYOUT

Tangent Data

Description	PT Station	Northing	Easting
Start :	0+00.000	4783975.487	464756.912
End :	1+29.746	4784061.467	464659.745

Tangent Data

Parameter	Value	Parameter	Value
Length :	129,746	Course :	N 48° 29' 42.1728" W

Spiral Point Data

Description	Station	Northing	Easting
TS:	1+29.746	4784061.467	464659.745
SPI:		4784127.858	464584.717
SC:	2+79.746	4784167.525	464554.002

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	150,000	L Tan:	100.185
Radius :	400,000	S Tan:	50,168

Theta:	10° 44' 34.6512"	Q:	2.341
X:	149,474	K:	74,912
AND:	9.351	TO:	244,949
Chord :	149,766	Course :	N 44° 54' 54.4625" W

Curve Point Data

Description	Station	Northing	Easting
SC:	2+79.746	4784167.525	464554.002
RP:		4784412.423	464870.269
CS:	3+26.063	4784205.704	464527.825

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	06° 38' 03.9684"	Type :	RIGHT
Radius :	400,000		
Length :	46.317	Tangent :	23.184
Mid -Ord:	0.670	External :	0.671
Chord :	46.291	Course :	N 34° 26' 05.5374" W

Spiral Point Data

Description	Station	Northing	Easting
CS:	3+26.063	4784205.704	464527.825
SPI:		4784248.653	464501.899
ST:	4+76.063	4784342.570	464467.019

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	150,000	L Tan:	100.185
Radius :	400,000	S Tan:	50,168
Theta:	10° 44' 34.6512"	Q:	2.341
X:	149,474	K:	74,912
AND:	9.351	TO:	244,949
Chord :	149,766	Course :	N 23° 57' 16.6124" W

Tangent Data

Description	PT Station	Northing	Easting
Start :	4+76.063	4784342.570	464467.019
End :	9+54.378	4784790.960	464300.489

Tangent Data

Parameter	Value	Parameter	Value
Length :	478,315	Course :	N 20° 22' 28.9021" W

Spiral Point Data

Description	Station	Northing	Easting
TS:	9+54.378	4784790.960	464300.489
SPI:		4784859.880	464274.893
SC:	10+64.378	4784890.781	464254.841

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	110,000	L Tan:	73,520
Radius :	250,000	S Tan:	36,837
Theta:	12° 36' 18.2574"	Q:	2.013
X:	109.469	K:	54,911
AND:	8.039	TO:	165,831
Chord :	109,764	Course :	N 24° 34' 28.7829" W

Curve Point Data

Description	Station	Northing	Easting
SC:	10+64.378	4784890.781	464254.841
RP:		4784754.695	464045.125
CS:	10+64.713	4784891.062	464254.659

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	00° 04' 36.4115"	Type :	LEFT
Radius :	250,000		
Length :	0.335	Tangent :	0.168
Mid -Ord:	0.000	External :	0.000
Chord :	0.335	Course :	N 33° 01' 05.3649" W

Spiral Point Data

Description	Station	Northing	Easting
CS:	10+64.713	4784891.062	464254.659
SPI:		4784921.936	464234.565
ST:	11+74.713	4784973.319	464181.982

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	110,000	L Tan:	73,520
Radius :	250,000	S Tan:	36,837
Theta:	12° 36' 18.2574"	Q:	2.013
X:	109.469	K:	54,911
AND:	8.039	TO:	165,831
Chord :	109,764	Course :	N 41° 27' 41.9475" W

Tangent Data

Description	PT Station	Northing	Easting
Start :	11+74.713	4784973.319	464181.982
End :	14+58.138	4785171.403	463979.269

Tangent Data

Parameter	Value	Parameter	Value
Length :	283,425	Course :	N 45° 39' 41.8284" W

Spiral Point Data

Description	Station	Northing	Easting
TS:	14+58.138	4785171.403	463979.269
SPI:		4785227.432	463921.931
SC:	15+78.138	4785260.641	463899.360

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80.168
Radius :	300,000	S Tan:	40.153
Theta:	11° 27' 32.9612"	Q:	1997
X:	119,521	K:	59,920
AND:	7.977	TO:	189,737
Chord :	119,787	Course :	N 41° 50' 35.5022" W

Curve Point Data

Description	Station	Northing	Easting
SC:	15+78.138	4785260.641	463899.360
RP:		4785429.277	464147.477
CS:	16+89.841	4785362.460	463855.012

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	21° 20' 00.8199"	Type :	RIGHT
Radius :	300,000		
Length :	111,702	Tangent :	56.505
Mid -Ord:	5.184	External :	5.275
Chord :	111,058	Course :	N 23° 32' 08.4572" W

Spiral Point Data

Description	Station	Northing	Easting
CS:	16+89.841	4785362.460	463855.012
SPI:		4785401.605	463846.070
ST:	18+09.841	4785481.749	463844.097

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80.168
Radius :	300,000	S Tan:	40.153
Theta:	11° 27' 32.9612"	Q:	1997
X:	119,521	K:	59,920
AND:	7.977	TO:	189,737
Chord :	119,787	Course :	N 05° 13' 41.4121" W

Tangent Data

Description	PT Station	Northing	Easting
Start :	18+09.841	4785481.749	463844.097
End :	19+72.412	4785644.271	463840.098

Tangent Data

Parameter	Value	Parameter	Value
Length :	162,571	Course :	N 01° 24' 35.0860" W

Spiral Point Data

Description	Station	Northing	Easting
TS:	19+72.412	4785644.271	463840.098
SPI:		4785724.297	463838.128
SC:	20+92.412	4785763.985	463832.790

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80,050
Radius :	550,000	S Tan:	40,045
Theta:	06° 15' 01.6152"	Q:	1,090
X:	119,857	K:	59,976
AND:	4.360	TO:	256,905
Chord :	119,937	Course :	N 03° 29' 34.8685" W
Mid -Ord:	1,836	External :	1,842
Chord :	89,793	Course :	N 12° 20' 32.9006" W

Spiral Point Data

Description	Station	Northing	Easting
CS:	21+82.305	4785851.703	463813.597
SPI:		4785889.993	463801.872
ST:	23+02.305	4785963.528	463770.240

Curve Point Data

Description	Station	Northing	Easting
SC:	20+92.412	4785763.985	463832.790
RP:		4785690.671	463287.698
CS:	21+82.305	4785851.703	463813.597

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	09° 21' 52.3989"	Type :	LEFT
Radius :	550,000		
Length :	89,893	Tangent :	45.047

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80,050
Radius :	550,000	S Tan:	40,045
Theta:	06° 15' 01.6152"	Q:	1,090
X:	119,857	K:	59,976
AND:	4.360	TO:	256,905
Chord :	119,937	Course :	N 21° 11' 30.9328" W

Tangent Data

Description	PT Station	Northing	Easting
Start :	23+02.305	4785963.528	463770.240
End :	24+37.974	4786088.156	463716.631

Tangent Data

Parameter	Value	Parameter	Value
Length :	135,668	Course :	N 23° 16' 30.7153" W

Spiral Point Data

Description	Station	Northing	Easting
TS:	24+37.974	4786088.156	463716.631
SPI:		4786161.994	463684.869
SC:	25+57.974	4786202.113	463680.591

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80.380
Radius :	200,000	S Tan:	40,346
Theta:	17° 11' 19.4419"	Q:	2,990
X:	118,925	K:	59,820

AND:	11.923	TO:	154,919
Chord :	119,521	Course :	N 17° 32' 59.9844" W

Curve Point Data

Description	Station	Northing	Easting
SC:	25+57.974	4786202.113	463680.591
RP:		4786223.319	463879.464
CS:	25+58.461	4786202.597	463680.540

Circular Curve Data

Parameter	Value	Parameter	Value
Delta:	00° 08' 22.2366"	Type :	RIGHT
Radius :	200,000		
Length :	0.487	Tangent :	0.243
Mid -Ord:	0.000	External :	0.000
Chord :	0.487	Course :	N 06° 01' 00.1552" W

Spiral Point Data

Description	Station	Northing	Easting

CS:	25+58.461	4786202.597	463680.540	Length :	110,350	Course :	N 11° 14' 30.4050" E
SPI:		4786242.726	463676.360				
ST:	26+78.461	4786321.564	463692.030				

Spiral Curve Data: clothoid

Parameter	Value	Parameter	Value
Length :	120,000	L Tan:	80.380
Radius :	200,000	S Tan:	40,346
Theta:	17° 11' 19.4419"	Q:	2,990
X:	118,925	K:	59,820
AND:	11.923	TO:	154,919
Chord :	119,521	Course :	N 05° 30' 59.6742" E

Tangent Data

Description	PT Station	Northing	Easting
Start :	26+78.461	4786321.564	463692.030
End :	27+88.811	4786429.798	463713.543

Tangent Data

Parameter	Value	Parameter	Value

2. REPORTS

P.K.	Girado.Derecha	Distancia	Coordenada.N	Coordenada.E
0+000.00	333.2467 (d)	84.428m	4,783,975.4867m	464,756.9118m
0+020.00	333.6313 (d)	104.418m	4,783,988.7404m	464,741.9338m
0+040.00	333.8923 (d)	124.411m	4,784,001.9941m	464,726.9558m
0+060.00	334.0810 (d)	144.406m	4,784,015.2478m	464,711.9779m
0+080.00	334.2238 (d)	164.402m	4,784,028.5015m	464,696.9999m
0+100.00	334.3357 (d)	184.400m	4,784,041.7551m	464,682.0219m
0+120.00	334.4256 (d)	204.397m	4,784,055.0088m	464,667.0439m
0+140.00	334.5003 (d)	224.395m	4,784,068.2648m	464,652.0680m
0+160.00	334.5794 (d)	244.393m	4,784,081.5737m	464,637.1391m
0+180.00	334.6902 (d)	264.386m	4,784,095.0325m	464,622.3453m
0+200.00	334.8529 (d)	284.371m	4,784,108.7370m	464,607.7792m
0+220.00	335.0823 (d)	304.336m	4,784,122.7787m	464,593.5381m
0+240.00	335.3896 (d)	324.264m	4,784,137.2421m	464,579.7261m
0+260.00	335.7830 (d)	344.130m	4,784,152.2030m	464,566.4551m
0+280.00	336.2691 (d)	363.902m	4,784,167.7254m	464,553.8463m
0+300.00	336.8492 (d)	383.539m	4,784,183.8457m	464,542.0120m
0+320.00	337.5121 (d)	403.012m	4,784,200.5374m	464,530.9981m
0+340.00	338.2446 (d)	422.302m	4,784,217.7549m	464,520.8257m
0+360.00	339.0264 (d)	441.414m	4,784,235.4161m	464,511.4436m
0+380.00	339.8352 (d)	460.373m	4,784,253.4273m	464,502.7515m
0+400.00	340.6525 (d)	479.217m	4,784,271.7079m	464,494.6402m
0+420.00	341.4630 (d)	497.984m	4,784,290.1886m	464,486.9950m
0+440.00	342.2536 (d)	516.720m	4,784,308.8090m	464,479.6963m
0+460.00	343.0129 (d)	535.465m	4,784,327.5160m	464,472.6220m
0+480.00	343.7312 (d)	554.263m	4,784,346.2607m	464,465.6480m
0+500.00	344.4034 (d)	573.139m	4,784,365.0094m	464,458.6848m
0+520.00	345.0326 (d)	592.088m	4,784,383.7581m	464,451.7217m
0+540.00	345.6227 (d)	611.104m	4,784,402.5069m	464,444.7585m
0+560.00	346.1772 (d)	630.181m	4,784,421.2556m	464,437.7954m
0+580.00	346.6990 (d)	649.314m	4,784,440.0043m	464,430.8322m
0+600.00	347.1909 (d)	668.497m	4,784,458.7530m	464,423.8690m
0+620.00	347.6553 (d)	687.727m	4,784,477.5017m	464,416.9059m
0+640.00	348.0945 (d)	707.000m	4,784,496.2504m	464,409.9427m
0+660.00	348.5103 (d)	726.312m	4,784,514.9992m	464,402.9796m
0+680.00	348.9045 (d)	745.660m	4,784,533.7479m	464,396.0164m
0+700.00	349.2788 (d)	765.042m	4,784,552.4966m	464,389.0532m
0+720.00	349.6346 (d)	784.455m	4,784,571.2453m	464,382.0901m
0+740.00	349.9732 (d)	803.897m	4,784,589.9940m	464,375.1269m
0+760.00	350.2958 (d)	823.365m	4,784,608.7427m	464,368.1638m
0+780.00	350.6035 (d)	842.858m	4,784,627.4915m	464,361.2006m
0+800.00	350.8972 (d)	862.375m	4,784,646.2402m	464,354.2374m
0+820.00	351.1780 (d)	881.913m	4,784,664.9889m	464,347.2743m

0+840.00	351.4465 (d)	901.471m	4,784,683.7376m	464,340.3111m
0+860.00	351.7037 (d)	921.049m	4,784,702.4863m	464,333.3479m
0+880.00	351.9502 (d)	940.644m	4,784,721.2350m	464,326.3848m
0+900.00	352.1866 (d)	960.256m	4,784,739.9838m	464,319.4216m
0+920.00	352.4135 (d)	979.883m	4,784,758.7325m	464,312.4585m
0+940.00	352.6315 (d)	999.526m	4,784,777.4812m	464,305.4953m
0+960.00	352.8410 (d)	1,019.182m	4,784,796.2295m	464,298.5311m
0+980.00	353.0372 (d)	1,038.869m	4,784,814.9428m	464,291.4735m
1+000.00	353.2062 (d)	1,058.628m	4,784,833.5209m	464,284.0687m
1+020.00	353.3340 (d)	1,078.484m	4,784,851.8424m	464,276.0519m
1+040.00	353.4077 (d)	1,098.432m	4,784,869.7595m	464,267.1707m
1+060.00	353.4150 (d)	1,118.428m	4,784,887.0879m	464,257.1925m
1+080.00	353.3470 (d)	1,138.378m	4,784,903.6240m	464,245.9513m
1+100.00	353.2137 (d)	1,158.196m	4,784,919.3493m	464,233.5985m
1+120.00	353.0326 (d)	1,177.850m	4,784,934.3814m	464,220.4091m
1+140.00	352.8201 (d)	1,197.358m	4,784,948.8776m	464,206.6314m
1+160.00	352.5913 (d)	1,216.769m	4,784,963.0218m	464,192.4918m
1+180.00	352.3600 (d)	1,236.146m	4,784,977.0135m	464,178.2008m
1+200.00	352.1350 (d)	1,255.539m	4,784,990.9914m	464,163.8963m
1+220.00	351.9169 (d)	1,274.950m	4,785,004.9693m	464,149.5918m
1+240.00	351.7053 (d)	1,294.379m	4,785,018.9472m	464,135.2873m
1+260.00	351.5000 (d)	1,313.825m	4,785,032.9251m	464,120.9828m
1+280.00	351.3006 (d)	1,333.288m	4,785,046.9030m	464,106.6783m
1+300.00	351.1070 (d)	1,352.766m	4,785,060.8809m	464,092.3738m
1+320.00	350.9189 (d)	1,372.260m	4,785,074.8588m	464,078.0693m
1+340.00	350.7361 (d)	1,391.767m	4,785,088.8367m	464,063.7648m
1+360.00	350.5583 (d)	1,411.289m	4,785,102.8145m	464,049.4603m
1+380.00	350.3853 (d)	1,430.824m	4,785,116.7924m	464,035.1558m
1+400.00	350.2171 (d)	1,450.371m	4,785,130.7703m	464,020.8513m
1+420.00	350.0533 (d)	1,469.931m	4,785,144.7482m	464,006.5468m
1+440.00	349.8938 (d)	1,489.502m	4,785,158.7261m	463,992.2424m
1+460.00	349.7384 (d)	1,509.084m	4,785,172.7040m	463,977.9379m
1+480.00	349.5888 (d)	1,528.687m	4,785,186.7164m	463,963.6672m
1+500.00	349.4519 (d)	1,548.346m	4,785,200.9009m	463,949.5680m
1+520.00	349.3351 (d)	1,568.091m	4,785,215.4092m	463,935.8027m
1+540.00	349.2458 (d)	1,587.938m	4,785,230.3814m	463,922.5445m
1+560.00	349.1909 (d)	1,607.877m	4,785,245.9402m	463,909.9812m
1+580.00	349.1771 (d)	1,627.870m	4,785,262.1838m	463,898.3186m
1+600.00	349.2091 (d)	1,647.846m	4,785,279.1532m	463,887.7408m
1+620.00	349.2860 (d)	1,667.718m	4,785,296.7897m	463,878.3169m
1+640.00	349.4058 (d)	1,687.404m	4,785,315.0147m	463,870.0889m
1+660.00	349.5667 (d)	1,706.824m	4,785,333.7474m	463,863.0933m
1+680.00	349.7666 (d)	1,725.903m	4,785,352.9044m	463,857.3611m
1+700.00 1+740.00	350.0033 (d) 350.5635 (d)	1,744.570m 1,780.650m	4,785,372.3999m 4,785,412.0000m	463,852.9131m 463,847.3908m
1+760.00	350.8714 (d)	1,798.184m	4,785,431.9432m	463,845.8962m
1+780.00	351.1887 (d)	1,815.501m	4,785,451.9206m	463,844.9543m
1+800.00	351.5090 (d)	1,832.707m	4,785,471.9112m	463,844.3437m
1+820.00	351.8264 (d)	1,849.911m	4,785,491.9050m	463,843.8473m
1+840.00	352.1380 (d)	1,867.169m	4,785,511.8989m	463,843.3552m

1+860.00	352.4439 (d)	1,884.481m	4,785,531.8929m	463,842.8632m
1+880.00	352.7442 (d)	1,901.845m	4,785,551.8868m	463,842.3711m
1+900.00	353.0391 (d)	1,919.261m	4,785,571.8808m	463,841.8791m
1+920.00	353.3286 (d)	1,936.727m	4,785,591.8747m	463,841.3871m
1+940.00	353.6130 (d)	1,954.242m	4,785,611.8687m	463,840.8950m
1+960.00	353.8924 (d)	1,971.803m	4,785,631.8626m	463,840.4030m
1+980.00	354.1667 (d)	1,989.412m	4,785,651.8565m	463,839.9098m
2+000.00	354.4350 (d)	2,007.089m	4,785,671.8491m	463,839.3659m
2+020.00	354.6943 (d)	2,024.885m	4,785,691.8364m	463,838.6548m
2+040.00	354.9419 (d)	2,042.850m	4,785,711.8111m	463,837.6556m
2+060.00	355.1749 (d)	2,061.027m	4,785,731.7610m	463,836.2476m
2+080.00	355.3903 (d)	2,079.449m	4,785,751.6663m	463,834.3106m
2+100.00	355.5855 (d)	2,098.139m	4,785,771.4977m	463,831.7270m
2+120.00	355.7588 (d)	2,117.095m	4,785,791.2227m	463,828.4288m
2+140.00	355.9103 (d)	2,136.286m	4,785,810.8148m	463,824.4157m
2+160.00	356.0406 (d)	2,155.681m	4,785,830.2481m	463,819.6930m
2+180.00	356.1498 (d)	2,175.250m	4,785,849.4968m	463,814.2669m
2+200.00	356.2388 (d)	2,194.959m	4,785,868.5400m	463,808.1579m
2+220.00	356.3103 (d)	2,214.768m	4,785,887.3849m	463,801.4614m
2+240.00	356.3679 (d)	2,234.642m	4,785,906.0572m	463,794.2970m
2+260.00	356.4149 (d)	2,254.557m	4,785,924.5911m	463,786.7812m
2+280.00	356.4547 (d)	2,274.495m	4,785,943.0272m	463,779.0285m
2+300.00	356.4904 (d)	2,294.444m	4,785,961.4106m	463,771.1512m
2+320.00	356.5248 (d)	2,314.396m	4,785,979.7830m	463,763.2483m
2+340.00	356.5586 (d)	2,334.349m	4,785,998.1553m	463,755.3453m
2+360.00	356.5919 (d)	2,354.303m	4,786,016.5277m	463,747.4424m
2+380.00	356.6246 (d)	2,374.257m	4,786,034.9000m	463,739.5394m
2+400.00	356.6567 (d)	2,394.212m	4,786,053.2724m	463,731.6365m
2+420.00	356.6883 (d)	2,414.168m	4,786,071.6447m	463,723.7335m
2+440.00	356.7194 (d)	2,434.125m	4,786,090.0171m	463,715.8306m
2+460.00	356.7517 (d)	2,454.077m	4,786,108.4185m	463,707.9959m
2+480.00	356.7920 (d)	2,474.002m	4,786,126.9602m	463,700.5004m
2+500.00	356.8476 (d)	2,493.854m	4,786,145.7521m	463,693.6590m
2+520.00	356.9257 (d)	2,513.558m	4,786,164.8709m	463,687.7982m
2+540.00	357.0328 (d)	2,532.989m	4,786,184.3435m	463,683.2572m
2+560.00	357.1749 (d)	2,551.961m	4,786,204.1291m	463,680.3866m
2+580.00	357.3543 (d)	2,570.275m	4,786,224.0978m	463,679.3961m
2+600.00	357.5639 (d)	2,587.905m	4,786,244.0827m	463,680.0455m
2+620.00	357.7956 (d)	2,604.923m	4,786,263.9843m	463,681.9995m
2+640.00	358.0423 (d)	2,621.458m	4,786,283.7684m	463,684.9205m
2+660.00	358.2973 (d)	2,637.676m	4,786,303.4497m	463,688.4742m
2+680.00	358.5545 (d)	2,653.765m	4,786,323.0744m	463,692.3303m
2+700.00	358.8095 (d)	2,669.882m	4,786,342.6907m	463,696.2293m
2+720.00	359.0613 (d)	2,686.050m	4,786,362.3069m	463,700.1283m
2+740.00	359.3102 (d)	2,702.270m	4,786,381.9232m	463,704.0273m
2+760.00	359.5560 (d)	2,718.541m	4,786,401.5395m	463,707.9263m
2+780.00	359.7990 (d)	2,734.861m	4,786,421.1557m	463,711.8253m
2+788.81	359.9051 (d)	2,742.066m	4,786,429.7975m	463,713.5430m

STRUCTURAL DESIGN

3. INTRODUCTION

The purpose of this annex is to define the structural section of the roadbed for the new section of road, the project for which is titled "Lanestosa Bypass." Key aspects such as the characteristics of the roadbed, the materials available in the area, and the projected heavy traffic during the year of commissioning were considered for its design.

The typical sections of the pavement have been designed following current regulations:

- **Instrucción 6.1-IC "Secciones de Firme" (Orden FOM/3460/2003 de diciembre de 2003).**
- **Orden FOM/891/2004 de marzo de 2004 "Firmes y Pavimentos".**
- **Pliego de Prescripciones Técnicas Generales para Obras de Carretera y Puentes PG-3.**

These regulations establish basic criteria for pavement projects on newly constructed roads. The analysis that led to the selection of the typical section and materials to be used is detailed below.

Furthermore, the esplanade category and heavy traffic were evaluated, resulting in a traffic category of T31. This ensures that the section's design meets the expected conditions upon commissioning.

4. ESPLANADE

A key parameter in the characterization of the esplanade, according to Standard 6.1-IC "Road Sections", is the compressibility modulus in the second loading cycle (EV2), obtained through the "Plate Load Test".

The classification of esplanades is determined by the type of soil present in the esplanade or the underlying structure, as well as the properties and thicknesses of the materials available for its construction. This is specified in Article 330 of the General Technical Specifications for Road and Bridge Works (PG-3).

Considering the soil conditions and materials available in the study area, the grade has been classified as E2, with an EV2 value ≥ 120 MPa. These characteristics ensure that the soil is tolerable and suitable for defining the materials to be used in the project.

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

Figure 1. Compressibility modulus in the second loading cycle.

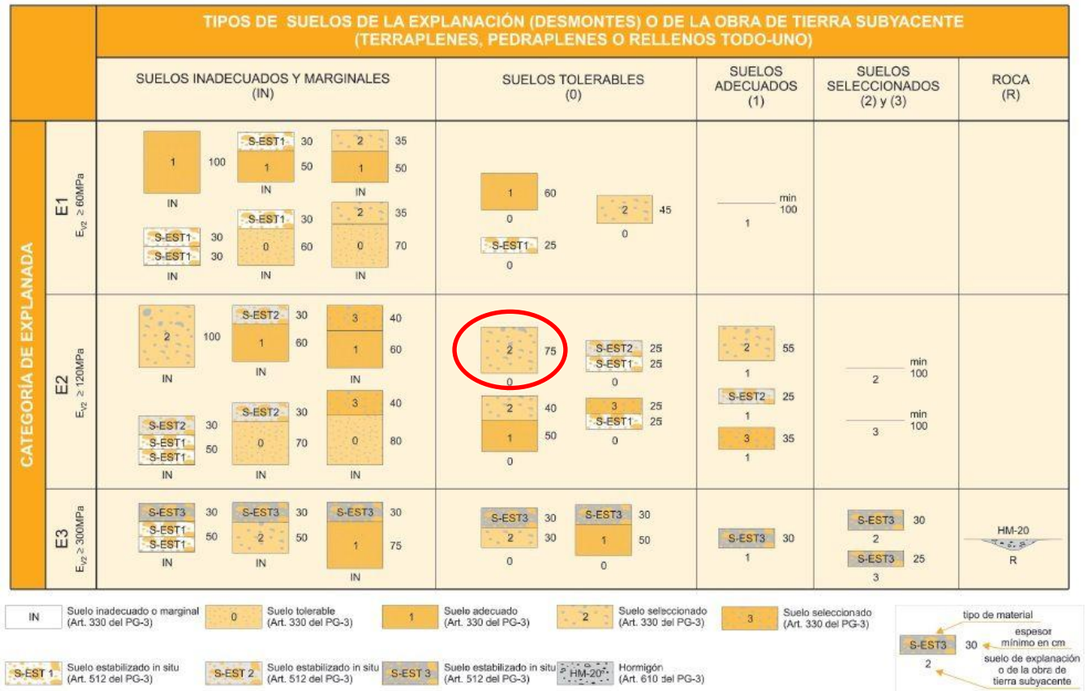


Figure 2. Formation of the esplanade.

As we can see in the table, having selected an E2 esplanade category and a tolerable soil, we will need an esplanade composed of 75 cm of selected soil to support the loads to which the road surface will be subjected.

5. SECTIONS OF THE ROAD

In accordance with Regulation 6.1C “Road sections”, considering an E2 type esplanade and a T31 traffic category, we will select a road section called 3121, which consists of:

- 16 cm of hot bituminous mixes
- 40 cm of artificial gravel

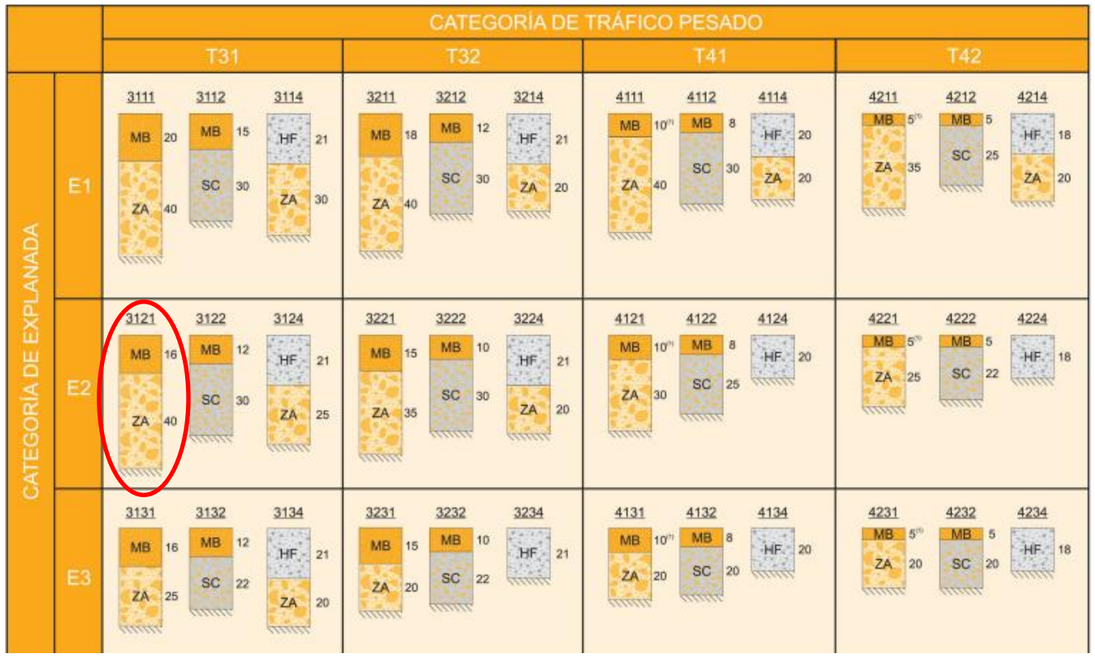


Figure 3. Catalogue of Pavement Sections for Heavy Traffic Categories T31 to T42.

6. BITUMINOUS MIX

Following the guidelines of regulation 6.1-IC in the section "Road sections", the thicknesses of the hot bituminous mix layers will be as follows:

TIPO DE CAPA	TIPO DE MEZCLA **DENOMINACIÓN.** NORMA UNE-EN 13108-1**(*)**	ESPESOR (cm)
RODADURA	AC16 surf D AC16 surf S	4 – 5
	AC22 surf D AC22 surf S	> 5
INTERMEDIA	AC22 bin D AC22 bin S AC32 bin S AC 22 bin S MAM (**)	5-10
BASE	AC32 base S AC22 base G AC32 base G AC 22 base S MAM (***)	7-15
ARCENES(****)	AC16 surf D	4-6

The 16 cm of bituminous mix required for our project is divided into the following thicknesses:

- 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
- Adhesion irrigation
- 10 cm of AC22 bin S 50/70 bituminous mix
- Primer irrigation on gravel
- 40 cm gravel 32020

ANNEX Nº. 4 – TECHNICAL SPECIFICATIONS

Index

1. DEFINITION AND SCOPE OF APPLICATION

1.1. DEFINITION

This technical document addresses the design and construction of a new road bypass on the N-629, near the municipality of Lanestosa. This road connects Cantabria with the province of Burgos, crossing Bizkaia. The project's main objective is to divert traffic that currently passes through the urban center, thereby eliminating existing traffic problems, especially for heavy vehicles such as trucks and buses, which face difficulties in the sharp turns on the current route.

During the initial phase of the study, a field visit was conducted to evaluate route alternatives. The option of locating the bypass to the east was ruled out due to the presence of caves of heritage value. Therefore, a route to the west of the municipality was chosen, prioritizing wide radii and minimizing river crossings to reduce environmental impact.

The planned route runs from the origin to kilometer point 3+543, connecting to the N-629 via a roundabout at the northern end. Given the low traffic volume (IMD) and the scale of the urban center, an additional interchange at the southern end is not considered necessary.

The typical section of the new road includes two 3.50-meter lanes and 1.5-meter shoulders. The pavement structure consists of:

- 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
- Adhesion irrigation
- 10 cm of AC22 bin S 50/70 bituminous mix
- Primer irrigation on gravel
- 40 cm gravel 32020

The section covered by this project extends from kilometer point 0+000 to kilometer point 2+788.

1.2. NATURE OF THE DOCUMENT

This Specific Technical Specifications Document (PPTP) establishes the specific technical conditions that must govern the execution of the project, complementing the provisions of the General Technical Specifications Document for Road and Bridge Works (PG-3) and the project plans. Together, both documents define the technical criteria, permitted materials, execution procedures, and guidelines for measuring and assessing the work units.

Both the contractor and the Project Management must adhere to these provisions throughout the entire duration of the work.

1.3. SCOPE OF APPLICATION

This document will be directly applicable to all phases of execution, supervision, control, and acceptance of the works corresponding to the "Lanestosa Bypass" project.

1.4. RELATIONSHIP WITH PG-3

Every effort has been made to ensure that the references between this document and the PG-3 are clear and easily locatable. In cases where modifications or additions to the PG-3 have been made, the original numbering of the affected article has been maintained, with the modified parts expressly indicated. For aspects not covered in the PG-3, new articles have been created with consecutive numbering, respecting the logic of the base document.

1.5. GENERAL PROVISIONS

1.5.1. CONTRACTOR'S TECHNICAL STAFF

The successful bidder must assign a Civil Engineer, with permanent on-site presence, to the project exclusively as Project Manager, as well as a Public Works Technical Engineer. In addition, the presence of a mid-level technician responsible for controlling signage and temporary safety elements, and a Civil Engineer responsible for the contractor's Technical Office on-site will be required. A Health and Safety Officer must also be designated.

1.6. OVERVIEW OF THE WORKS

The planned bypass connects initially with the upgraded section of the N-629 (Burgos–Colindres Highway), extending to kilometer point 3+543. The connection to the existing road is via a roundabout at the northern end. No additional interchange is planned in the south, given the low traffic volume and the scale of the urban center.

The typical section of the new road includes two 3.50 m lanes and 1.5 m shoulders. The road surface structure consists of:

- 5 cm of AC16 surf D 50/70 bituminous mix in the tread layer.
- Adhesion irrigation
- 10 cm of AC22 bin S 50/70 bituminous mix
- Primer irrigation on gravel
- 40 cm gravel 32020

1.6.1. PLANS

The contractor must prepare, at the request of the Project Manager, all detailed drawings deemed necessary for the proper execution of the works. These must be submitted along with the relevant supporting reports and calculations and are subject to approval by the Project Manager.

1.7. ERRORS, OMISSIONS OR CONTRADICTIONS

Any omission or error in this document affecting essential elements for the proper execution of the works, which, based on experience or standard practice, must be carried out, does not exempt the contractor from compliance. These elements must be executed as if they had been explicitly specified in the plans or in this document.

2. ACTIVITIES THAT MAKE UP THE WORKS

The main actions that are part of the scope of the project are described below.

2.1. PRELIMINARY WORK AND EARTHWORKS

Initial tasks include:

- General layout and establishment of topographic references.
- Clearing and cleaning of the entire surface affected by the project, including scarification and necessary demolition.
- Extraction and storage of topsoil for later reuse, as well as transportation of excess material to a landfill.
- Elimination of unusable materials within the area of action.
- Preparation of access roads and auxiliary roads to facilitate the execution of the works.
- Installation of temporary drainage systems to ensure proper water management until the final system is implemented.
- Execution of excavations, transportation and laying of materials to form the esplanade.
- Slope profiling and topsoil cover.
- Final cleaning and removal of auxiliary elements.
- Preservation of completed work until receipt.

2.1.1. DRAINAGE WORKS

Actions in this area include:

- Staking out and topographic marking.
- Trench excavation, earth transportation, and compacted backfilling of spaces not occupied by drainage elements.
- Construction of ditches, wells and connections with cross drainage pipes.
- Installation of pipes with concrete casings and prefabricated frames.
- Slope protection using gutters and curbs.
- Cleaning and waste removal.
- Land preparation and maintenance until reception.

2.1.2. FACTORY WORKS

They include:

- Topographical staking out.
- Assembly and disassembly of formwork, falsework and scaffolding.
- Placement of reinforcements according to plans.
- Pouring, compacting and curing of concrete.

- Installation of auxiliary elements such as drains, railings, supports, joints, etc.
- Filling of abutments and foundations.
- Load testing and quality control in accordance with EHE regulations.
- Conservation of the structures until their reception.

2.1.3. AFFIRMED

Includes:

- Surface preparation.
- Spreading, moistening, compacting and leveling of the granular base.
- Application of primer and adhesion treatments.
- Placement of hot bituminous mixtures for the different layers of the road surface.

2.1.4. SIGNAGE AND ROAD SAFETY

General works:

- Topographical redesign of all elements.
- Execution of all tasks necessary to ensure the correct installation and operation of the signaling and safety systems.
- Cleaning and removal of waste and auxiliary elements.
- Conservation of the installed elements until the work is received.

2.1.4.1. VERTICAL SIGNAGE:

- Redesigning the location of signs.
- Supply of plates supports and anchors.
- Construction of foundations and installation of signs.

2.1.4.2. HORIZONTAL SIGNAGE:

- Pre-marking and cleaning of surfaces.
- Application of reflective paints and microspheres.
- Protection of marks during drying.

2.1.4.3. SAFETY BARRIERS:

- Layout and supply of materials (posts, plates, shock absorbers, etc.).
- Installation of anchors and fixing of elements.
- Welding and leveling of bands.

2.1.5. BEACONING

- Individuals are staking out of each milestone or sign.
- Supply of materials.
- Execution of foundations or driving of elements.

2.1.6. SOWING AND PLANTATIONS

General:

- Staking out and preparing the land.
- Cleaning and waste removal.
- Maintenance of the garden areas up to the reception.

Topsoil:

- Excavation, stockpiling, fertilization and spreading.

Sowing:

- Land preparation, sowing and burying seeds.

Plantations:

- Digging holes, planting and aftercare.

2.1.7. REPOSITIONS

- Redesign and execution of the work necessary to restore services or elements affected by the work.
- Excavation, installation and restoration of elements according to the project.

2.2. START OF WORKS

2.2.1. INITIAL INSPECTION

Before work begins, an inspection will be conducted of the workshops, factories, or facilities where the materials intended for the project are manufactured or prepared. This review will verify that the processes comply with the established technical requirements.

2.2.2. WORK PROGRAM

The contractor must submit a detailed execution program, in accordance with the template indicated in the bidding documents or as determined by the Project Management. This program must include:

- Environmental, landscape and archaeological conditions.
- Impact corrective measures not included as work units, which must be completed before acceptance.

2.3. DEVELOPMENT AND CONTROL OF WORKS

2.3.1. REPLANNING OF DETAILS

In addition to the general layout, the following conditions must be met:

- The Construction Manager or his representative will mark the foundation heights on the ground.
- Filling of trenches will not be permitted without taking the necessary measurements for their assessment.
- The contractor will assume the costs arising from these redesigns.

2.4. LABORATORY TESTS

2.4.1. CONTRACTOR SELF-CONTROL

The contractor is required to perform control tests on each work unit, in accordance with the provisions of this document, current regulations, and PG-3. To this end, they must have an auxiliary laboratory on-site, equipped with qualified personnel and adequate resources. All associated costs will be borne by the contractor.

2.4.2. CONTROL BY THE CONSTRUCTION MANAGEMENT

The Department may conduct contrast tests in designated laboratories to verify the results of the contractor's self-control and ensure the quality of materials and processes.

2.5. MATERIALS

All materials used must meet the specifications of PG-3 and these specifications. Acceptance will be subject to prior testing and approval by the Project Management. No objection to a material does not imply final acceptance.

2.6. TEMPORARY DETOURS

The execution and maintenance of temporary traffic detours will be carried out in accordance with the corresponding annex to the project.

2.7. CONSTRUCTION SIGNAGE AND MARKING

During construction, signage and markings must be installed in accordance with Standard 8.3-IC, approved by Ministerial Order of August 31, 1987. The contractor must submit a specific plan that includes the planned measures and, where appropriate, proposed alternatives, without exceeding the allocated budget.

2.8. EXECUTION AND MAINTENANCE OF DRAINAGE WORKS

2.8.1. CONSTRUCTION

General conditions:

- The layout of the surface drainage system must be carried out with the necessary precision to ensure its proper functioning.
- Particular attention will be paid to the relationship between surface and deep drainage, avoiding interference or inadequate connections.
- In areas where embankments are built over abandoned riverbeds, prior land reclamation is mandatory.
- During construction, the accumulation of waste (concrete, soil, aggregates, etc.) near drainage elements will be avoided.

Buried elements:

- The pipes will be laid from the drainage point upstream.
- Trenches should remain open for as short a time as possible and be kept clean.
- The ducts will be supported on a bed of sand or gravel, or on concrete supports as appropriate.
- The fill will be compacted symmetrically to avoid displacement.

Surface elements:

- The execution will also be carried out from the drainage point upstream.

- Puddles will be avoided, and gutters will be protected before laying the lining.

Temporary drainage during the work:

- Temporary solutions must be provided to evacuate water during the construction phase.
- Slope erosion will be prevented, and water will be channeled through the designated downpipes.

2.8.2. CONSERVATION

General considerations:

- Items such as sandboxes and retention ponds should be cleaned periodically.
- After rainy episodes, surveillance will be intensified and materials obstructing the system will be removed.

Buried elements:

- Water flow will be checked in manholes and conduit outlets, especially after rain.
- Periodic cleaning will be carried out, preferably with pressurized water.

Surface elements:

- Irregularities that cause deadlocks will be corrected.
- Vegetated ditches will be watered and replaced if necessary.
- The lined gutters will be cleaned at least once a year.
- Unlined gutters shall be reprofiled where necessary.

2.9. SAFETY AND HEALTH AT WORK

The Health and Safety Study included in this project is contractual and must be complied with by the contractor. All preventive measures, action protocols, and provisions contained in this study must be rigorously applied throughout the execution of the works, without exception.

2.10. STORAGE DURING THE WARRANTY PERIOD

The contractor shall be responsible for the maintenance and upkeep of all completed work units until their provisional acceptance. Any deterioration resulting from negligence, poor workmanship, or avoidable causes must be repaired at the contractor's expense, at no additional cost to the Administration.

2.11. FINAL CLEANING OF THE WORKS

Before final acceptance, a comprehensive cleaning of the work area will be carried out. This includes the removal of surplus materials, waste, debris, auxiliary facilities, warehouses, and any other temporary elements. The cleaning must extend to all areas affected by the work, including public domain areas, easements, and temporarily occupied land, which must be left in a condition similar to that existing before the start of work.

2.12. EXECUTION OF UNSPECIFIED UNITS

If, during construction, work units not expressly contemplated in this document are required, the specifications of PG-3/75 will apply. If they are not included in this document, the instructions of the Project Manager will be followed, always within the standards of good technical practice.

2.13. CONTRACTOR RESPONSIBILITIES

The contractor shall assume all obligations arising from the execution of the works, including:

2.13.1. PERMITS AND LICENSES

The contractor shall be responsible for managing and obtaining, at its own expense, all necessary licenses and authorizations for the execution of the works, with the exception of those related to the expropriations provided for the project.

2.13.2. POLLUTION PREVENTION

The provisions of Royal Decree 105/2008 of February 1, on the management of construction and demolition waste, must be complied with. The contractor must adopt all necessary measures to avoid negative environmental impacts resulting from its activities.

2.14. MEASUREMENT AND FERTILIZER

2.14.1. GENERAL CONDITIONS

The unit prices established in this document include all materials, labor, machinery, transportation, tools, and auxiliary resources necessary for the proper execution of each work unit. Also included are costs associated with signage, traffic management, and repair of unavoidable damage.

2.14.2. DEFECTIVE WORKS

Construction units that do not meet the technical specifications will not be paid for. The contractor must demolish and reconstruct them at its own expense. If the Construction Management accepts a defective unit, it may apply a proportional financial reduction, without the contractor having any right to make a claim.

2.14.3. CONTRADICTORY PRICES

If, during execution, a work unit not included in the budget is required, a contradictory price will be established before execution. This will be proposed by the Construction Management and approved by the Administration. If the contractor does not accept the established price, they will be exempt from execution, and the Administration may contract it through other means.

2.15. LUMP SUMS

Fixed-price items shall be governed by the provisions of Article 154 of the General Regulations of the Public Sector Contracts Law. Payment shall be made upon completion of the corresponding work unit or at the end of the planned execution period.

3. ENVIRONMENTAL CONDITIONS DURING THE EXECUTION OF THE WORKS

This chapter establishes the preventive and corrective measures that must be adopted during the construction phase to minimize the environmental impact of the works. It also includes a series of specific prohibitions and obligations that the contractor must strictly comply with.

3.1. PRELIMINARY PROVISIONS

During the execution of the works, all necessary measures must be implemented to avoid unnecessary disturbances to the surrounding ecosystems. These actions include both the prevention of impacts and the restoration of affected areas, should unforeseen disturbances occur.

3.2. PROTECTION OF WATER RESOURCES

3.2.1. PROTECTION OF CHANNELS AND WATERCOURSES

It is strictly prohibited:

- Discharge polluting substances, directly or indirectly, into waterways.
- Accumulate waste or materials that may pose a risk to water quality or its environment.
- Carry out activities that alter the physical or biological environment of the river environment.
- Driving machinery through the interior of the channels.
- Carry out any activity within the protection zones defined by the hydrological plans if there is a risk of contamination.

The contractor must submit a specific channel protection plan, including bank defense measures, water quality control, and environmental restoration. If channel crossings are necessary, they must be done using temporary structures or the project's own structures.

3.2.2. USED OIL MANAGEMENT

Used oils are considered hazardous waste and must be managed in accordance with current regulations. The following are prohibited:

- Pouring oils into surface water, groundwater, or sewage systems.
- Depositing oils on the ground without control.
- Carry out treatments that generate polluting emissions.

The contractor must store the oil safely, avoid mixing them with other waste, and deliver them to authorized waste managers.

3.2.3. WATER INTAKES

If there are water intakes in service, the contractor must inform those responsible for their management before beginning work. Any alteration in water quality must be reported, and if damage is caused, the contractor will be responsible for the corresponding compensation.

3.3. PROTECTION OF THE TERRESTRIAL ENVIRONMENT

Auxiliary facilities (machinery yards, concrete or asphalt plants, warehouses, etc.) must be located in the areas designated in the project. If an alternative location is proposed, a detailed plan must be submitted for approval by the Project Management, ensuring minimal impact on the natural environment.

Clearing, felling, and land clearing operations should be carried out with caution, avoiding damage to protected or sensitive areas. These tasks are recommended in autumn or winter to avoid interfering with breeding wildlife.

Construction roads must be limited to those defined in the plans, with a maximum width of 5 meters. Upon completion of the work, they will be rehabilitated.

Surplus materials will be deposited in authorized landfills. The resulting slopes must be properly stabilized and replanted.

3.4. WILDLIFE PROTECTION

Since the Calera River is part of a protected river network, work that could affect water quality is prohibited between October and January, coinciding with the breeding season for vulnerable fish species.

Likewise, blasting is prohibited in the vicinity of Peña Lobera between January 15 and the end of June, as this is a nesting area for wild birds. Clearing and earthmoving should preferably be carried out in winter.

3.5. VEGETATION PROTECTION

During the execution of the works, specific measures must be taken to preserve existing vegetation, especially trees and shrubs near the work area. Any action that could damage the root system, trunk, or canopy of those trees that are not to be felled must be avoided.

Excavations near trees must be kept at a minimum distance equivalent to five times the trunk diameter measured at a height of 1.20 m, and never less than 0.50 m. If roots larger than 5 cm in diameter are cut during work, they must be cleanly sectioned and treated with healing products.

Exposed roots must be covered within a maximum of three days and watered appropriately. Trees kept next to embankments or causeways must be protected with permeable materials to prevent soil compaction in the area affected by their roots.

It is prohibited:

- Nailing metal elements into trees.
- Light a fire in its vicinity.
- Handle chemicals near the roots.
- Stacking materials or parking machinery over the root zone.
- Make cuts without subsequent treatment with antiseptic mastic.

Any damage caused to protected vegetation must be compensated by replacing it with specimens, at the contractor's expense and in accordance with the instructions of Construction Management.

3.6. PROTECTION OF THE ATMOSPHERE

The contractor must adopt measures to minimize the emission of dust and suspended particles, especially in areas close to inhabited areas or crops. To this end, construction roads and material stockpiles will be periodically watered, especially during dry and windy periods.

Trucks transporting soil or fine materials must be covered with tarps. Stockpiles must be protected with awnings when weather conditions require it. Special attention will be paid to areas devoid of vegetation, where irrigation will be intensified.

3.7. PROTECTION OF HISTORICAL AND CULTURAL HERITAGE

Before the start of the work, the Project Management or the contractor must notify the competent heritage authority so that, if deemed appropriate, it may conduct archaeological surveys or establish specific protection measures.

In the event of accidental discoveries of historical or archaeological remains, work in the affected area must be immediately halted and the Construction Management notified. Work may not resume without express authorization.

During the earthmoving phase, an archaeologist and his team will be present to conduct preventive monitoring. Any work that could affect the caves or heritage sites identified in the project area will be avoided.

4. BASIC MATERIALS

This chapter contains the technical specifications that the key materials used in the execution of the works must meet. All products must comply with current regulations, especially PG-3 and the applicable UNE and EN standards.

4.1. CONGLOMERATES

4.1.2. CEMENTS

Definition:

Cement is a hydraulic binder that, when mixed with water, forms a paste that sets and hardens through chemical reactions, maintaining its strength in both dry and submerged environments.

Types used:

The following types of cement will be used for the manufacture of concrete, in accordance with Specification RC-03:

- CEM II/AD/32.5
- CEM II/AD/42.5
- CEM II/AS/32.5

In bituminous mixtures, if cement is used as a filler, CEM-V/25 must be used. Any change in type will not affect the unit price.

Technical conditions:

Cements must comply with the provisions of Article 202 of PG-3 and Instruction EHE. The physical, mechanical, and chemical characteristics must conform to the corresponding tables of RC-08.

Measurement and payment:

Cement will be measured by the ton actually used on site. It will not be paid separately if it is part of another work unit.

4.2. BITUMINOUS BINDERS

4.2.2. ASPHALT BITUMENS

Definition:

They are high-viscosity hydrocarbon binders, derived from petroleum or present in natural asphalts, which comply with the UNE-EN 12597 standard.

Types contemplated:

- Conventional bitumens (UNE-EN 12591)
- Hard bitumens (UNE-EN 13924-1)
- Multigrade bitumens (UNE-EN 13924-2)

Technical characteristics:

The bitumens must comply with Article 211 of PG-3. The following shall be used:

- B-60/70 for wearing courses
- B-40/50 for intermediate and base layers

Denomination:

It will be expressed using two figures indicating the penetration limits (for example, B-60/70). In the case of multigrade, the softening point range will be added.

Transport and storage:

Bitumen will be transported in heat-resistant tanks and stored in insulated tanks with adequate heating and ventilation systems. The entire transfer system must be heated and allow for efficient cleaning.

Reception and identification:

Each tanker must be accompanied by a delivery note and CE marking, including information on the manufacturer, type of bitumen, delivery date, and technical specifications.

Quality control:

Inspections will be performed at reception, at the mixer entrance, and additional monthly inspections. Samples will be taken for penetration, softening point, and penetration index tests.

Measurement and payment:

Bitumen will be paid for by the ton used, as indicated for each work unit.

4.3. BITUMINOUS EMULSIONS

Definition:

Bitumen emulsions are mixtures in which small particles of bitumen, with or without polymers, are dispersed in an aqueous solution with the aid of an emulsifying agent. This project will use only cationic emulsions, in which the bitumen particles carry a positive charge.

Types and uses:

- **Primer irrigation:** Slow-breaking emulsion type ECL-1.
- **Adhesion irrigation:** Fast-breaking emulsion type ECR-1.

Designation:

According to UNE-EN 13808, the designation of emulsions will include information on the type of binder, bitumen content, presence of polymers or fluidifiers, breaking speed and intended application (for example, ADH, IMP, MIC, etc.).

Transport and storage:

Emulsions will be transported in tanks and stored in insulated tanks, with ventilation, agitation, and recirculation systems if long-term storage is anticipated. The temperature should not exceed 50°C. ° C to prevent premature breakage.

Reception and identification:

Each tank must be accompanied by a delivery note and CE marking in accordance with UNE-EN 13808, including manufacturer information, emulsion type, delivery date, technical characteristics, and destination.

Quality control:

Tests will be performed upon receipt and during use, including determination of viscosity, water content, breaking index, sieving, penetration, softening point, and cohesion of the residual binder. If the emulsion remains stored for more than 15 days, additional tests will be performed to verify its stability.

Measurement and payment:

The emulsion will be paid for by the ton used, as indicated for each work unit. The price will include surface preparation and product application.

4.4. METALS

4.4.2. CORRUGATED BARS FOR REINFORCED CONCRETE

Definition:

Steel bars with raised edges that improve their adhesion to concrete. Type B 500 S steel is used, in accordance with Instruction EHE.

Technical characteristics:

- Yield strength ≥ 500 N/mm²
- Breaking load ≥ 550 N/mm²
- Elongation ≥ 12%
- Break/yield strength ratio ≥ 1.05
- Absence of cracks after bending tests

Supply and control:

The bars must be identified, free of defects, and accompanied by quality certificates. They must be stored protected from moisture and contaminants.

4.5. ELECTRO-WELDED MESH

Definition:

Welded mesh is defined as mesh formed by orthogonally arranged steel wires joined by electric welding. It can be smooth or corrugated, the latter having better adhesion properties to concrete.

Technical conditions:

The steel used will be type B 500 T, in accordance with UNE 36080. Each panel must be identified with the manufacturer's brand and the mesh designation according to Instruction EHE.

Supply and control:

Each consignment must be accompanied by a delivery note, technical specifications sheet, and quality certificate. Samples will be taken for acceptance tests, and others will be kept for preventive purposes.

Measurement:

It will be carried out according to the work unit in which they are integrated.

4.6. ROLLED STEEL

Definition:

Rolled steel is a hot-formed ferrous product intended for metal structures. Type AE 355 steels, grades B and D, are used, according to UNE 36080-90.

General conditions:

The sheets will be supplied standardized, and the profiles will have a smooth surface. The corresponding UNE standards will be applied to ensure surface and dimensional quality.

Composition and properties:

The chemical composition and mechanical characteristics (strength, yield strength, elongation, resilience) will comply with the tables of the UNE 36080-90 standard.

Reception:

The sheets will be subjected to ultrasonic inspection and the profiles will be engraved with the manufacturer's name and type of steel.

4.7. DUCTILE IRON

Definition:

Ductile iron is an iron-carbon alloy with spheroidal graphite, which gives it high strength and toughness. It is obtained by adding magnesium during the casting process.

Quality:

The fracture must have a fine, compact, and homogeneous grain. The pieces must not show any defects such as pores, cracks, or inclusions.

Mechanical properties:

- Minimum tensile strength: ≥ 420 N/mm²
- Yield strength: ≥ 300 N/mm²
- Elongation: ≥ 10% (according to DN)
- Brinell hardness: ≤ 230

Periodic tests will be carried out during manufacturing to verify compliance with these properties.

4.8. PAINTINGS

Types used:

- **Anti-corrosive primer:** Based on lead red lead and epoxy resin, applied in two coats.
- **Finishing paint:** High solids epoxy resin, suitable for metal, concrete or wood surfaces.

Application:

The color will be as indicated in the plans or as determined by the Project Manager. Application conditions will follow the manufacturer's recommendations and the Director 's instructions.

5. VARIOUS MATERIALS

This chapter contains the technical specifications for other materials that, while not structural, are essential for the proper execution of the works, especially regarding signage, drainage, and finishes.

5.1. REFLECTIVE ROAD MARKING PAINTS

Assessment coefficient:

The paints used must maintain adequate reflectance throughout their useful life. Their performance will be evaluated 48–96 hours after application and subsequently at 3, 6, and 12 months using a digital retroreflectometer. After 6 months, the loss of reflectance may not exceed 30%. % in central lines nor 20 % on border lines.

Sampling:

An original container of paint (25–30 kg) and a bag of microspheres (25 kg) will be sent to the official laboratory for identification. A sample will also be kept on-site for possible contrast testing.

5.2. WATER FOR MORTARS AND CONCRETES

Any water that has been proven suitable for mixing and curing concrete may be used. At least two samples will be taken during the project: one before the start of work and another during execution. If the water comes from the drinking water network, testing will not be necessary. Any change of source must be authorized by the Project Management.

5.3. WOOD

General conditions:

The wood used in shoring, formwork, formwork, and auxiliary equipment must comply with Article 286 of PG-3. Sound wood, free of root and cracks, and with a durability equivalent to Scots pine, must be required.

Shapes and dimensions:

- For shoring: sufficient dimensions to ensure safety.
- For formwork: preferably coniferous, straight grain, class I/80 according to UNE 56-525-72.
    - On visible surfaces: tongue and groove boards.
    - On hidden surfaces: squared, planned or rough boards.

The wood must not contain substances that affect concrete or cause leaks or deformations.

5.4. GLASS MICROSPHERES FOR ROAD MARKINGS

Sampling:

Metal sheets (30 x 15 cm) will be placed on the pavement to collect samples of applied paint and microspheres. It is recommended to use between 10 and 12 sheets per batch.

Identification tests:

For large-volume projects, one sample will be taken for every 1,000 kg of stockpiled material. One sample will be sent to the laboratory, while others will be retained for cross-reference testing.

5.5. SPRAY PAINT - PLASTIC FOR HORIZONTAL SIGNAGE

Definition and application:

Thermoplastic material for hot application, by spreading or spraying, which allows the immediate incorporation of reflective microspheres.

Composition:

Free at the manufacturer's discretion, provided it meets the technical specifications.

General characteristics:

- Solid at room temperature, pasty at 40 ° C.
- Resistant to salt, oils and chemicals.
- Softening point ≥ 90 ° C.
- Thermal stability for 6 h without degradation.
- Good resistance to impact, flow, light and sliding.

6. MAIN WORK UNITS

This chapter describes the main work units comprising the project, detailing their definition, execution, measurement, and payment criteria. All activities must be executed in accordance with the specifications of PG-3 and the instructions of the Project Management.

6.1. PRELIMINARY WORK

6.1.1. LAND CLEARING

Definition:

It consists of surface clearing of the land, removing vegetation, organic remains, debris, and any other material that interferes with the execution of the works.

Execution:

All unwanted elements will be removed and disposed of, complying with environmental and safety regulations. The extracted material will be transported to an authorized landfill.

Measurement and payment:

It will be measured in square meters (m²) of the area cleared. The price will include obtaining permits, removing vegetation, and loading and transporting waste.

6.1.2. DEMOLITIONS

Definition:

It includes the demolition of existing structures, foundations, buildings or other elements that interfere with the planned layout.

Execution:

The areas to be demolished will be watered to prevent dust buildup. Adjacent infrastructure will be protected, and affected services will be restored. In the event of unforeseen events (gas, water, buried debris), work will be suspended, and the Construction Management will be notified.

Measurement and payment:

Demolitions will be measured in cubic meters (m³) or square meters (m²), depending on the type of element. The price will include the removal and transportation of the resulting materials.

6.1.3. MILLING OF EXISTING PAVEMENT

Definition:

It consists of removing surface layers of the road surface using specialized machinery, leaving the base ready to receive new layers.

Execution:

Milling machines with electronic thickness control will be used. The milled material will be removed immediately, and the resulting surface will be cleaned.

Measurement and payment:

It will be measured in square meters (m²) of milled surface. The price includes milling, loading, transportation, and cleaning.

6.1.4. CLEANING OF PIPES AND DRAINS

Definition:

It refers to the cleaning of existing drainage elements to ensure their functionality.

Execution:

Materials that obstruct the flow of water, including soil, roots, stones and debris, will be removed manually or mechanically.

Measurement and payment:

It will be paid per unit (unit) for cleaned pipes or slices, including the transportation of waste to the landfill.

6.1.5. GUTTER CLEANING

Definition:

It consists of the adaptation of concrete gutters to ensure the correct evacuation of water.

Execution:

Vegetation, soil, and other obstructions will be manually removed. Adjacent manholes will also be cleaned.

Measurement and payment:

It will be measured in linear meters (m) of cleaned ditch. The price will include all necessary operations.

6.2. EXCAVATIONS

6.2.1. FLATWORK EXCAVATION AND BORROW PITS

Definition:

It includes all the excavations necessary to create the esplanade, access roads, auxiliary roads and temporary detours.

Classification:

The excavation will be unclassified, that is, it will not be differentiated by type of terrain.

Execution:

The contractor must notify the start of work for approval. Excessive excavation will be avoided, and drainage will be always maintained. Unsuitable materials will be transported to a landfill. Topsoil will be stockpiled for later reuse.

Measurement and payment:

It will be measured in cubic meters (m^3) according to the theoretical profile. The price will include excavation, transportation, dumping, permits, and any necessary material treatment.

6.3. FILLINGS

6.3.1. EMBANKMENTS

Definition and execution:

Embankments will be constructed by adding, spreading, and compacting suitable materials, forming successive layers until the projected geometry is achieved. Several zones will be distinguished:

- **Coronation:** upper 75 cm, made with selected quarry soil.
- **Core:** intermediate zone, with suitable or all-in-one soils.
- **Shoulder:** outer part of the embankment, which may form part of the slope.
- **Foundation:** base of the embankment, on the natural ground, with more resistant materials.

Conditions of execution:

The work will be carried out at temperatures above 2 ° C. The passage of machinery over uncompacted layers shall be avoided. The spreading and compaction equipment must be sufficient to guarantee the required quality.

Measurement and fertilization:

Measured in cubic meters (m^3) actually executed. The price will include all necessary operations, including transportation, spreading, moistening, and compaction.

6.3.2. CAUSEWAYS

Definition:

They consist of the formation of fillings by placing large stone materials, especially in areas with low load-bearing capacity or where greater stability is required.

Differentiated zones:

- **Transition:** top, with at least two courses.
- **Core:** intermediate zone.
- **Foundation:** base of the causeway, in contact with the natural ground.
- **Shoulders:** lateral areas.
- **Special zones:** such as flood-prone areas.

Measurement and fertilization:

Payment will be made based on the volume executed (m^3), including excavation, transportation, spreading and compaction.

6.3.3. ALL-IN-ONE FILLINGS

Definition:

Fills made with materials from excavation, without granulometric classification, provided they comply with the conditions of article 333 of PG-3.

Measurement and payment:

This will be carried out in accordance with the provisions of said article, by volume executed.

6.4. TERMINATION

6.4.1. COMPLETION AND REFINING OF THE ESPLANADE

Definition and execution:

This involves the final profiling of the esplanade to ensure its geometry and support conditions before laying the road surface. This will be done just before starting the upper layers. If a resurfacing of less than half a layer is required, the existing layer will be scarified to ensure adhesion.

Measurement and fertilizer:

This unit is considered included in the excavation, embankment or fill items.

6.4.2. SLOPE REFINEMENT

Definition and execution:

This involves the final profiling of the cut or fill slopes, ensuring proper landscape integration. Unstable materials will be removed, and any landslides will be corrected. The slopes will be modeled with smooth transitions, and the edges will be rounded.

Measurement and fertilization:

Included in the corresponding earthworks units.

6.5. BITUMINOUS IRRIGATION

6.5.1. PRIMER IRRIGATIONS

Definition:

Application of a hydrocarbon binder on a granular layer before spreading a bituminous layer.

Materials and supplies:

- Binder: 0.5–1 kg/m^2
- Cover aggregate: 4–6 l/m^2 (if required)

Execution:

The surface will be cleaned, and the binder and, if necessary, the aggregate will be applied. Traffic will not be allowed until the bonder has been absorbed.

Measurement and fertilization:

By tons of binder applied. The aggregate will not be fertilized separately.

6.5.2. ADHESION RISKS

Definition:

Application of bituminous emulsion on a treated layer, before spreading a new bituminous layer.

Materials and supplies:

- ECR-1 type emulsion
- Endowment: 0.2–0.5 kg/m^2

Execution:

Apply with appropriate equipment, avoiding duplication. Protect sensitive elements and wait for the emulsion to break before spreading the mixture.

Measurement and fertilization:

Per ton of emulsion applied, including surface preparation.

6.6. HOT BITUMINOUS MIXTURES

6.6.1. DEFINITION AND EXECUTION

Hot-mix asphalt is composed of aggregates, binder, and, where applicable, additives. They are manufactured at high temperatures and hot-spread and compacted.

Execution phases:

- Study of the mixture and working formula
- Manufacturing in plants
- Transport in protected trucks
- Extension with automatic paver
- Compaction with suitable rollers
- Control of longitudinal and transverse joints

Thermal conditions:

- Mixing temperature: 150–170 ° C
- Minimum spreading temperature: 135 ° C

Test section:

Before starting production, a test section will be executed to validate the formula and compaction plan.

7. SIGNALING

This chapter establishes the technical requirements for the execution of horizontal and vertical signage, as well as marking and vehicle restraint elements. All products used must be AENOR certified and comply with current regulations.

7.1. ROAD MARKINGS

Definition:

Road markings are horizontal signage elements applied to the roadway, serving as informational, regulatory, or warning elements for road users. They may be reflective or not, and are classified as:

- **Longitudinal and transverse markings:** edge lines, lane separation, stop lines, arrows, etc.
- **Label and island markings:** symbols, texts, channeling areas.
- **Optical-sound markings:** embossed thermoplastic lines that generate vibration or sound when stepped on.
- **Raised cross markings:** prefabricated or on-site plastic-based blocks, for warning purposes in high-risk sections.

Execution:

Includes surface cleaning, removal of old marks, application of paint and microbeads, layout, and protection during drying. Thermoplastic materials or cold-set plastic paints will be used, depending on the type of mark.

7.2. RETROREFLECTIVE VERTICAL SIGNS AND POSTERS

Definition:

Includes regulatory, informational, and warning signs, as well as large-format posters. Their location, shape, and dimensions will conform to the project plans and the official catalog of the Ministry of Transportation.

Materials:

- **Side panels:** extruded galvanized steel, with 175x40 mm slats.
- **Supports:** steel or aluminum, prepared according to PP1 standard to ensure the adhesion of the reflective material.
- **Reflective device:** composed of protective film, adhesive, binder, glass microspheres and external lacquer.

Technical characteristics:

- Maximum thickness: 0.30 mm
- Specular gloss: > 40 (angle 85°)
- Resistance to solvents, impact, heat, cold and humidity

- 70% retention % of reflectance after accelerated aging

Execution:

The final location will be adjusted on-site to ensure visibility. The contractor must replace any defective signage during the warranty period.

Measurement and payment:

Payment will be made per unit installed (signs) or per square meter (posters). Supporting elements will be measured per linear meter, including anchors. Foundations will be paid for separately.

7.3. RETROREFLECTIVE BEACONING ELEMENTS

Definition:

Devices installed permanently or temporarily to enhance visual guidance along the road. These include mile markers, edge markers, and snow markers.

Materials:

- **Edge markers:** PVC without plasticizers, UV stabilized.
- **Black stripes:** heavy duty pigmented vinyl, with high adhesion adhesive.
- **Reflective material:** in accordance with Ministry specifications.
- **Kilometer and mile markers:** galvanized steel sheet, with level II reflectance.
- **Snow beacons:** metal cylinders with red and white stripes.

Execution:

A preliminary layout will be carried out, and non-aggressive methods will be used for installation and removal. The use of chemicals or heat to remove elements is prohibited.

Quality Control:

The contractor must submit daily reports with the location, type of installed element, and observations. Materials will be verified to match those approved.

Measurement and payment:

Payment will be made per unit placed, including surface preparation and pre-marking.

7.4. SAFETY BARRIERS

Definition:

Restraint systems installed on the sides of the road to prevent vehicles from leaving the platform and reduce the consequences of accidents.

Execution:

They will be installed at the points indicated in the plans and at those determined by the Construction Management. They must comply with the containment and deformation levels established by the regulations.

7.5. METAL PARAPETS

Definition:

Containment elements installed on structures, intended to protect both vehicles and pedestrians. They can consist of metal railings on concrete parapets or complete metal systems.

ANNEX Nº5. – BUDGET

Index

BREAK DOWN OF EXPENSES

1. INTRODUCTION

The purpose of this appendix is to justify the unit prices included in Price Schedule No. 1, which serves as the basis for preparing the project budget. The material execution price of each unit of work is determined by adding its direct and indirect costs, applying a coefficient to the former to obtain the latter.

The formula used is the following:

$$P_n = CD + CI = CD * (1 + \frac{K}{100})$$

Where:

- P_n: Material execution price of the work unit (€)
- CD: Direct cost of the work unit (€)
- CI: Indirect cost of the work unit (€)
- K: Percentage of indirect costs (%)

2. DIRECT COSTS

The direct costs of each unit of work are composed of three fundamental elements:

- Cost of labor
- Cost of machinery
- Cost of materials

2.1. LABOR COST

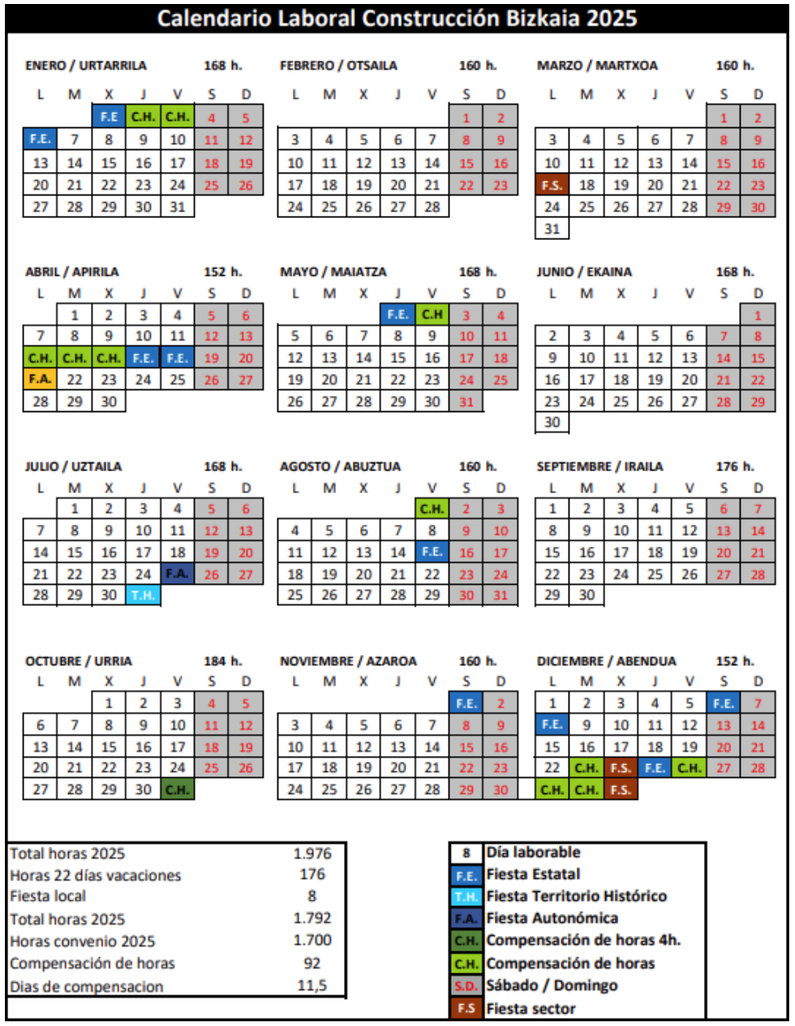
The hourly cost of labor is calculated in accordance with the Collective Agreement for the Construction and Public Works Sector of Bizkaia for 2024, applying the following formula:

$$C = k * A + B$$

Where:

- C: Hourly cost for the company (€ / h)
- k: Contribution coefficient (1.4)
- A: Salary remuneration (€ / h)
- B: Non-salary remuneration (€ / h)

2.1.1. BIZKAIA WORK CALENDAR



2.1.2. SALARY REMUNERATION (A)

Salary is calculated by adding the following items: base salary, collective bargaining bonus, vacation time, extra pay (summer and Christmas), seniority, and, where applicable, hazard pay. These values are obtained from the salary table in force for Bizkaia in 2025.

2.1.3. NON-SALARY REMUNERATION (B)

This component includes per diem, mileage, tool wear, work clothing, and termination compensation.

2.1.4. TOTAL LABOR COST (C)

To obtain the total cost of labor we will apply the following formula:

$$C = 1.40 * A + B$$

CONCEPTO	VI	VII	VIII	XII
	Encargado	Capataz	Oficial de 1ª	Peón ordinario
Horas de trabajo anual según convenio: 1.704h				
A.- RETRIBUCIONES SALARIALES				
A.1. Salario base	15.325,93	14.145,31	14.035,23	11.778,10
A.2. Plus actividad	7.695,53	6.972,42	6.913,79	5.520,68
A.3. Vacaciones	2.111,09	1.942,22	1.933,26	1.602,22
A.4. Pagas extraordinarias	4.222,18	3.884,44	3.866,52	3.204,44
TOTAL A	29.354,73	26.944,39	26.748,80	22.105,44
TOTAL COSTE HORARIO SALARIAL (1.704 h/año)	17,23	15,81	15,70	12,97
B.- RETRIBUCIONES EXTRASALARIALES				
B.1. Plus extra salarial (1.704 h)	904,82	904,82	904,82	904,82
B.2. Dietas (213 días)	3.269,55	3.269,55	3.269,55	3.269,55
TOTAL B	4.619,12	4.596,13	4.577,47	4.539,84
TOTAL COSTE HORARIO EXTRASALARIAL (1.704 h/año)	2,71	2,65	2,64	2,62
C. COSTE HORARIO PARA LA EMPRESA (C=1,4xA+B)**	**27,91**	**25,84**	**25,67**	**21,82**

2.2. COST OF MACHINERY

The equipment planned for the project is detailed below, along with its hourly cost per unit. Prices were obtained from the Bizkaia Government's Reference Price Database:

MAQUINARIA (PRESUPUESTO)

CÓDIGO	RESUMEN	UD.	PRECIO/UD.
U39AB004	Pala neumáticos CAT.950	H.	23,97
U39AB005	Pala s/orugas CAT.955	H.	26,79
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
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
U39AQ001	Maqui.hinca postes barre.segu	H.	10,12
U39AT001	Trac. s/orug.bull.410 cv D-9	H.	61,15
U39AT002	Trac. s/orug. bull. 140 cv	H.	28,38
U39AW001	Wagon-drill s/ruedas 0.6 tm	H.	5,52
U39AX010	Bomba de 6 cv	H.	24,52
U39AY002	Compr. movil 6 martill.150 cv	H.	16,55
U39AY003	Compr. movil 2 martill.	H.	6,74
U39BK205	Planta asfáltica en caliente	h	516,00

2.3. COST OF MATERIALS

The materials planned for the construction project are valued according to the unit prices established in the Bizkaia Government's Reference Price Base. Some representative examples are presented below:

MATERIALES (PRESUPUESTO)

CÓDIGO	RESUMEN	UD.	PRECIO/UD.
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
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
U39VF012	Señal tipo P L=90 cm.reflecta	Ud	67,23
U39VF020	Sñ.circular D=120 cm A.I.	Ud	181,06
U39VF070	Señal octogonal A-90	Ud	130,58
U39VM003	Poste tubo galvaniz.80x40x2mm	Ml	7,66
U39VM006	Poste galvanizado IPN 160	Ml	28,35
U39VM007	Poste galvan. CPN 120 de 1.5 m.	Ml	16,18
U39VM008	Poste tubo galvan.100x50x3 mm	Ml	15,33
U39VQ001	Juego de tornillería galvaniz	Ud	2,76
U39VS001	Captafaros	Ud	3,07
U39VÑ003	Barrera seguri.doble onda gal	Ml	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 are calculated as a percentage applied to the direct costs of each unit of work. This percentage is obtained using the formula:

$$K = V + J$$

Where:

- V: Percentage corresponding to general expenses (5%)
- J: Percentage allocated to unforeseen events (1%)

Therefore, the total coefficient applied to direct costs is 6%.

4. BROKEN DOWN PRICES

CUADRO DE PRECIOS UNITARIOS

CÓDIGO	CANTIDAD	UD.	RESUMEN	PRECIO	SUBTOTAL	IMPORTE
D38AN015		M2	DESPEJE Y DESBROCE DEL TERRENO			
			M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.			
U39AT002	0,004	H.	Trac. s/orug. bull. 140 cv	28,38	0,11	
U39AB004	0,003	H.	Pala neumáticos CAT.950	23,97	0,07	
U39AH024	0,012	H.	Camión basculante 125cv	17,50	0,21	
%0100000	0,004	%	Costes indirectos.../s/total)	3,00	0,01	
			COSTE UNITARIO TOTAL			0,40
D38AP024		M3	EXCAVITTE.DTE.ROCA CON VOLADURA			
			M3. Excavación en zonas de desmonte en roca, mediante voladura incluso carga, descaraga y transporte a vertedero o lugar de empleo.			
U01AA006	0,010	Hr	Capataz	25,84	0,26	
U01AA007	0,020	Hr	Oficial primera	25,67	0,51	
U01AA011	0,010	Hr	Peón ordinario	21,82	0,22	
U39AW001	0,030	H.	Wagon-drill s/ruedas 0.6 tm	5,52	0,17	
U39AY002	0,080	H.	Compr. movil 6 martill.150 cv	16,55	1,32	
U39AT001	0,003	H.	Trac. s/orug.bull.410 cv D-9	61,15	0,18	
U39AB006	0,008	H.	Pala s/neumaticos CAT.980	39,66	0,32	
U39AH010	0,050	H.	Camión basculante 16 tm	26,10	1,31	
U39ZK001	0,350	Kg	Dinamita i/detonante y acceso	2,15	0,75	
%0100000	0,050	%	Costes indirectos.../s/total)	3,00	0,15	
			COSTE UNITARIO TOTAL			5,19
D38AP039		M3	EXCAVITTE TUNEL CON EXPLOSIVOS			
			M3. Excavación en túnel bóveda en terreno duro, caliza o similar, con explosivos, agotamiento de agua, carga mediante pala cargadora en camión basculante y transporte de productos a vertedero i/p.p. de medios auxiliares.			
U01AA006	0,200	Hr	Capataz	25,84	5,17	
U01AA007	0,400	Hr	Oficial primera	25,67	10,27	
U01AA011	1,400	Hr	Peón ordinario	21,82	30,55	
U39AB005	0,200	H.	Pala s/orugas CAT.955	26,79	5,36	
U39AH024	0,200	H.	Camión basculante 125cv	17,50	3,50	
U39AY003	0,200	H.	Compr. movil 2 martill.	6,74	1,35	
U39ZK001	0,800	Kg	Dinamita i/detonante y acceso	2,15	1,72	
U39AX010	0,050	H.	Bomba de 6 cv	24,52	1,23	
%0100000	0,592	%	Costes indirectos.../s/total)	3,00	1,78	
			COSTE UNITARIO TOTAL			60,93
D38AR015		M3	TERRAPLEN PROCEDENTE EXCAVACION			
			M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.			
U01AA006	0,010	Hr	Capataz	25,84	0,26	
U01AA011	0,035	Hr	Peón ordinario	21,82	0,76	
U39AD002	0,010	H.	Motoniveladora 130 cv	27,99	0,28	
U39AL005	0,010	H.	Camión cisterna/agua 140 cv	17,10	0,17	
U39AC007	0,020	H.	Compactador neumát.autp.100cv	29,73	0,59	
%0100000	0,021	%	Costes indirectos.../s/total)	3,00	0,06	
			COSTE UNITARIO TOTAL			2,12
D38CA015		ML	CUNETA TRIANGULAR REVESTIDA HM-15			
			ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 2/1-2/1 y profundidad 0.30 m.			
U04MA310	0,134	M3	Hormigón HM-15/P/40 central	57,12	7,65	
U39BF101	0,134	M3	Fabr. y tte. de hormigón	5,99	0,80	
U39BH125	1,340	M2	Encofr.desencofr.cimient.sole	3,49	4,68	
%0100000	0,131	%	Costes indirectos.../s/total)	3,00	0,39	
			COSTE UNITARIO TOTAL			13,52
D38CE530		UD	ARQ.DESAG.MEDIANA,DREN,COLECTOR			
			UD. Arqueta de desagüe de cuneta de mediana, dren y colector a terraplén.			
U01AA007	2,000	Hr	Oficial primera	25,67	51,34	
U01AA011	2,500	Hr	Peón ordinario	21,82	54,55	
U04MA510	1,943	M3	Hormigón HM-20/P/40/ I central	64,39	125,11	
U39BF101	1,943	M3	Fabr. y tte. de hormigón	5,99	11,64	
U39BH125	18,100	M2	Encofr.desencofr.cimient.sole	3,49	63,17	
U39FD001	1,836	M2	Rejilla fundici.tapas arqueta	28,87	53,01	
%0100000	3,588	%	Costes indirectos.../s/total)	3,00	10,76	
			COSTE UNITARIO TOTAL			369,58

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CUADRO DE PRECIOS UNITARIOS

CÓDIGO	CANTIDAD	UD.	RESUMEN	PRECIO	SUBTOTAL	IMPORTE
D38GA115		**M3**	**ZAHORRA ARTIFICIAL**			
			M3. Zahorra artificial, incluso extensión y compactación en formación de bases.			
U01AA006	0,005	Hr	Capataz	25,84	0,13	
U01AA011	0,050	Hr	Peón ordinario	21,82	1,09	
U39CE002	1,150	M3	Zahorra artificial	10,42	11,98	
U39AI012	0,010	H.	Equipo extend.base,sub-bases	40,18	0,40	
U39AH025	0,060	H.	Camión bañera 200 cv	23,63	1,42	
U39AC006	0,020	H.	Compactador neumát.autp. 60cv	13,74	0,27	
%0100000	0,153	%	Costes indirectos...(s/total)	3,00	0,46	
			COSTE UNITARIO TOTAL			**15,75**
D38GJ0010		**t**	**EMULSIÓN C60BF5 IMP**			
			Emulsión C60BF5 IMP en riego de imprimación, barrido y preparación de la superficie, totalmente terminado.			
U01AA006	0,120	Hr	Capataz	25,84	3,10	
U01AA007	0,480	Hr	Oficial primera	25,67	12,32	
U01AA011	0,480	Hr	Peón ordinario	21,82	10,47	
U39CE0020	1,000	t	Emulsion bituminosa C60BF5 IMP	305,00	305,00	
U39AL005	0,240	H.	Camión cisterna/agua 140 cv	17,10	4,10	
U39AG001	0,120	h	Barredora remát autropopulsad	6,20	0,74	
%CI	3,357	%	Costes indirectos...(s/total)	3,00	10,07	
			COSTE UNITARIO TOTAL			**345,80**
D38GJ0015		**t**	**EMULSIÓN C60B3 ADH**			
			Emulsión C60B3 ADH en riegos de imprimación i/ el barrido y la preparación de la superficie, totalmente terminado.			
U01AA011	0,960	Hr	Peón ordinario	21,82	20,95	
U01AA007	0,960	Hr	Oficial primera	25,67	24,64	
U01AA006	0,240	Hr	Capataz	25,84	6,20	
U39CE0021	1,000	t	Emulsión bituminosa C60B3 ADH	243,26	243,26	
U39AG001	0,240	h	Barredora remát autropopulsad	6,20	1,49	
U39AL005	0,480	H.	Camión cisterna/agua 140 cv	17,10	8,21	
%CI	3,048	%	Costes indirectos...(s/total)	3,00	9,14	
			COSTE UNITARIO TOTAL			**313,89**
D38GJ2001		**t**	**MBC AC 22 BIN 50/70 S CALIZA**			
			TM. Mezcla bituminosa en caliente tipo AC 22 BIN 50/70 S CALIZA incluso betún y filler, totalmente extendida y compactada.			
U01AA006	0,017	Hr	Capataz	25,84	0,44	
U01AA007	0,083	Hr	Oficial primera	25,67	2,13	
U01AA011	0,067	Hr	Peón ordinario	21,82	1,46	
U39BK205	0,017	h	Planta asfáltica en caliente	516,00	8,77	
U39AI008	0,017	h	Extendedora aglomerado	118,00	2,01	
U39AE001	0,017	h	Compactador tandem autopropulsado de 10 t	65,00	1,11	
U39AC007	0,017	H.	Compactador neumát.autp.100cv	29,73	0,51	
U39AH005	0,009	H.	Camión basculante 10 tm	11,99	0,11	
U39DA002	0,045	t	Betún asfáltico B 50/70	650,00	29,25	
U39CQ002	0,952	t	Polvo mineral de aportación	56,47	53,76	
%CI	0,996	%	Costes indirectos...(s/total)	3,00	2,99	
			COSTE UNITARIO TOTAL			**102,54**
D38GJ2002		**t**	**MBC AC 16 SURF 50/70 D OFITA**			
			TM. Mezcla bituminosa en caliente tipo AC 16 SURF 50/70 CALIZA incluso betún y filler, totalmente extendida y compactada.			
U01AA006	0,017	Hr	Capataz	25,84	0,44	
U01AA007	0,083	Hr	Oficial primera	25,67	2,13	
U01AA011	0,067	Hr	Peón ordinario	21,82	1,46	
U39BK205	0,017	h	Planta asfáltica en caliente	516,00	8,77	
U39AI008	0,017	h	Extendedora aglomerado	118,00	2,01	
U39AE001	0,017	h	Compactador tandem autopropulsado de 10 t	65,00	1,11	
U39AC007	0,017	H.	Compactador neumát.autp.100cv	29,73	0,51	
U39AH005	0,012	H.	Camión basculante 10 tm	11,99	0,14	

CUADRO DE PRECIOS UNITARIOS

CÓDIGO	CANTIDAD	UD.	RESUMEN	PRECIO	SUBTOTAL	IMPORTE
U39DA002	0,055	t	Betún asfáltico B 50/70	650,00	35,75	
U39CQ002	0,952	t	Polvo mineral de aportación	56,47	53,76	
%CI	1,061	%	Costes indirectos...(s/total)	3,00	3,18	
			COSTE UNITARIO TOTAL			**109,26**
D38IC050		**u**	**POSTE IPN-160**			
			ML. Poste galvanizado IPN-160, colocado.			
U01AA007	0,125	Hr	Oficial primera	25,67	3,21	
U01AA011	0,250	Hr	Peón ordinario	21,82	5,46	
U39AH003	0,012	H.	Camión 5 tm	9,10	0,11	
U39VM006	1,000	Ml	Poste galvanizado IPN 160	28,35	28,35	
%0100000	0,371	%	Costes indirectos...(s/total)	3,00	1,11	
			COSTE UNITARIO TOTAL			**38,24**
D38ID130		**UD**	**SEÑAL TRIANGULAR P 90**			
			UD. Señal reflectante triangular tipo P L=90 cm., i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.			
U01AA006	0,200	Hr	Capataz	25,84	5,17	
U01AA011	1,200	Hr	Peón ordinario	21,82	26,18	
U39AH003	0,500	H.	Camión 5 tm	9,10	4,55	
U39VF012	1,000	Ud	Señal tipo P L=90 cm.reflecta	67,23	67,23	
U39VM003	3,000	Ml	Poste tubo galvaniz.80x40x2mm	7,66	22,98	
U04MA310	0,125	M3	Hormigón HM-15/P/40 central	57,12	7,14	
%0100000	1,333	%	Costes indirectos...(s/total)	3,00	4,00	
			COSTE UNITARIO TOTAL			**137,25**
D38ID165		**UD**	**SEÑAL CIRCULAR 120**			
			UD. Señal reflectante circular D=120 cm. alta intensidad, i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.			
U01AA006	0,200	Hr	Capataz	25,84	5,17	
U01AA011	1,200	Hr	Peón ordinario	21,82	26,18	
U39AH003	0,500	H.	Camión 5 tm	9,10	4,55	
U39VF020	1,000	Ud	Sñ.circular D=120 cm A.I.	181,06	181,06	
U39VM008	4,500	Ml	Poste tubo galvan.100x50x3 mm	15,33	68,99	
U04MA310	0,130	M3	Hormigón HM-15/P/40 central	57,12	7,43	
%0100000	2,934	%	Costes indirectos...(s/total)	3,00	8,80	
			COSTE UNITARIO TOTAL			**302,18**
D38ID170		**UD**	**SEÑAL OCTOGONAL 90**			
			UD. Señal octogonal A-90, i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.			
U01AA006	0,200	Hr	Capataz	25,84	5,17	
U01AA011	1,200	Hr	Peón ordinario	21,82	26,18	
U39AH003	0,500	H.	Camión 5 tm	9,10	4,55	
U39VF070	1,000	Ud	Señal octogonal A-90	130,58	130,58	
U39VM003	3,500	Ml	Poste tubo galvaniz.80x40x2mm	7,66	26,81	
U04MA310	0,130	M3	Hormigón HM-15/P/40 central	57,12	7,43	
%0100000	2,007	%	Costes indirectos...(s/total)	3,00	6,02	
			COSTE UNITARIO TOTAL			**206,74**
D38IM060		**ML**	**DEFENSA SEMIRIGIDA**			
			ML. Defensa semirrígida terraplén hincada, i/parte proporcional de poste, captafaros, separador y colocación.			
U01AA006	0,075	Hr	Capataz	25,84	1,94	
U01AA007	0,150	Hr	Oficial primera	25,67	3,85	
U01AA011	0,300	Hr	Peón ordinario	21,82	6,55	
U39AQ001	0,075	H.	Maqui.hinca postes barre.segu	10,12	0,76	
U39AH005	0,075	H.	Camión basculante 10 tm	11,99	0,90	
U39VÑ003	1,000	Ml	Barrera seguri.doble onda gal	11,04	11,04	
U39VM007	0,250	Ml	Poste galvan. CPN 120 de 1.5 m.	16,18	4,05	
U39VQ001	0,250	Ud	Juego de tornillería galvaniz	2,76	0,69	
U39ZH001	0,250	Ud	Separador	4,29	1,07	
U39VS001	0,250	Ud	Captafaros	3,07	0,77	
%0100000	0,316	%	Costes indirectos...(s/total)	3,00	0,95	
			COSTE UNITARIO TOTAL			**32,57**
D38PA030		**M3**	**EXTENDIDO TIERRA VEGETAL**			
			M3. Extendido de tierra vegetal.			
U01AA011	0,009	Hr	Peón ordinario	21,82	0,20	
U39AH005	0,010	H.	Camión basculante 10 tm	11,99	0,12	
U39AB010	0,010	H.	Pala s/neumáticos (CAT-920)	17,72	0,18	
%0100000	0,005	%	Costes indirectos...(s/total)	3,00	0,02	
			COSTE UNITARIO TOTAL			**0,52**

CUADRO DE PRECIOS UNITARIOS

CÓDIGO	CANTIDAD	UD.	RESUMEN	PRECIO	SUBTOTAL	IMPORTE
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.			
U04PY001	0,150	M3	Agua	0,55	0,08	
U40MA615	1,000	M2	Manta orgánica biodegradable	1,38	1,38	
U40MA650	0,250	Kg	Mezcla completa hidrosiembra	0,79	0,20	
%0100000	0,017	%	Costes indirectos...(s/total)	3,00	0,05	
			COSTE UNITARIO TOTAL			1,71

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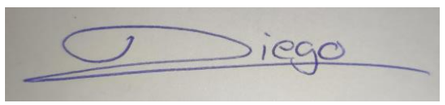

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5. ESTIMATED COSTS

PRESUPUESTO Y MEDICIONES

CÓDIGO	RESUMEN	UDS	LONGITUD	ANCHURA	ALTURA	CANTIDAD	PRECIO	IMPORTE
01	**EXPLANACIONES**							
0101	**TRABAJOS PRELIMINARES**							
01.01.01	**DESPEJE Y DESBROCE**							
D38AN015	M2 DESPEJE Y DESBROCE DEL TERRENO							
	M2. Despeje y desbroce del terreno por medios mecánicos incluso carga y transporte de productos a vertedero.					15.600,00	0,40	6.240,00
	TOTAL 01.01.01							**6.240,00**
	TOTAL 0101							**6.240,00**
01.02	**EXCAVACIONES**							
D38AP024	M3 EXCAV/TTE.DTE.ROCA CON VOLADURA							
	M3. Excavación en zonas de desmonte en roca, mediante voladura incluso carga, descaraga y transporte a vertedero o lugar de empleo.					2.255,41	5,19	11.705,58
D38AP039	M3 EXCAV/TTE TUNEL CON EXPLOSIVOS							
	M3. Excavación en túnel bóveda en terreno duro, caliza o similar, con explosivos, agotamiento de agua, carga mediante pala cargadora en camión basculante y transporte de productos a vertedero i/p.p. de medios auxiliares.					61.915,00	60,93	3.772.480,95
	TOTAL 01.02							**3.784.186,53**
01.03	**RELLENO EN TERRAPLÉN**							
D38AR015	M3 TERRAPLEN PROCEDENTE EXCAVACION							
	M3. Terraplén procedente de excavación incluso extensión, humectación y compactación hasta el 95% P.M. utilizando rodillo vibratorio.					29.562,10	2,12	62.671,65
	TOTAL 01.03							**62.671,65**
	TOTAL 01							**3.853.098,18**
02	**DRENAJE**							
D38CE530	UD ARQ.DESAG.MEDIANA,DREN,COLECTOR							
	UD. Arqueta de desagüe de cuneta de mediana, dren y colector a terraplén.					6,00	369,58	2.217,48
D38CA015	ML CUNETA TRIANGULAR REVESTIDA HM-15							
	ML. Cuneta triangular revestida de hormigón HM-15/P/40/IIA (e=0.10 m), taludes 2/1-2/1 y profundidad 0.30 m.					874,00	13,52	11.816,48
	TOTAL 02							**14.033,96**
03	**ESTRUCTURA**							
03.01	m2 PARTIDA ALZADA PUENTE ML					5.600,00	1.200,00	6.720.000,00
03.02	m PARTIDA ALZADA TUNEL ML					14.185,45	500,00	7.092.725,00
	TOTAL 03							**13.812.725,00**

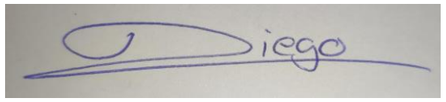
PRESUPUESTO Y MEDICIONES

CÓDIGO	RESUMEN	UDS	LONGITUD	ANCHURA	ALTURA	CANTIDAD	PRECIO	IMPORTE
04	**FIRMES**							
04.01	**CAPAS GRANULARES**							
D38GA115	M3 ZAHORRA ARTIFICIAL							
	M3. Zahorra artificial, incluso extensión y compactación en formación de bases.					10.968,00	15,75	172.746,00
	TOTAL 04.01							**172.746,00**
04.02	**RIEGOS DE IMPRIMACIÓN Y ADHERENCIA**							
D38GJ0010	t EMULSIÓN C60BF5 IMP							
	Emulsión C60BF5 IMP en riego de imprimación, barrido y preparación de la superficie, totalmente terminado.					137,00	345,80	47.374,60
D38GJ0015	t EMULSIÓN C60B3 ADH							
	Emulsión C60B3 ADH en riegos de imprimación i/ el barrido y la preparación de la superficie, totalmente terminado.					137,00	313,89	43.002,93
	TOTAL 04.02							**90.377,53**
04.03	**MEZCLAS BITUMINOSAS**							
D38GJ2001	t MBC AC 22 BIN 50/70 S CALIZA							
	TM. Mezcla bituminosa en caliente tipo AC 22 BIN 50/70 S CALIZA incluso betún y filler, totalmente extendida y compactada.					6.169,50	102,54	632.620,53
D38GJ2002	t MBC AC 16 SURF 50/70 D OFITA							
	TM. Mezcla bituminosa en caliente tipo AC 16 SURF 50/70 CALIZA incluso betún y filler, totalmente extendida y compactada.					3.684,25	109,26	402.541,16
	TOTAL 04.03							**1.035.161,69**
	TOTAL 04							**1.298.285,22**
05	**SEÑALIZACIÓN, BALIZAMIENTO Y DEFENSAS**							
05.01	**SEÑALES**							
D38ID130	UD SEÑAL TRIANGULAR P 90							
	UD. Señal reflectante triangular tipo P L=90 cm., i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.					2,00	137,25	274,50
D38ID170	UD SEÑAL OCTOGONAL 90							
	UD. Señal octogonal A-90, i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.					3,00	206,74	620,22
D38ID165	UD SEÑAL CIRCULAR 120							
	UD. Señal reflectante circular D=120 cm. alta intensidad, i/p.p. poste galvanizado, tornilleria, cimentación y anclaje, totalmente colocada.					2,00	302,18	604,36

PRESUPUESTO Y MEDICIONES

CÓDIGO	RESUMEN	UDS	LONGITUD	ANCHURA	ALTURA	CANTIDAD	PRECIO	IMPORTE
D38IC050	u POSTE IPN-160							
	ML. Poste galvanizado IPN-160, colocado.					7,00	38,24	267,68
	TOTAL 05.01							**1.766,76**
05.02	**DEFENSA**							
D38IM060	ML DEFENSA SEMIRIGIDA							
	ML. Defensa semirrígida terraplén hincada, i/parte proporcional de poste, captafaros, separador y colocación.					437,00	32,57	14.233,09
	TOTAL 05.02							**14.233,09**
	TOTAL 05							**15.999,85**
06	**PLANTACIONES**							
D38PA030	M3 EXTENDIDO TIERRA VEGETAL							
	M3. Extendido de tierra vegetal.					734,34	0,52	381,86
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.					3.084,75	1,71	5.274,92
	TOTAL 06							**5.656,78**
07	**GESTION DE RESIDUOS**							
	TOTAL 07							**4.587,00**
08	**SEGURIDAD Y SALUD**							
08.01	SEGURIDAD Y SALUD					1,00	27.854,46	27.854,46
	TOTAL 08							**27.854,46**
	TOTAL							**19.032.240,45**

Santander, July 2025



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ANNEX Nº6. – EXECUTION PLAN

Index

COSTRUCTION SCHEDULE

1. COSTRUCTION SCHEDULE INTRODUCTION

This appendix presents the timeline of the tasks planned for project execution, as well as their corresponding schedule. To do this, the time required for each activity is estimated based on the expected output for each work unit. Based on these durations, a Gantt chart is created to visualize the sequence and overlap of tasks.

2. PROGRAMMING OF THE WORK

The calculation of the execution time for each work unit is carried out using a formula that determines the number of hours required, taking into account both the performance of the resources (human or mechanical) and the operational efficiency of the project:

$$Horas\ necesarias = \frac{Rendimiento\ limitante * medición}{eficiencia\ de\ la\ obra}$$

Construction efficiency measures the actual time an operator or machine spends compared to the scheduled time. The estimated average efficiency is 80%.

Once the hours required for the execution of the entire work unit have been obtained, the required days are obtained by dividing between the working day (8 h/day) and its equivalent in months, considering 22 working days per month.

Certain work units may overlap and be developed simultaneously, with several teams of labor and machinery working at the same time. In these cases, the longest of the overlapping work units' execution times will be taken.

2.1. RELATIONS OF PREDECESSION AND SUCCESSION

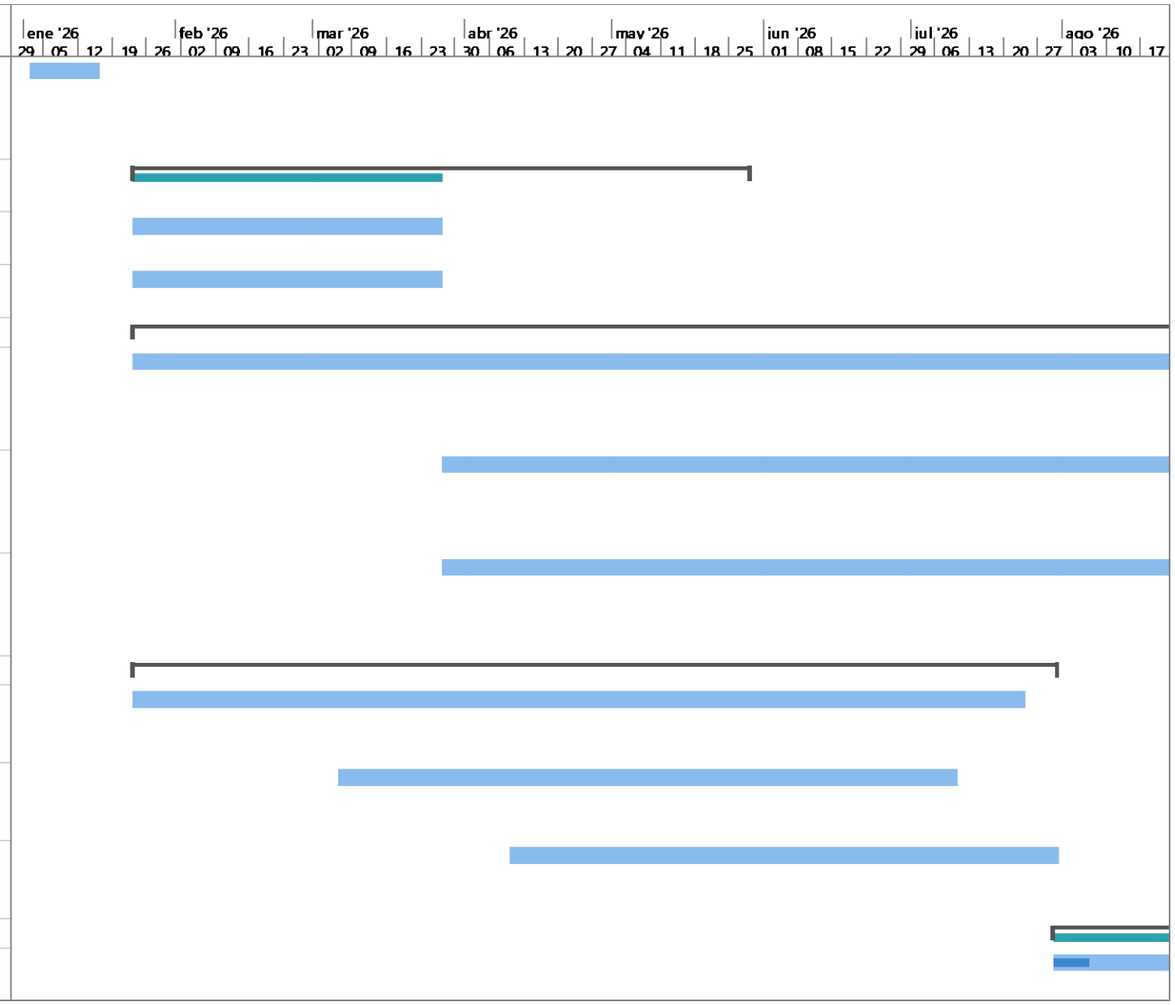
Four types of logical links between tasks are considered, which define their temporal sequence:

- **Finish-Start (FC)** : The successor task starts once the predecessor task has finished.
- **Finish-Finish (FF)** : both tasks complete at the same time.
- **Start-Start (CC)** : Both tasks start simultaneously.
- **Start-Finish (CF)** : The successor task finishes when the predecessor task starts.

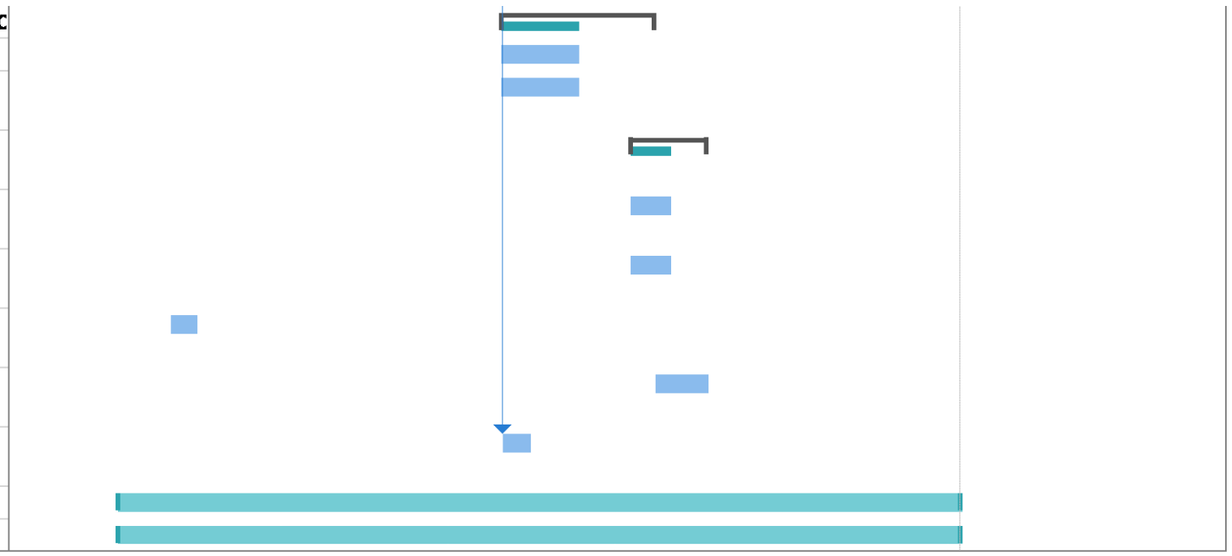
In addition, it is possible to incorporate time lags (leads or delays) between activities, expressed in days, to more precisely adjust the schedule.

3. CONSTRUCTION PLAN

Id	Modo de tarea	Nombre de tarea	Duración	Comienzo	Fin	Predecesoras	Nombres de los recursos
4		Desbroce, limpieza y señalización provisional	10 días	vie 02/01/26	jue 15/01/26		
5		**Movimiento de tierras**	**90 días**	**vie 23/01/26**	**jue 28/05/26**		
6		Excavaciones generales	45 días	vie 23/01/26	jue 26/03/26	3CC	
7		Explanaciones por tramos	45 días	vie 23/01/26	jue 26/03/26	3CC+10 días	
8		**Túneles**	**255 días**	**vie 23/01/26**	**jue 14/01/27**		
9		Túnel 1: Emboquilles + Excavación + Revestimiento	180 días	vie 23/01/26	jue 01/10/26	**3CC+15 días**	
10		Túnel 2: Emboquilles + Excavación + Revestimiento	210 días	vie 27/03/26	jue 14/01/27	**3CC+60 días**	
11		Túnel 3: Emboquilles + Excavación + Revestimiento	150 días	vie 27/03/26	jue 22/10/26	**3CC+60 días**	
12		**Puentes**	**135 días**	**vie 23/01/26**	**jue 30/07/26**		
13		Puente 1: Cimentación + Estructura +	130 días	vie 23/01/26	jue 23/07/26	**3CC+15 días**	
14		Puente 2: Cimentación + Estructura +	90 días	vie 06/03/26	jue 09/07/26	**3CC+45 días**	
15		Puente 3: Cimentación + Estructura +	80 días	vie 10/04/26	jue 30/07/26	**3CC+70 días**	
16		**Drenaje**	**20 días**	jue 30/07/26	mié 26/08/26	**3FC-10 días**	
17		Drenaje longitudinal	20 días	jue 30/07/26	mié 26/08/26		



18		**Firme**	**60 días**	jue 30/07/26	**mié 21/10/26**	**4FC+10 días;5FC**
19		Zahorras	30 días	jue 30/07/26	mié 09/09/26	11CC
20		Mezclas bituminosas	30 días	jue 30/07/26	mié 09/09/26	11CC+15 días
21		**Señalización y balizamiento**	**30 días**	**vie 09/10/26**	**jue 19/11/26**	**11FC-10 días**
22		Señalización vertical	15 días	vie 09/10/26	jue 29/10/26	12CC
23		Señalización horizontal	15 días	vie 09/10/26	jue 29/10/26	12CC+10 días
24		Sistemas de contención	10 días	vie 30/01/26	jue 12/02/26	**12CC+5 días**
25		Integración ambiental	20 días	vie 23/10/26	jue 19/11/26	11
26		Finalización y puesta en servicio	10 días	vie 31/07/26	jue 13/08/26	12;13
27		Gestión de residuo	330 días	jue 01/01/26	mié 07/04/27	1
28		Seguridad y salud	330 días	jue 01/01/26	mié 07/04/27	1



MEMORY

Index

1. INTRODUCTION

This document presents the Health and Safety Study in compliance with the guidelines contained in Royal Decree 1627/1997, of October 24, which establishes minimum health and safety provisions for construction projects. Its objective is to prevent workplace accidents, occupational diseases, and injuries to third parties that may occur during the construction of the N-629 bypass through Lanestosa.

According to what is mentioned in article 4 of said law, a Health and Safety Study will be required when the following conditions are met:

- The contracted execution budget included in the project is equal to or greater than 75 million pesetas (approx. 450,000 euros).
- The estimated duration is greater than 30 working days, with more than 20 workers being employed simultaneously at some point.
- The estimated labor volume, meaning the sum of the working days of all workers on the project, is greater than 500.
- Work on tunnels, galleries, underground pipelines and dams is being carried out.

Therefore, since all conditions are met in this project, it requires a Health and Safety Study.

This study examines the specifics of the construction project—including materials, work units, construction processes, and machinery used—with the aim of identifying risks that may affect worker health. Based on this analysis, a series of preventive measures are established to ensure safety and health in the workplace. These measures will be mandatory for all personnel involved in the project.

The Study includes the budget for the health and safety elements required during execution, as well as the associated price tables and measurements. It also includes the Terms and Conditions (Tender Documents) with the technical specifications for these elements, which must be strictly observed during the execution of the works.

2. CHARACTERISTICS OF THE WORK

2.1. DESCRIPTION OF THE WORK

The project involves building a road bypass on Highway N -629 as it passes through the town of Lanestosa to divert traffic away from the area.

The planned route contemplates a design speed of 90 km/h. The typical section consists of a roadway with two 3.5-meter-wide lanes, one in each direction, accompanied by 1.5-meter-wide shoulders. The bypass begins and ends at two newly constructed intersections, which will connect it to the existing road network.

Along its 2,788 meters in length, the route includes three tunnels and two viaducts that allow it to overcome the complex surface over which the project will run. However, the construction of these structures is not part of the current project.

2.2. PLANNED STAFF

Due to the complexity of the work, a maximum number of workers on site of around 25 is expected.

2.3. HEALTH CENTERS AND EMERGENCIES

- Lanestosa Health Center:
  - Plaza José María Makua Zarandona, 1, 48895 Lanestosa (Vizcaya).
  - Telephone: 946 10 71 34.
- Municipal Civil Protection and Emergency Service of Ramales de la Victoria – 6 km:
  - Mazo Neighborhood 10A, 39800 Ramales de la Victoria (Cantabria).
  - Telephone: 689 69 61 28.
- IMQ Castro Medical Center – Castro Urdiales – 35 km:
  - C. Javier Echevarría, 5, 39700 Castro-Urdiales (Cantabria).
  - Telephone: 942 06 12 88.
- DYA Cantabria – Emergencies and Rescue – 35 km:
  - C/ Leonardo Rucabado , 9, 39700 Castro-Urdiales (Cantabria)
  - Telephone: 942 86 03 00 .
- MEDICUR 24 Hours – Laredo – 40 km:

- C/ Comandante Villar, 13, 39770 Laredo (Cantabria).
- Telephone: 942 60 69 83

Likewise, the construction company must have a Health Center from the Mutual Insurance Company they have contracted.

- Useful phone numbers:
  - Emergencies: 112
  - Civil Guard: 062
  - Ertzaintza: 900 103 584

3. CONSTRUCTION UNITS

3.1. PREVIOUS WORK

- Topographical redesign of the layout and unique elements.
- Conditioning of temporary access roads and construction roads.
- Installation of booths, warehouses and auxiliary services.
- Execution of temporary water and power intakes.
- Removal of existing enclosures that interfere with the work.
- Temporary construction signage in accordance with current regulations.

3.2. EARTH MOVEMENTS

- Clearing and surface cleaning of natural terrain.
- Removal, storage and preservation of the topsoil layer for later reuse.
- Excavation in clearing and clearing of land.
- Construction of embankments with layer compaction.
- Slope profiling and stabilization.
- Formation of the esplanade using selected and compacted soils.

3.3. DRAINAGE

- Longitudinal drainage: construction of gutters, installation of collectors, drain pipes, downpipes and inspection chambers.

3.4. FIRM

- Spreading and compaction of the granular subbase.
- Execution of pavement layers using hot bituminous mixtures.

3.5. SIGNALING

- Application of horizontal road markings.
- Installation of regulatory vertical signage.
- Installation of vehicle restraint systems

3.6. ENVIRONMENTAL INTEGRATION

- Spreading of topsoil on slopes and affected areas.
- Hydroseeding for revegetation and slope stabilization.

3.7. COMPLETION WORKS

- Removal of auxiliary installations and temporary elements.
- Replacement of affected access roads and paths.
- Reconstruction of enclosures removed during the work.
- Restoration of affected services (supply networks, sanitation, electricity, etc.).

4. MACHINERY, EQUIPMENT AND PLANTS

Earthmoving machinery

- Crawler and pneumatic tractors.
- Front loaders.
- Mixed and rotating backhoes.

- Motor graders for profiling.
- Smooth compaction rollers and crowbar.
- Articulated and rigid trucks for earth transport.

Concrete pouring equipment:

- On-site or off-site concrete manufacturing plants.
- Cement mixer trucks.
- Self-propelled concrete pumps.
- Electric or pneumatic vibrators for compaction.

Media for pavements and road surfaces:

- Bituminous mixture manufacturing plants.
- Asphalt pavers.
- Vibrating roller compactors.
- Dump trucks for transporting mix.

Stockpiles and storage:

- Land and aggregate storage areas.
- Storage of pipes, prefabricated elements, ironwork, etc.
- Warehouses for chemicals, paints, release agents, and fuels.

Auxiliary facilities:

- Aggregate crushing plant.
- Classification and screening plant.
- Fixed and mobile conveyor belts.
- Temporary electrical installations for construction work.

Machinery and tools:

- Crane truck for lifting elements.
- Air compressors.
- Mechanical sweepers.
- Tanker trucks for irrigation and dust control.
- Self-propelled marker for horizontal marking.
- Hydroseeder .
- Post driver machine .
- Road painting machine.

5. AUXILIARY MEANS

- Ladders.
- Approved metal scaffolding.

6. HAND TOOLS

- Chainsaw for spot clearing.
- Brushes, paintbrushes and rollers for finishes.
- Level, ruler, set square and plumb line for geometric control.
- Hand tools: pick, shovel, hoe, pickaxe.
- Bow saw.
- Ironworker's pliers.
- Basic tools: hammers, pliers, pincers.

7. RISK IDENTIFICATION

7.1. TO WORK ACTIVITIES

Earthworks:

Clearing and brush cutting:

- Medium danger.
- Means of execution:
  - Removal of sparse vegetation, debris and topsoil using a tractor.
  - Transport of waste to an authorized landfill using a dump truck.
  - Collection and storage of topsoil for later reuse using a loader.

- Associated risks:
    - Projection of particles during removal.
    - Landslides due to poor positioning of machinery.
    - Accidents caused by construction vehicles
    - Falls at the same level.
    - Wounds caused by sharp or cutting objects.
    - Insect bites.
    - Presence of suspended dust.
    - Dust clouds that reduce visibility.
    - Exposure to high noise levels.

Felling and removal of trees:

- Low danger.
- Means of execution:
    - Felling trees using a tractor, chainsaw, axes or other hand tools.
    - Chopping of trunks and branches.
    - Transportation of unusable waste to landfills using dump trucks.
- Associated risks:
    - Cuts and amputations from cutting tools.
    - Injuries caused by impact from branches or splinters.
    - Insect bites.
    - Run over by machinery.
    - Falls at the same and different levels.
    - Entrapment due to uncontrolled tree fall.
    - Suspended dust and dust clouds.
    - Exposure to high noise.

Excavation by mechanical means:

- High danger.
- Means of execution:
    - Excavation with a tracked backhoe.
    - Transportation of excavated material to landfill or reuse areas using dump trucks.
- Associated risks:
    - Run over and hit by heavy machinery.
    - Entrapment by moving parts of machinery.
    - Construction vehicle collisions and rollovers.
    - Falls at different levels.
    - Landslides or mudslides.
    - Induced subsidence in nearby structures.
    - Contact with power lines (direct or indirect).
    - Blows from tools or objects.
    - Falling objects from a height.
    - Flooding due to broken water pipes.
    - Fires or explosions due to rupture of gas or hydrocarbon pipelines.
    - Risk of explosion due to the presence of buried artifacts.
    - Suspended dust and reduced visibility.
    - Noise exposure.

Tunnel excavation with blasting:

- Very high danger.
- Means of execution:
    - Drilling of the tunnel face using a drilling jumbo or hydraulic hammers.
    - Loading explosives into the holes and performing controlled blasting.
    - Forced ventilation of the tunnel after blasting to evacuate gases.
    - Removal of excavated material (debris) with a loader or backhoe.
    - Transportation of the material to a landfill or storage area by trucks.
    - Front irrigation and galleries for dust control.
    - Primary support installation: bolting , mesh , shotcrete .
- Associated risks:
    - Accidental explosion during handling or loading of explosives.
    - Projection of rock fragments during blasting.
    - Presence of toxic gases or oxygen deficiency after blasting.

- Entrapment due to falling blocks or landslides from the front.
- People falling from different levels inside the tunnel.
- Machinery run over in confined spaces.
- Impacts from tools, equipment or materials.
- Contact with electrical cables or temporary installations.
- Prolonged exposure to suspended dust (silica).
- Exposure to high levels of noise and vibrations.
- Risk of fire due to gas build-up or electrical failures.
- Fatigue and thermal stress due to adverse environmental conditions.

Embankments and fills:

- High danger.
- Means of execution:
  - Land preparation with a crawler tractor.
  - Dumping of material with dump trucks.
  - Spread with tractor and leveled with motor grader.
  - Compaction with a roller compactor.
  - Surface irrigation with a tanker truck.
- Associated risks:
  - Run over and struck by machinery.
  - Entrapments by mobile equipment.
  - Collisions and overturns of machinery.
  - Falls at different levels.
  - Landslides.
  - Contact with power lines.
  - Blows from tools or objects.
  - Falling objects.
  - Suspended dust and reduced visibility.
  - High ambient noise.

Ditches:

- Low danger.
- Means of execution:
  - Excavation with a backhoe.
  - Stockpiling of soil at the edge of the ditch or transporting it to a landfill by truck.
- Associated risks:
  - Detachment of excavation walls.
  - Falls at the same and different levels.
  - Interference with buried electrical lines.
  - Flooding due to burst pipes or heavy rains.
  - Gas emissions due to broken pipes.
  - Blows from tools or objects.
  - Falling objects on workers.
  - Entrapment by machinery.
  - Run over by construction vehicles.
  - Damage to nearby structures.
  - Dust in suspension.
  - Noise.

Firms and pavements:

Firm:

- High danger.
- Means of execution:
  - Spreading of gravel with a paver, truck and compactor.
  - Application of primer and adhesion sprays with a tanker truck.
  - Asphalt paving using a paver fed by dump trucks.
  - Compaction with vibrating rollers.
- Associated risks:
  - Falls at the same level.
  - Run over by machinery.

- Hits and collisions between equipment.
- Accidents due to internal traffic at construction sites.
- Impact on nearby roads in service.
- Burns from contact with hot materials.
- Dehydration due to prolonged exposure to heat.
- Entrapment by moving parts of machinery.
- Suspended dust and reduced visibility.
- Noise exposure.

Affected services:

Electric Power Transmission Lines

- Low danger.
- Associated risks:
  - Falls from different levels during work at height or handling of elements.
  - Direct electrical contacts with active lines.
  - Indirect electrical contacts due to proximity or conductive tools.
  - Electrical contacts of machinery with overhead lines.
  - Diseases arising from work in adverse weather conditions.
  - Overexertion due to manual handling of elements or equipment.

Underground Electric Power Transmission Lines

- Low danger.
- Associated risks:
  - Accidental breakage of electrical conduits.
  - Direct electrical contacts during excavation.
  - Electrical contacts of machinery with buried elements.
  - Deep falls into trenches or manholes.
  - Diseases caused by exposure to adverse weather conditions.
  - Overexertion due to manual tasks in confined spaces.

Underground Water Pipelines

- Low danger.
- Associated risks:
  - Pipe breakage with risk of leakage.
  - Flooding in work areas.
  - Deep falls into ditches or wells.
  - Landslides in unsupported excavations.
  - Diseases caused by adverse weather conditions.
  - Overexertion from handling heavy or repetitive items.

Interference with tracks in service:

Removal and Replacement of Elements:

- Low danger.
- Associated risks
  - Hit by moving vehicles.
  - Inhalation of toxic gases from paints or solvents.
  - Invasion of the roadway with tools or materials.
  - Injuries from the use of hand tools.
  - Overexertion due to handling of elements.
  - Suspended dust and dust clouds that reduce visibility.
  - Exposure to environmental noise.

Lane closure:

- Low danger.
- Associated risks:
  - Vehicle accidents.
  - Vehicle lane changes.
  - Invasion of the roadway with tools or materials.
  - Noise exposure.

Lane Deviation:

- Medium danger:
- Associated risks:
    - Accidents against workers or users.
    - Road exits, rollovers or collisions between vehicles.
    - Invasion of the roadway with tools or materials.
    - Exposure to environmental noise.

Signaling, Beaconing and Vehicle Containment Systems:

Vertical signage:

- Medium danger.
- Means of execution:
    - Transport of signs and supports by truck.
    - Manual placement with specific tools.
- Associated risks:
    - Falls at the same or different levels during handling or installation.
    - Falling objects due to improper handling.
    - Overturning of machinery during loading or unloading operations.
    - Run over by moving vehicles or construction machinery.
    - Entrapment between structural elements or tools.
    - Overexertion from manual handling of loads.
    - Bumps and cuts caused by tools or materials during transport and assembly.
    - Exposure to high noise levels.

Safety bars:

- Medium danger:
- Means of execution:
    - Placement of barriers using a post -driving machine.
    - Use of hand tools and dump truck for transport and positioning.
- Associated risks:
    - Falls at the same and different levels.
    - Dropping of objects during handling.
    - Run over by machinery or vehicles.
    - Entrapments between structural elements.
    - Overexertion due to repetitive or poorly executed tasks.
    - Blows and cuts with tools or materials.
    - Exposure to environmental noise.

Road Markings

- Entity (order of magnitude): Medium
- Means for its execution:
    - Sweeper cleaning.
    - Painted with marker.
- Associated risks:
    - Falls at the same and different levels.
    - Paint splashes.
    - Run over by vehicles or machinery.
    - Overexertion.
    - Contact with harmful substances.

Drainage works:

General Drainage Works

- Entity (order of magnitude): Medium
- Means for its execution:
    - Land preparation with a tractor, loader or backhoe.
    - Pipe laying with a crane truck.
    - Concrete coating using vibrators.
    - Filling with shovels.
- Associated risks:
    - Crushing by falling suspended loads.
    - Burial by landslide.
    - Skin disease.
    - Wounds caused by tools or sharp objects.

- Vehicles falling into ditches.
- Overexertion.
- Dust in the environment.
- Dust clouds that reduce visibility.
- Noises and vibrations.
- Adverse environmental conditions.

Ditches

- Entity (order of magnitude): Medium
- Means for its execution:
  - Excavation with a backhoe.
  - Pouring concrete with a concrete mixer truck.
  - Finished with hand tools.
- Associated risks:
  - Falls at the same and different levels.
  - Landslide.
  - Skin disease.
  - Run over by machinery.
  - Overexertion.
  - Blows and cuts with tools.
  - Noises and vibrations.
  - Entrapment with moving parts.
  - Machinery overturning.
  - Adverse weather conditions.

Prefabricated Downpipes

- Entity (order of magnitude): Reduced
- Means for its execution:
  - Truck transport.
  - Unloading with a crane truck.
- Associated risks:
  - Falls at the same and different levels.
  - Landslide.
  - Fall of suspended elements.
  - Run over by machinery.
  - Overexertion.
  - Blows and cuts with tools.
  - Entrapments.
  - Machinery overturning.
  - Adverse environmental conditions.

<u>Environmental integration:</u>

Hydroseeding

- Entity (order of magnitude): Reduced
- Means for its execution:
  - Transport and spreading of topsoil with a dump truck and shovel.
  - Application of mixture with hydroseeder .
- Associated risks:
  - Falls at the same and different levels.
  - Landslide.
  - Run over by machinery.
  - Impacts against moving objects.
  - Thermal contacts.
  - Electrical contacts.
  - Inhalation or ingestion of harmful or toxic substances.
  - Fires and explosions.
  - Traffic accidents.
  - Noise exposure.

7.2. RISK ACCORDING TO THE MACHINERY USED

Earthworks

Tractors

- People being run over or hit by moving machinery.
- Slides or overturns on inclined planes.
- Loss of control due to driver abandonment without the brakes activated.
- Falls to different levels from the machine.
- Collisions with other machines or vehicles.
- Contact with overhead or buried power lines.
- Entrapment by tools or transmissions.
- Burns during maintenance tasks.
- Impacts or projections of ground materials.
- Vibrations transmitted by the machine.
- Presence of dust and dust clouds that reduce visibility.
- Noise exposure.

Loaders

- Risks similar to tractors, with special attention to:
- Collapse of slopes or excavation fronts.
- Risk of exhaust gases in the cabin.

Motor graders

- Risks similar to the previous ones, highlighting:
- Improper blade position.
- Risk when reversing maneuvers.
- Stability when moving on slopes.

Backhoes

- Common risks to earthmoving machinery, with emphasis on:
- Collapse of excavation fronts.
- Maneuvers in parallel with other machines.
- Improper use as a crane without specific measures.

Compactors

- Similar risks, including:
- Low back pain due to vibrations.
- Need to delimit the work area.

Trucks

- Traffic accidents at access points and detours.
- Spillage of transported materials.
- Common risks of run-over, rollover, collision, and electrical contact.
- Risks due to inadequate maintenance.
- Dust, vibrations, noise and fumes.

Concreting

Concrete Plants

- Falls at different and same levels.
- Direct and indirect electrical contacts.
- Crushing by suspended loads.
- Entrapments, burns, dermatoses.
- Puncture wounds.
- Noise exposure.

Concrete Mixer Truck

- Similar risks to trucks, with special attention to:
- Maneuvers in trenches or inclined planes.
- Vibrations and dust.

Self-propelled concrete pump

- Previous risks plus:
- Projection of concrete on workers.
- Hose lashes.
- Dry concrete plugs.

Vibrators

- Electrical contacts.
- Blows to workers.
- Overexertion and low back pain.
- Hose bursts.
- Noise exposure.

Manufacturing and Installation of Pavements and Pavements

Bituminous Mixing Plants

- Falls, electrical contacts, entrapment.
- Burns, fires, harmful fumes.
- Wounds and noise.

Chipboard Paver

- Run overs, falls, collisions.
- Entrapments, burns, vibrations.
- Fires and fumes.

Tire Compactor

- Road accidents.
- Common hazards include tip-over, entrapment, dust, and noise.

Self-propelled Vibrating Roller

- Similar risks, with emphasis on:
- Stability on inclined surfaces.
- Bituminous emissions.

Dump Truck

- Traffic risks, rollover, accident.
- Electrical contact, entrapment, fumes.
- Dust, noise and reduced visibility.

Stockpiles and Storage

Stockpiling of Land and Aggregates

- Landslides.
- Accidents due to inappropriate location.
- Environmental damage.
- Dust in suspension.

Storage of Pipes, Prefabricated Elements and Rebar

- Similar risks, with:
- Collapse of stockpiling.
- Crushing, sprains.
- Overexertion.

Storage of Paints, Release Agents and Fuels

- Inhalation of toxic fumes.
- Risk of fire or explosion.
- Dermatosis and eye irritation due to contact or splashes.
- Environmental impacts due to leaks or spills.

Auxiliary facilities

Aggregate Crushing Plant

- Entrapment by moving parts.
- Direct and indirect electrical contacts.
- Falls at different and same levels.
- Entrapment by tools or transmissions.
- Burns during maintenance.
- Suspended dust and dust clouds.
- Noise exposure.

Aggregate Classification and Separation Plant

- Compartment collapse.
- Direct and indirect electrical contacts.
- Falls at different and same levels.
- Entrapment by tools or transmissions.
- Blows during the bowl throw.
- Dust in the environment and reduced visibility.
- Noise.

Temporary Electrical Installations

- Direct and indirect electrical contacts.
- Improper handling of switches or disconnectors.
- Power surge fires.
- Induction of dangerous magnetic fields.
- Noise exposure.

Miscellaneous machinery and tools

Crane Truck

- Travel accidents.
- Crane collisions and overturning.
- Landslides in nearby areas.
- Crushing by suspended loads.
- Electrical contact of the pen.
- Power surge fires.
- Entrapments and burns.

Compressors

- Fires and explosions.
- Blows from hose lashes.
- Particle projection.
- Bursts in hoses or nozzles.
- Inhalation of exhaust gases.
- Entrapments and burns.
- Noise.

Pneumatic Hammers

- Particle projection.
- Risks due to inexperience.
- Hammer blows.
- Overexertion and low back pain.
- Contact with buried power lines.
- Hose bursts.
- Dust, noise and vibrations.

Mountains

- Cuts or amputations.
- Blows from projected objects.
- Tool drops.
- Indirect electrical contacts.
- Puncture wounds.

- Power surge fires.
- Noise.

Nail Gun

- Accidental shootings.
- Hose bursts.
- Indirect electrical contacts.
- Falls of the tool or operator.
- Falls due to excessive push.

Welders

- Explosions due to overheating or flashback.
- Leak poisoning.
- Fires and burns.
- Team falls.
- Overexertion and crushing.
- Risks due to inexperience.

Lifting Machines

- Falls during assembly or maintenance.
- Machine overturns.
- Electrical contacts.
- Crushing by suspended loads.
- Power surge fires.
- Falls due to load drag or push.

Post Driving Machine

- Falls from the machine.
- Vehicle crashes.
- Contact with power lines.
- Entrapments and burns.
- Impacts or projections of materials.
- Dust, vibrations and noise.

Self-propelled marker

- Falls from the machine.
- Vehicle collisions.
- Entrapments.
- Burns.
- Vibrations.

Portable Drill

- Accidental drilling.
- Indirect electrical contacts.
- Falls of the equipment or operator.
- Stumbles.
- Noise.

Hand Tools

- Dropped tools.
- Falls of people.
- Burns.
- Blows or projections.
- Dust, vibrations and noise.

Ladders

- Falls at different levels.
- Falling objects.
- Impacts against moving objects.
- Entrapments.
- Slip or rollover.
- Breakage due to defects.

8. PREVENTIVE MEASURES

8.1. PREVENTIVE MEASURES ACCORDING TO WORK ACTIVITIES

Staking out

- The team leader must identify and communicate potential risks before the start of work.
- All workers will be provided with the necessary PPE: helmet, reflective vest, gloves, safety boots, among others.
- A prior on-site assessment will be carried out to evaluate the danger of the environment.

Land Clearing and Brush Clearance

- The area will be inspected to detect irregularities or unevenness that could cause machinery to overturn.
- Tree felling will be carried out by qualified personnel using a chainsaw, delimiting the area and assisting with felling with ropes.
- Stump removal will be done at low speed, using anchors and scarifiers.
- Weeds should preferably be removed with a brush cutter, avoiding the use of fire.
- Warning strips will be installed in areas with a risk of falling.
- The circulation of machinery near uneven surfaces without personnel guidance will be prohibited.
- The maximum speed limit on construction sites will be 20 km/h.
- Mandatory PPE: helmet, reflective clothing, rubber boots, waterproof suits, rubber gloves, hearing protectors, self-filtering masks, and anti-vibration belts and sashes.
- EPC: wooden barriers on ditches and slopes, construction signage.
- Periodic watering will be carried out to minimize suspended dust.

Felling of Trees Over 5 m

- A manager will oversee all operations and coordinate the team.
- All workers present will be verbally warned of the felling of the tree.
- Specific PPE: leather gloves, overalls, protective glasses.
- Slings and hooks shall have safety latches.
- Operations will be suspended in case of strong winds.

Excavations

- Preliminary inspection of the land before starting work.
- Periodic inspection of vehicles and machinery.
- Only qualified and accredited operators will operate machinery.
- Mandatory shoring in case of risk of collapse.
- The excavation front shall not exceed the attack height of the machine arm by more than 1 m.
- Signaling of minimum safety distances at the edge of the excavation.
- Slope crown protection with railings.
- It is prohibited to work at the foot of unstable or uncleaned slopes.
- Vehicles will not circulate less than 3 m from the edge of the slope.
- PPE: overalls, helmet, boots, waterproof suits, dust mask, anti-vibration belt , gloves.
- EPC: crossing platforms, handrails, toxic waste containers, traffic signs, ramp stops.

Embankments

- Periodic review of machinery and vehicles.
- It is prohibited to overload vehicles beyond the permissible limit.
- Only accredited personnel may operate machinery.
- Signage for access and internal routes.
- Each filling team will be under direct supervision.
- Access to persons within 5 m of compaction machinery is prohibited.
- Periodic watering to control dust.
- PPE: helmet, boots, dust mask, gloves, anti-vibration belt , work overalls.

Construction of gravel

- Mandatory supervision by a competent technician.
- The truck operator must have full visibility of the area and be assisted by another operator during unloading.

Pavement Construction with Bituminous Mixture

Bitumen Tank Operator:

- Warn with the horn before starting off and when reversing.
- Mandatory use of seat belts.
- Have a fire extinguisher in the cabin.
- Drive at low speed, taking extreme care around stones or obstacles.

Compactor Operator:

- Check brakes and reverse gear system before starting.
- Maintain safe distances, especially in areas with slopes.
- Place shims at the end of the day.

Paver Operator:

- Do not operate without delivery augers.
- Follow the instructions of the specialized personnel.
- Assume responsibility in the absence of the foreman.
- Common PPE: helmet, gloves, boots, overalls, goggles, hearing protectors, waterproof clothing.

Drainage

- Stockpiles will be placed with stops to prevent shifting.
- It is forbidden to stand under suspended loads.
- Transport maneuvers will be supervised by specialized personnel.
- Access to excavations will be via non-slip, secured ladders of appropriate length.
- PPE: overalls, helmet, boots, waterproof suits, dust mask, anti-vibration belt , gloves.
- EPC: platforms, handrails, toxic containers, guidance signs, ramp stops.

Signaling and Marking

- Workers must take extreme caution when installing signage on existing roads, due to the risk of collisions.
- The storage of signs, beacons, and auxiliary elements will be carried out exclusively in designated areas, avoiding interference with the movement of machinery.
- It is prohibited to light flames, create sparks, or perform welding work in areas where road markings are being applied or near stockpiles of paint and flammable materials.
- The use of the following personal protective equipment (PPE) will be mandatory:
- High visibility reflective overalls
- Safety helmet
- Safety boots
- Rainsuit
- Paint fume protection mask

Hydroseeding

- The use of a safety helmet will be mandatory throughout the operation.
- The machines used must be properly marked to ensure visibility by the operators.
- In areas with reduced visibility, an operator will be assigned to warn traffic of the presence of hydroseeding work.
- Hydroseeder operators must be aware of the risks associated with the chemicals present in the mixture.
- During the spraying of the mixture, extreme caution will be taken to avoid splashing other workers.
- The following PPE will be used:
- Safety helmet
- Face shield
- Safety gloves
- Safety boots
- Goggles
- Rainsuit
- Respiratory protection mask
- The following collective protection equipment (CPE) will be installed:
- Specific traffic signage
- Perimeter marking of the work area

8.2. PREVENTIVE MEASURES ACCORDING TO CONSTRUCTION MACHINERY

8.2.1. HEAVY MACHINERY

Reception of the Machine

- Each machine must have, in its documentation folder, the specific safety regulations for its operation.
- Every machine incorporated into the project must have an approved, sealed fire extinguisher with current inspections.
- anti-impact protection systems .
- Operators must be properly trained and certified to operate the machinery safely. Otherwise, they must be replaced or receive specific training.
- The use of cabins that present structural deformations due to previous rollovers will not be permitted.
- All machinery must be equipped with working lights and an audible reverse signal in good working order.

Using the Machine

- Before each shift, the correct operation of all controls will be verified.
- Access to the cabin with loose clothing, jewelry, or accessories that could get caught is prohibited.
- The horn will be sounded before starting any movement.
- The operator's seat must be properly adjusted to ensure a safe posture.
- Access to the machine must be via the designated steps and handholds only. Jumping from the machine to the ground is prohibited, except in an emergency.
- Only persons authorized by the Construction Management will be able to access the machine.
- Before starting the engine, the operator will check that all controls are in the neutral position.
- Before starting the march, it will be verified that there are no personnel in the vicinity.
- Chocks will be installed to immobilize the machine before releasing the brakes.
- In the case of starting with an auxiliary battery, extreme caution must be exercised and the maneuver must be coordinated between operators.
- On pneumatic machinery, the pressure must be controlled according to the manufacturer's specifications. During inflation, the operator must stand off the connecting axis.
- When leaving the machine, even for a short period, the implement will be lowered to the ground, the parking brake will be applied, and if the absence exceeds three minutes, the engine will be switched off.
- Any failure affecting the brakes or steering will result in the immediate shutdown of the machine until it can be repaired.
- It is prohibited to climb onto the moving machine.
- Driving or parking will not be permitted within 3 meters of the edge of ditches or slopes.
- When working on slopes, it will be necessary to ensure that there are no people or objects at the base that could be affected by landslides.
- Driving with lights on will be required if visibility is reduced by dust.
- It is prohibited to transport persons on the machine if it does not have an approved seat.
- The machine shall not be used beyond its mechanical capabilities or on excessive slopes.

On-Site Repairs and Maintenance

- Any breakdown must be corrected before resuming work.
- During maintenance, the machine will remain with the engine off, the tool resting on the ground, the handbrake engaged, and the roadway open.
- Do not place foreign objects on the machine to prevent fires.
- Do not open the radiator cap when hot.
- The oil change will be carried out when the engine is cold.
- When changing batteries, wear waterproof gloves and protective glasses.
- Any source of ignition should be avoided near batteries.
- Tools for handling batteries will be insulated.
- No metal objects shall be placed on the battery.
- Shielded batteries with covered terminals are preferred.
- During refueling, avoid the proximity of flames or sparks.
- The coolant level will be checked by first removing the internal pressure.
- To work on the electrical system, the engine must be turned off and the key removed.
- Before welding hydraulic pipes, they must be drained and cleaned of oil.

8.2.2. EARTHMOVING MACHINERY

Bulldozers and Tractors

- No speeds exceeding 3 km/h will be allowed during earthmoving work.
- Its use will only be permitted on slopes less than 50%.

- Before working on the base of the slope, loose materials (rocks, trees, etc.) will be inspected and the slope will be cleaned if necessary.

Loaders

- They must have a first aid kit accessible.
- The engine exhaust points will be checked to prevent gases from entering the cabin.
- They may only circulate on public roads if they are authorized.
- Before operating near wells or trenches, check that there are no personnel inside.
- Before traveling on new sections, the driver will inspect the terrain on foot.
- The engine will not be started without verifying that the area is clear of people.
- It is prohibited to transport or lift people in the bucket.
- During transport, the bucket will be kept as low as possible.
- Ascents or descents with a load will be done in short gears.
- On uneven terrain, drive at low speed.
- Operation with heavy loads in strong wind conditions will be avoided.
- Resting under the shadow cast by the stopped machine is prohibited.

Motor graders

- The operator will continuously check the position of the blade, adjusting it according to the terrain and the work phase.
- Always drive at a moderate speed.
- The horn will be used to warn of the presence of the machine, especially before starting to reverse.
- When leaving the machine, it must be secured and prevented from being started by unauthorized persons.
- The operator will wear a safety helmet whenever outside the cab.
- Maintenance tasks will be carried out with the machine stopped and the blade resting on the ground.
- The presence of persons in the motor grader work area will be prohibited.
- Extreme caution will be taken near slopes and ditches.
- During transfers, the blade will remain elevated and will not exceed the width of the machine.
- Before starting to reverse, the acoustic signal will be activated.
- Unauthorized persons, vehicles, or machinery will not be permitted to enter the work area.
- When the machine is stopped, the scarifier and blade will rest on the ground, without protruding beyond the width of the machine.

Backhoes

- Backhoes will be equipped with lights and a properly functioning reverse acoustic signal.
- Working or remaining within the reach of the excavator arm is prohibited.
- In the presence of other machines working in parallel, the assistance of a signalman will be required.
- Internal construction roads will be maintained in adequate condition to avoid muddy areas.
- If a clamshell bucket is used, it must remain closed and resting on the ground when leaving the machine.
- During travel, the bucket will remain supported on the machine to prevent rocking.
- Ascents or descents with loads will be carried out at reduced speed.
- Transporting people on the backhoe is prohibited.
- No maneuvers will be carried out without first activating the hydraulic immobilization supports.
- Operation with large loads in strong wind conditions will be prohibited.

Compactors

- The operator will be informed of the specific risks of using compactors.
- Only workers with proven experience will operate the machine.
- The land will be watered to reduce dust; in cases of high concentrations, a dust mask will be worn.
- The use of hearing protection (helmets or earplugs) will be mandatory.
- Elastic bands will be available to prevent lower back pain when using tampers or rollers.
- The compaction area will be closed to machinery and vehicle traffic.

Trucks and Dumpers

- The driver must have the appropriate license and comply with the highway code and construction signs.
- Internal circulation will be adjusted to what is established in the Health and Safety Plan.
- Loading and unloading operations will be carried out in designated areas.
- Vehicles must be kept in perfect condition.
- Before loading or unloading, the handbrake must be applied and chocks must be placed.
- Access to the box will be via ladders.

- Maneuvers on inclined planes will be directed by two workers using ropes; no one will be allowed at the edge of the plane.
- The maximum height of loose materials will not exceed 5% slope and will be covered with canvas.
- The load will be distributed evenly.
- The driver must wear gloves, safety boots, and a helmet when leaving the cab.
- Jumping from the box or load is prohibited, except in case of emergency.

dumper equipment :

- Front and rear backup lights.
- Turn signals.
- Position and beacon lights.
- Power assisted braking system and handbrake.
- Automatic backup horn.
- Roll-proof cabin.
- (Optional) Air conditioning, cover tarps, etc.

Daily pre-inspections:

- Engine, brakes, steering, lights, horns, tires, and hydraulic systems.
- Access to the cabin will be prohibited to unauthorized persons.
- The box will not be driven with raised.
- No fuels or flammable products shall be stored in the vehicle.
- A minimum distance of 10 m must be maintained from dumpers in operation.
- The load will be watered superficially to avoid dust.
- The manufacturer's maximum load shall not be exceeded.
- Danger and no-entry signs will be installed 15 m from the discharge points.

8.2.3. PAVEMENT AND ROAD MANUFACTURING AND INSTALLATION EQUIPMENT

Bituminous Mixture Manufacturing Plants

- Plants must have adequate lighting, fire extinguishing systems and visible signage.
- The location of the facilities will be planned taking into account the direction of the prevailing winds to avoid contamination of inhabited or frequently visited areas.
- Pipes carrying hot products will be thermally insulated to prevent burns and heat loss.
- A marked vehicle circulation circuit will be established, preventing the transit of people.
- Access points, stairs, platforms, and walkways located at a height of more than 2 meters must have collective protection.
- It is prohibited to light fires or create sparks in areas with flammable products.
- Inspection, cleaning, or maintenance tasks will only be carried out when the facility is shut down.
- Special attention will be paid to the condition of electrical installations, pipe joints, and temperature control of materials.

Asphalt Paver

- Only the operator may remain on the moving machine.
- Dumping operations in the hopper will be conducted by an experienced specialist.
- Auxiliary operators must stand on ditches or sidewalks, in front of the machine, while the hopper is being filled.
- The side edges will be marked with yellow and black bands to prevent entrapment.
- Multipurpose fire extinguishers in good condition will be placed on the platform.
- Access to the vibrating screed is prohibited during paving.

Tire Compactor

- Only the operator may remain on the machine.
- It must have visibility lights, position signals and an acoustic reversing signal.
- A metal staircase will be provided for access to the platform.
- The staircase and the edge of the platform will have non-slip coating.
- Tire pressure will be checked at the start of the day.
- The general condition of the machine will be monitored.
- It is prohibited to light fires or create sparks during refueling or battery checks.

Self-Propelled Tandem Compactor

- Only the operator may remain on the machine.
- Pedestrians should stand on the sidewalk or verge, in front of the compactor.
- Ladder and platform with non-slip surface.

- The operator must exercise extreme caution on inclined surfaces or layer edges.
- Systematic maintenance of the machine will be maintained.
- Smoking is prohibited during refueling or battery checks.
- anti-vibration seat or, failing that, an anti-vibration belt will be used .

Self-propelled Vibrating Roller

- Only the operator may remain on the roller.
- Workers in the pit must stand in front of the machine, on ditches or sidewalks.
- Ladder and platform with non-slip surface.
- The operator will pay special attention to the stability of the roller on slopes or edges.
- The status of the machine will be monitored.
- Training and supervision will be strengthened to prevent smoking during refueling or inspection operations.
- The use of an anti-vibration seat or anti-vibration belt will be guaranteed .

Dump Truck

- The driver must have a valid license and comply with the highway code and construction signs.
- During the coupling maneuver with the paver, you will follow the instructions of the foreman and the assistant.
- After unloading, the box must be lowered before resuming travel.
- The presence of electrical or telephone lines will be checked before lifting the box.
- Maintenance operations with the box elevated will be carried out with interlocking to prevent accidental lowering.

8.2.4. MISCELLANEOUS MACHINERY

Crane Truck

- Before operating, the vehicle will be immobilized with wheel chocks and stabilizing jacks.
- The maneuvers will be directed by a specialist.
- All lifting elements (hooks, slings, balancers) must have safety latches.
- The maximum authorized load will not be exceeded.
- The operator must have direct visibility of the load or act under the guidance of a signalman.
- Dragging loads is prohibited.
- No driving or parking shall be allowed within 2 m of the edge of ditches or excavations.
- The presence of persons within 5 m of the crane truck or under suspended loads is prohibited.
- No reversing without a signal or abandoning a truck with a suspended load.
- Only authorized personnel may access the cabin or operate the controls.
- PPE: leather gloves, non-slip footwear and safety helmet outside the cabin.

Compressors

- They will be placed more than 2 m from the edge of ditches or cuttings.
- Once positioned, they will be leveled and wedged.
- Refueling will be carried out with the engine off.
- Protective housings will remain closed except for maintenance.
- If the compressor is not silent, it must be properly marked and warned of the high sound pressure level. Hearing protection must be worn when in close proximity.
- The condition of hoses and nozzles will be checked periodically, paying special attention to possible bursts or leaks.

Mountains

- The saws must have the following protection elements:
- Dividing knife.
- Pusher and cutting guide.
- Disc cover casing.
- Protection of transmissions and pulleys.
- Waterproof switch.
- Grounding.
- They will be located in areas away from traffic and areas with risk of falling objects.
- They may only be used by personnel trained and authorized by the Site Manager.
- Mandatory PPE: leather gloves, protective glasses, dust mask, safety shoes, and elastic belt.
- The condition of the cutting disc and the cleanliness of the work area will be checked.
- A powder fire extinguisher will be provided next to the machine.

Fixed nail gun

- It may only be used by trained and authorized personnel.
- Extreme caution should be exercised if other workers are present in the vicinity.
- Mandatory PPE: helmet, leather gloves, wristbands or sleeves, safety glasses.

Oxyacetylene Welding and Oxycutting

- The supply, transportation and storage of gas cylinders will be carried out under strict control:
- Valves protected with caps.
- Transport in an upright position, tied down and in safety carts.
- Do not mix different gases in storage.
- Empty bottles will be treated as if they were full.
- They will not be exposed to the sun for long periods of time.
- They shall not be used in a horizontal position or with an inclination less than 45°.
- Lighters must have non-return valves on both lines.
- The hoses must be in good condition and without sharp bends.

Portable Drill

- They must have double electrical insulation and watertight compartments.
- It is forbidden to leave the drill connected and abandoned on the ground.
- Only specialized personnel may carry out repairs.
- Mandatory PPE: leather gloves, helmet, safety shoes and protective glasses.

Hand Tools

- Their condition will be checked before each use and they will be cleaned after use.
- They will be stored in specific boxes or shelves, never left on site.
- PPE: leather gloves, safety boots, helmet and protective glasses as needed.

Post Driving Machine

- Only qualified personnel may operate the machine.
- A piling order will be established.
- It is forbidden to climb onto the running gear.
- Only authorized personnel may access the machine.
- The engine exhaust points will be checked.
- The operator will check that there are no people in the area before maneuvering.
- Do not open the radiator cap when hot.

Self-propelled marker

- It may only be used by authorized personnel.
- The edges will be marked with yellow and black bands.
- Two multipurpose fire extinguishers will be placed on the platform.

Ladders

- They will be installed at an angle of 75° to the horizontal.
- They must be secured at the top and have non-slip elements at the base.
- In extension ladders, the sections shall be fixed before use.
- They will be placed on firm and stable ground.
- They will not rest on pipes or electrical cables.
- They will not exceed 5 meters in length.

- For work involving height or effort, a safety harness will be used.
- Only one worker may use the ladder at a time.
- The steps will be checked periodically.
- The ascent and descent will be done facing the stairs.
- Loads will be handled without compromising stability.
- Non-slip footwear must be worn and hands and soles must be kept clean.

Slings and Slings

- New cables will be subjected to reduced loads before first use.
- If they have been exposed to low temperatures, the loads will be reduced or the cable will be preheated.
- Sharp bends should be avoided.
- They will be stored in dry and ventilated places.
- Knotted elements will not be used.
- They will be checked for deformation, wear or corrosion.
- For loads with edges, protective blocks or angles will be placed.
- Specific rings will be used for joints.
- During hoisting, workers must remain at a safe distance.

Lifting Platform

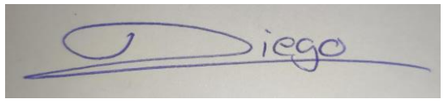
- It may only be used by trained and authorized personnel.
- Its general condition and the operation of all safety devices will be checked.
- It will have redundant controls on the platform and ground.
- It will not be used until the hydraulic oil reaches the proper temperature.
- The operator must have visibility and ensure that no one is at risk.
- Drive with the lights on and at low speed.
- The platform will not be raised in strong winds or on unstable surfaces.
- It is prohibited to transport persons without adequate equipment.
- Access will be via stairs, without jumping from the machine.
- No auxiliary means will be used to increase the height.
- If there is a risk of falling objects, the area will be cordoned off.
- Upon completion, the machine will be turned off, immobilized, and the keys removed.

9. CONCLUSION

This Health and Safety Study provides a structured and comprehensive description of the project's characteristics, including the planned work schedule and the identification of the risks inherent in each phase of execution, as well as the machinery and auxiliary equipment used. It also establishes the preventive and protective measures necessary to guarantee the safety and health of workers, specifying the appropriate personal protective equipment (PPE) and collective protective equipment (CPE) for each activity.

This document will serve as a technical basis for the contractor to draft the corresponding Health and Safety Plan, adapting it to the specific construction procedures that will be carried out during the execution of the work.

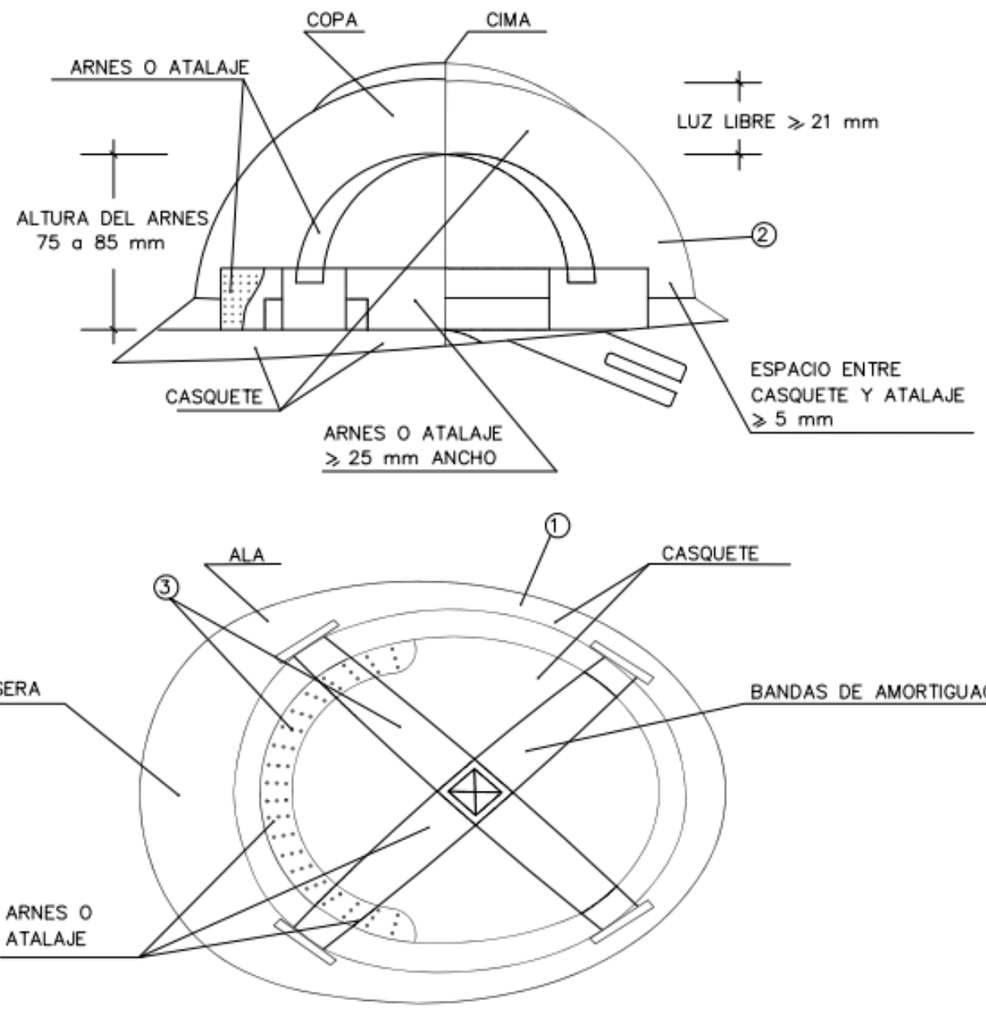
Santander, July 2025



Signed: Diego García Abril

PLANS

CASCO DE SEGURIDAD NO METALICO

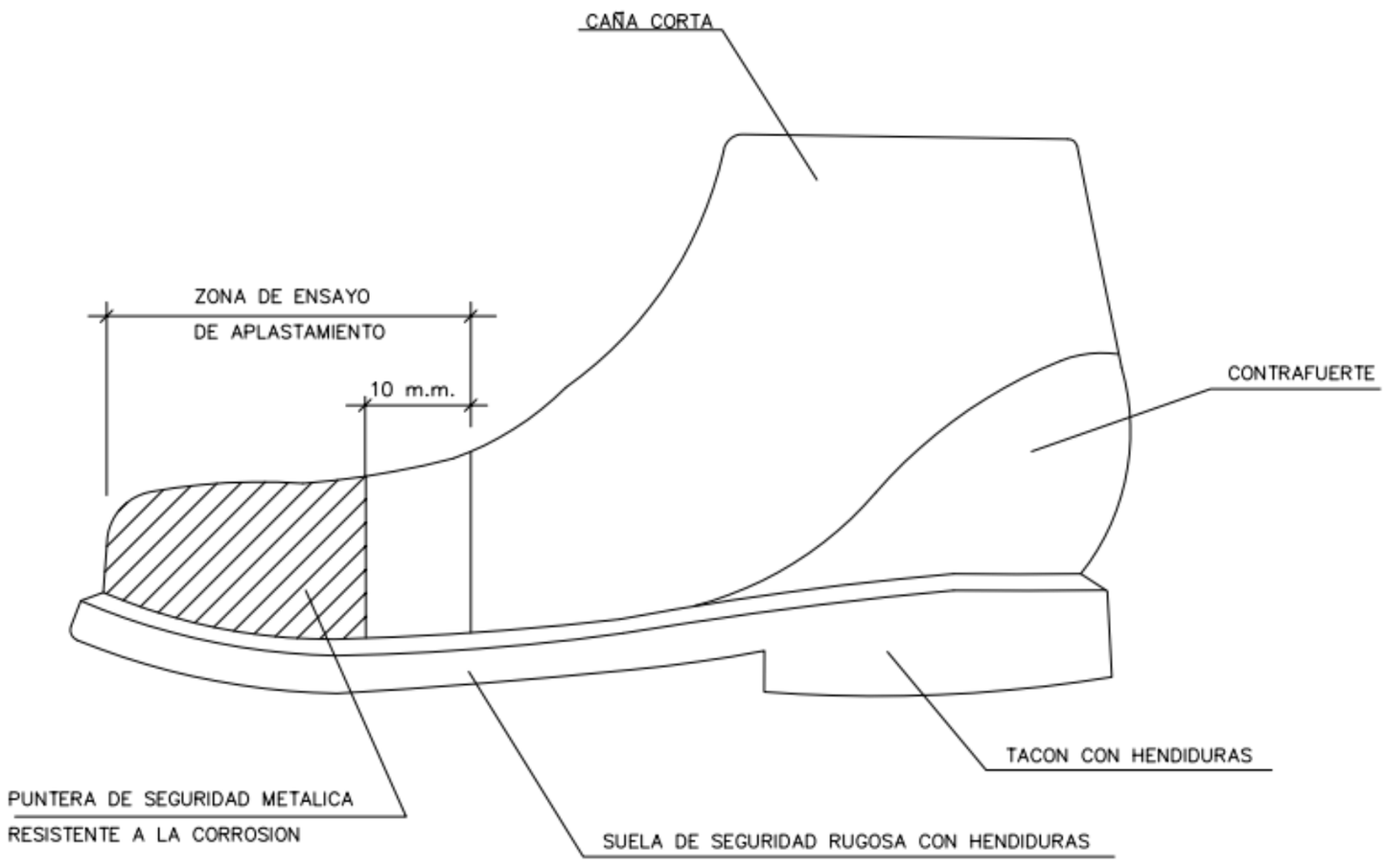


① MATERIAL INCOMBUSTIBLE, RESISTENTE A GRASAS, SALES Y AGUA

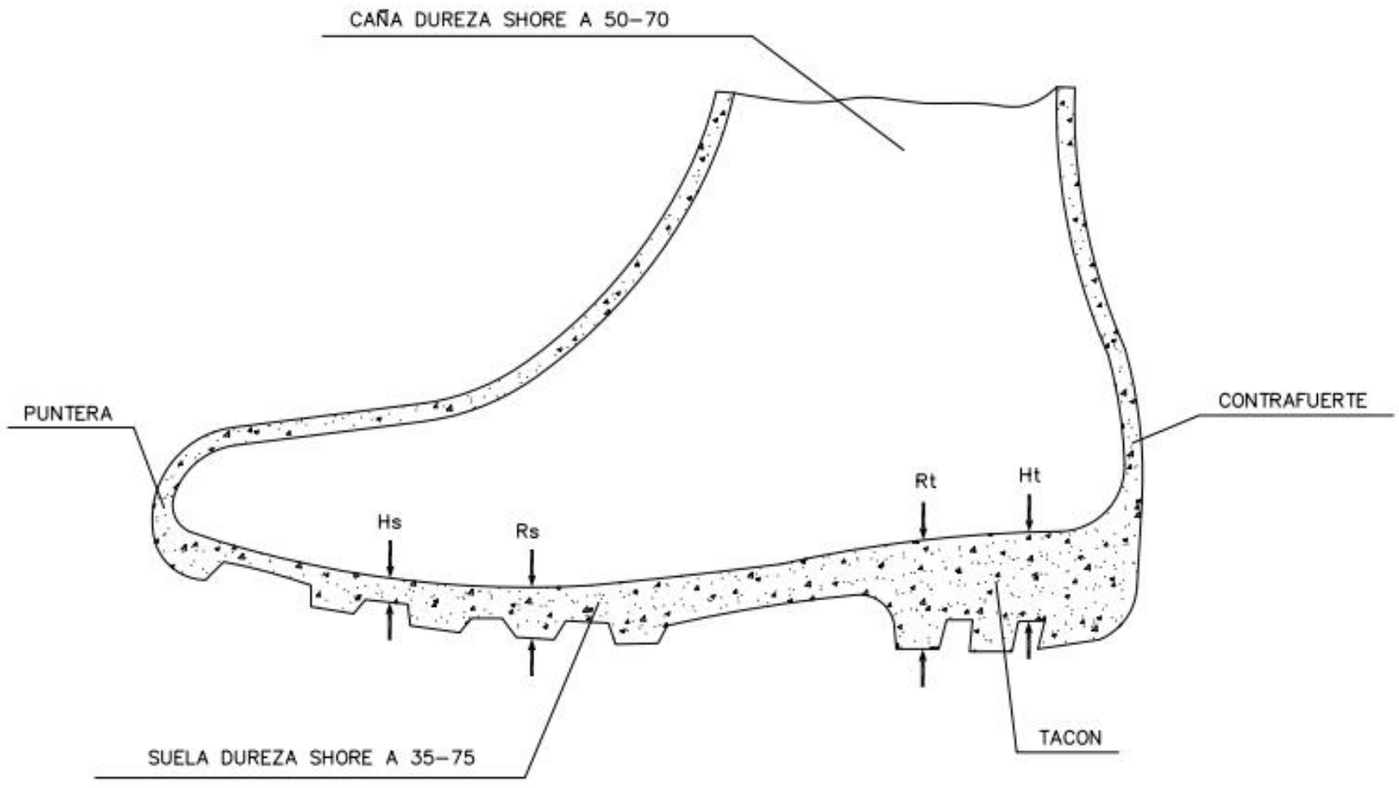
② CLASE M AISLANTE A 1000 v. CLASE E–AT AISLANTE A 25000 v.

③ MATERIAL NO RIGIDO, HIDROFUGO, FACIL LIMPIEZA Y DESINFECCION

BOTA DE SEGURIDAD CLASE III

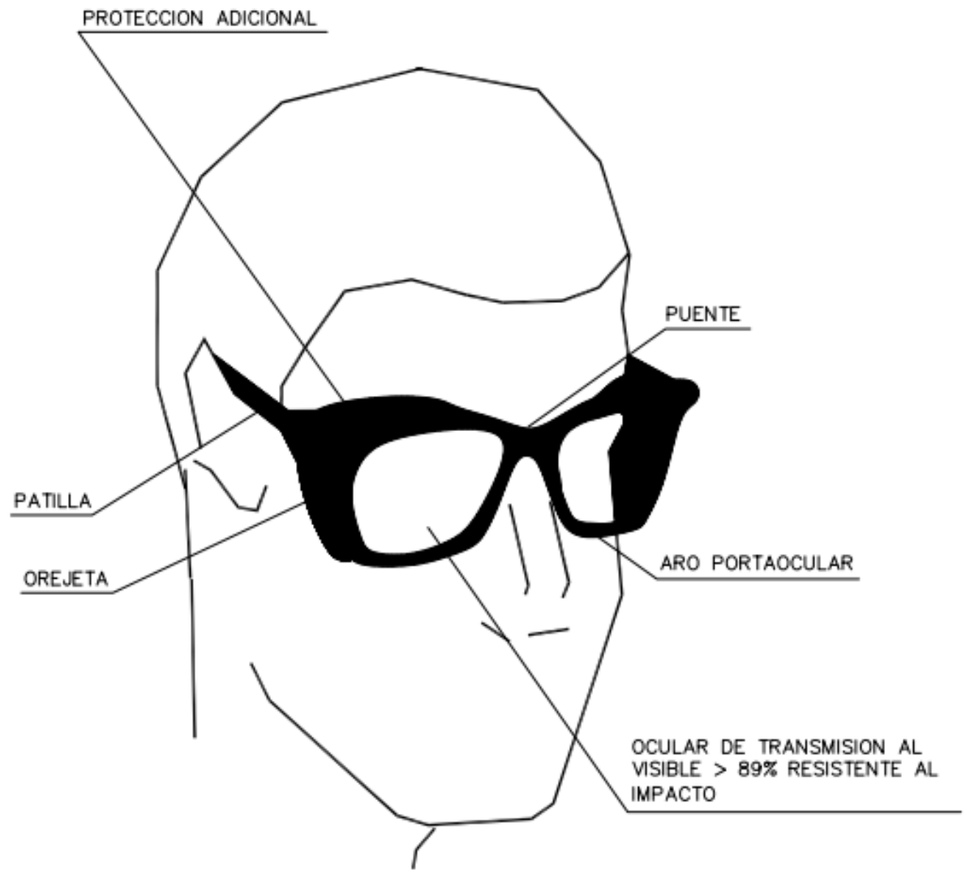


BOTA IMPERMEABLE AL AGUA Y A LA HUMEDAD

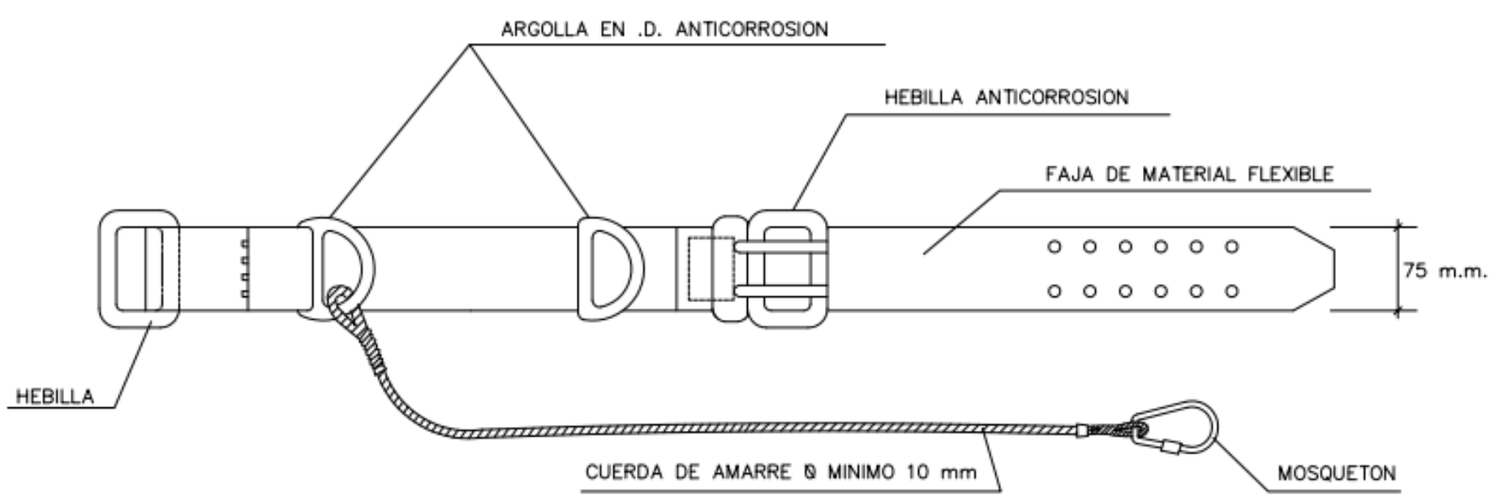


Hs	HENDIDURA DE LA SUELA	=5 m.m.
Rs	RESALTE DE LA SUELA	= 9 m.m.
Ht	HENDIDURA DEL TACON	=20 m.m.
Rt	RESALTE DEL TACON	=25 m.m.

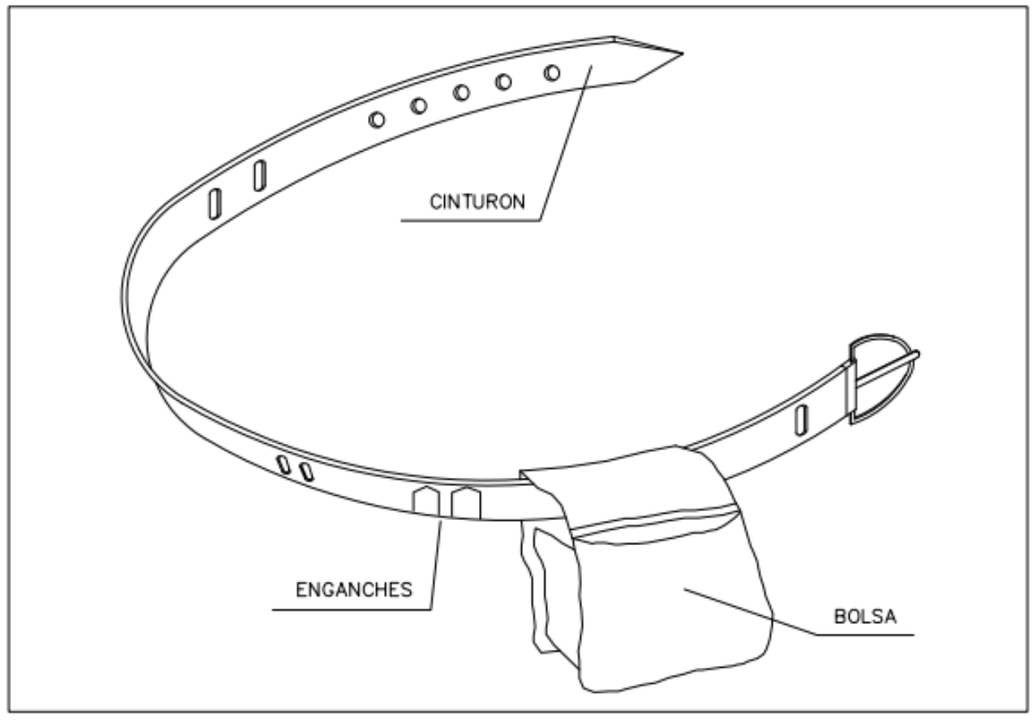
GAFAS DE MONTURA TIPO UNIVERSAL CONTRA IMPACTOS



CINTURON DE SEGURIDAD



PORTAHERRAMIENTAS



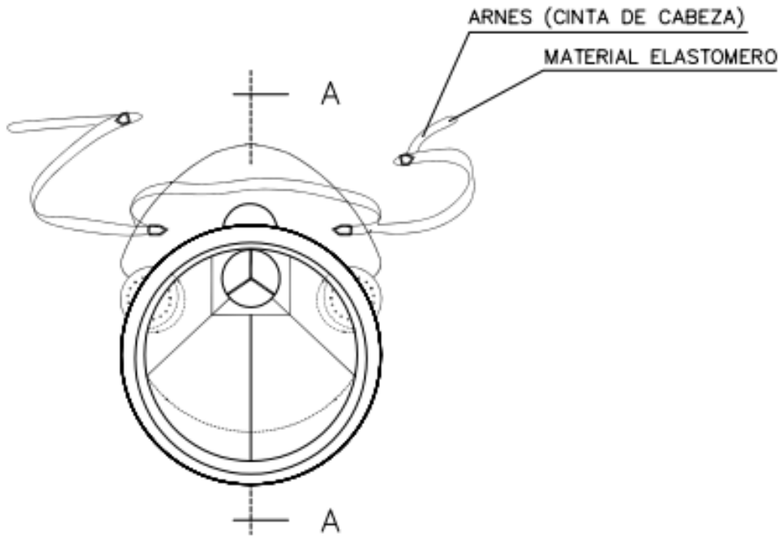
① PERMITE TENER LAS MAMNOS LIBRES, MAS SEGURIDAD AL MOVERSE

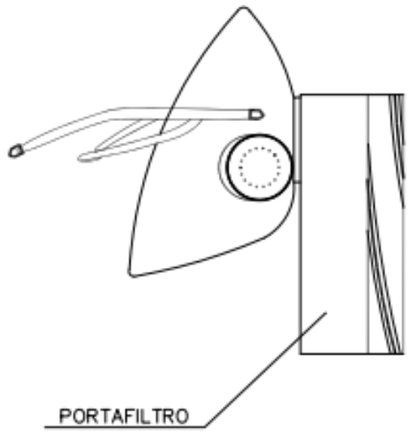
② EVITA CAIDAS DE HERRAMIENTAS

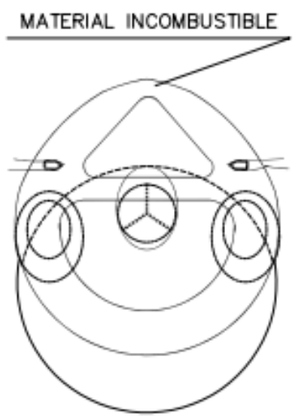
③ NO EXIME DEL CINTURON DE SEGURIDAD CUANDO ESTE ES NECESARIO

MASCARILLA ANTIPOLVO

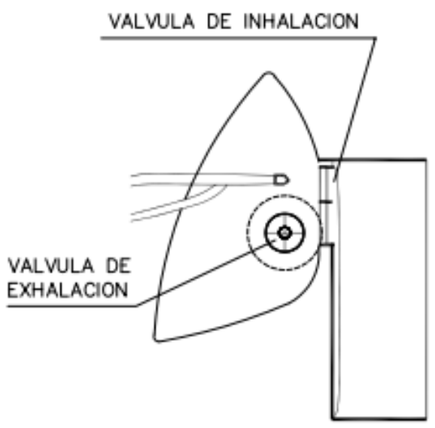
PROTECCION ADICIONAL





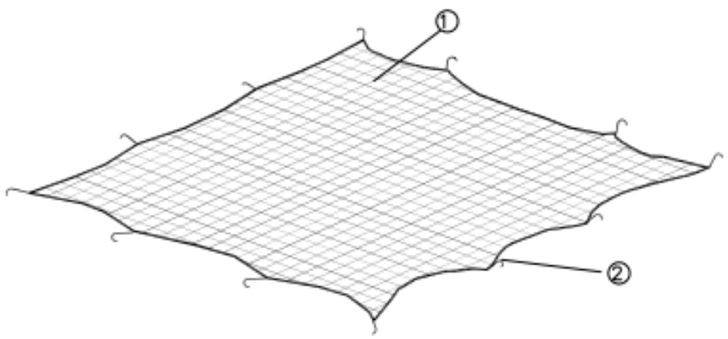


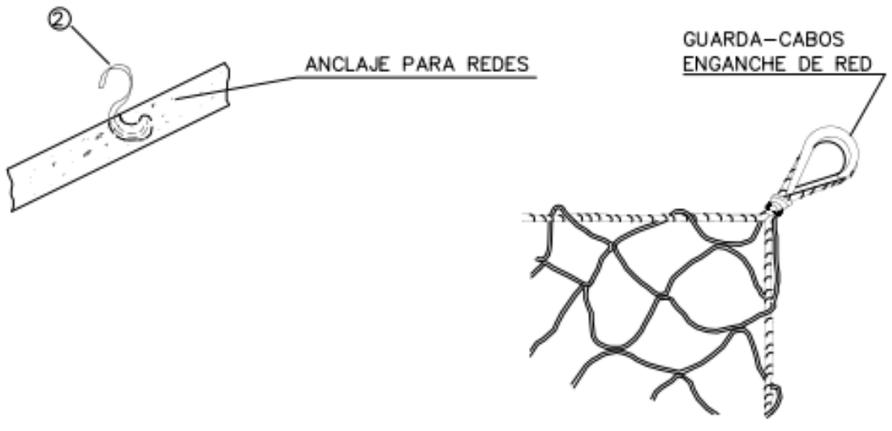
SECCION A–A



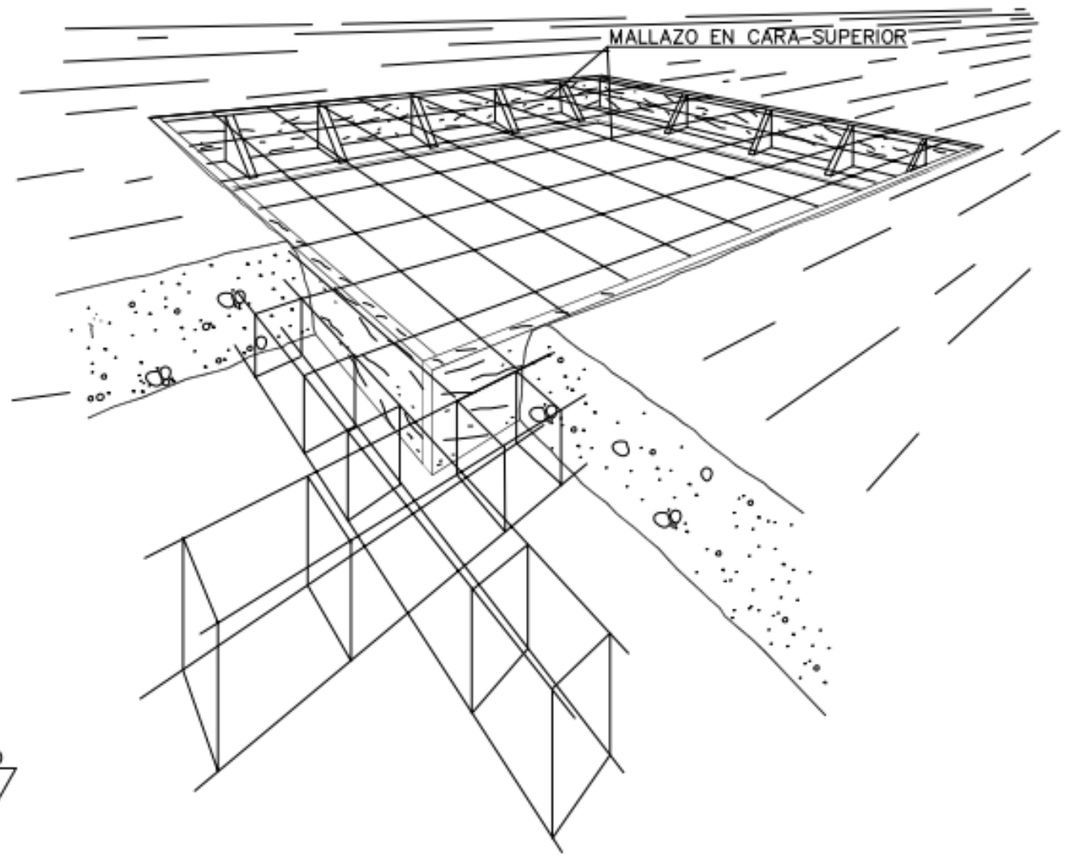
PROTECCIÓN DE HUECOS HORIZONTALES

MEDIANTE RED DE PROTECCIÓN





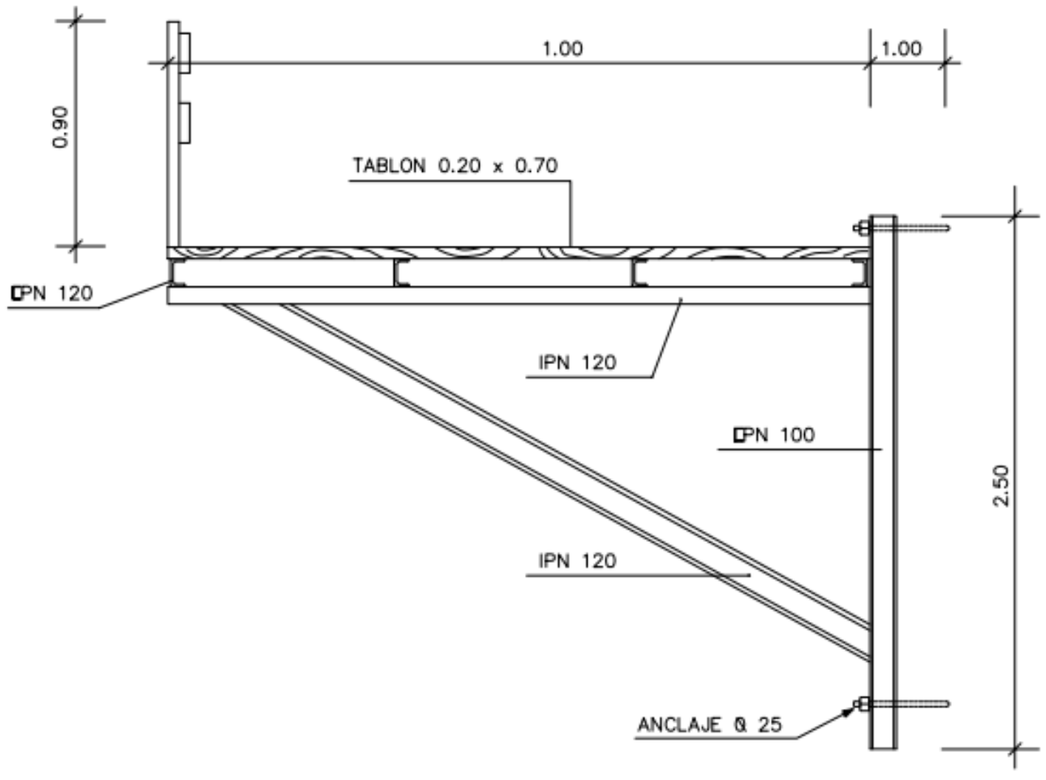
MEDIANTE MALLAZO METÁLICO



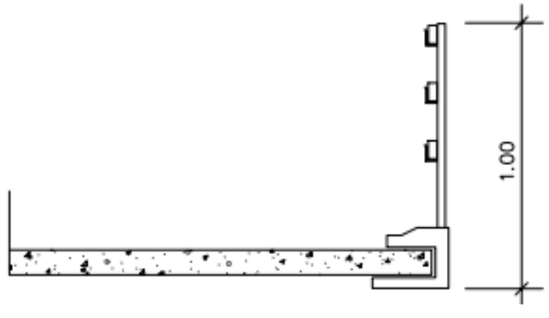
① Red de protección de hilo de 1 cm de diámetro y malla de 15x15 cm

② Ganchos incorporados al forjado al echar el hormigón

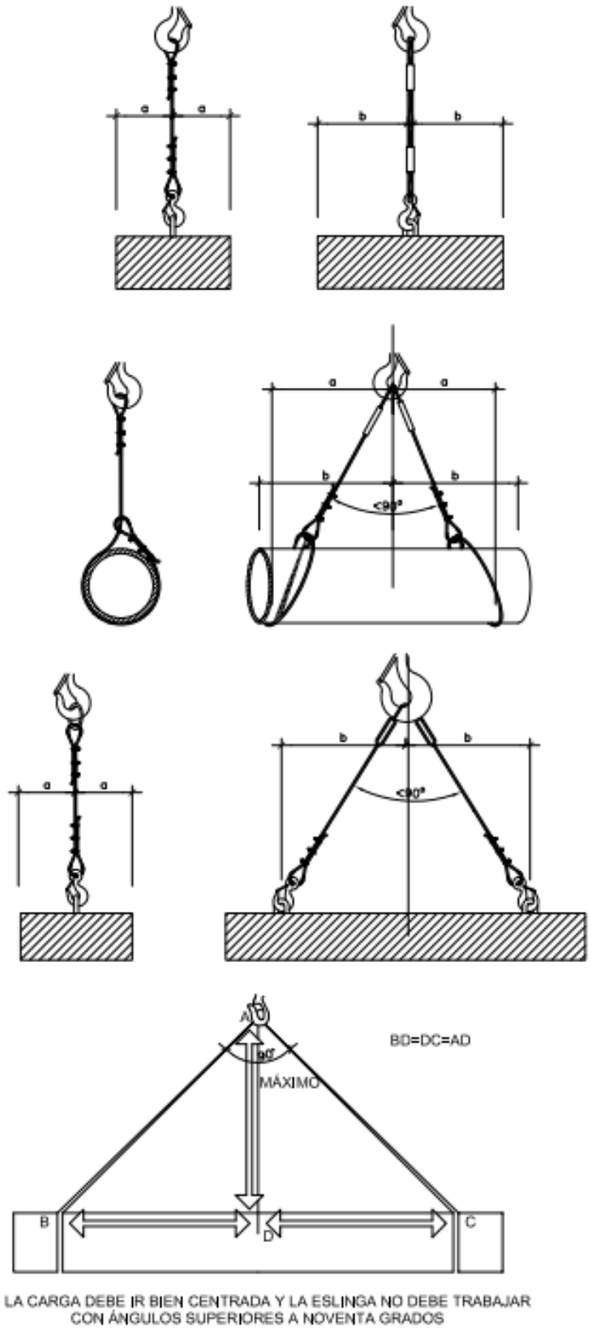
PLATAFORMA DE TRABAJO



BARANDILA PARA LOSAS Y TABLEROS

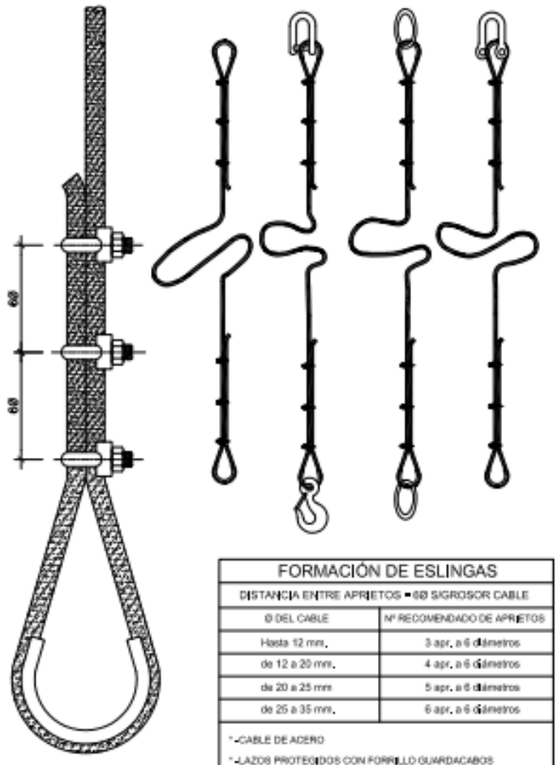


FORMAS DE SUSTENTACIÓN DE CARGAS



LA CARGA DEBE IR BIEN CENTRADA Y LA ESLINGA NO DEBE TRABAJAR CON ÁNGULOS SUPERIORES A NOVENTA GRADOS

FORMACIÓN DE ESLINGAS



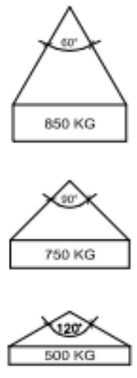
FORMACIÓN DE ESLINGAS	
DISTANCIA ENTRE APRIETOS = 6Ø SIGROSOR CABLE	
Ø DEL CABLE	Nº RECOMENDADO DE APRIETOS
Hasta 12 mm.	3 apr. a 6 diámetros
de 12 a 20 mm.	4 apr. a 6 diámetros
de 20 a 25 mm	5 apr. a 6 diámetros
de 25 a 35 mm.	6 apr. a 6 diámetros

* -CABLE DE ACERO
* -LAZOS PROTEGIDOS CON FORRILLO GUARDACABOS
* -PUEDEN SUSTITUIRSE LOS APRIETOS POR CASQUILLOS SOLDADOS

MANEJO DE MATERIALES

LA MISMA ESLINGA

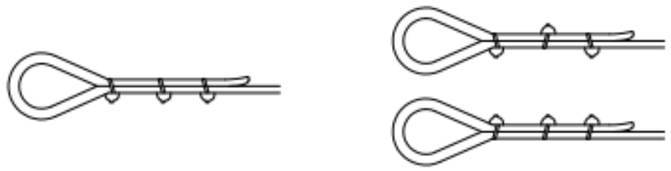
ángulo 30° 1000kg
ángulo 60° 850kg
ángulo 90° 750kg
ángulo 120° 500kg



RELACIÓN ENTRE EL ÁNGULO DE LA ESLINGA Y SU CAPACIDAD DE CARGA

TIPOS DE ESLINGAS

GAZAS



MÉTODO CORRECTO MÉTODOS INCORRECTOS

Diámetro del Cable	Número de Perfiles	Distancia entre Perfiles
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

CÓDIGO DE SEÑALES DE MANIOBRAS

SI SE QUIERE QUE NO HAYA CONFUSIONES PELIGROSAS CUANDO EL MAQUINISTA O ENGACHADOR CAMBIEN DE UNA MÁQUINA A OTRA Y CON MAYOR RAZÓN DE UN TALLER A OTRO ES NECESARIO QUE TODO EL MUNDO HABLE EL MISMO IDIOMA Y MANDE CON LAS MISMAS SEÑALES. NADA MEJOR PARA ELLO QUE SEGUIR LOS MOVIMIENTOS QUE PARA CADA OPERACIÓN SE INSERTAN A CONTINUACIÓN:

1 LEVANTAR LA CARGA

2 LEVANTAR EL AGUILÓN O PLUMA

3 LEVANTAR LA CARGA LENTAMENTE

4 LEVANTAR EL AGUILÓN O LA PLUMA LENTAMENTE

5 LEVANTAR EL AGUILÓN O LA PLUMA Y BAJAR LENTAMENTE

6 BAJAR LA CARGA

7 BAJAR LA CARGA LENTAMENTE

8 BAJAR EL AGUILÓN O PLÚMA

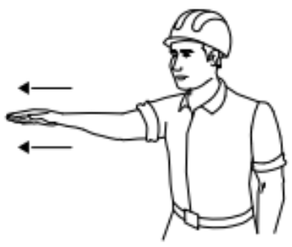
9 BAJAR EL AGUILÓN O PLÚMA LENTAMENTE

10 BAJAR EL AGUILÓN O PLÚMA Y LEVANTAR LA CARGA

11 GIRAR EL AGUILÓN EN LA DIRECCIÓN INDICADA POR EL DEDO

12 AVANZAR EN LA DIRECCIÓN INDICADA POR EL SEÑALISTA

13 SACAR PLUMA



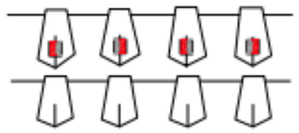
14 METER PLUMA

15 PARAR

ELEMENTOS AUXILIARES DE SEÑALIZACIÓN

PANELES DIRECCIONALES PARA CURVAS

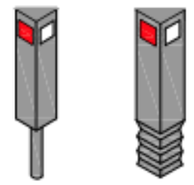
PANELES DIRECCIONALES PARA OBRAS



CORDÓN DE BALIZAMIENTO

PORTALÁMPARAS DE PLÁSTICO

CORDÓN DE BALIZAMIENTO NORMAL Y REFLEXIVO

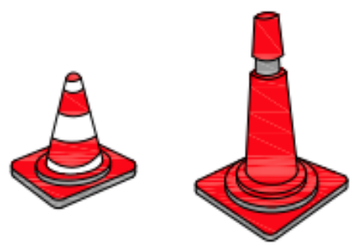


HITOS CAPTAFÁROS PARA SEÑALIZACIÓN LATERAL DE AUTOPISTAS EN POLIETILENO

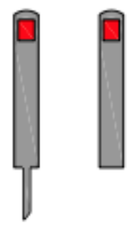
VALLA DE OBRA MODELO 1

VALLA DE OBRA MODELO 2

CINTA DE BALIZAMIENTO REFLECTANTE



CONOS DE GOMA



HITOS DE PVC

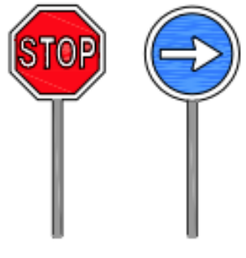
VALLA EXTENSIBLE

VALLA DE CONTENCIÓN DE PEATONES TIPO AYUNTAMIENTO

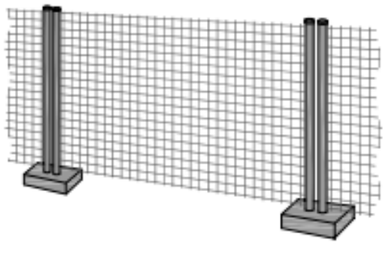
CINTA DE BALIZAMIENTO PLÁSTICO

CLAVOS DE DESACELERACIÓN

LÁMPARA AUTÓNOMA FIJA INTERMITENTE



PALETAS MANUALES DE SEÑALIZACIÓN



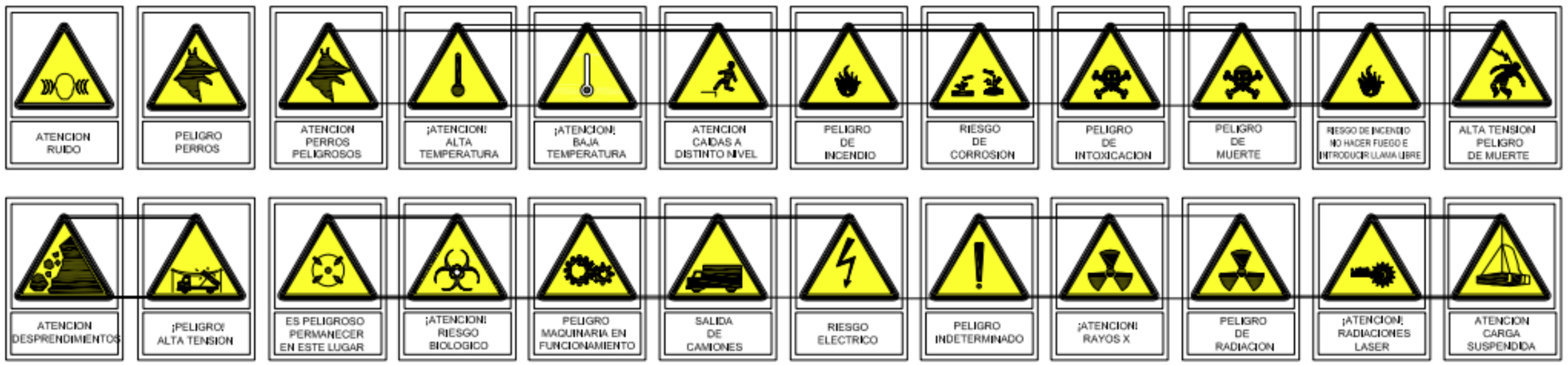
VALLA DE CERRAMIENTO DE OBRA

CINTA DE BALIZAMIENTO PLÁSTICO

CAPTAFAROS HORIZONTAL (OJO DE GATO)

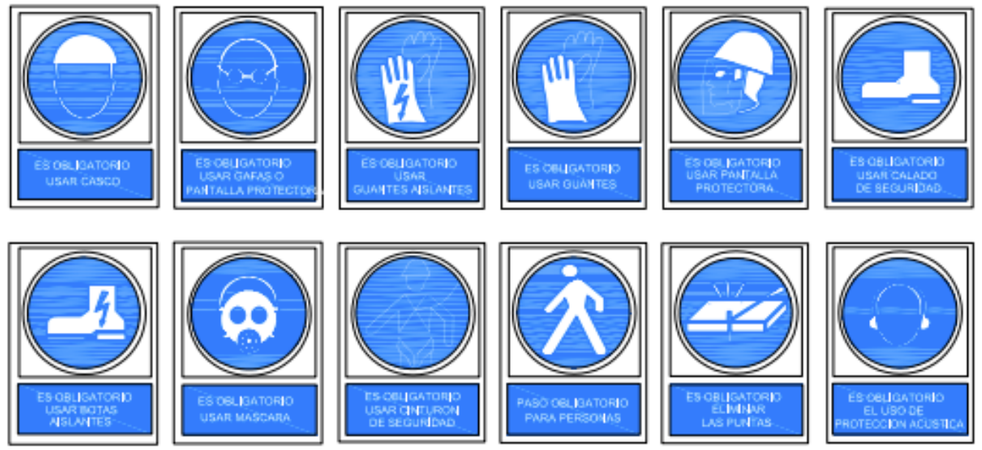
HITOS LUMINOSOS

Señales de Advertencia de Peligro



Señales de Prohibición

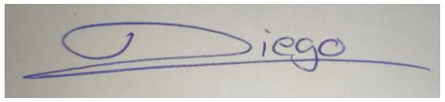
Señales de Uso Obligatorio



Señales de Riesgos Diversos

Señales de Equipos Contra Incendios

Santander, July 2025



Signed: Diego García Abril

SPECIAL TECHNICAL SPECIFICATIONS

Index

1. SCOPE OF APPLICATION

This Specific Technical Specifications Document is an integral part of the Health and Safety Study for the Lanestosa Bypass Construction Project. Its wording complies with the provisions of Article 5 of Royal Decree 1627/1997, of October 24, which regulates the minimum health and safety requirements for construction projects. This article establishes that the study must include, among other documents, a specific specification document that addresses both the applicable legal regulations and the project's specific technical specifications, including the conditions of use, maintenance, and characteristics of the equipment, tools, systems, and protective devices.

This document, therefore, includes the organizational and technical provisions necessary to guarantee the prevention of occupational hazards during the execution of the project. It includes both the preventive obligations of the contractor and its subcontractors, as well as the technical specifications that work equipment and individual and collective protection systems must meet, whether or not they are part of the machinery used.

The content of this document is complemented by the information contained in the Health and Safety Study Report, particularly with regard to the technical characteristics of the work equipment, auxiliary means, and protection systems. Both documents must be considered a single, binding set of regulations during the execution of the works.

2. REGULATIONS AND LAWS

All current regulations regarding occupational risk prevention must be complied with, including, among others, the following provisions:

- Ley 31/1995, de 8 de noviembre, de Prevención de Riesgos Laborales, y sus modificaciones posteriores.
- Ley 54/2003, de 12 de diciembre, de reforma del marco normativo de la prevención.
- Ley 32/2006, de 18 de octubre, reguladora de la subcontratación en el sector de la construcción.
- Real Decreto 1627/1997, de 24 de octubre, sobre disposiciones mínimas de seguridad y salud en obras de construcción.
- Real Decreto 171/2004, de 30 de enero, sobre coordinación de actividades empresariales.
- Real Decreto 39/1997, de 17 de enero, por el que se aprueba el Reglamento de los Servicios de Prevención.
- Real Decreto 773/1997, de 30 de mayo, sobre utilización de equipos de protección individual.
- Real Decreto 1215/1997, de 18 de julio, sobre condiciones mínimas de seguridad en el uso de equipos de trabajo.
- Real Decreto 614/2001, de 8 de junio, sobre protección frente al riesgo eléctrico.
- Real Decreto 485/1997, de 14 de abril, sobre señalización de seguridad y salud en el trabajo.
- Real Decreto 486/1997, de 14 de abril, sobre condiciones de seguridad en los lugares de trabajo.
- Real Decreto 286/2006, de 10 de marzo, sobre protección frente al ruido.
- Real Decreto 1311/2005, de 4 de noviembre, sobre exposición a vibraciones mecánicas.
- Real Decreto 665/1997 y sus modificaciones, sobre exposición a agentes cancerígenos.
- Real Decreto 664/1997, sobre exposición a agentes biológicos.
- Real Decreto 396/2006, sobre trabajos con riesgo de exposición al amianto.
- Reglamento Electrotécnico de Baja Tensión y Reglamento de Líneas Aéreas de Alta Tensión.
- Norma 8.3-IC de señalización de obras.
- Estatuto de los Trabajadores y Convenio Colectivo de la Construcción de Bizkaia.

3. PREVENTIVE OBLIGATIONS OF THE CONTRACTOR

The contractor awarded the contract must comply with all obligations established in current regulations regarding occupational risk prevention, particularly those contained in:

- La Ley 31/1995, de Prevención de Riesgos Laborales, y sus modificaciones posteriores.
- El Real Decreto 1627/1997, de 24 de octubre, sobre disposiciones mínimas de seguridad y salud en obras de construcción.
- El Real Decreto 171/2004, sobre coordinación de actividades empresariales.
- El Real Decreto 39/1997, por el que se aprueba el Reglamento de los Servicios de Prevención.

La Circular 1/02 de la Secretaría General de la Consejería de Obras Públicas (BOC 14/03/2002). Furthermore, it must ensure the effective integration of prevention at all levels of construction, harmonizing the company's general preventive measures with those specific to the construction environment.

Specific requirements:

- Prepare and submit the Health and Safety Plan (HSP) within a maximum of 25 calendar days from notification of contract award.

- The PSS must be signed by the contractor, the site manager, and the prevention technician who participated in its drafting.
- If the health and safety coordinator or project management requests modifications, they must be incorporated within a maximum of 15 calendar days from the date the contract is signed.
- No activity may be initiated that is not contemplated and planned in the approved PSS.
- Any changes to working methods must be reflected in an updated PSS, which must be approved before implementation.
- The contractor must attend all coordination meetings convened by the health and safety coordinator, signing the corresponding minutes.
- You will be responsible for enforcing and monitoring compliance with the PSS by all subcontractors and freelancers.
- You must deliver to each subcontractor the part of the PSS that affects them, with sufficient advance notice for analysis and compliance.
- It will inform all participating workers and companies about the applicable safety measures and the agreements adopted at the coordination meetings.
- It will ensure that preventive measures are properly implemented before the start of each activity.
- You will be responsible for providing and verifying the proper use of personal protective equipment (PPE) by all workers.
- You will inform the health and safety coordinator in advance of the incorporation of new contractors, subcontractors, or self-employed workers.
- You will immediately report any accident or incident that occurs on the site, regardless of its severity, and submit a full report with the corresponding documentation.

Preventive organization on site

To ensure compliance with its prevention obligations, the contractor must establish a minimum organizational structure on site, which will include:

- Site manager or contractor's representative: with continuous presence on site, responsible for ensuring compliance with the PSS.
- Prevention Technician: responsible for planning preventive measures, training and informing workers, investigating accidents, coordinating with the CSS, and supervising the rest of the preventive staff.
- Safety Officer: Responsible for ensuring compliance with the PSS by your company and subcontractors.
- PPE Manager: responsible for the provision, maintenance and control of the use of personal protective equipment.
- Health and Safety File Manager: responsible for keeping all preventive documentation up to date.
- Access control: person in charge of managing the access of authorized personnel to the work.

Depending on the scope of the project, these functions may be performed by one or more people, except for the safety technician, who will always be assigned a specific role. The list of personnel assigned to these functions must be included in the PSS and communicated in writing to the health and safety coordinator and the project management before the start of work.

4. PREVENTIVE MEASURES AT THE BEGINNING OF THE WORK

4.1. GENERAL CONDITIONS

No work may begin without prior approval of the Health and Safety Plan drafted by the construction company. Before the start of activities, the spaces designated for sanitary and well-being services for workers must be cleared. Furthermore, the contractor must have all necessary licenses, permits, and authorizations, including those related to enclosures, signage, traffic diversions, access, and staging areas. Protective measures must also be adopted against disturbing, unhealthy, or dangerous activities in the immediate vicinity of the construction site that could affect the health of workers.

4.2. PREVIOUS INFORMATION

Before carrying out any preparatory work, the contractor must gather all relevant information that may affect health and safety conditions. This information will include, among other things:

- Existence of hidden service networks or installations that may interfere with the work.
- Traffic characteristics on adjacent roads, including dynamic loads that may generate risks of landslides or subsidence.
- Possible vibrations or tremors resulting from nearby activities.
- External activities that may pose a risk to the health of workers.

4.3. SERVICES AFFECTED

Before starting work, any public or private utility network that could interfere with the execution of the project or pose a risk to workers or third parties must be identified.

In the case of overhead power lines near the work area, work cannot begin until the supplier has rerouted or disconnected them.

If this is not possible, minimum safety distances will be established between drivers and any part of the body, tool, or machinery, always considering the most unfavorable situation.

For underground networks (gas, water, electricity), their exact location must be confirmed before excavation. If in doubt, information must be obtained from the relevant companies.

If rerouting or canceling the route is not feasible, it will be marked on the ground, indicating the direction, route, depth, and safety zone, with warning signs and appropriate protection.

4.4. ACCESSES. INTERIOR CIRCULATION AND DELIMITATION OF THE WORKS

At all entrances, visible signs will be posted with the following messages: "No entry to persons not related to the work site," "Helmet required," and, at vehicle entrances, "Vehicle entry and exit."

Vehicles must have a paved or hard surface exit section of at least 6 meters or 1.5 times the wheelbase. If this is not possible, signaling personnel will be assigned to carry out maneuvers.

Ramps for machinery and trucks will have a minimum width of 4.5 meters, widened on curves, and maximum gradients of 12% on straight sections and 8% on curves.

Loading, unloading, stockpiling and storage areas will be clearly delimited.

5. GENERAL MEASURES DURING THE EXECUTION OF THE WORK

5.1. GENERAL MEASURES

During the execution of the works, the following must be complied with at all times:

- The specifications of the Technical Specifications Document of the project.
- The instructions of the Technical Management regarding the construction process.
- The health and safety measures included in the Study and in the approved Health and Safety Plan.
- The guidelines of the health and safety officer designated to monitor the work.

Besides:

- Preventive measures adopted must be reviewed as frequently as necessary to ensure their effectiveness.
- Work will be suspended due to adverse weather conditions (strong wind, heavy rain, snow, etc.).
- Once each work unit is completed, the necessary collective protections will be installed to prevent further risks.
- Workers will be informed about the use and maintenance of the installed protections.
- All equipment, tools, surplus materials and generated waste will be removed from the work area.

5.2. WORKPLACES

Workstations, both fixed and mobile, located above or below ground level, must be stable and safe, considering:

- The number of workers who will use them.
- The maximum expected loads and their distribution.
- External conditions that may affect its stability.

If they do not have their own structural stability, they must be secured with secure anchors to prevent accidental movement.

Stability should be checked periodically, especially after changes in height or depth.

Workplaces must be maintained in adequate conditions of cleanliness and hygiene, and any deficiencies detected must be corrected immediately.

The areas designated for testing or sampling "in situ" must be clearly delimited and marked.

5.3. SPECIAL RISK AREAS

The following are considered high-risk areas:

- Access to the site, especially at intersections with existing roads, will require extreme caution due to the presence of vehicle traffic.
- Even if structures are not built at this stage, the risks of falling will be taken into account in work such as paving, signage installation, or containment barriers.

Besides:

- Areas with serious risks (fuel storage facilities, transformer stations, etc.) must be closed to unauthorized personnel.
- Only duly informed and authorized workers will be allowed access to these areas.
- Clear and visible signage will be installed, delimiting restricted or conditional access areas.

5.4. TRANSIT ZONES

Passage and circulation areas, including stairs and access points, must be designed and maintained to ensure safe transit:

- Risk to workers working near these areas will be avoided.
- If vehicles are used, safety distances or protections for pedestrians will be established.
- In unfinished or high-risk areas, walkways at least 60 cm wide will be provided, with 90 cm handrails and 20 cm baseboards if they exceed 2 m in height.
- Walkways must have safe access, be free of obstacles, and have non-slip surfaces.
- Overloading platforms or work floors will be avoided.
- Dangerous openings shall be protected with railings, mesh or other solid elements.
- Ladders must be made of a single piece, without joints, and with well-assembled rungs.
- Vehicle traffic lanes will be separated from pedestrian lanes and appropriately signposted.
- Transit areas must be kept clean and free of obstacles at all times.
- Unprotected areas will be closed and marked to prevent dangerous access.

5.5. WORK WITH SPECIAL RISKS

Tasks involving the handling or storage of hazardous substances—such as products that generate dust, vapors, gases, corrosive mists, or radiation—must be performed in isolated areas and by the smallest number of workers possible, taking all necessary preventive measures.

Whenever feasible, closed systems will be used to prevent the release of harmful substances into the environment.

Otherwise, localized collection systems will be installed at the emission point, as well as effective general ventilation (natural or forced) to renew the air.

Exposed workers must receive specific training from qualified technical personnel and demonstrate their competence through theoretical and practical tests.

Containers containing hazardous substances must be clearly labeled, indicating their contents and the precautions required for handling.

Persistent or bothersome odors will be prevented by using appropriate extraction systems. If this is not possible, respirators will be used.

Workers exposed to corrosive, toxic, infectious, or radioactive agents must be provided with appropriate work clothing and personal protective equipment.

They will be informed, both verbally and in writing, of the risks inherent to their activity and the available means of protection.

5.6. NOISES AND VIBRATIONS

Noise and vibration levels will be minimized at their source, preventing their spread to work areas.

Machines that generate noise or vibrations must be installed on suitable supports or isolation systems that guarantee their stability and reduce transmission.

Vibration-generating equipment must be maintained in good condition, paying special attention to its moving and transmitting components.

From 80 dB(A), the use of hearing protectors (earplugs, helmets, etc.) will be mandatory.

From 110 dB(A), protective measures will be intensified to avoid hearing damage.

Tools that generate vibrations must have shock-absorbing systems, and operators must use anti-vibration equipment.

Self-propelled vehicles and machinery must be equipped with cushioned seats, and drivers must wear appropriate PPE (goggles, gloves, etc.).

5.7. LOW VOLTAGE ELECTRICAL CURRENT

Workers should not approach low-voltage live parts within 0.5 meters without using appropriate protective equipment: insulated gloves, a helmet, protective glasses, and approved tools.

If an element is suspected to be under high voltage, a minimum distance of 4 meters must be maintained until its actual voltage is confirmed.

In the event of interference with low-voltage overhead lines that cannot be removed, protective gantries will be installed, maintaining a minimum distance of 0.5 meters between the conductor and the lintel of the gantry.

Protection against indirect contacts will be guaranteed by combining grounding and differential connections, in accordance with Technical Instructions MI BT 039, 021 and 044 of the Low Voltage Electrotechnical Regulations.

All metal masses shall be grounded using copper-plated steel rods of at least 14 mm diameter and 2 m length.

The grounding resistance will not exceed 20 ohms and will be checked especially during the driest time of the year.

Electrical panels must have 30 mA differentials for lighting and 300 mA for power.

All metal masses of equipment and panels will be grounded using 35 mm^2 copper conductors.

5.8. HIGH VOLTAGE ELECTRICAL CURRENT

The contractor must know the exact voltage of any high-voltage installation present on the site or interfering with it, and must request this information from the utility company.

The following minimum safety distances must be respected between any part of the body, tool or machinery and live elements:

- Voltage from 1 to 18 kV: 0.50 m
- Voltage from 18 kV to 35 kV: 0.70 m
- Voltage from 35 kV to 80 kV: 1.30 m
- Voltage from 80 kV to 140 kV: 2.00 m
- Voltage from 140 kV to 250 kV: 3.00 m
- Voltage greater than 250 kV: 4.00 m

If the project interferes with a high-voltage overhead line, protective gantries will be installed to maintain a minimum distance of 4 meters from the conductors.

Work on high-voltage installations may only be performed by specialized personnel, in teams of at least two people.

The following measures will be applied before intervening:

- Visible cut-off of all voltage sources.
- Locking or interlocking of the cutting devices.
- Verification of absence of tension.
- Grounding and short-circuiting of conductors.
- Clear signage and delimitation of the work area.

Service will only be restored after confirming that no personnel are working at the facility.

If high-voltage equipment (power lines, transformers, etc.) is installed, the Regulations for Power Plants, Substations and Transformation Centers, especially ITC MIE-RAT 09 and 13, must be complied with.

5.9. CLEANING THE SITE

Transit areas, work areas, access points, and restrooms must be kept clean and sanitary throughout the entire duration of the project.

Floors must be free of obstacles, uneven surfaces, sharp objects, slippery substances, or any other elements that could pose a risk to workers.

In areas with high dust generation, cleaning using wet cleaning methods or vacuum systems will be prioritized.

Adequate cleaning frequency will be established in all spaces, especially those where dangerous equipment or machinery is located.

The accumulation of waste, oils, grease, or other substances that could cause falls or fires should be avoided.

Personnel responsible for cleaning in risk areas must have appropriate protective equipment.

Machines and equipment must be kept clean by the operators responsible for their use.

If flammable cleaning products (gasoline, solvents, etc.) are used, smoking must be prohibited in the vicinity and appropriate signs must be posted.

5.10. Fire Prevention and Fighting

The contractor shall take all necessary measures to:

- Prevent the start of fires.
- Ensure rapid and effective extinguishing in the event of an emergency.
- Ensure the safe evacuation of workers.

Specific measures:

Flammable materials will be stored in secure locations, with access restricted to authorized personnel.

Smoking will be prohibited in areas with a risk of combustion, and this prohibition will be clearly marked.

In confined spaces (tunnels, shafts, etc.) protected electrical equipment must be used and open flames must be avoided.

Rags, debris, or clothing impregnated with flammable substances will be removed immediately.

Adequate ventilation shall be ensured in areas at risk of gas accumulation.

Periodic inspections will be carried out in areas at risk of fire.

Welding or cutting tasks will be carried out under the supervision of qualified personnel and with specific preventive measures.

The work will be equipped with visible, accessible, and properly functioning fire-fighting equipment.

The supply of water with sufficient pressure for emergencies will be ensured.

Personnel will be instructed in the use of fire-fighting equipment and evacuation procedures.

Emergency exits will be marked, clear, and subject to periodic inspections.

Audible alarm systems will be installed throughout the project.

Visible signs will be posted indicating the location of alarms, emergency telephone numbers, and care centers.

5.11. LIFTING LOADS

The passage of people under suspended loads must be avoided. Whenever possible, the lifting area must be demarcated.

For loose materials, trays with side protection (mesh or sheet metal) will be used to prevent the load from falling.

Elongated elements (struts, planks, etc.) must be tied beforehand to prevent slipping.

Mortar or concrete will be lifted using buckets equipped with a discharge gate and support legs.

The filling of these containers must not exceed their useful capacity.

Workers lifting loads from height must wear safety belts if there are no railings.

Extension poles may be used to bring loads closer, as long as they do not compromise the worker's stability.

It is prohibited to leave loads suspended over people, traffic areas, or elements external to the work.

The crane operator must have direct visibility of the load or act with the help of a signalman.

It is prohibited to remain under loads suspended by cranes.

6. WORK TEAMS

6.1. PREVIOUS CONDITIONS

All equipment, machinery, tools, or installations used on the site must be selected so as not to pose additional risks to the safety and health of workers or third parties.

The equipment must be designed and manufactured in accordance with the safety principles established by the manufacturer, ensuring its safe use during assembly, operation, and maintenance.

Its components must be able to withstand the expected loads and stresses, as well as resist the usual environmental and usage conditions on site.

The selection of equipment will be based on the specific characteristics of each task and the risks associated with the work environment.

The use of equipment for functions other than those for which it was designed will not be permitted.

6.2. SIGNS

All work equipment must incorporate visible warnings and signs that inform about the risks associated with its use.

Control systems and controls must be clearly identified and marked, especially those that affect safety.

6.3. PROTECTION MEASURES

The equipment must be designed to avoid risks of fire, overheating or emission of hazardous substances (gases, vapors, liquids, dust, etc.).

They must have protection against explosions, direct and indirect electrical contacts, and loss of stability.

In the event of pollutant emissions, collection or extraction systems must be incorporated at the source.

Equipment that emits radiation must be equipped with effective shielding or protection.

Measures will be taken to prevent falling objects, projections or breakage of moving parts.

Dangerous moving elements must be protected by guards or automatic stopping devices.

Parts that reach extreme temperatures must be insulated or protected to prevent burns or frostbite.

All equipment must have clearly identifiable and accessible disconnection systems.

6.4. INFORMATION AND INSTRUCTIONS

Workers will be provided with clear and understandable information on the use, maintenance, and risks of the equipment.

This information may be presented in the form of manuals, graphic diagrams or specific training.

The equipment must include instructions for safe transport, indicating weight, tie-down points, and stability position.

Detailed instructions will be provided for assembly, use, and disassembly, including risk areas and necessary maneuvering spaces.

6.5. CONDITIONS OF USE

When equipment involves specific risks, additional measures will be taken to prevent accidents.

Protections will be installed at the points of operation (guards, stop bars, automatic feeding, etc.).

The equipment must be adapted to the tasks to be performed, without compromising operator safety.

Rotating or breakable elements must have protections that prevent the projection of fragments.

The use of equipment that generates noise or vibration levels higher than those permitted by regulations will be avoided.

Drive systems must be safe, avoiding unintentional starts or dangerous situations in the event of a failure.

Start-up can only be carried out through voluntary action by the operator.

All equipment must have a safe complete shutdown system.

If a shutdown occurs due to a power failure or activation of a protection system, it cannot be restarted automatically without restoring safety conditions.

The guards must be solid, not create additional risks, be securely fastened, and allow for maintenance without complete disassembly.

7. TEMPORARY FACILITIES

7.1. GENERALITIES

Temporary installations must be designed and implemented so that they do not pose any risk of fire, explosion, or electrocution, whether by direct or indirect contact.

- The selection of materials and protective devices will depend on the type of energy distributed, the environmental conditions, and the training level of the personnel accessing the facilities.
- The protection of people from any electrical, mechanical, or thermal risks arising from the use of these facilities will be guaranteed.

7.2. ELECTRICAL INSTALLATIONS

Assembly and installation

The electrical installation must be carried out exclusively by qualified personnel, under the supervision of a qualified technician.

Before commissioning, the contractor must submit the certification of compliant installation to the person responsible for monitoring the Safety Plan.

Electrical panels

They will be located in areas protected against falling objects from higher levels, or will be provided with specific protections.

They will be kept away from areas where machinery and vehicles pass, and always within the construction site.

Access to the paintings must be free of obstacles and materials.

An insulated platform will be installed at least 25 cm above the ground to prevent the risk of flooding.

There will be a general panel from which branches will be drawn to auxiliary panels, minimizing long electrical lines.

The general switchboard will preferably be located near the offices or maintenance staff.

Grounding

All metallic elements of electrical equipment must be grounded.

The resistance of the ground connection will depend on the sensitivity of the associated differential.

Disconnectors, fuses, and switches shall not be permitted in ground circuits.

The minimum characteristics of the electrodes will be:

Copper spikes: diameter ≥ 14 mm, length ≥ 2 m.

Galvanized iron spikes: diameter ≥ 25 mm, length ≥ 2 m.

Copper plates: thickness ≥ 2 mm, area ≥ 0.5 m².

Galvanized iron plates: thickness ≥ 2.5 mm, surface ≥ 0.5 m².

The land where they are installed should preferably be humid.

7.3. DRINKING WATER INSTALLATIONS

The construction company must guarantee the supply of drinking water through taps distributed throughout the project, as well as in dining and restroom areas.

All supply points will be marked, indicating whether the water is potable or not.

In the absence of a water supply, clean containers, preferably plastic, will be provided for storing drinking water.

If there is any doubt about the potability, tests will be requested from an approved laboratory and consumption will be prohibited until favorable results are obtained.

Cross-contamination between drinking and non-drinking water networks will be avoided.

The conduits will be installed away from areas of electrical risk and protected against falling objects.

7.4. HYGIENE AND WELLNESS FACILITIES AND SERVICES

The changing rooms, dining rooms, toilets, sinks, and showers will be defined in the Health and Safety Plan, in accordance with Royal Decree 1627/1997.

The following will be available:

1 toilet for every 25 workers.

1 sink for every 10 workers.

1 locker per worker.

The supply of drinking water in sufficient quantities will be guaranteed.

A first aid kit will be installed in an accessible location, signposted, and with visible emergency telephone numbers.

At least one worker per shift must be trained in first aid.

The facilities will comply with the electrical and sanitation requirements established by the regulations.

The changing rooms will have a recommended area of 2 m² per worker, a minimum height of 2.5 m, and lockable lockers.

Showers will have hot and cold water, with a minimum of 1 shower for every 10 workers.

Restrooms will be gender-segregated and will have closed sanitary containers in the women's restrooms.

On linear projects, portable toilets will be installed in the work areas with the highest concentration of personnel.

The contractor will assume the cost of installing and maintaining these facilities, regardless of their inclusion in the budget.

8. SIGNS

Two types of signage will be distinguished in the work:

- **Internal signage** , directed at workers within the construction site.
- **External signage** , oriented to vehicle and pedestrian traffic affected by the execution of the works.

Internal signage shall comply with the provisions of Royal Decree 485/1997, of April 14, on minimum provisions regarding occupational health and safety signage.

External signage and traffic markings shall be governed by Standard 8.3-IC of the General Directorate of Highways. However, this signage may be supplemented with additional elements when necessary to protect workers from accidental vehicle intrusion into work zones. These additional measures must be included in the Health and Safety Plan.

9. PERSONAL PROTECTIONS

9.1. GENERAL PRESCRIPTIONS

All personal protective equipment (PPE) must comply with the requirements established in Royal Decrees 542/2020 and 773/1997.

Only PPE with CE marking and approval in accordance with current regulations will be used.

The equipment will be ergonomic, comfortable, and appropriate for the tasks to be performed, to encourage continued use.

Expired or damaged PPE will be removed immediately and replaced, with documentary evidence of the change.

In the event of premature wear due to working conditions, they will be replaced without waiting for the scheduled renewal date.

All PPE must be designed so that it does not represent an additional risk to the worker.

In the absence of a specific approval standard, the manufacturer will be required to provide a technical performance report.

9.2. MONKEYS AND DIVERS

Made in a single piece, with a double front zipper and six zippered pockets.

They incorporate an elastic lumbar band for ergonomic adjustment.

Made of cotton, in high visibility colors (yellow or orange).

They comply with UNE 863/96 and UNE 1149/96 standards.

9.3. PVC raincoat

Thermo-welded jacket and pants set, in yellow or orange.

Jacket with pockets and button closure; pants with adjustable waist.

Approved with CE marking according to PPE regulations.

9.4. REFLECTIVE VEST

Made of breathable, reflective or retroreflective synthetic fabric .

Colors: white, yellow or orange.

Adjustment by means of Velcro straps.

Complies with UNE.EN 471/95 and UNE.EN 966/95 standards.

9.5. SAFETY HELMET

Guys:

- Class N: general use, insulating up to 1,000 V.
- Class E-AT: high voltage up to 25,000 V.
- Class EB: resistant to low temperatures (-15 °C).

Equipped with adjustable inner harness, chin strap and ventilation.

Maximum weight: 450 g.

Tests: impact, perforation, flame resistance and electrical insulation.

Complies with UNE.EN 397/95 and UNE.EN 966/95 standards.

9.6. SAFETY FOOTWEAR

Class III safety boots with metal toe caps for impact protection and puncture-resistant soles.

They should completely cover the foot, fit properly, and allow mobility without discomfort.

Made with water and moisture resistant materials, with shock absorbing reinforcements.

Maximum weight: 800 g.

Tests: crushing resistance (1,500 kg), impact, perforation, bending, corrosion.

They comply with UNE.EN 344/93, 345/93, 345-2/96, 346/93, 346-2/96, 347/93 and 347-2/96 standards.

9.7. WATERPROOF FOOTWEAR

Class N or E boots, made of natural or synthetic rubber, without seams or defects.

They should cover at least the lower third of the leg and allow for comfortable walking.

Non-slip sole with studs and open grooves.

Flexible, easy to fit and corrosion resistant.

Tests: thermal aging, impermeability, perforation.

Approved according to the Regulatory Technical Standard M-27.

9.8. HEARING PROTECTOR

Earmuff-type protectors with padded ear cups and harness.

Acoustic attenuation tests at frequencies from 125 to 8000 Hz.

Minimum attenuation:

- 10 dB at low frequencies (250 Hz)
- 20 dB in averages (500–4000 Hz)
- 35 dB at high frequencies (6000–8000 Hz)

They comply with UNE.EN 352-1/94, 352-2/94 and 352-3/94 standards.

9.9. SAFETY GLOVES

Anti-cut, anti-puncture and anti-erosion , made of natural or non-rigid synthetic materials.

Waterproof, ergonomic and adapted to the user's size.

Standard length: up to 320 mm (except special jobs).

They comply with UNE.EN 388/95 standard.

9.10. ELECTRICAL INSULATING GLOVES

For low voltage (up to 1,000 V) or high voltage (up to 30,000 V).

Made of high quality rubber, without seams or defects.

Tests: tensile strength, elongation, aging, leakage current and puncture voltage.

Approved according to the Regulatory Technical Standard MT-4.

9.11. SAFETY GLASSES

Universal mount, class A minimum.

Lightweight, sharp, with good ventilation and corrosion resistance.

Impact-resistant eyepieces with light transmission greater than 89%.

Tests: ball, punch and shot impact.

They comply with UNE.EN 167/96 and 168/96 standards.

9.12. DUST MASKS

Made of non-irritating, flame-retardant or slow-burning materials.

Tight fit, minimal leak inhalation and exhalation valves.

Leakage, inhalation and exhalation resistance tests.

Approved according to the Regulatory Technical Standard MT-7.

9.13. OVEREXERTION BELT

Made of elastic material, lightweight and adjustable with velcro.

Mandatory use when loading, unloading or handling heavy objects.

Approved with CE marking in accordance with EPI regulations.

10. COLLECTIVE PROTECTIONS

10.1. GENERAL PRESCRIPTIONS

Collective protections are considered essential auxiliary elements and their cost will be borne by the contractor.

Its installation, maintenance and removal will be the responsibility of the corresponding contractor or subcontractor.

They must comply with current regulations regarding dimensions, strength, and technical characteristics.

They will be new or in perfect condition, and will be available on site before use.

Work will not be permitted to begin without the protections being correctly installed.

Any deterioration will require immediate removal and replacement.

Any modifications to its provisions must be approved by the Health and Safety Coordinator.

The use of collective protection will always take priority over personal protective equipment.

10.2. PROTECTION AND DELIMITATION FENCES

The fences used to delimit work areas or restrict access will be made of welded metal tubes.

They will have a minimum height of 90 cm and will be painted in high-visibility colors (white, yellow or orange).

They must be kept in good condition, without rust, deformations or loose or broken elements.

Its installation will be stable and resistant, guaranteeing its containment and warning function.

10.3. RAILINGS AND WALKWAYS

Railings installed on platforms, walkways or elevated areas must have a minimum resistance of 150 kg/m.

They will consist of a handrail at a height of 90 cm, an intermediate bar and a skirting board of at least 15 cm.

Walkways will have a minimum width of 60 cm and will be installed whenever there is a risk of falling from a height of more than 2 meters.

They must have safe access, be free of obstacles, and have non-slip surfaces.

10.4. LADDERS

All ladders must be equipped with non-slip pads and offer sufficient stability.

It is prohibited to join ladders together or support them on unstable surfaces such as bricks, loose wood or temporary materials.

Only ladders in good condition will be used, without joints or loose steps.

10.5. PROTECTION AGAINST ELECTRICITY

The resistance of the ground connections must be such as to guarantee a contact voltage of less than 24 V.

Residual current switches with a minimum sensitivity of 30 mA for lighting and 300 mA for power will be installed.

All electrical panels will be equipped with omnipolar switches that allow power to be cut off to the entire area.

Electrical elements (fuses, switches, terminals) will be of the closed type and protected against accidental contact.

The socket outlets will be equipped with individual switches to prevent live connections.

Portable lamps must operate at 24 V or be powered by an isolation transformer.

Electrical machines must be grounded, with double-insulated cables and hoses with an additional ground wire.

10.6. EXTINGUISHERS

Multipurpose powder fire extinguishers will be installed in accordance with the UNE 23010 standard.

They will be located at points of greatest risk of fire, at a height of 1.50 m above the ground.

They will be properly marked and in perfect working order.

11. SECURITY PERSONNEL

This section covers the human resources needed to ensure safety and health at work, including:

Health and Safety Committee : composed of a prevention technician with the rank of supervisor, two operators (2nd-class officers), an assistant, and a security guard (1st-class officer). It will meet at least once a month. The hours worked will be counted as a unit of work.

Health and safety training : One hour of specific training will be provided weekly, depending on the site's needs. It will be assessed by the hour.

Mandatory medical examination : All workers will be given medical examinations at the start of the project. The assessment will be per unit, equivalent to the number of workers.

Cleaning and maintenance team : One hour a day will be allocated for cleaning temporary facilities. This fee will be charged on an hourly basis.

First aid service : A specialized company will be contracted for emergency care and ambulance transport. This will be assessed monthly.

12. ACCIDENT PROTOCOL

The contractor must notify the Health and Safety Coordinator, with sufficient advance notice, of the incorporation of any company, subcontractor, or self-employed worker into the project.

In the event of an accident or incident, regardless of its severity, you must:

- Immediately inform the Health and Safety Coordinator or, failing that, the Project Management.
- Submit a full report with details of the incident.
- Provide the documentation generated by the Labor Inspectorate, the Health and Safety Office, or other agencies involved.
- This obligation also extends to any other preventive action resulting from external inspections.

12.1. PRINCIPLES OF ACTION IN CASE OF ACCIDENT

The injured worker will receive priority and immediate care.

In the event of a fall from a height or an electrical accident, immobilization and resuscitation techniques will be applied until emergency services arrive.

If the severity of the situation requires it, the transfer will be carried out by ambulance, avoiding the use of private vehicles.

The Health and Safety Plan must include the planned health infrastructure (own, jointly managed, or contracted). The reference healthcare center will be indicated, with address and contact telephone number.

Information signs will be installed at key points throughout the project: entrances, offices, changing rooms, restrooms, and first-aid kits.

A recommended evacuation route will be defined to facilitate the transfer of injured people in critical situations.

12.1. FIRST AID KIT

First aid kits shall be located in accessible and marked locations and shall contain at least:

- Antiseptics: hydrogen peroxide, alcohol, iodine, crystalmine
- Dressing material: gauze, cotton, bandages, adhesive tape, tourniquets.
- Instruments: thermometer, disposable syringes, sterile gloves.
- Basic medication: analgesics, antispasmodics, cardiac tonics.
- Others: ice pack, ammonia, masks.

13. HEALTH AND SAFETY PLAN

Before the start of work, the contractor must draft a Health and Safety Plan (HSP) that develops and adapts the measures contained in this Study to the specific means, procedures, and phases of the project.

The PSS will be prepared in accordance with the provisions of Article 7 of Royal Decree 1627/1997, of October 24.

It must be approved by the Administration promoting the work, after the corresponding report has been issued by the Health and Safety Coordinator.

A copy of the PSS will be permanently available on site for consultation by the Project Management.

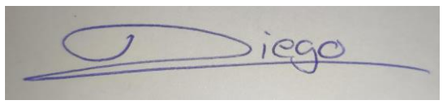
Another copy will be delivered to the workers' representatives, thus ensuring their awareness and effective implementation.

14. CONCLUSION

This Health and Safety Study is a technical document that thoroughly analyzes the characteristics of the project, anticipates the risks inherent in its execution, and proposes specific preventive measures for each phase and activity. It also defines the individual and collective protective equipment necessary to guarantee the physical integrity of workers.

Based on this study, the contractor will develop a Health and Safety Plan tailored to the specific construction procedures that will be used in the execution of the work, thus ensuring effective preventive management in compliance with current regulations.

Santander, July 2025



Signed: Diego García Abril

BUDGET

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1. MEASUREMENTS

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41A	**INST. PROVISIONALES DE OBRA**			
D41AA	**ALQUILER CASETAS PREFA. OBRA**			
D41AA210	Ud ALQUILER CASETA PREFA.OFICINA	10,000	109,00	1.090
	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.			
D41AA310	Ud ALQUILER CASETA PREFA.COMEDOR	10,000	109,00	1.090
	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.			
D41AA320	Ud ALQUILER CASETA P.VESTUARIOS.	20,000	109,00	2.180
	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.			
D41AA410	Ud A.A/INOD,DUCHA LAVAB 3G,TERMO	20,000	170,00	3.400
	Ud. Més de alquiler de caseta prefabricada para aseos de obra de 3.25x1.90 m. con un inodoro, una ducha, un lavabo con tres grifos y termo eléctrico de 50 litros de capacidad; con las mismas caracteristicas 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 fontaneria con tuberias de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático.			
D41AA420	Ud A.A/2INOD,2DUCHA,LAV.3G,TERMO	20,000	212,00	4.240
	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 caracteristicas 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 fontaneria con tuberias de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático.			
D41AA601	Ud ALQUILER CASETA PREFA.ALMACEN	10,000	109,00	1.090
	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.			
D41AA820	Ud TRANSPORTE CASETA PREFABRICAD	5,000	243,00	1.215
	Ud. Transporte de caseta prefabricada a obra, incluso descarga y posterior recogida.			
	TOTAL D41AA			**14.305**

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41AE	**ACOMETIDAS PROVISIONALES**			
D41AE001	Ud ACOMET.PROV.ELECT.A CASETA.	4,000	29,00	116
	Ud. Acometida provisional de electricidad a casetas de obra.			
D41AE101	Ud ACOMET.PROV.FONTAN.A CASETA.	4,000	35,00	140
	Ud. Acometida provisional de fontaneria a casetas de obra.			
D41AE201	Ud ACOMET.PROV.SANEAMT.A CASETA.	4,000	41,00	164
	Ud. Acometida provisional de saneamiento a casetas de obra.			
	TOTAL D41AE			**420**
D41AG	**MOBILIARIO Y EQUIPAMIENTO**			
D41AG201	Ud TAQUILLA METALICA INDIVIDUAL.	10,000	12,00	120
	Ud. Taquilla metálica individual con llave de 1.78 m. de altura colocada.			
D41AG210	Ud BANCO POLIPROPILENO 5 PERS.	4,000	20,00	80
	Ud. Banco de polipropileno para 5 personas con soportes metalicos, colocado.			
D41AG401	Ud JABONERA INDUSTRIAL.	3,000	4,00	12
	Ud. Jabonera de uso industrial con dosificador de jabón, en acero inoxidable, colocada.			
D41AG410	Ud PORTARROLLOS INDUS.C/CERRADUR	3,000	4,00	12
	Ud. Portarrollos de uso industrial con cerradura, en acero inoxidable, colocado.			
D41AG601	Ud CALIENTA COMIDAS 50 SERVICIOS	2,000	92,00	184
	Ud. Calienta comidas para 50 servicios, colocado.			
D41AG610	Ud CALIENTA COMIDAS 25 SERVICIOS	2,000	89,00	178
	Ud. Calienta comidas para 25 servicios, colocado.			
D41AG630	Ud MESA MELAMINA 10 PERSONAS.	1,000	20,00	20
	Ud. Mesa metálica para comedor con una capacidad de 10 personas, y tablero superior de melamina colocada.			
D41AG700	Ud DEPOSITO DE BASURAS DE 800 L.	2,000	16,00	32
	Ud. Deposito de basuras de 800 litros de capacidad realizado en polietileno inyectado, acero y bandas de caucho, con ruedas para su transporte, colocado.			
D41AG801	Ud BOTIQUIN DE OBRA.	1,000	20,00	20
	Ud. Botiquín de obra instalado.			
D41AG810	Ud REPOSICION DE BOTIQUIN.	2,000	39,00	78
	Ud. Reposición de material de botiquín de obra.			
D41AG820	Ud CAMILLA PORTATIL EVACUACIONES	1,000	6,00	6
	Ud. Camilla portátil para evacuaciones, colocada.			
	TOTAL D41AG			**742**
	TOTAL D41A			**15.467**

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41C	**SEÑALIZACIONES**			
D41CA	**SEÑALES**			
D41CA010	Ud SEÑAL STOP I/SOPORTE.	7,000	30,00	210
	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.			
D41CA040	Ud CARTEL INDICAT.RIESGO I/SOPOR	7,000	13,00	91
	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.			
D41CA240	Ud CARTEL INDICAT.RIESGO SIN SO.	3,000	4,00	12
	Ud. Cartel indicativo de riesgo de 0,30x0,30 m., sin soporte metálico, incluso colocación y desmontado			
	TOTAL D41CA			**313**
D41CC	**ACOTAMIENTOS**			
D41CC020	Ud VALLA DE OBRA CON TRIPODE.	35,000	4,00	140
	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.			
D41CC040	Ud VALLA CONTENCION PEATONES.	42,000	3,00	126
	Ud. Valla autónoma metálica de 2,5 m. de longitud para contención de peatones normalizada, incluso colocación y desmontaje.			
D41CC210	Ml VALLA COLGANTE SEÑALIZACION.	28,000	6,00	168
	Ml. Valla colgante de señalización realizada con material plástico pintado en rojo y blanco, incluso cordón de sujección, soporte métalico, colocación y desmontado.			
D41CC230	Ml CINTA DE BALIZAMIENTO R/B.	800,000	1,00	800
	Ml. Cinta corrida de balizamiento plástica pintada a dos colores roja y blanca, incluso colocación y desmontado.			
	TOTAL D41CC			**1.234**
D41CE	**VARIOS**			
D41CE001	Ud BOYAS INTERMITENTES C/CELULA.	4,000	1,00	4
	Ud. Boya Nightflasher 5001 con carcasa de plástico y pieza de anclaje, con célula fotoeléctrica y dos pilas, incluso colocación y desmontado.			
D41CE020	Ud PLATAFORMA MET. EN VOLADIZO.	6,000	52,00	312
	Ud. Plataforma metálica en voladizo para descarga de materiales, incluso montaje y desmontaje.			
D41CE030	Ml P.VOLADA SOP.MET.Y TAB.CUBIER	7,000	58,00	406
	Ml. Plataforma volada de 0.60ml. de anchura formada por soportes metálicos de 3 m. de largo en la base y tablones de 0,20x0,07 m. con una longitud de 1,20ml, sujetos mediante puntales telescópicos cada 2ml. de longitud, montaje y desmontaje para trabajos en cubierta			
D41CE040	Ml MARQUESI.SOP.MET.Y PLAT.MADER	5,000	45,00	225
	Ml. Marquesina de protección de 1.20ml. de anchura formada por soportes metálicos de tubo de 40x40 de 3ml. de altura separados cada 1,50ml. y correas perimetrales para apoyo del material de cubrición i/plataforma de madera con tablón de 0,20x0,07m. totalmente montada, incluso desmontaje. como base y plataforma de madera con tablón de 0,20x0,07 m. totalmente montada, incluso desmontaje.			
	TOTAL D41CE			**947**
	TOTAL D41C			**2.494**

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41E	**PROTECCIONES PERSONALES**			
D41EA	**PROTECCIONES PARA CABEZA**			
D41EA001	Ud CASCO DE SEGURIDAD.	30,000	2,00	60
	Ud. Casco de seguridad homologado.			
D41EA201	Ud PANT.SEGURID. PARA SOLDADURA.	5,000	12,00	60
	Ud. Pantalla de seguridad para soldadura, homologada.			
D41EA210	Ud PANTALLA CONTRA PARTICULAS.	7,000	5,00	35
	Ud. Pantalla para protección contra partículas, homologada.			
D41EA220	Ud GAFAS CONTRA IMPACTOS.	30,000	11,00	330
	Ud. Gafas contra impactos, homologadas.			
D41EA230	Ud GAFAS ANTIPOLVO.	30,000	2,00	60
	Ud. Gafas antipolvo, homologadas.			
D41EA401	Ud MASCARILLA ANTIPOLVO.	30,000	4,00	120
	Ud. Mascarilla antipolvo, homologada.			
D41EA410	Ud FILTRO RECAMBIO MASCARILLA.	30,000	1,00	30
	Ud. Filtro recambio mascarilla, homologado.			
D41EA601	Ud PROTECTORES AUDITIVOS.	30,000	12,00	360
	Ud. Protectores auditivos, homologados.			
	TOTAL D41EA			**1.055**
D41EC	**PROTECCIONES PARA CUERPO**			
D41EC001	Ud MONO DE TRABAJO.	30,000	13,00	390
	Ud. Mono de trabajo, homologado			
D41EC010	Ud IMPERMEABLE.	30,000	8,00	240
	Ud. Impermeable de trabajo, homologado.			
D41EC030	Ud MANDIL CUERO SOLDADOR.	5,000	14,00	70
	Ud. Mandil de cuero para soldador, homologado.			
D41EC401	Ud CINTURON SEGURIDAD CLASE A.	6,000	51,00	306
	Ud. Cinturón de seguridad clase A (sujección), homologado.			
D41EC440	Ud CINTURON SEGURIDAD CLASE C.	27,000	111,00	2.997
	Ud. Cinturón de seguridad clase C (paracaidas), homologado.			
D41EC480	Ud APARATO FRENO.	24,000	60,00	1.440
	Ud. Aparato de freno de paracaidas, homologado.			
D41EC490	Ud CUERDA D=16mm PARA FRENO.	14,000	5,00	70
	Ud. Cuerda de poliamida para freno de paracaidas D=16 mm.			
D41EC500	Ud CINTURON ANTIVIBRATORIO.	8,000	17,00	136
	Ud. Cinturón antivibratorio, homologado.			
D41EC510	Ud FAJA ELASTICA SOBRESFUERZOS.	15,000	14,00	210
	Ud. Faja elástica para protección de sobreesfuerzos, homologada.			
D41EC520	Ud CINTURON PORTAHERRAMIENTAS.	27,000	21,00	567
	Ud. Cinturón portaherramientas, homologado.			
D41EC550	Ud AMARRE REGULABLE POLIAMIDA	19,000	14,00	266
	UD. 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.			
D41EC600	Ud AMARRE POLIAMIDA 1M	17,000	8,00	136
	UD. Amarre de longitud 1,00 mt, realizado en poliamida de alta tenacidad de 14 mm de diámetro, i/ argollas en extremos de polimida revestidas de PVC, homologado.			
	TOTAL D41EC			**6.828**

CÓDIGO	RESUMEN		CANTIDAD	PRECIO	IMPORTE
D41EE	**PROTECCIONES PARA MANOS**				
D41EE001	Ud	PAR GUANTES GOMA.	30,000	1,00	30
	Ud. Par de guantes de goma.				
D41EE010	Ud	PAR GUANTES USO GENERAL.	20,000	2,00	40
	Ud. Par de guantes de uso general.				
D41EE020	Ud	PAR GUANTES SOLDADURA.	6,000	3,00	18
	Ud. Par de guantes para soldador, homologado.				
D41EE030	Ud	PAR GUANTES AISLANTES.	8,000	27,00	216
	Ud. Par de guantes aislantes para electricista, homologados.				
D41EE401	Ud	MANO PARA PUNTERO.	4,000	3,00	12
	Ud. Protector de mano para puntero, homologado.				
		TOTAL D41EE			**316**
D41EG	**PROTECCIONES PARA PIES**				
D41EG001	Ud	PAR BOTAS AGUA.	30,000	11,00	330
	Ud. Par de botas de agua, homologadas.				
D41EG010	Ud	PAR BOTAS SEGURIDAD.	30,000	21,00	630
	Ud. Par de botas de seguridad con puntera y plantillas metálicas, homologadas.				
D41EG030	Ud	PAR BOTAS AISLANTES.	8,000	25,00	200
	Ud. Par de botas aislantes para electricista, homologadas.				
D41EG401	Ud	PAR POLAINAS SOLDADURA.	7,000	8,00	56
	Ud. Par de polainas para soldador, homologadas.				
		TOTAL D41EG			**1.216**
		TOTAL D41E			**9.415**

CÓDIGO	RESUMEN		CANTIDAD	PRECIO	IMPORTE
D41G	**PROTECCIONES COLECTIVAS**				
D41GA	**PROTECCIONES HORIZONTALES**				
D41GA001	M2	RED HORIZONTAL PROTEC.HUECOS.	45,000	3,00	135
	M2. Red horizontal para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.				
D41GA201	M2	MALLAZO PROTECCION HUECOS.	45,000	3,00	135
	M2. Mallazo electrosoldado 15x15 cm. D=4 mm. para protección de huecos, incluso colocación y desmontado.				
D41GA300	M2	TAPA PROVIS.MADERA S/HUECOS	5,000	19,00	95
	M2. Tapa provisional para protecciones colectivas de huecos, formada por tablones de madera de 20x5 cm. armados mediante clavazón sobre rastreles de igual material, incluso fabricación y colocación. (Amortización en dos puestas).				
D41GA350	Ud	PASARELA MONTAJE FORJADO	4,000	13,00	52
	UD. Pasarela para ejecución de forjados, realizada mediante tablones de madera 20x7 cm. y 3 m. de longitud con una anchura de 60 cm. y unidos entre sí mediante clavazón, incluso fabricación y colocación. (Amortización en dos puestas).				
D41GA040	Ml	CABLE DE ATADO TRAB.ALTURA	500,000	3,00	1.500
	Ml. Cable de seguridad para atado en trabajos de altura, sujeto madiante anclajes hormigonados y separados cada 2ml.i/montaje y desmontaje.				
		TOTAL D41GA			**1.917**
D41GC	**PROTECCIONES VERTICALES**				
D41GC001	Ml	RED SEGU.PERIMETRO FORJ.1ªPUE	75,000	13,00	975
	Ml. Red de seguridad en perímetro de forjado de poliamida de hilo de D=4 mm. y malla de 75x75 mm. de 10 m. de altura, incluso pescante metálico tipo horca de 8 m. de altura, anclajes de red, pescante y cuerdas de unión de paños de red, en primera puesta.				
D41GC020	Ml	RED VERTICAL PERIMETRO FORJA.	75,000	2,00	150
	Ml. Red vertical en todo el perímetro del forjado a desencofrar de poliamida de hilo de D=4 mm. y malla de 75x75 mm. de 5 m. de altura incluso colocación y desmontado.				
D41GC025	Ml	MALLA POLIETILENO SEGURIDAD	75,000	1,00	75
	Ml. Malla de polietileno alta densidad con tratamiento para protección de ultravioletas, color naranja de 1 m. de altura y doble zócalo del mismo material, i/colocación y desmontaje. (Amortización en dos puestas).				
D41GC028	M2	PROTECC.ANDAMIO MALLA TUPIDA	40,000	2,00	80
	M2. Protección vertical de andamio con malla tupída plástica, i/colocación y desmontaje. (Amortización en dos puestas).				
D41GC030	M2	RED VERTICAL PROTECCIO.HUECOS	40,000	2,00	80
	M2. Red vertical para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.				
D41GC201	Ml	BARANDILLA TIPO SARGTO. TABL.	75,000	5,00	375
	Ml. Barandilla con soporte tipo sargento y tres tablónes de 0,20x0,07 m. en perímetro de forjados tanto de pisos como de cubierta, incluso colocación y desmontaje.				
D41GC210	Ml	BARANDILLA PUNTALES Y TABLON.	75,000	5,00	375
	Ml. Barandilla con soporte de puntales telescópicos y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.				
D41GC220	Ml	BARAN.PIES DERECHOS Y TABLON.	75,000	8,00	600
	Ml. Barandilla de pies derechos de madera de 1,8 m. de altura, empotrados en el terreno 0,3 m. y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.				
D41GC401	Ml	VALLA METALICA PREF.DE 2.5 MI	75,000	16,00	1.200
	Ml. Valla metálica prefabricada con protección de intemperie Alucín, con soportes del mismo material en doble W, separados cada 2 ml. y chapa ciega del mismo material.				
D41GC410	Ml	VALLA P.DEREC.Y MALLAZO 2.5 M	75,000	6,00	450
	Ml. Valla formada por pies derechos de madera de 2,5 m. de altura y D=10/12 cm. anclados al terreno y mallazo electrosoldado de 15x15 cm. D=4 mm., incluso colocación y desmontado.				

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41GC450	Ml 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.	75,000	8,00	600
	TOTAL D41GC			4.960
D41GG	PROTECCIONES VARIAS			
D41GG001	Ml CABLE DE SEGUR.PARA ANCL.CINT Ml. Cable de seguridad para anclaje de cinturón de seguridad.	200,000	3,00	600
D41GG101	Ml BAJANTE DE ESCOMBROS PLASTICO Ml. Bajante de escombros de plastico, incluso p.p. de bocas de vertido, arandelas de sujección y puntales de acodalamiento, montaje y desmontaje.	15,000	22,00	330
D41GG201	Ml PROT.H.CRUCE DE LINEAS CONDUC Ml. Protección horizontal enterrada, realizada con tuberia de fibrocemento D=80 mm. para cruce de lineas de conducción en pasos, incluso apertura de zanja a mano y posterior tapado.	15,000	39,00	585
D41GG210	Ud FUNDAS TERMORETRACTILES A.HUM Ud. Fundas termoretráctiles antihumedad compuestas por clavija y enchufe, instaladas.	20,000	17,00	340
D41GG300	Ud CUADRO GENERAL INT.DIF.300 mA Ud. Armario tipo PLT2 de dos cuerpos y hasta 26Kw con protección, compuesto por: Dos armarios para un abonado trifásico; brida de unión de cuerpos; contador activa 30-90A; caja IPC-4M practicable; Int.Gen.Aut.4P 40A-U; IGD.4P 40A 0,03A; Int.Gen.Dif.2P 40A 0,03A; Int.Aut.4P 32A-U; Int.Aut.3P 32A-U; Int.Aut.3P 16A-U; Int.Aut.2P 32A-U; 2Int.Aut.16A-U; toma de corriente Prisinter c/interruptor IP 447,3P+N+T 32A con clavija; toma Prisinter IP 447,3P+T 32A c/c; toma Prisinter IP 447,3P+T 16A c/c; dos tomas Prisinter IP 447,2P+T 16A c/c; cinco bornas DIN 25 mm2., i/p.p de canaleta, borna tierra, cableado y rótulos totalmente instalado.	1,000	2.123,00	2.123
D41GG310	Ud CUADRO SECUND.INT.DIF.30 mA. Ud. Armario tipo PLT2 de dos cuerpos y hasta 26Kw con protección, compuesto por: Dos armarios para un abonado trifásico; brida de unión de cuerpos; contador activa 30-90A; caja IPC-4M practicable; Int.Gen.Aut.4P 40A-U; IGD.4P 40A 0,03A; Int.Gen.Dif.2P 40A 0,03A; Int.Aut.4P 32A-U; Int.Aut.3P 32A-U; Int.Aut.3P 16A-U; Int.Aut.2P 32A-U; 2Int.Aut.16A-U; toma de corriente Prisinter c/interruptor IP 447,3P+N+T 32A con clavija; toma Prisinter IP 447,3P+T 32A c/c; toma Prisinter IP 447,3P+T 16A c/c; dos tomas Prisinter IP 447,2P+T 16A c/c; cinco bornas DIN 25 mm2., i/p.p de canaleta, borna tierra, cableado y rótulos totalmente instalado.	5,000	203,00	1.015
	TOTAL D41GG			4.993
	TOTAL D41G			11.870

CÓDIGO	RESUMEN	CANTIDAD	PRECIO	IMPORTE
D41I	MANO DE OBRA DE SEGURIDAD			
D41IA	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.	24,000	52,00	1.248
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.	48,000	11,00	528
D41IA040	Ud RECONOCIMIENTO MEDICO OBLIGAT Ud. Reconocimiento médico obligatorio.	12,000	42,00	504
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.	400,000	20,00	8.000
D41IA210	Ud LIMPIEZA Y DESINFECCION CASET. Ud. Limpieza y desinfección de casetas de obra, considerando una limpieza por cada dos semanas.	14,000	152,00	2.128
	TOTAL D41IA			12.408
	TOTAL D41I			12.408
	TOTAL			51.654

2. PRICE CHART NO. 1

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0001	D41AA210	Ud	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.	CIENTO NUEVE EUROS	109
0002	D41AA310	Ud	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.	CIENTO NUEVE EUROS	109
0003	D41AA320	Ud	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.	CIENTO NUEVE EUROS	109
0004	D41AA410	Ud	Ud. Més de alquiler de caseta prefabricada para aseos de obra de 3.25x1.90 m. con un inodoro, una ducha, un lavabo con tres grifos y termo eléctrico de 50 litros de capacidad; con las mismas caracteristicas 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 fontaneria con tuberias de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático.	CIENTO SETENTA EUROS	170
0005	D41AA420	Ud	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 caracteristicas 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 fontaneria con tuberias de polibutileno e instalación eléctrica para corriente monofásica de 220 V. protegida con interruptor automático.	DOSCIENTOS DOCE EUROS	212

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0006	D41AA601	Ud	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.	CIENTO NUEVE EUROS	109
0007	D41AA820	Ud	Ud. Transporte de caseta prefabricada a obra, incluso descarga y posterior recogida.	DOSCIENTOS CUARENTA Y TRES EUROS	243
0008	D41AE001	Ud	Ud. Acometida provisional de electricidad a casetas de obra.	VEINTINUEVE EUROS	29
0009	D41AE101	Ud	Ud. Acometida provisional de fontaneria a casetas de obra.	TREINTA Y CINCO EUROS	35
0010	D41AE201	Ud	Ud. Acometida provisional de saneamiento a casetas de obra.	CUARENTA Y UN EUROS	41
0011	D41AG201	Ud	Ud. Taquilla metálica individual con llave de 1.78 m. de altura colocada.	DOCE EUROS	12
0012	D41AG210	Ud	Ud. Banco de polipropileno para 5 personas con soportes metalicos, colocado.	VEINTE EUROS	20
0013	D41AG401	Ud	Ud. Jabonera de uso industrial con dosificador de jabón, en acero inoxidable, colocada.	CUATRO EUROS	4
0014	D41AG410	Ud	Ud. Portarrollos de uso industrial con cerradura, en acero inoxidable, colocado.	CUATRO EUROS	4
0015	D41AG601	Ud	Ud. Calienta comidas para 50 servicios, colocado.	NOVENTA Y DOS EUROS	92
0016	D41AG610	Ud	Ud. Calienta comidas para 25 servicios, colocado.	OCHENTA Y NUEVE EUROS	89
0017	D41AG630	Ud	Ud. Mesa metálica para comedor con una capacidad de 10 personas, y tablero superior de melamina colocada.	VEINTE EUROS	20
0018	D41AG700	Ud	Ud. Deposito de basuras de 800 litros de capacidad realizado en polietileno inyectado, acero y bandas de caucho, con ruedas para su transporte, colocado.	DIECISÉIS EUROS	16
0019	D41AG801	Ud	Ud. Botiquín de obra instalado.	VEINTE EUROS	20
0020	D41AG810	Ud	Ud. Reposición de material de botiquín de obra.	TREINTA Y NUEVE EUROS	39

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0021	D41AG820	Ud	Ud. Camilla portátil para evacuaciones, colocada.	SEIS EUROS	6
0022	D41CA010	Ud	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.	TREINTA EUROS	30
0023	D41CA040	Ud	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.	TRECE EUROS	13
0024	D41CA240	Ud	Ud. Cartel indicativo de riesgo de 0,30x0,30 m., sin soporte metálico, incluso colocación y desmontado	CUATRO EUROS	4
0025	D41CC020	Ud	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.	CUATRO EUROS	4
0026	D41CC040	Ud	Ud. Valla autónoma metálica de 2,5 m. de longitud para contención de peatones normalizada, incluso colocación y desmontaje.	TRES EUROS	3
0027	D41CC210	Ml	Ml. Valla colgante de señalización realizada con material plástico pintado en rojo y blanco, incluso cordón de sujección, soporte métalico, colocación y desmontado.	SEIS EUROS	6
0028	D41CC230	M	Ml. Cinta corrida de balizamiento plástica pintada a dos colores roja y blanca, incluso colocación y desmontado.	UN EUROS	1
0029	D41CE001	Ud	Ud. Boya Nightflasher 5001 con carcasa de plástico y pieza de anclaje, con célula fotoeléctrica y dos pilas, incluso colocación y desmontado.	UN EUROS	1
0030	D41CE020	Ud	Ud. Plataforma metálica en voladizo para descarga de materiales, incluso montaje y desmontaje.	CINCUENTA Y DOS EUROS	52
0031	D41CE030	Ml	Ml. Plataforma volada de 0.60ml. de anchura formada por soportes metálicos de 3 m. de largo en la base y tablones de 0,20x0,07 m. con una longitud de 1,20ml, sujetos mediante puntales telescópicos cada 2ml. de longitud, montaje y desmontaje para trabajos en cubierta	CINCUENTA Y OCHO EUROS	58
0032	D41CE040	Ml	Ml. Marquesina de protección de 1.20ml. de anchura formada por soportes metálicos de tubo de 40x40 de 3ml. de altura separados cada 1,50ml. y correas perimetrales para apoyo del material de cubrición i/plataforma de madera con tablón de 0,20x0,07m. totalmente montada, incluso desmontaje. como base y plataforma de madera con tablón de 0,20x0,07 m. totalmente montada, incluso desmontaje.	CUARENTA Y CINCO EUROS	45

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0033	D41EA001	Ud	Ud. Casco de seguridad homologado.	DOS EUROS	2
0034	D41EA201	Ud	Ud. Pantalla de seguridad para soldadura, homologada.	DOCE EUROS	12
0035	D41EA210	Ud	Ud. Pantalla para protección contra partículas, homologada.	CINCO EUROS	5
0036	D41EA220	Ud	Ud. Gafas contra impactos, homologadas.	ONCE EUROS	11
0037	D41EA230	Ud	Ud. Gafas antipolvo, homologadas.	DOS EUROS	2
0038	D41EA401	Ud	Ud. Mascarilla antipolvo, homologada.	CUATRO EUROS	4
0039	D41EA410	Ud	Ud. Filtro recambio mascarilla, homologado.	UN EUROS	1
0040	D41EA601	Ud	Ud. Protectores auditivos, homologados.	DOCE EUROS	12
0041	D41EC001	Ud	Ud. Mono de trabajo, homologado	TRECE EUROS	13
0042	D41EC010	Ud	Ud. Impermeable de trabajo, homologado.	OCHO EUROS	8
0043	D41EC030	Ud	Ud. Mandil de cuero para soldador, homologado.	CATORCE EUROS	14
0044	D41EC401	Ud	Ud. Cinturón de seguridad clase A (sujección), homologado.	CINCUENTA Y UN EUROS	51
0045	D41EC440	Ud	Ud. Cinturón de seguridad clase C (paracaidas), homologado.	CIENTO ONCE EUROS	111
0046	D41EC480	Ud	Ud. Aparato de freno de paracaidas, homologado.	SESENTA EUROS	60
0047	D41EC490	Ud	Ud. Cuerda de poliamida para freno de paracaidas D=16 mm.	CINCO EUROS	5
0048	D41EC500	Ud	Ud. Cinturón antivibratorio, homologado.	DIECISIETE EUROS	17
0049	D41EC510	Ud	Ud. Faja elástica para protección de sobreesfuerzos, homologada.	CATORCE EUROS	14
0050	D41EC520	Ud	Ud. Cinturón portaherramientas, homologado.	VEINTIÚN EUROS	21
0051	D41EC550	Ud	UD. 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.	CATORCE EUROS	14

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0052	D41EC600	Ud	UD. Amarre de longitud 1,00 mt, realizado en poliamida de alta tenacidad de 14 mm de diámetro, i/ argollas en extremos de polimida revestidas de PVC, homologado.	OCHO EUROS	8
0053	D41EE001	Ud	Ud. Par de guantes de goma.	UN EUROS	1
0054	D41EE010	Ud	Ud. Par de guantes de uso general.	DOS EUROS	2
0055	D41EE020	Ud	Ud. Par de guantes para soldador, homologado.	TRES EUROS	3
0056	D41EE030	Ud	Ud. Par de guantes aislantes para electricista, homologados.	VEINTISIETE EUROS	27
0057	D41EE401	Ud	Ud. Protector de mano para puntero, homologado.	TRES EUROS	3
0058	D41EG001	Ud	Ud. Par de botas de agua, homologadas.	ONCE EUROS	11
0059	D41EG010	Ud	Ud. Par de botas de seguridad con puntera y plantillas metálicas, homologadas.	VEINTIÚN EUROS	21
0060	D41EG030	Ud	Ud. Par de botas aislantes para electricista, homologadas.	VEINTICINCO EUROS	25
0061	D41EG401	Ud	Ud. Par de polainas para soldador, homologadas.	OCHO EUROS	8
0062	D41GA001	M2	M2. Red horizontal para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.	TRES EUROS	3
0063	D41GA040	Ml	Ml. Cable de seguridad para atado en trabajos de altura, sujeto madiante anclajes hormigonados y separados cada 2ml.i/montaje y desmontaje.	TRES EUROS	3
0064	D41GA201	M2	M2. Mallazo electrosoldado 15x15 cm. D=4 mm. para protección de huecos, incluso colocación y desmontado.	TRES EUROS	3
0065	D41GA300	M2	M2. Tapa provisional para protecciones colectivas de huecos, formada por tablones de madera de 20x5 cm. armados mediante clavazón sobre rastrales de igual material, incluso fabricación y colocación. (Amortización en dos puestas).	DIECINUEVE EUROS	19
0066	D41GA350	Ud	UD. Pasarela para ejecución de forjados, realizada mediante tablones de madera 20x7 cm. y 3 m. de longitud con una anchura de 60 cm. y unidos entre sí mediante clavazón, incluso fabricación y colocación. (Amortización en dos puestas).	TRECE EUROS	13

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0067	D41GC001	Ml	Ml. Red de seguridad en perímetro de forjado de poliamida de hilo de D=4 mm. y malla de 75x75 mm. de 10 m. de altura, incluso pescante metálico tipo horca de 8 m. de altura, anclajes de red, pescante y cuerdas de unión de paños de red, en primera puesta.	TRECE EUROS	13
0068	D41GC020	Ml	Ml. Red vertical en todo el perímetro del forjado a desencofrar de poliamida de hilo de D=4 mm. y malla de 75x75 mm. de 5 m. de altura incluso colocación y desmontado.	DOS EUROS	2
0069	D41GC025	Ml	Ml. Malla de polietileno alta densidad con tratamiento para protección de ultravioletas, color naranja de 1 m. de altura y doble zócalo del mismo material, i/colocación y desmontaje. (Amortización en dos puestas).	UN EUROS	1
0070	D41GC028	M2	M2. Protección vertical de andamio con malla tupída plástica, i/colocación y desmontaje. (Amortización en dos puestas).	DOS EUROS	2
0071	D41GC030	M2	M2. Red vertical para protección de huecos de poliamida de hilo de D=4 mm. y malla de 75x75 mm. incluso colocación y desmontado.	DOS EUROS	2
0072	D41GC201	Ml	Ml. Barandilla con soporte tipo sargento y tres tablónes de 0,20x0,07 m. en perímetro de forjados tanto de pisos como de cubierta, incluso colocación y desmontaje.	CINCO EUROS	5
0073	D41GC210	Ml	Ml. Barandilla con soporte de puntales telescópicos y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.	CINCO EUROS	5
0074	D41GC220	Ml	Ml. Barandilla de pies derechos de madera de 1,8 m. de altura, empotrados en el terreno 0,3 m. y tres tablones de 0,20x0,07 m., incluso colocación y desmontaje.	OCHO EUROS	8
0075	D41GC401	Ml	Ml. Valla metálica prefabricada con protección de intemperie Alucín, con soportes del mismo material en doble W, separados cada 2 ml. y chapa ciega del mismo material.	DIECISÉIS EUROS	16
0076	D41GC410	Ml	Ml. Valla formada por pies derechos de madera de 2,5 m. de altura y D=10/12 cm. anclados al terreno y mallazo electrosoldado de 15x15 cm. D=4 mm., incluso colocación y desmontado.	SEIS EUROS	6
0077	D41GC450	Ml	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.	OCHO EUROS	8

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0078	D41GG001	Ml	Ml. Cable de seguridad para anclaje de cinturón de seguridad.	TRES EUROS	3
0079	D41GG101	Ml	Ml. Bajante de escombros de plastico, incluso p.p. de bocas de vertido, arandelas de sujección y puntales de acodalamiento, montaje y desmontaje.	VEINTIDÓS EUROS	22
0080	D41GG201	Ml	Ml. Protección horizontal enterrada, realizada con tuberia de fibrocemento D=80 mm. para cruce de lineas de conducción en pasos, incluso apertura de zanja a mano y posterior tapado.	TREINTA Y NUEVE EUROS	39
0081	D41GG210	Ud	Ud. Fundas termoretráctiles antihumedad compuestas por clavija y enchufe, instaladas.	DIECISIETE EUROS	17
0082	D41GG300	Ud	Ud. Armario tipo PLT2 de dos cuerpos y hasta 26Kw con protección, compuesto por: Dos armarios para un abonado trifásico; brida de unión de cuerpos; contador activa 30-90A; caja IPC-4M practicable; Int.Gen.Aut.4P 40A-U; IGD.4P 40A 0,03A; Int.Gen.Dif.2P 40A 0,03A; Int.Aut.4P 32A-U; Int.Aut.3P 32A-U; Int.Aut.3P 16A-U; Int.Aut.2P 32A-U; 2Int.Aut.16A-U; toma de corriente Prisinter c/interruptor IP 447,3P+N+T 32A con clavija; toma Prisinter IP 447,3P+T 32A c/c; toma Prisinter IP 447,3P+T 16A c/c; dos tomas Prisinter IP 447,2P+T 16A c/c; cinco bornas DIN 25 mm2., i/p.p de canaleta, borna tierra, cableado y rótulos totalmente instalado.	DOS MIL CIENTO VEINTITRÉS EUROS	2.123
0083	D41GG310	Ud	Ud. Armario tipo PLT2 de dos cuerpos y hasta 26Kw con protección, compuesto por: Dos armarios para un abonado trifásico; brida de unión de cuerpos; contador activa 30-90A; caja IPC-4M practicable; Int.Gen.Aut.4P 40A-U; IGD.4P 40A 0,03A; Int.Gen.Dif.2P 40A 0,03A; Int.Aut.4P 32A-U; Int.Aut.3P 32A-U; Int.Aut.3P 16A-U; Int.Aut.2P 32A-U; 2Int.Aut.16A-U; toma de corriente Prisinter c/interruptor IP 447,3P+N+T 32A con clavija; toma Prisinter IP 447,3P+T 32A c/c; toma Prisinter IP 447,3P+T 16A c/c; dos tomas Prisinter IP 447,2P+T 16A c/c; cinco bornas DIN 25 mm2., i/p.p de canaleta, borna tierra, cableado y rótulos totalmente instalado.	DOSCIENTOS TRES EUROS	203
0084	D41IA001	H.	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 DOS EUROS	52
0085	D41IA020	H.	H. Formación de seguridad e higiene en el trabajo, considerando una hora a la semana y realizada por un encargado.	ONCE EUROS	11
0086	D41IA040	Ud	Ud. Reconocimiento médico obligatorio.	CUARENTA Y DOS EUROS	42

CUADRO DE PRECIOS 1

Nº	CÓDIGO	UD.	RESUMEN	PRECIO EN LETRA	PRECIO
0087	D41IA201	H.	H. Equipo de limpieza y conservación de instalaciones provisionales de obra, considerando una hora diaria de oficial de 2ª y de ayudante.	VEINTE EUROS	20
0088	D41IA210	Ud	Ud. Limpieza y desinfección de casetas de obra, considerando una limpieza por cada dos semanas.	CIENTO CINCUENTA Y DOS EUROS	152

3. BUDGET SUMMARY

RESUMEN DE PRESUPUESTO

CAPÍTULO	RESUMEN	IMPORTE	%
D41A	INST. PROVISIONALES DE OBRA	15.467	29,94
D41C	SEÑALIZACIONES	2.494	4,83
D41E	PROTECCIONES PERSONALES	9.415	18,23
D41G	PROTECCIONES COLECTIVAS	11.870	22,98
D41I	MANO DE OBRA DE SEGURIDAD	12.408	24,02
	PRESUPUESTO DE EJECUCIÓN MATERIAL	**51.654**	
	13,00 % Gastos generales	6.715	
	6,00 % Beneficio industrial	3.099	
	Suma	9.814	
	PRESUPUESTO BASE DE LICITACIÓN SIN IVA	**61.468**	
	16% IVA	9.835	
	PRESUPUESTO BASE DE LICITACIÓN	**71.303**	

Asciende el presupuesto a la expresada cantidad de SETENTA Y UN MIL TRESCIENTOS TRES EUROS

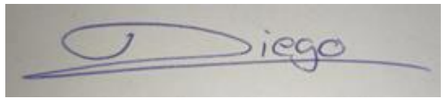
, 2 de abril 2007.

Promotor de la obra **Proyectista**

Promotor de la obra Proyectista

29 junio 2025 1

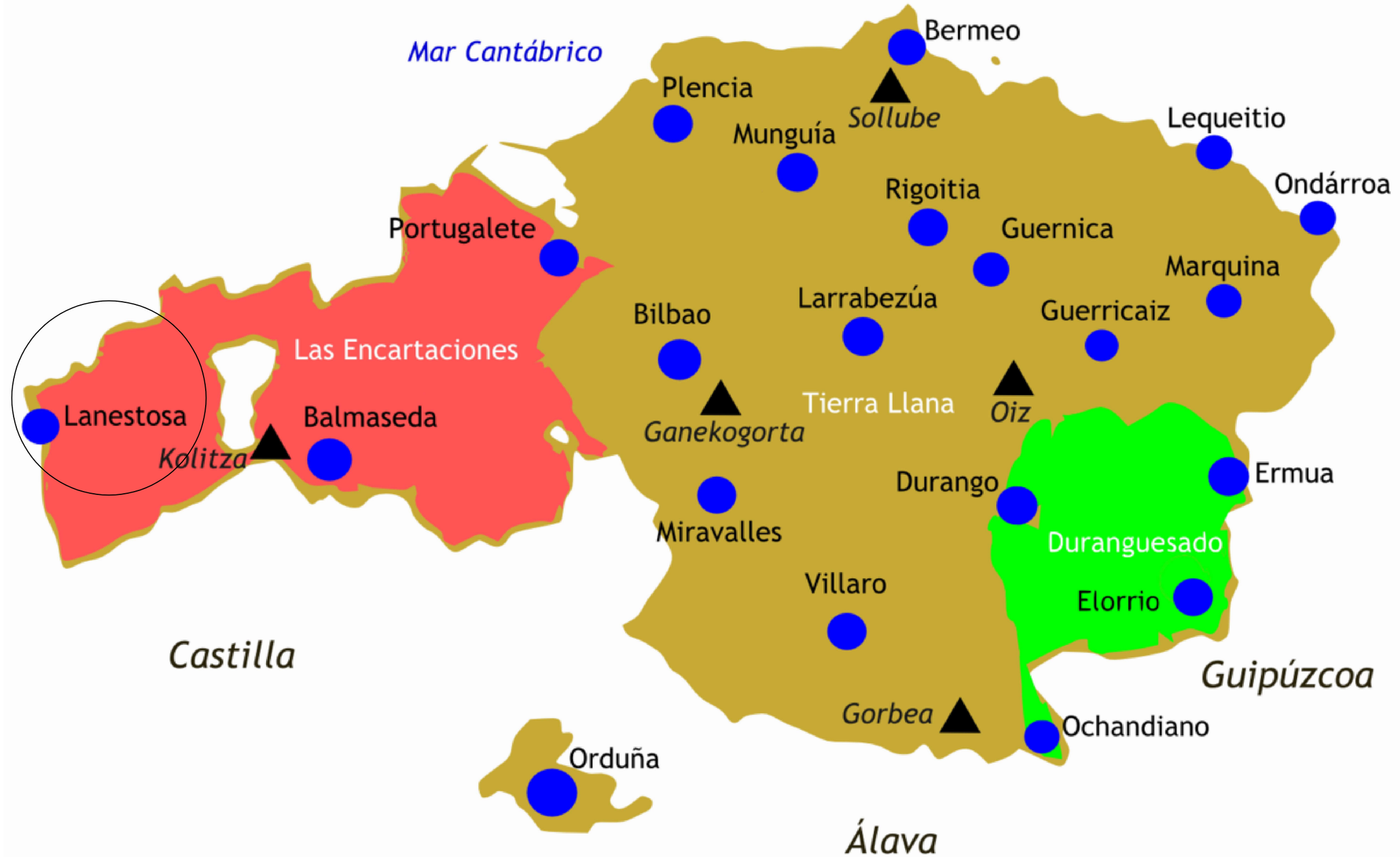
Santander, julio de 2025



Fdo.: Diego García Abril

DOCUMENT Nº. 7 APPENDICES

	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Plano de situación	AUTHOR Diego García Abril	SCALE	DATE June 10	NORTE	Map 1 Sheet 1 of 2



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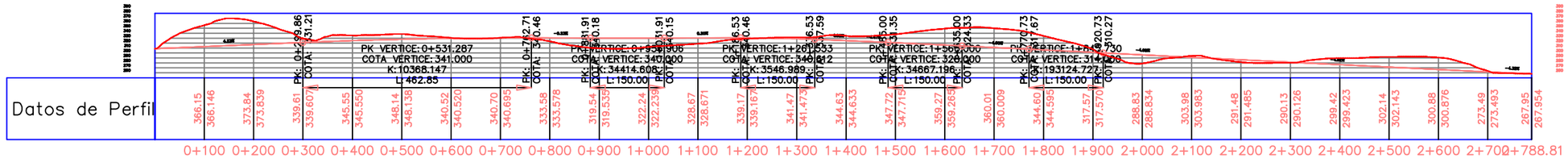
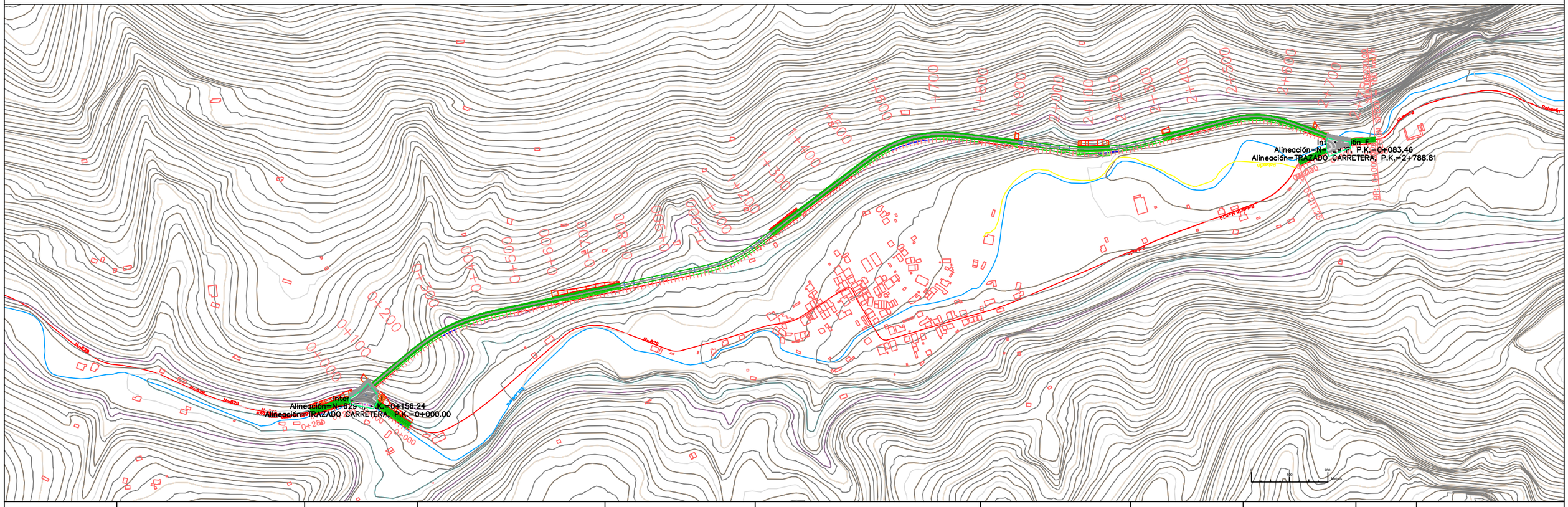
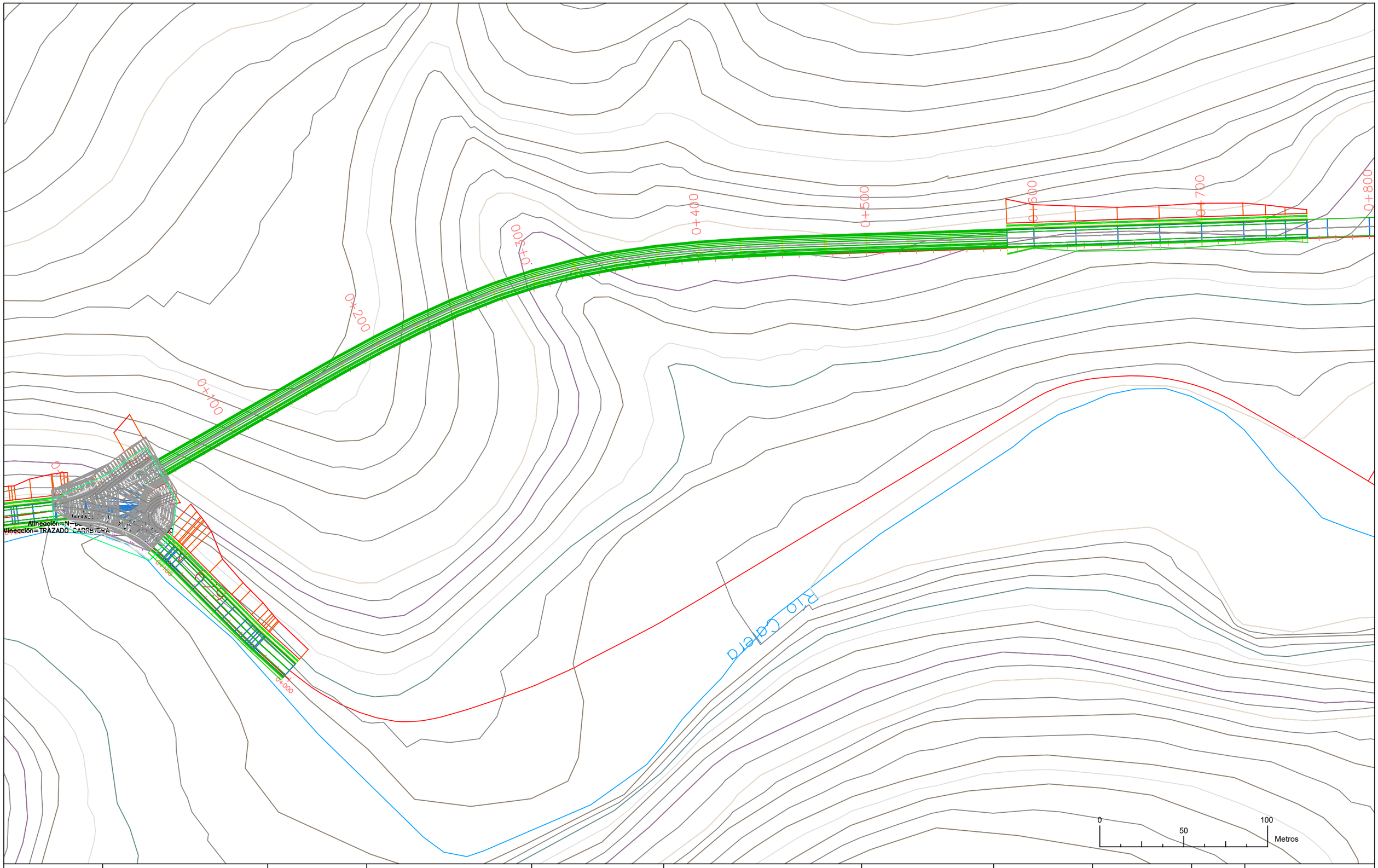




ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Plano de Conjunto	AUTHOR Diego García Abril	SCALE 1/5000	DATE June 10	NORTE Map 2 Sheet 1 of 1



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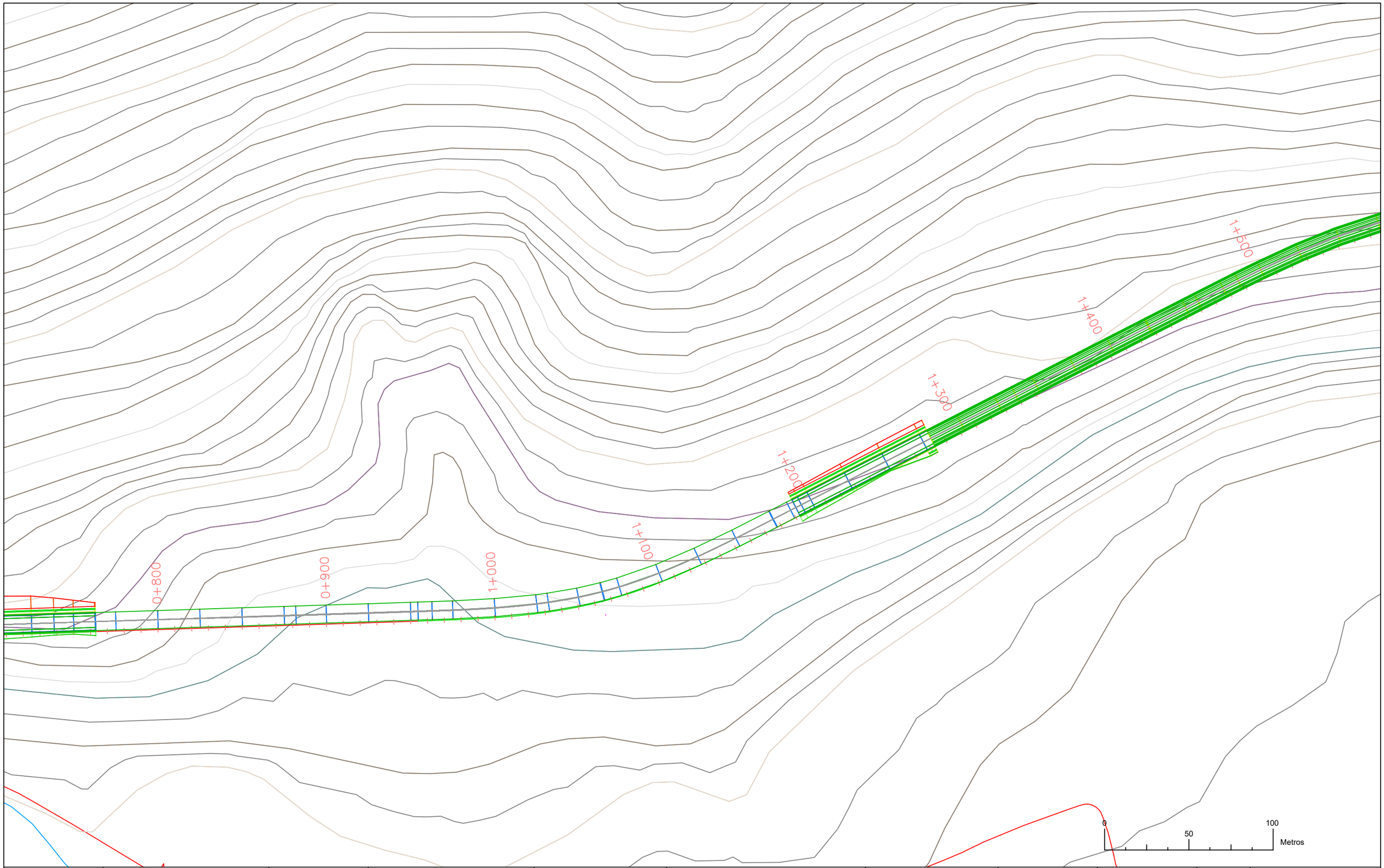

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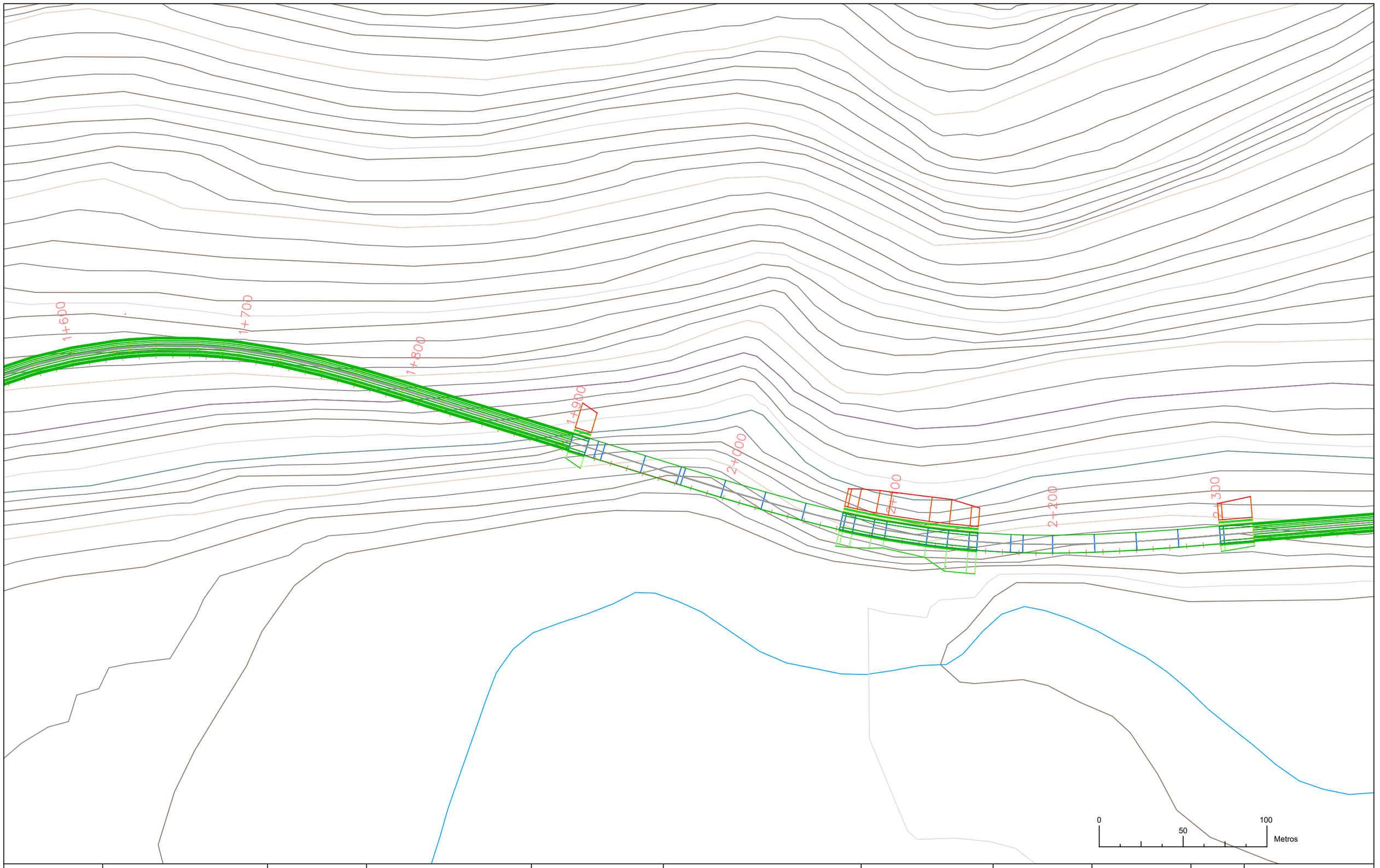

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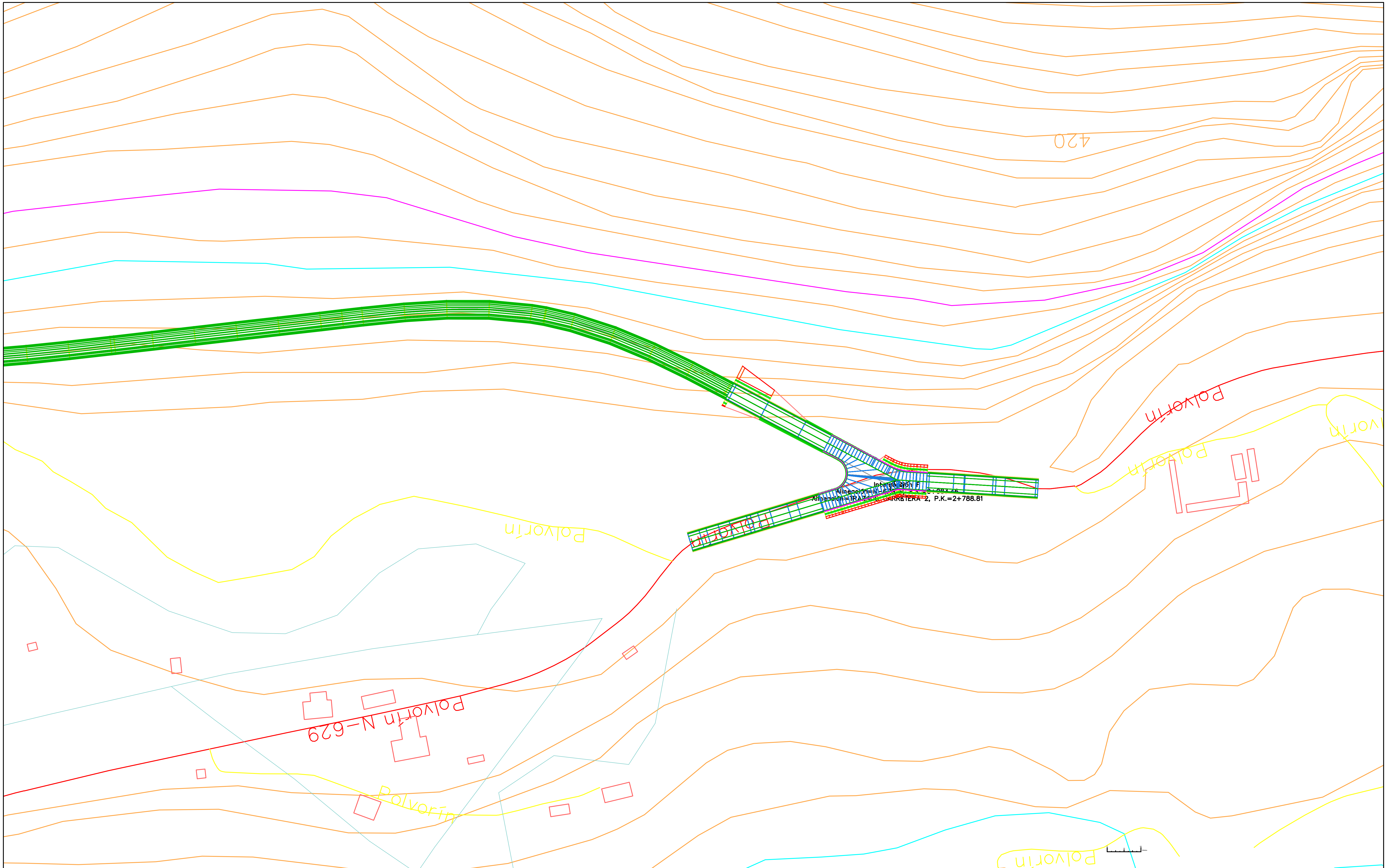
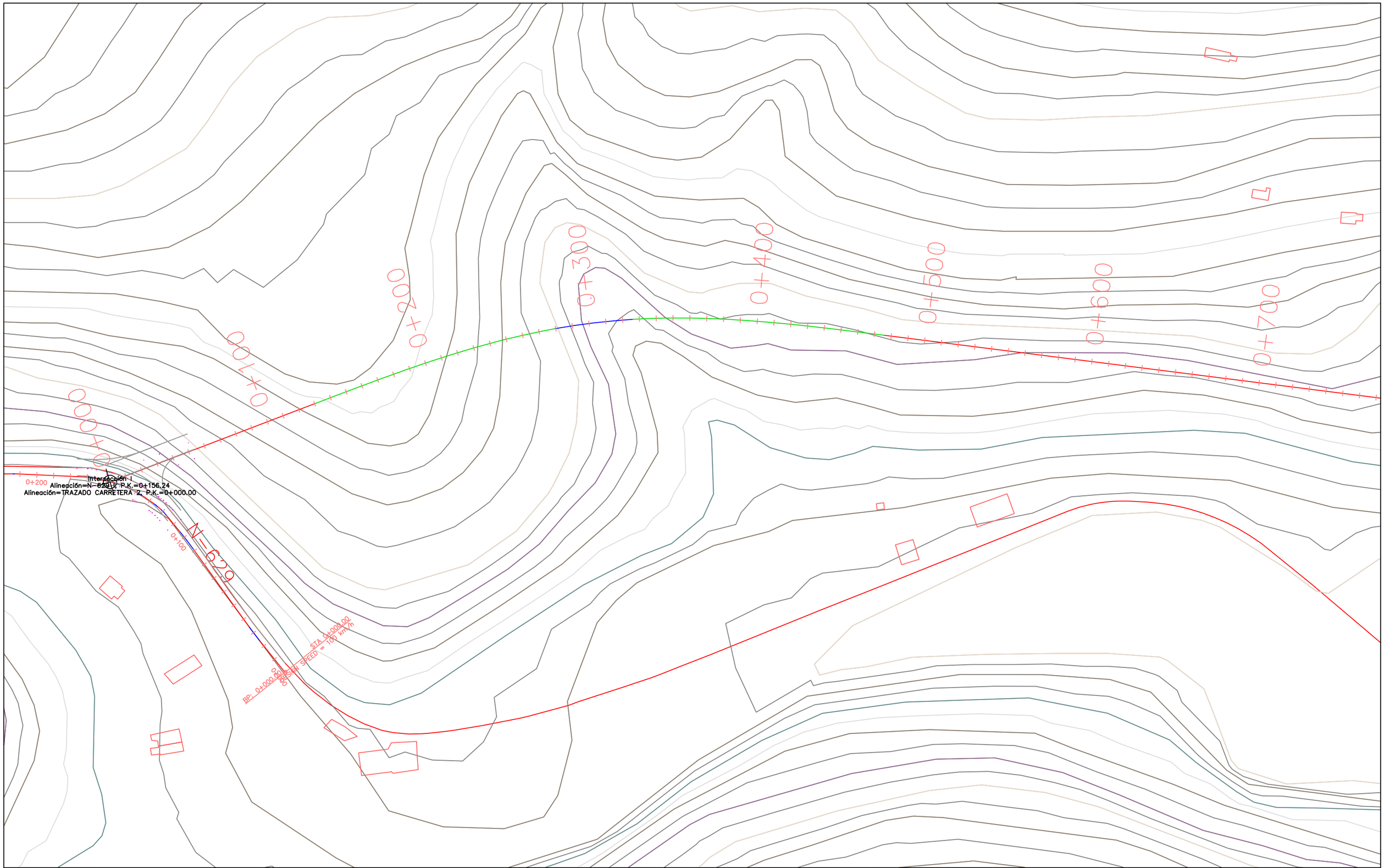
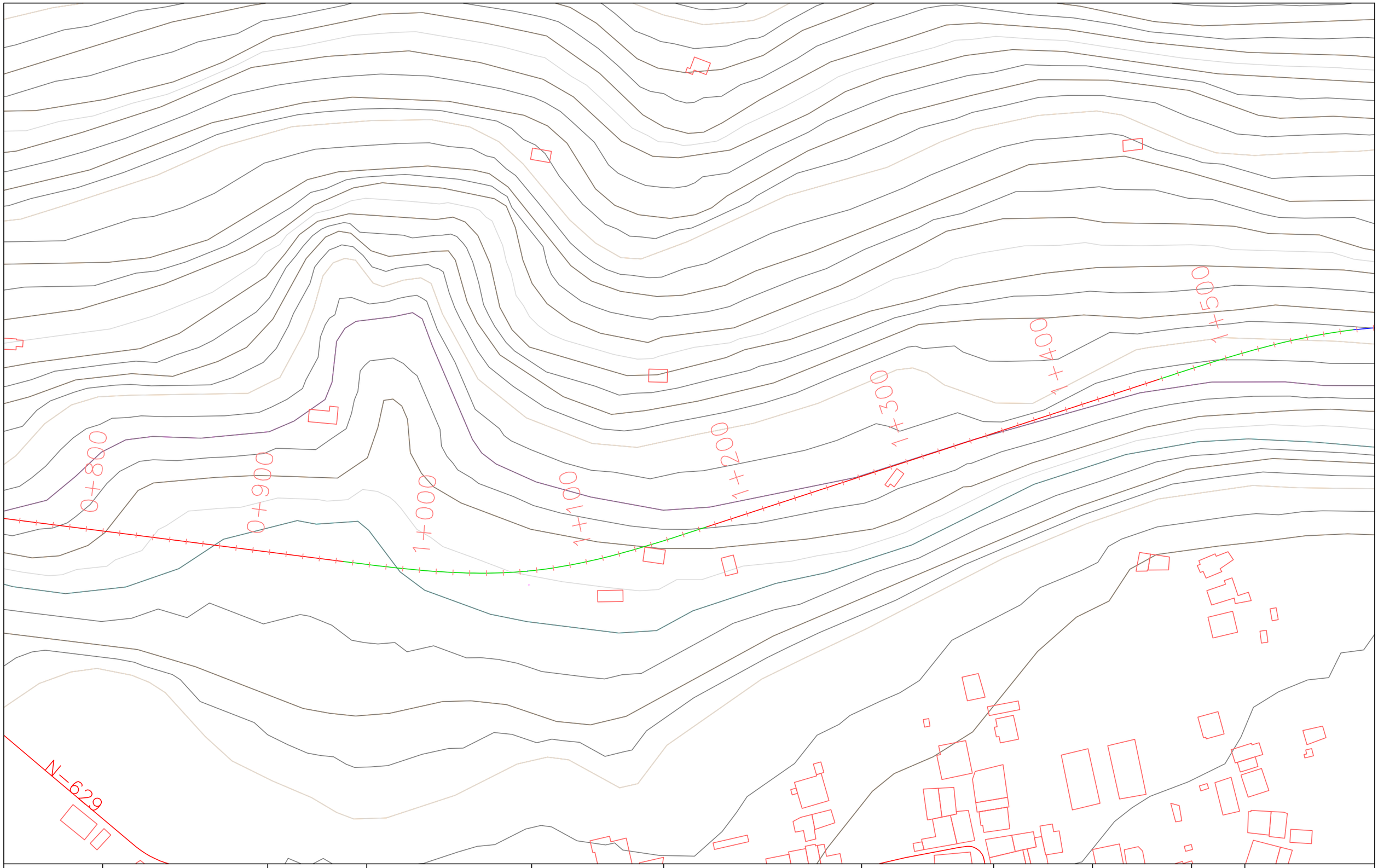


ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Planta	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 3 Sheet 4 of 4



ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Replanteo	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map Sheet 1 of 4



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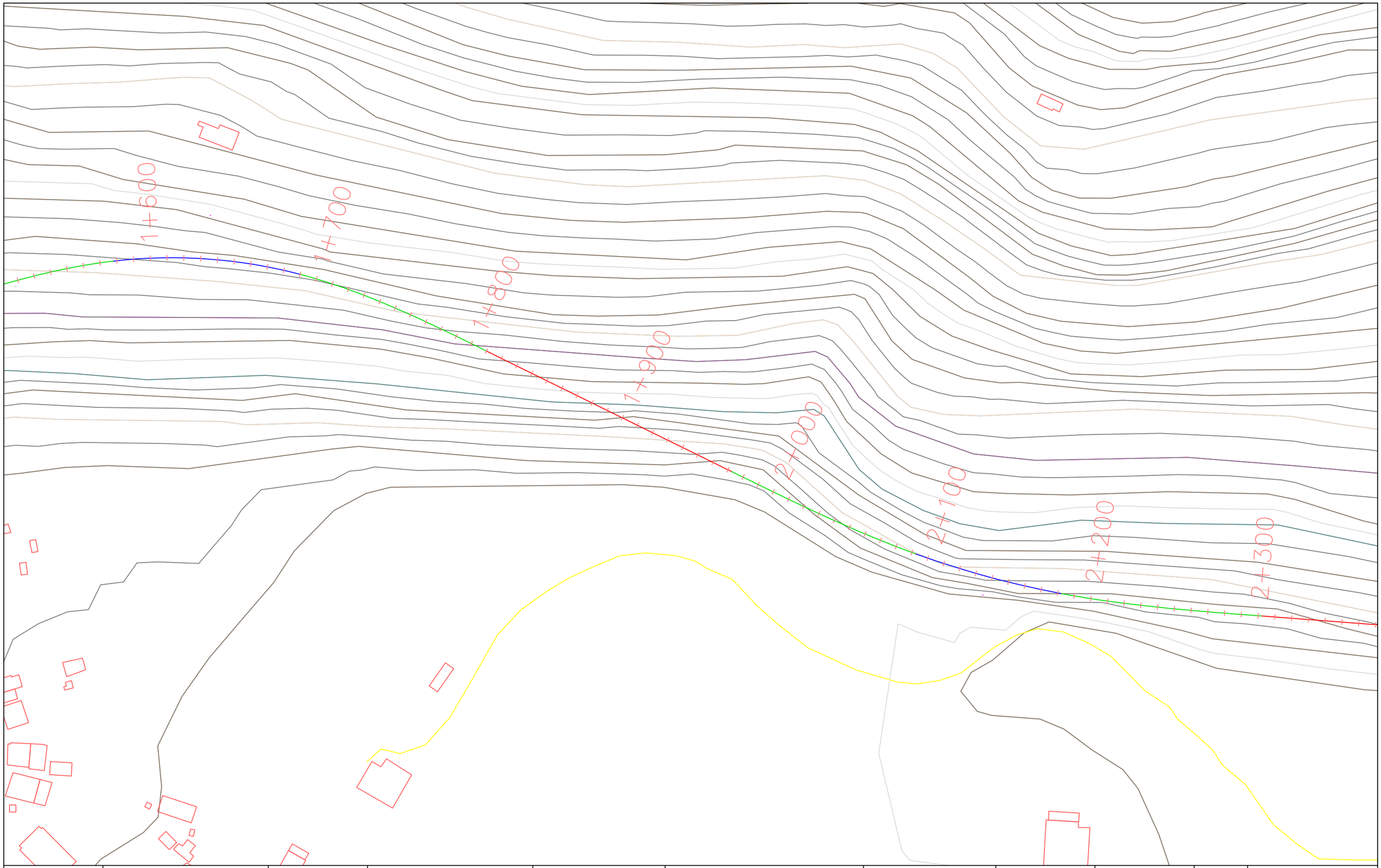

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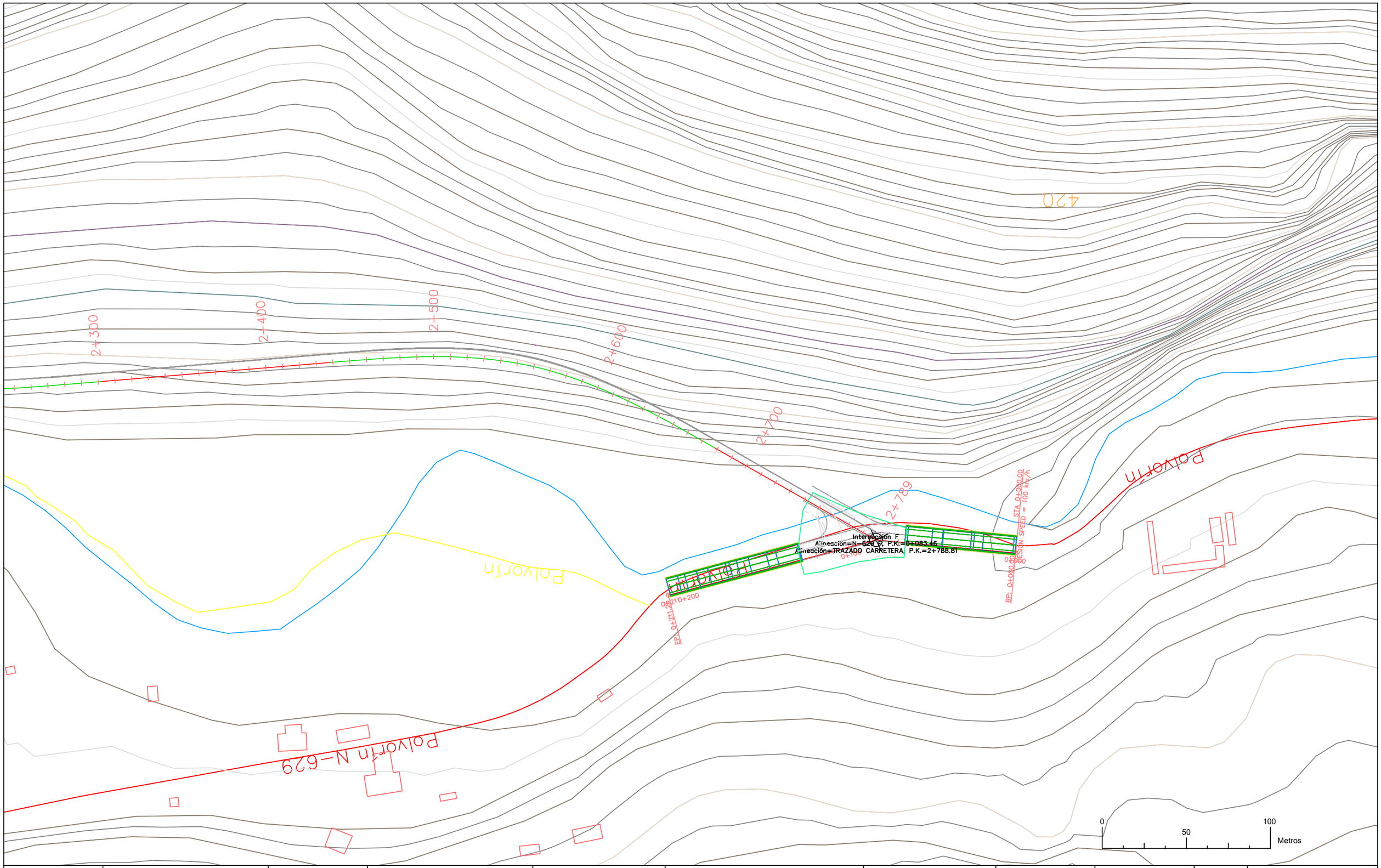

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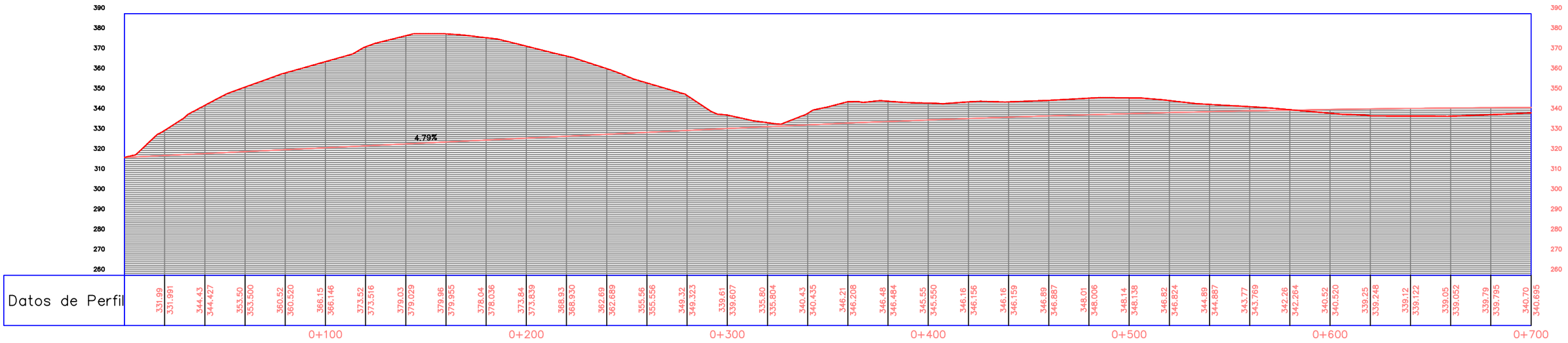
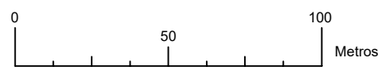
PERFIL: Variante de Lanestosa





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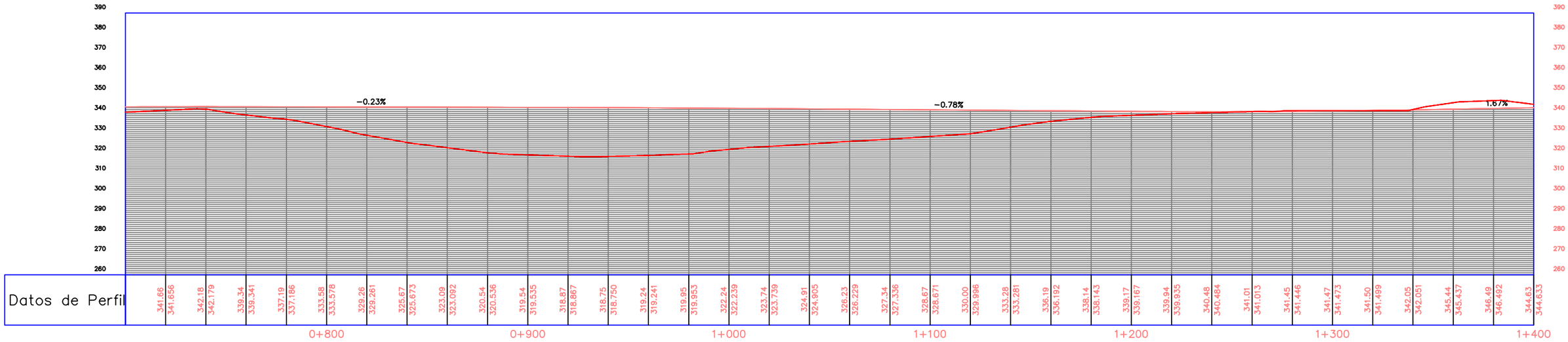
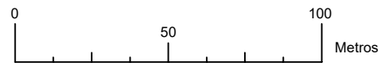
PERFIL: Variante de Lanestosa





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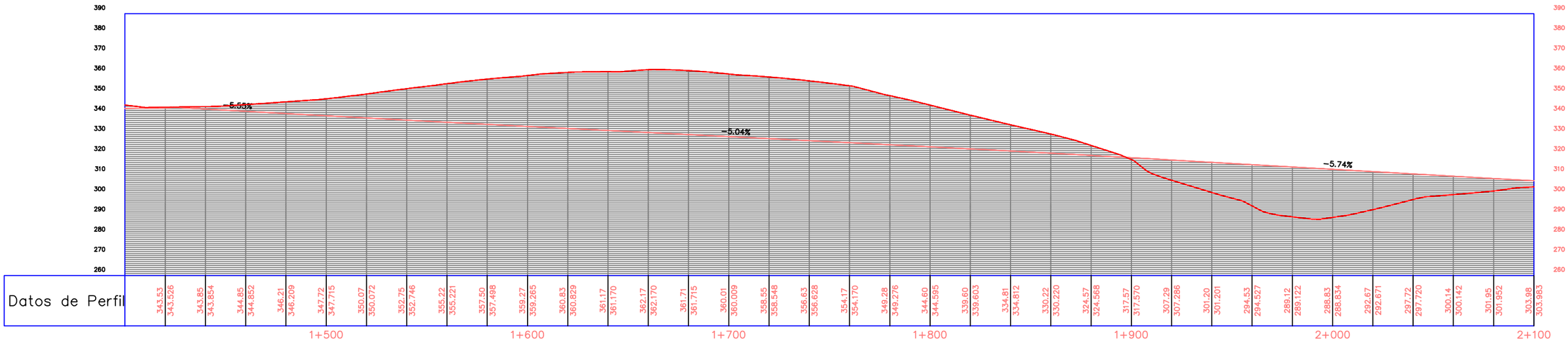

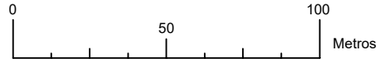

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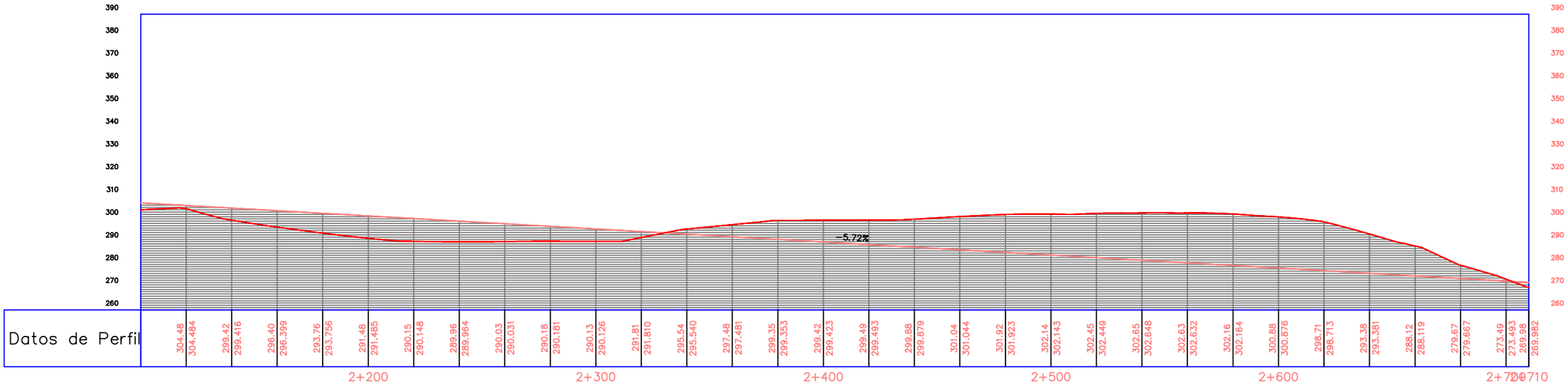
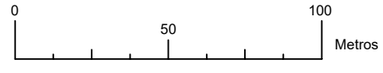
PERFIL: Variante de Lanestosa





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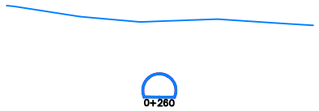
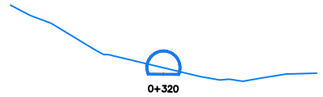
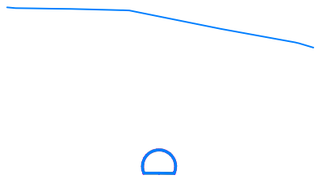
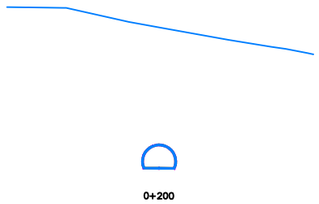
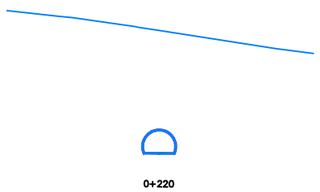
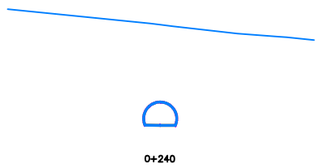


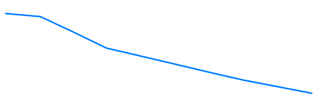


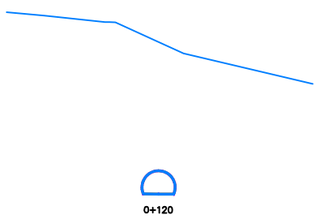


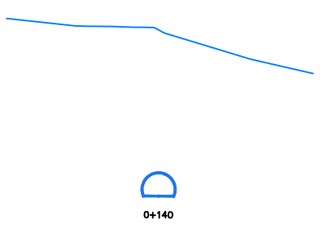


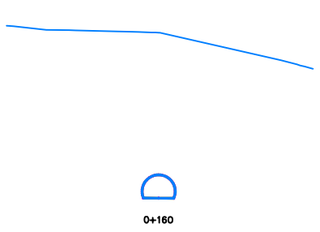


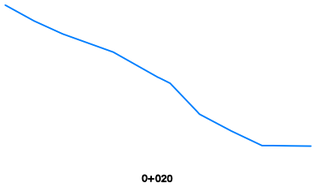


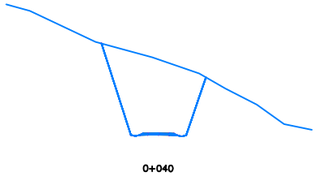


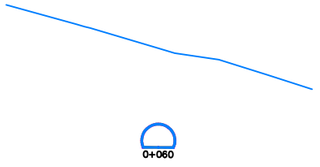


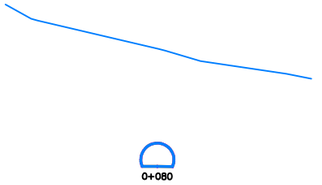




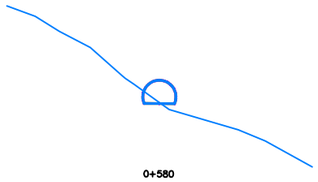


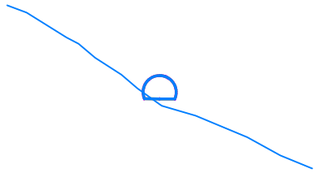


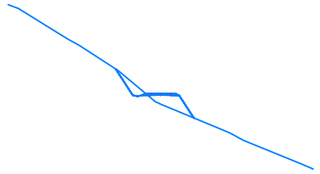


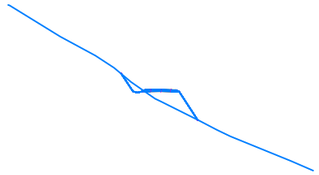


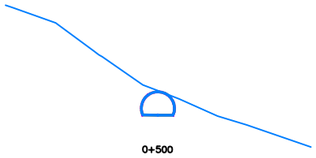
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 1 of 9

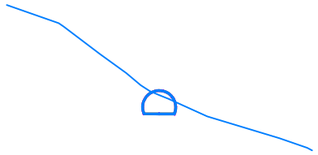


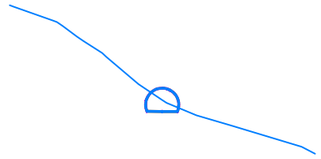


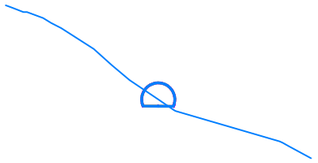


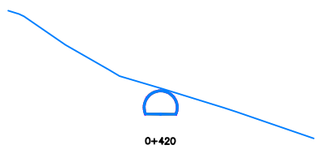


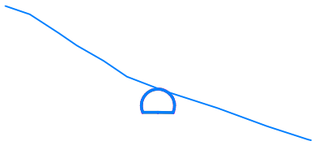


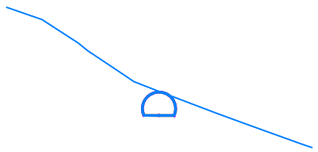


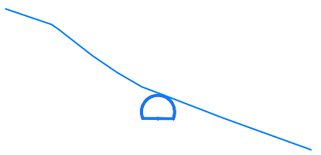


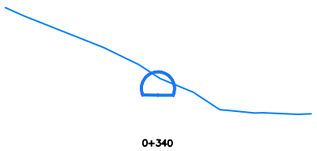


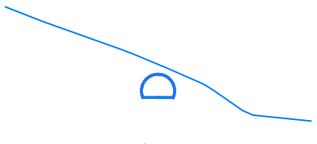


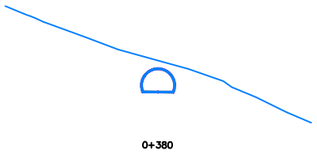


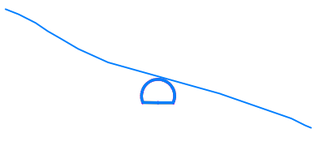












ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS
UNIVERSIDAD DE CANTABRIA
PROYECTO FIN DE CARRERA

TYPE
Construcction Proyect

TITLE
Variante de Lanestosa

MUNICIPAL DISTRICT
Lanestosa

PROVINCE
Bizkaia

MAP TITLE
Perfiles transversales

AUTHOR
Diego García Abril

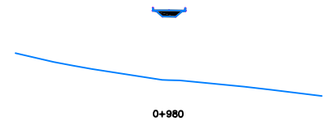
SCALE
1/1000

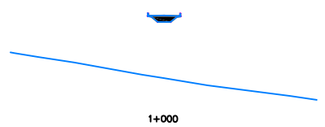
DATE
June 10

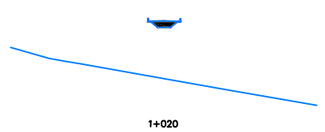
NORTE

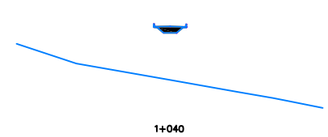
Map 5

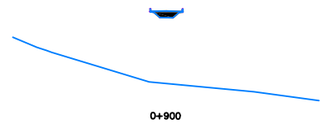
Sheet 2 of 9

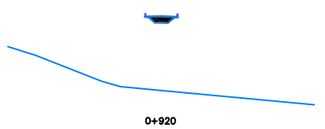


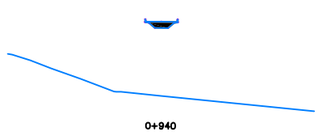


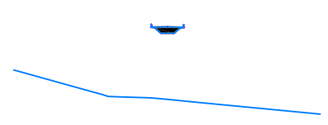


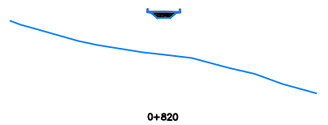


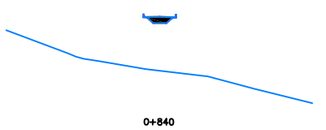


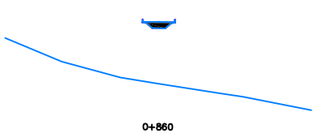


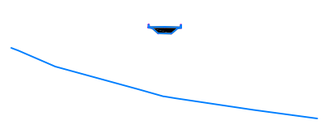


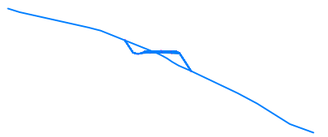


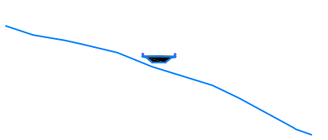


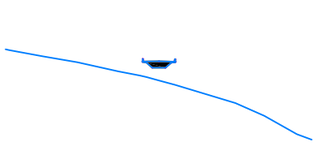


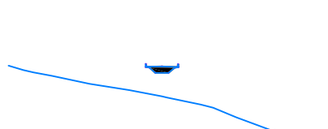




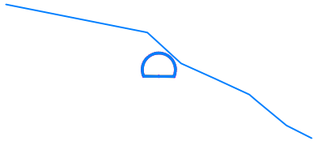








	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 3 of 9



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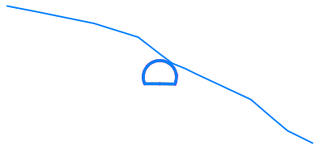

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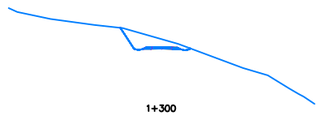

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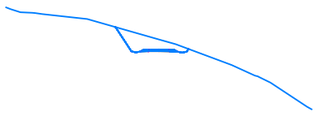

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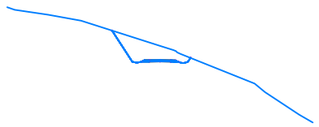

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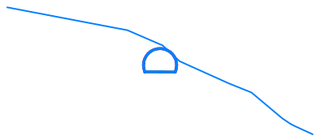

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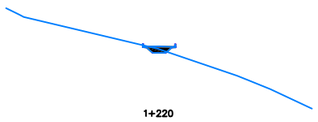

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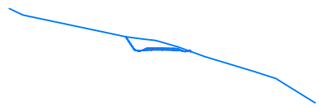

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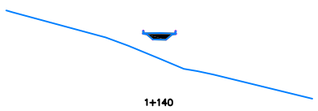

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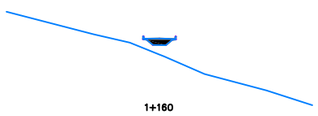

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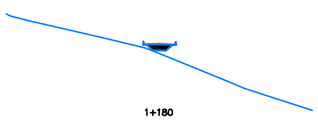

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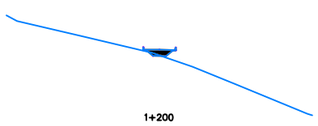

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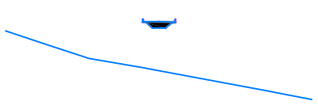

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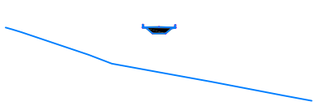

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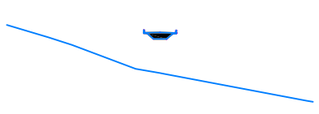

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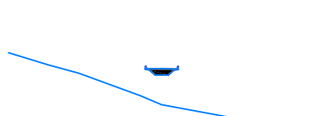

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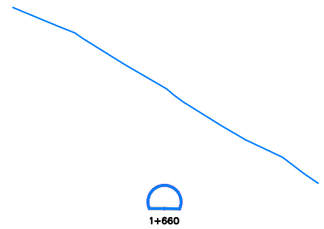
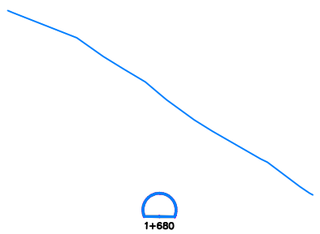
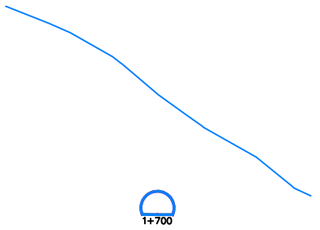
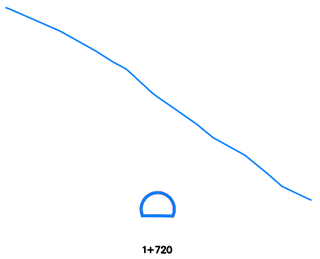
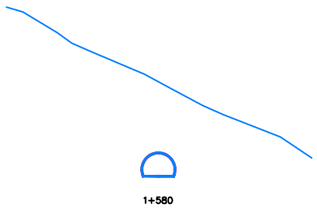
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 4 of 9

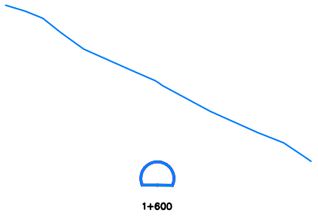


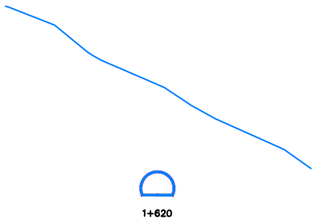


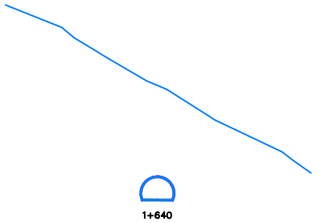


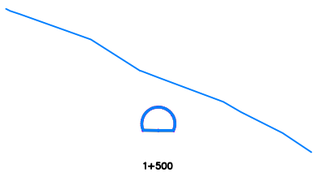


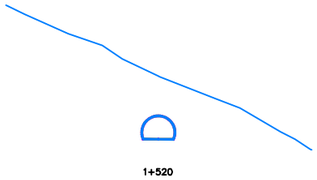


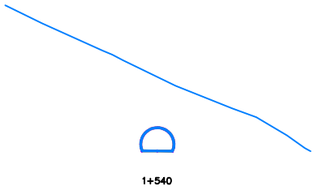


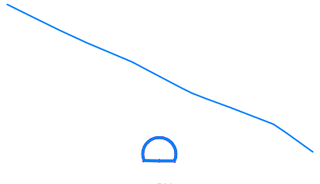


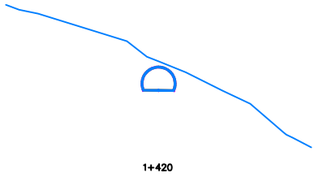


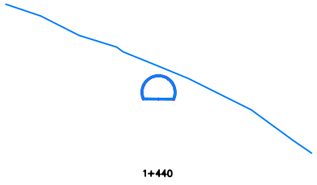


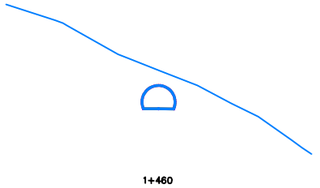


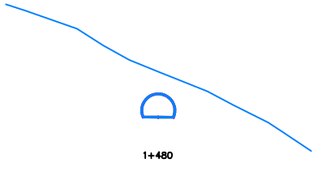




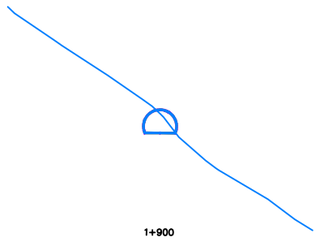








	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 5 of 9



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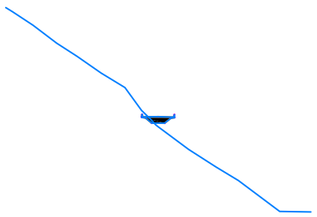

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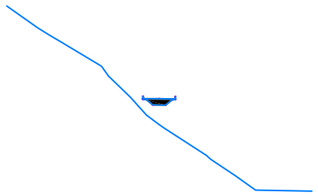

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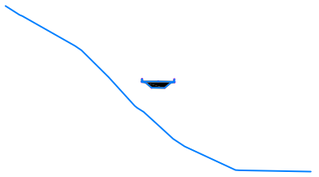

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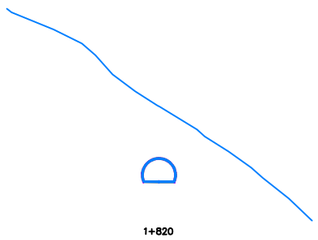

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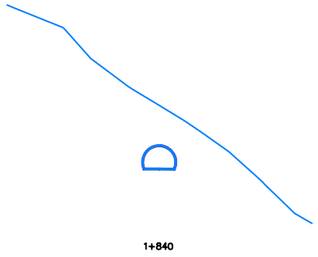

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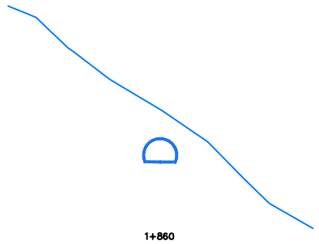

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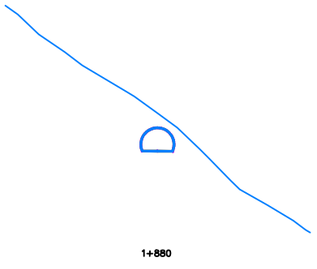

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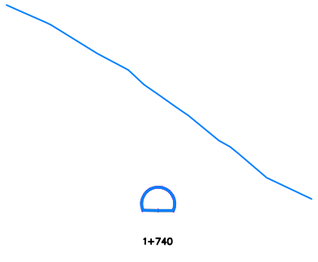

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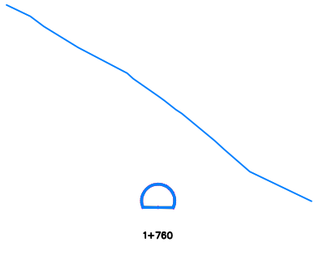

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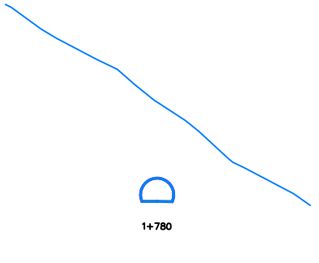

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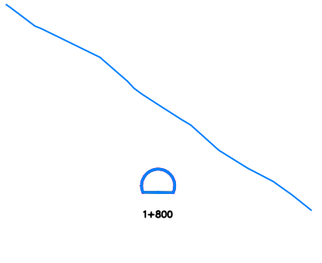

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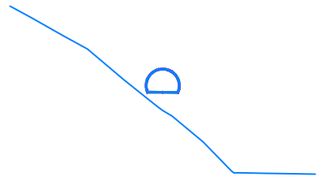
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 6 of 9



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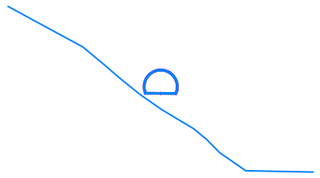

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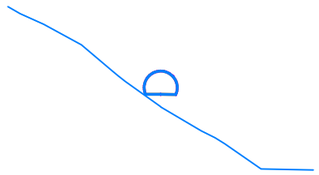

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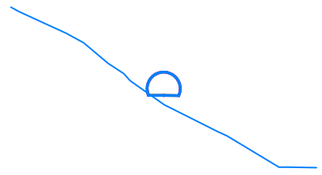

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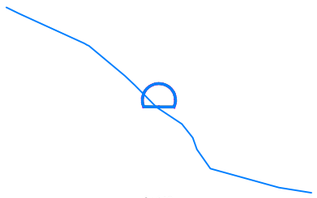

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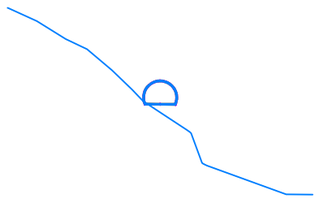

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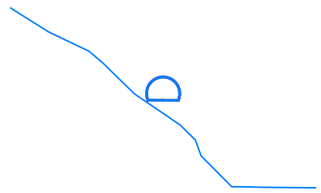

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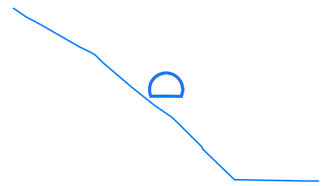

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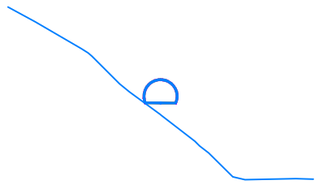

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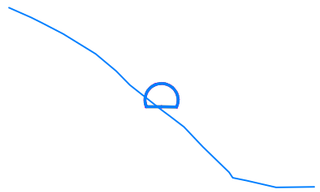

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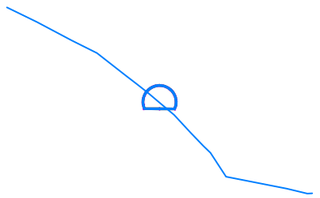

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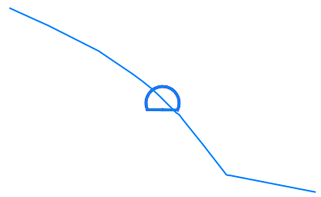

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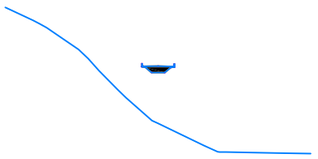

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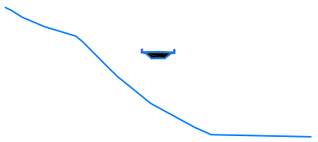

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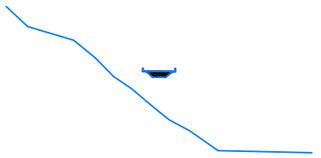

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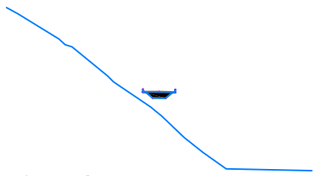

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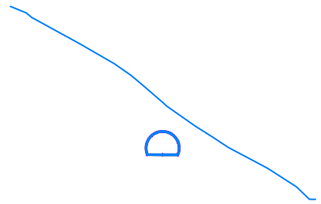
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 7 of 9



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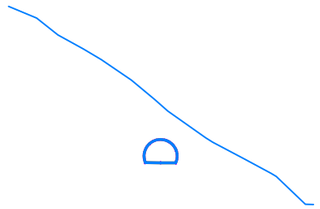

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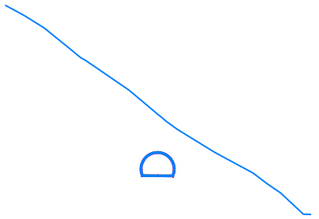

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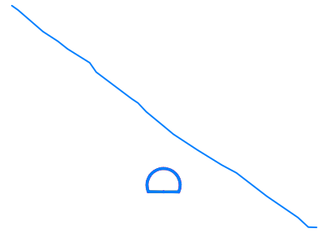

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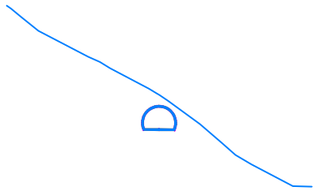

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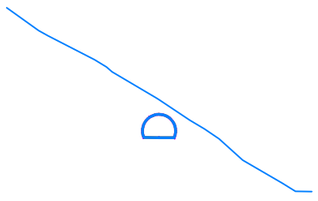

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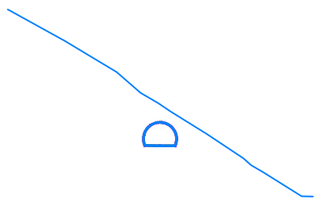

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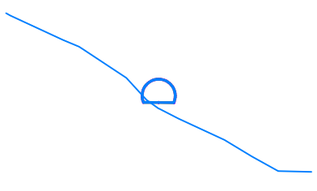

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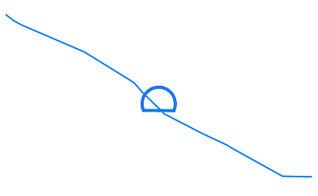

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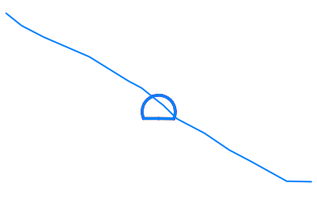

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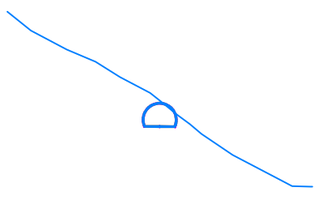

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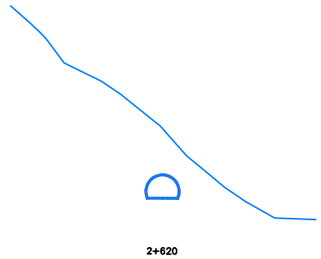
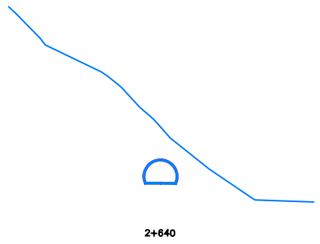
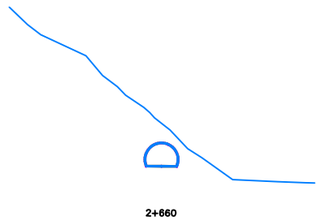
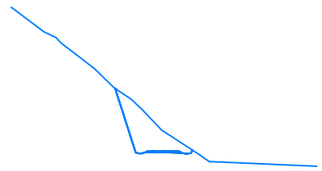
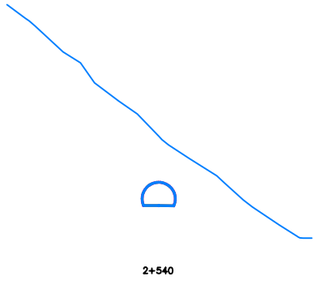
	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 8 of 9

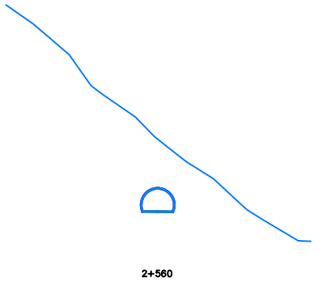


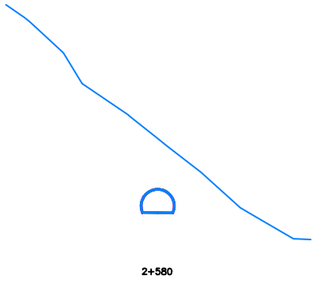


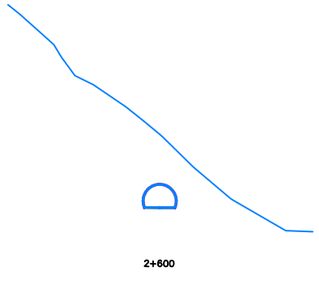












	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Perfiles transversales	AUTHOR Diego García Abril	SCALE 1/1000	DATE June 10	NORTE	Map 5 Sheet 9 of 9

0 10 20 Metros

ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS

UNIVERSIDAD DE CANTABRIA

PROYECTO FIN DE CARRERA

TYPE
Construcction Proyect

TITLE
Variante de Lanestosa

MUNICIPAL DISTRICT
Lanestosa

PROVINCE
Bizkaia

MAP TITLE
Planta intersección PK 0+000

AUTHOR
Diego García Abril

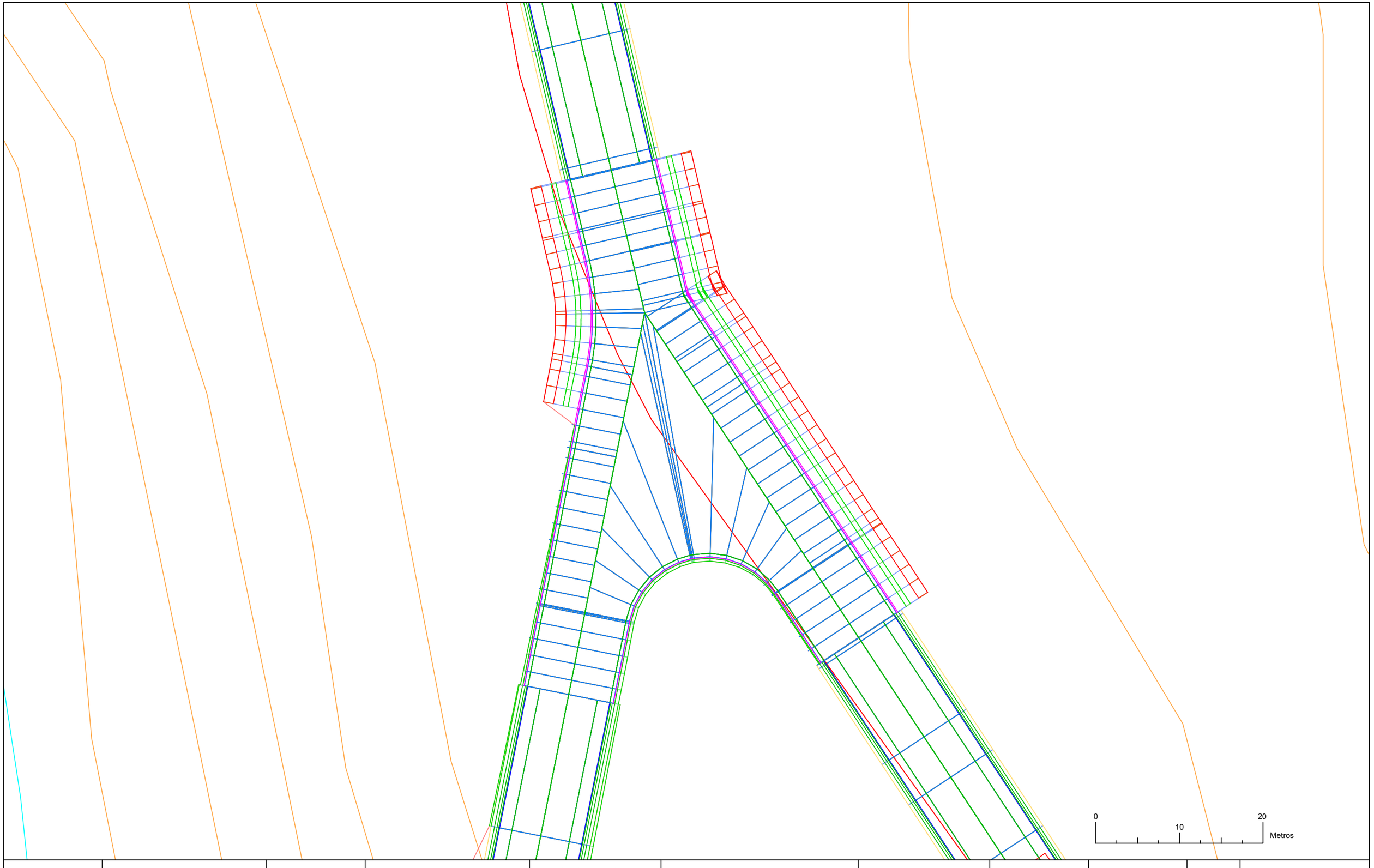
SCALE
1/200

DATE
June 10

NORTE

Map 6

Sheet 1 of 2



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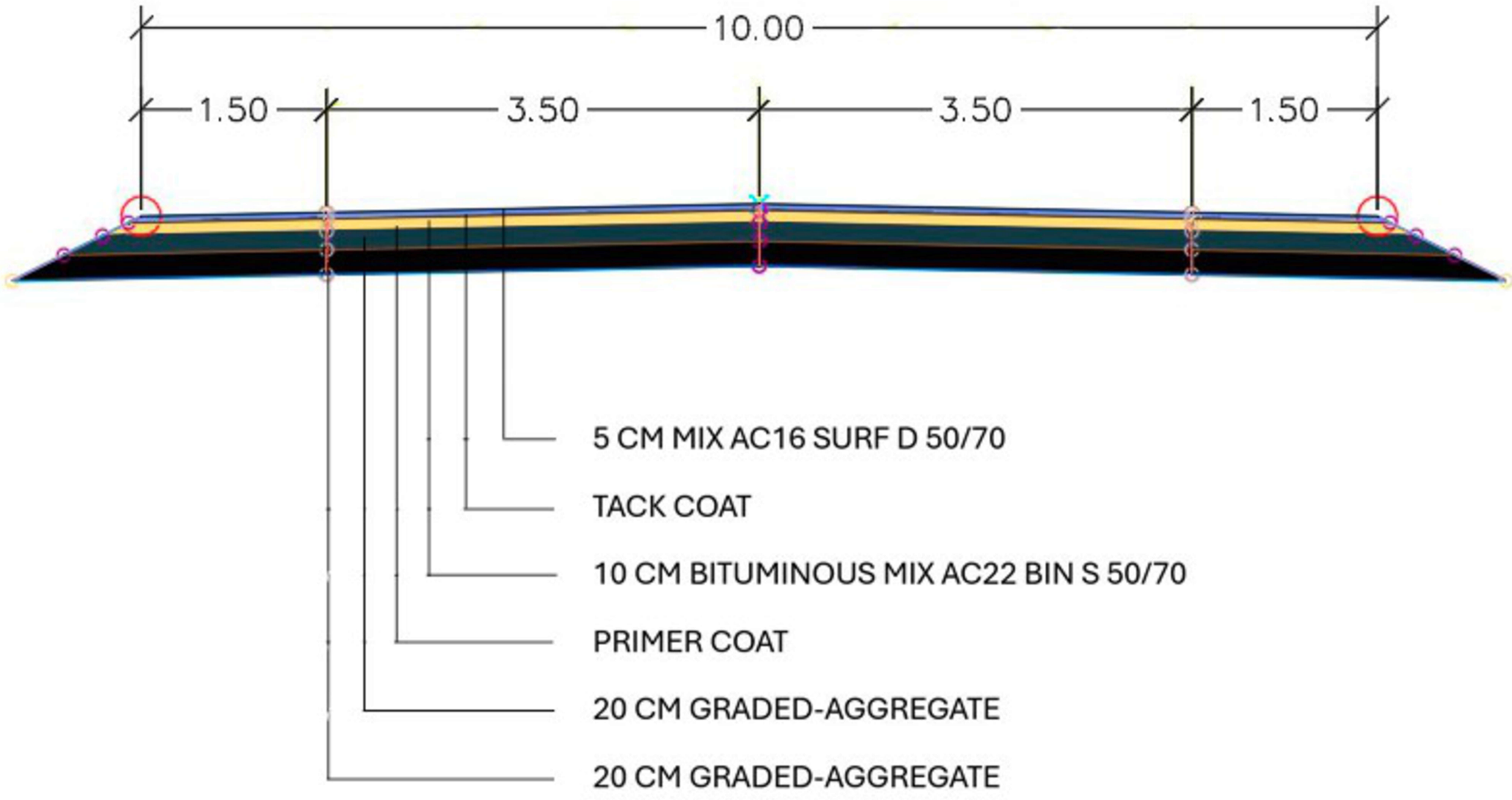

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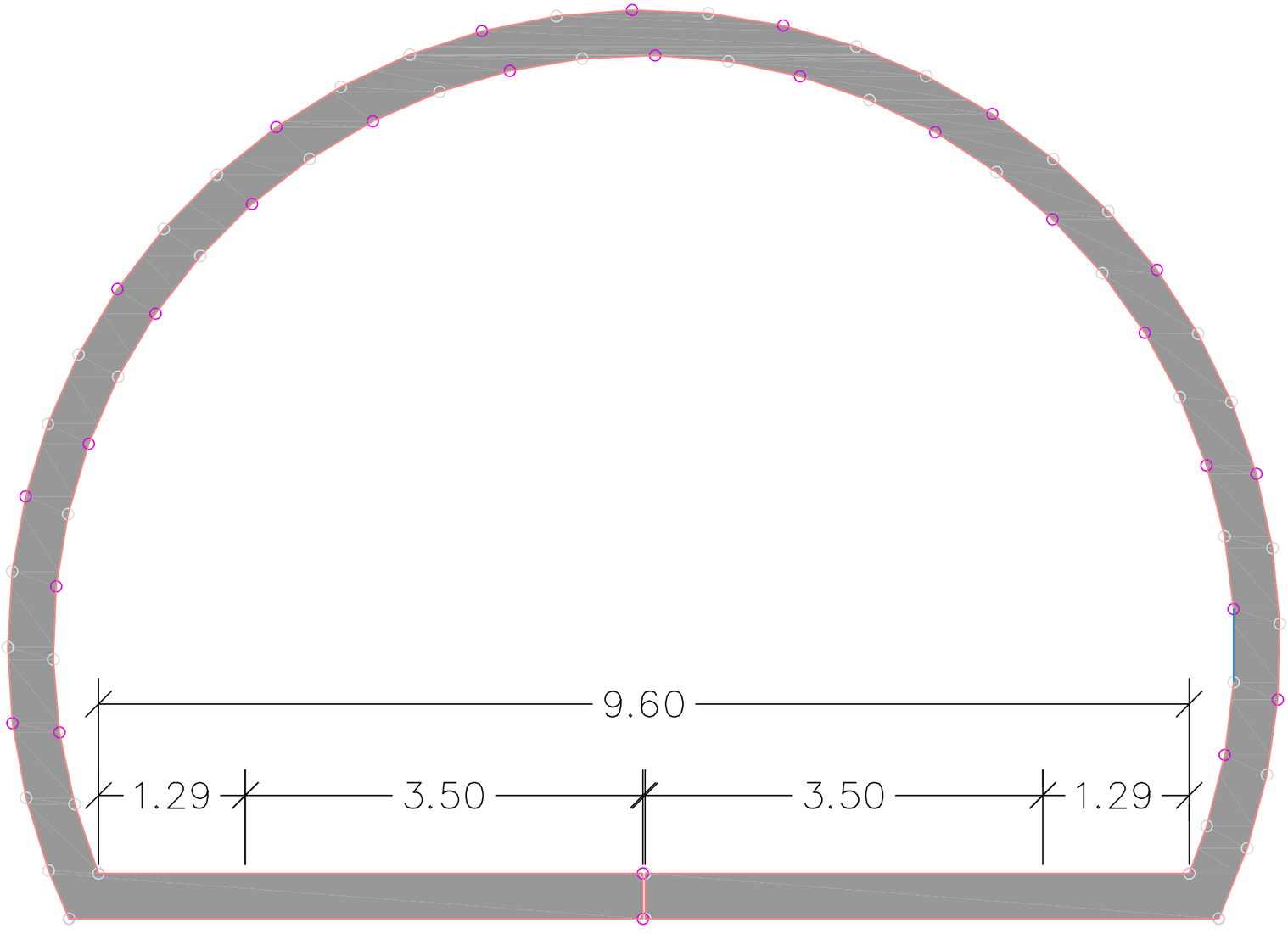
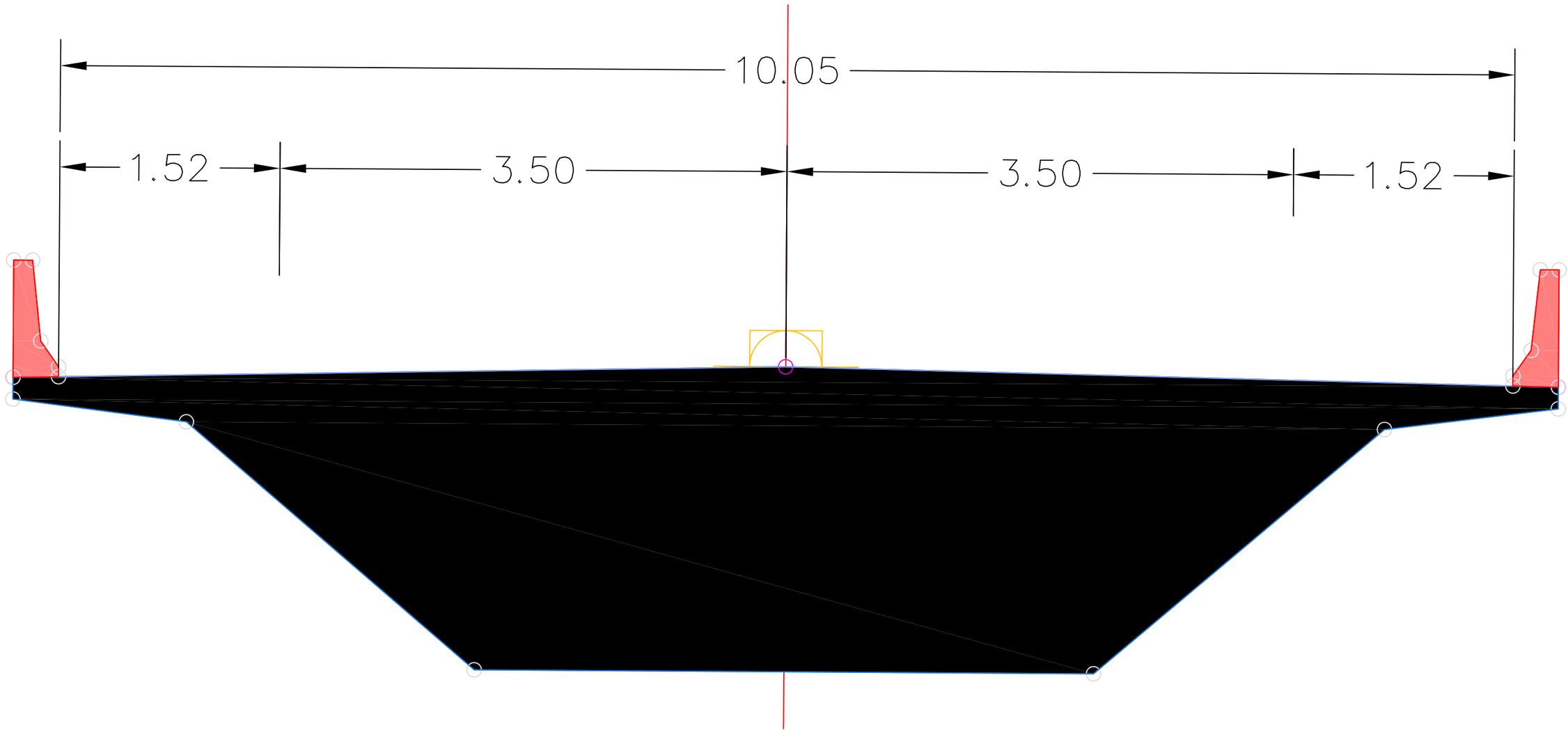


	ESCUELA TECNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UNIVERSIDAD DE CANTABRIA PROYECTO FIN DE CARRERA	TYPE Construcction Proyect	TITLE Variante de Lanestosa	MUNICIPAL DISTRICT Lanestosa PROVINCE Bizkaia	MAP TITLE Sección tipo	AUTHOR Diego García Abril	SCALE	DATE June 10	NORTE	Map 7 Sheet 3 of 3



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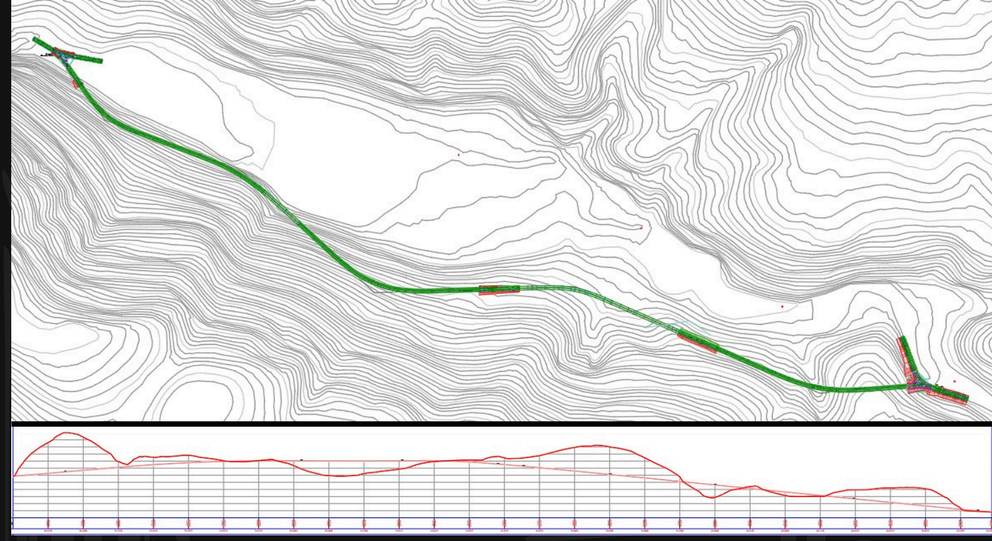
Menos tráfico, más vida

La variante de Lanestosa



Problemas

- Tráfico intenso atravesando el casco urbano.
- Paso frecuente de vehículos pesados por calles estrechas.
- Riesgos para peatones y ciclistas.
- Contaminación acústica y ambiental.
- Deterioro del entorno urbano y del patrimonio histórico.

Soluciones

- Construcción de una variante que rodea el núcleo urbano.
- Desvío del tráfico de paso, especialmente el pesado.
- Mejora de la seguridad vial y reducción del ruido.
- Recuperación del espacio urbano para los vecinos.
- Integración paisajística y respeto al entorno natural.

Presupuesto

1. EXPLANACIONES	4.084.561,34
2. DRENAJE	14.874,92
3. ESTRUCTURA	14.641.488,50
4. FIRMES	1.376.238,39
5. SEÑALIZACIÓN, BALIZAMIENTO Y DEFENSAS	16.957,97
6. PLANTACIONES	5.987,29
7. GESTIÓN DE RESIDUOS	4.587,00
8. SEGURIDAD Y SALUD	29.525,73
TOTAL	**20.174.221,14 €**

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