Document 3

Technical Specifications
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PART 1 INTRODUCTION AND GENERALITIES

ARTICLE 100. DEFINITION AND SCOPE

100.1 Definition

This Technical Specification is the set of rules which, together with those set out in the Statement of General Technical Specifications for Road and Bridge Works (PG-3) of the General Directorate of Roads and Local Roads, approved by OM of February 6, 1976, and as indicated in the plans of the project, define all technical requirements of the works that make up the Constructive Project.

It is legal, for all purposes, for O.M. 2-VII-76, the publication of the General Technical Requirements Specification, published by the Publishing Service MOPU.

The combination of both Sheets also contains the general description of the works, the conditions have to comply with the materials, instructions for execution, measurement and purchase of work units and are the norm and guide to be followed by the Contractor and the Director.

100.2. Scope

The Statement of General Technical Specifications for Construction of Roads and Bridges PG 3 supplemented with this Technical Specification shall be applied in the construction, management, control and inspection of the works on the Prestressed Bridge in Berlin, Germany.

The rules of this Technical Specification (PPTP) will prevail, if any, over the General.

ARTICLE 101. GENERAL DISPOSITIONS

101.4. Contractor personnel

Shall be applied the provisions of PG-3/75.

The Site Manager may demand that not to work if no named, accepted and present, a Representative of the Contractor, with the degree of Civil Engineer, Channels and Ports, or Engineer of Public Works, with responsibility for the delay and its consequences for the Contractor in that case.

101.5. Orders to the Contractor

It is understood that the communication Construction Management - Contractor is channeled between the Site Manager and the Chief, notwithstanding that for simplification and efficiency, especially in urgent or routine cases, there may be communication between their personal, but it will on their behalf and they must be informed promptly, based on good will and common sense and in form and materials than those set, so if anybody has a problem of interpretation or decision of major importance, not worth without ratification by indicated Site Manager and Chief.

101.6. Logbook
It shall consist in all the circumstances and details of the development of the works that the Engineer Works Project Execution Manager may consider appropriate, and among others, on a daily basis, the following:

- General weather conditions and maximum and minimum ambient temperature.
- Ratio of work done, with details of their location within the work.
- List of tests carried out, with summary results or list of documents in which they are collected.
- Teams of staff and mechanics employed.
- List of equipment on site with expression of which one has been active and at what cut and which one merely present and which one damaged and repaired.
- Modifications signs on the existing road network.
- Any other condition that may affect the quality or rate of execution of the work.

The Logbook will remain guarded in work by the Contractor during the execution of the works and the warranty period of the same being delivered to the Administration in the act of final acceptance.

**ARTICLE 102. DESCRIPTION OF WORKS**

**102.1. Plans**

At the request of the Project Execution Manager, the Contractor shall prepare all levels of detail that are deemed necessary for the execution of the contracted works. These plans shall be submitted to the approval of that Director, accompanied, if necessary, of reports and supporting calculations required for better understanding.

**102.2. Contradictions, omissions or errors**

If the Project Execution Manager of Development would find inconsistency in the joint implementation of all the technical limitations that define a unit, only those limitations that, in his opinion, report higher quality will be applied.

**ARTICLE 103. INITIATION OF WORKS**

**103.1. Inspection of works**

The inspection of works also includes workshops or factories that produce and prepare the materials for the work or works were carried out.

**103.3. Work program and auxiliary facilities**

Under the precepts in the General Rules of Hiring date from November 25th 1975, the Contractor shall submit for approval of the Administration, within a maximum period of one (1) month as from the release start of construction, a program of work in which the partial deadlines and completion dates of the various units of work compatible with fixed annuities and lead-time specified by the Contractor.

a) Writing
The work program shall be drawn up under the Order Circular 187/64 C. of General Directorate of Roads.
Within the overall execution time the necessary for the first phase of works (installations, stakeout, etc.) and for the last (inspections, closing, etc.) shall be provided. It will also take into account the time constraints that the Environmental Impact Statement or measures of environmental protection establishes in this Specification. This program must be submitted before the commencement of the work, for approval by the Engineer thereof, who can make comments and/or corrections that seem appropriate in order to achieve adequate progress of the work.

b) Monitoring

The program should be kept updated at all times, having analyzed the performance thereof or otherwise analyze the possible causes of deviation, together with the Direction of the Works, and propose possible solutions to this (new equipment, increased pits, etc.). The Contractor shall also submit a complete list of services and equipment that agrees to use at each stage of the plan. The proposed means will remain assigned to the work without; in any event, the Contractor may withdraw without permission of the Engineer in charge. Also, the Contractor shall increase auxiliary means and technical staff provided that the Site Manager verify that it is necessary for the development of the works on time.

Acceptance of the plan and the proposed ratio of auxiliary means will not involve any waiver of liability for the Contractor in case of breach of partial or total deadlines agreed.

ARTICLE 104. DEVELOPMENT AND CONTROL OF WORKS

104.0. Self Contractor Management and Control

The Contractor is obliged to make checks to the dimensions, tolerances and geometry in general and quality through testing of materials, consolidate densities, etc., To ensure that materials and units of work executed meet the conditions of the contract, it is understood that not inform the Administration, represented by the Site Manager or delegated by the same person to the effect that a unit construction is finished, in his view, for testing, until the same Contractor, through its power to the case; staff have done their own checks and tests and is satisfied meet specifications. This is without prejudice to the Site Manager does the inspections and tests it deems useful at any time of execution. To do so, the Contractor is obliged to have at work the necessary and sufficient equipment, laboratory materials, facilities, equipment, etc., as staff, with technics and assistants, trained for such measurements and tests.

The Site Manager may prohibit the execution of a unit of work if these elements of self-control of the Contractor for it are not available, and the Contractor's sole responsibility of the possible consequences of delay, cost, etc..

These checks are performed in accordance with the "Guidelines for quality control in road works 1978", published by the Directorate General of Highways (MOPT).

104.4. - Materials
104.4.1. - General scope

The Management does not assume responsibility for ensuring that the Contractor found in the places of origin indicated, materials suitable and sufficient for the works at the time of execution amount.
In general all the requirements, regarding the requirements to be met by materials listed in the instructions, specifications or official rules that govern the receipt, carriage, handling or use of each of the validated materials used in the work and defined in the Project, must not be contrary to the particular requirements of this Specification.

104.4.3. - Storage

The materials shall be stored so as to ensure proper storage and so that an easy inspection is provided if necessary.

104.8. Construction and maintenance of deviations

Deviations and provisional access to the works will be constructed as posted on the Drawings, or otherwise, as pointed by the Project Execution Manager.

Its construction, maintenance and security during the period of use by the Contractor shall, at this point considering included the paint and vertical signaling necessary, unless expressly otherwise specified in the Contract Documents Project, be subjected to the Site Manager of Works.

104.9. Signaling works and installations

The Contractor is required to know and fulfillment of all current provisions relating to signaling works and installations, and in particular, the provisions of Articles 41 and 171.b) A Law on road traffic in the OC 300/89 P.P. of March 20, 89, signs, markings, defense, cleaning and finishing works on fixed routes into the town, in the OC 301/89T April 1989 and 8.1.I.C. Standards June 1998 draft, 8.2.I.C. March 1987 and 8.3.I.C. of 31 August 1987 concerning the roadwork signaling.

The Contractor shall designate a responsible Head of signage, markings, and defense works relating to traffic during the execution of works, full time and permanent presence, even in non working days.

Any accident in the works for breach of the foregoing, it will be entirely the responsibility of the Contractor.

104.12. Cleaning works

Once the works are completed, and prior to its receipt, it shall be general cleaning, removing the excess or waste materials, debris, ancillary works, facilities, warehouses and buildings that are not required for conservation during the period of warranty. This cleaning will extend the domain areas, bonded and condition of the road and lands which are temporarily occupied, and must meet a similar situation as they were before the work.

The Contractor shall be required to ensure compliance with the provisions of Articles 2, 3, 4, 5 and 6 of the OM of 31 August 1987 concerning the signs, markings, defense, cleaning and finishing works on fixed routes into the town.
104.13. Conservation of Works Executed

The Contractor is committed to preserve at its own expense and until they are received, all the works that make up the project. Also, he is bound to maintenance and operation to the facilities during the warranty period set in the contract from the date of receipt and shall replace any part thereof that has experienced displacement or deterioration suffered by negligence or otherwise that will be attributable, or as a result of the anticipated weather conditions, or other causes that cannot be seen as inevitable.

104.16. Execution of works not specified in this Schedule

The execution of the work units of this project, the specifics are not listed in this Technical Specification shall be in accordance with the specifications for the same in the tender documents General Technical Specifications for Road and Bridge Works (PG-3), the Standards indicated in section 100.3. of these Terms or as ordered by the Engineer Works within the best practice for similar works.

ARTICLE 105. RESPONSABILITIES OF THE CONTRACTOR

105.4. Permits and licenses

The Contractor shall obtain, at its expense, all permits and licenses necessary for the execution of works, except those relating to the expropriation of the areas defined in the project.

105.5. Signage and cleaning works

The Contractor is required to complete signaling works, general cleaning of the road and its area for the same condition, as well as completion, including final withdrawal of collected materials they no longer have use (Clauses 23 and 42 of PCAG, PG 106-3 Aq and Aq-3 9 and 10 of the Standard 8.3.1C).

ARTICLE 106. MEASUREMENT AND PURCHASE

106.2. Purchase of works

Mode of purchase of the Completed Works

Each unit of work will be measured and paid as indicated in the corresponding article of this Technical Specifications. If there is not any indication, it will be as laid down in Tables of Prices and the PG3.

All unitary prices of measurement standards and purchase contained in this Technical Specification relate prices shall be deemed to always include the supply, handling and use of all materials necessary for the execution of the relevant work units, unless specifically exclude any in the corresponding article.

It is also understood that all unit prices include the cost of machinery, labor, fixtures, transport, tools and few direct all operations necessary or incidental to the work units, completed as specified in this with specification and Drawings, are approved by the Administration.
Mode of purchase of the Incomplete Works

The figures for weights or volumes of materials contained in the decomposed units Price Table No. 2, will serve only for understanding the cost of these materials collected on site, but by no means have value in order to define the proportions of mixtures, and the required volume on preparations, for achieve unity consolidated on site.

When for termination or other cause would be necessary to value incomplete works the Price Table nº 2 shall be applied. It may not be pretended neither the valuation of each unit other than the valuation of the work table, or that the Contractor is entitled to claim any failure or omission by the cost of any element that constitutes the price. The items comprising the decomposition of the price of purchase will be collected when all the material, including accessories or performed entirely the work and operations to determine the definition of the party, since the criteria to be followed should be that payable only the completed executed phases are to consider, the Awardee lose all the rights in the case of leaving them incomplete.

106.3. Other expenses of the Contractor

Shall bear the Contractor, among others, the expenses incurred by general rethinking of the works or their verification, and partial stakeout procedures, the construction and maintenance during the period of its temporary ramps to partial stretches or completed, the conservation during the same period all the deviations, the derivatives maintaining the intermittent traffic while work is being performed, the acquisition of water and energy.

Are not included as a "costs of the Contractor" those corresponding to the planned units of work and Signage Safety and Health at Work, as are objects to pay separately.

In cases of contract rescission, whatever the cause that motivates it, shall be borne by the Contractor the costs arising from the settlement and the withdrawal of auxiliary means or employees in the execution of works.

106.4. Faulty works

If any work is unable to be executed under the conditions of the contract and go with, however, permissible in the opinion of Site Manager, may be admitted, being required to conform the Contractor, without relay, to the economic downgrade that the Engineer Works deems, except in case that the Awardee demolish at their expense and remake under the conditions of the contract.

106.7. Other units

Those units not specifically listed in the Technical Prescription will be paid fully completed in accordance with the prices fixed in Table No. 1 comprising all expenses necessary for execution, understanding materials included by saying completely finished with, auxiliary means, assembly, falsework, testing, placed in service and all those elements or operations as appropriate for the use of the units in question.

ARTICLE 107. OFFICE WORK

Pursuant to Clause 7 of the Statement of General Administrative Clauses for Contracting in
State Works, Decree 3954/1970 of December 31st, prescribes the obligation of the Contractor to provide the Site Manager, sufficient units within his office work for the facilities he may need for the control and supervision of works.

ARTICLE 109. RECEPTIONS

109.3 - Guarantee period: Responsibility of the contractor

The warranty period starting from the reception of the works, shall be one year, and two growing seasons, for plantations, during which the Contractor will be responsible for routine maintenance of those whatever the nature of the work to perform is, the latter is applicable were is not motivated by reasons of force majeure. The Contractor also must correct any that were reflected in the record of receiving the work.

Of the Contractor shall be the expenditure on overall testing that during the warranty period would to be done, provided in the record of receiving the work.

For maintenance and conservation is set in a party of Corrective Measures servicing and maintenance of plantations throughout the warranty period. The Direction of Work shall perform such inspections as it considers necessary to order the proper maintenance of plants, crops and infrastructures.

In regard to the Contractor's liability is for the Project Manager to judge the true cause of the damage or deficiency, deciding who is responsible for managing the costs of repairs.

ARTICLE 110. HEALTH AND SAFETY AT WORK

It is defined as health and safety at work the measures and precautions which the Contractor is required to make and take during the execution of the works to prevent hazards, accidents and diseases, as well as derivatives of the repair, conservation, entertainment, and the required facilities for health and welfare of workers.

According to Royal Decree 1627/1997 of 24 October, the mandatory inclusion of a Study on Safety and Health in Construction Works is implanted, the Contractor shall prepare a Health and Safety Plan adjusted to its form and methods of work.

ARTICLE 112. CONTRADICTORY PRICES

If it is necessary to establish any changes requiring usage of a new unit of work, not covered by the Price Tables is contradictorily determine the new price, according to the general conditions and taking into account the prices of materials, auxiliary prices and Prices tables of the Present Project.

Pricing in any case, will be made before the new unit is run. The application rate shall be fixed by the Administration in view of the proposal of the Project Execution Manager and the Contractor observations. If any does not accept the approved price shall be released running the new unit and the Administration may contract it from another employer.
PART 2 BASIC MATERIALS

GENERALITIES

All materials used in the works shall meet the conditions of this PPTP and his reception must be made by the Project Execution Manager of the works, who will determine those to be subjected to tests before acceptance, when is not enough considering their visual examination. The Contractor shall inform the Project Execution Manager on the origin of the materials to be used, with a minimum of one month to the time of use, so that it can proceed to the order of the tests if he deems necessary.

The fact that at a certain time a material can be accepted will not mean a presumption of waiver of the right to later rejection if defective is checked.

In principle the work or part of which has been done with materials not tested or not expressly approved by the Project Execution Manager shall be considered defective.

In case to be precise the use of some material not included in this PPTP, the Contractor shall select one that best suits the use to be designed and present few samples, reports, certificates, etc., Can achieve the manufacturers in order to demonstrate to the Project Execution Manager the suitability of the selected product. If the information prove insufficient guarantees for the Project Execution Manager of the works, it may order the testing even resorting to specialized laboratories. All accepted material will not be removed from the work immediately, unless expressly authorized in writing by the Director.

ARTICLE 202. CEMENTS


Mixed Portland Cement CEM II / AM are commonly used throughout the work. The Chief Engineer may order or authorize the use of other types of cement, not being overrun reason for the change of the corresponding unit.

The production of concrete of characteristic strength exceeding two hundred kilograms per square centimeter (200 kg/cm²) cement CEM II / AM 32.5 UNE 80301:96 type can be used, either the characteristic strength of greater than 200 kg/cm² cement CEM II / AM 42.5 UNE 80301:96.

The cement concrete to be used is normal setting. If for any reason it was necessary to use quick-setting cement, they require the 28 day strength of concrete.

ARTICLE 211. ASPHALTIC BITUMEN

The asphaltic bitumen shall comply the specified in Article 211 of the PG-3 with its corresponding changes included in the OM of December 27, 1999.
The binder used in bituminous mixtures will be dense bitumen of penetration 50/70. The characteristics of the bitumen are shown in the table below:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>Normative NLT</th>
<th>B 50/70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration <em>25°C</em> 100g_5s</td>
<td>0,1 mm</td>
<td>124</td>
<td>60</td>
</tr>
<tr>
<td>Penetration ratio</td>
<td></td>
<td>181</td>
<td>-1</td>
</tr>
<tr>
<td>Softening point</td>
<td>°C</td>
<td>125</td>
<td>48</td>
</tr>
<tr>
<td>Ring and Ball</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brittle point Frass</td>
<td>°C</td>
<td>182</td>
<td>-8</td>
</tr>
<tr>
<td>Ductility_5cm/min a_15ºC</td>
<td>cm</td>
<td>126</td>
<td>90</td>
</tr>
<tr>
<td>Ductility_5cm/min a_25ºC</td>
<td>cm</td>
<td>126</td>
<td>90</td>
</tr>
<tr>
<td>Solubility in toluene</td>
<td>%</td>
<td>130</td>
<td>99,5</td>
</tr>
<tr>
<td>Water content (vol)</td>
<td>%</td>
<td>123</td>
<td>0,2</td>
</tr>
<tr>
<td>Swelling point</td>
<td>°C</td>
<td>127</td>
<td>235</td>
</tr>
<tr>
<td>(º) Relative density 25ºC/25ºC*</td>
<td></td>
<td>122</td>
<td>1,0</td>
</tr>
<tr>
<td>Variation of mass</td>
<td>%</td>
<td>185</td>
<td>0,8</td>
</tr>
<tr>
<td>Penetration _25°C_100g_5s</td>
<td>% p.o.</td>
<td>124</td>
<td>50</td>
</tr>
<tr>
<td>Variation of the softening point A_y_B*</td>
<td>°C</td>
<td>125</td>
<td>9</td>
</tr>
<tr>
<td>Ductility_5cm/min a_15ºC</td>
<td>cm</td>
<td>126</td>
<td>50</td>
</tr>
<tr>
<td>Ductility_5cm/min a_25ºC</td>
<td>cm</td>
<td>126</td>
<td>50</td>
</tr>
</tbody>
</table>

ARTICLE 213. BITUMINOUS EMULSIONS

Bitumen emulsions will meet the specified in Article 213 of the PG3 with its corresponding modifications included in the OM of December 27, 1999.

The binders used in the different treatments are:

- Irrigation primer Emulsion type ECI
- Adhesion irrigation Emulsion type ECR-1

Their characteristics are given by the following table:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>Normative NLT</th>
<th>ECI</th>
<th>ECR-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity Saybolt Furol at 25ºC</td>
<td>s</td>
<td>138</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Particle charge</td>
<td></td>
<td>194</td>
<td>Positiva</td>
<td>Positiva</td>
</tr>
<tr>
<td>Water content (vol)</td>
<td>%</td>
<td>137</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Residual asphaltic bitumen</td>
<td>%</td>
<td>139</td>
<td>40</td>
<td>57</td>
</tr>
<tr>
<td>Fluidifying by distillation (vol)</td>
<td>%</td>
<td>139</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Sedimentation at 7 days</td>
<td>%</td>
<td>140</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Sieving</td>
<td>%</td>
<td>142</td>
<td>0,10</td>
<td>0,10</td>
</tr>
<tr>
<td>Stability: cement mix test</td>
<td>%</td>
<td>144</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration (25ºC,100g,5s)</td>
<td>0,1 mm</td>
<td>124</td>
<td>200</td>
<td>300</td>
</tr>
</tbody>
</table>
ARTICLE 240. CORRUGATED STRUCTURAL CONCRETE BARS

Steel B500S will be used. The modulus must be always greater than \(2.1 \times 10^6\) kiloponds per square centimeter.

Shall comply with the provisions of Article 240 of the FOM/475/2002 Order of 13 February (BOE March 6). Also comply with the specifications set out in paragraph 31.2 of the current "Structural Concrete (EHE)" or superseding legislation, as well as the UNE 36068 and UNE 36065.

ARTICLE 245. STEEL FOR ACTIVE REINFORCEMENTS.

The strands used as prestressing steel shall consist of six (6) wires of the same nominal diameter “d”, wound helically with equal step with the same sense of twist around a straight core wire whose diameter is between 1, 02d and 1.05d.

The quality of steel wires, defined by the maximum unit load shall be 190 or 180 kp/mm\(^2\), as specified on the plans. The following limitations shall met:

- Yield strength: Running from 85% to 95% of maximum unit load.
- Elongation at maximum load: asbove 3.5%, measured on the basis of length not less than 500 mm.
- Relaxation in a thousand (1000) hours at temperature of 20 \(+1\) °C and an initial stress equal to 70% of maximum unit load: less than 2%.

The strands are supplied in coils or spools, each containing a single length of cord. The inner diameter of the roll or spool core is not less than six hundred millimeters (600 mm). Each roll or bear a label indicating: name of manufacturer, nominal diameter and lace section, guaranteed tensile strength and modulus of elasticity. There may be used in making a single tendon, cords from different rolls, except in the case that the mechanical characteristics are equal for real modules of elasticity differing by no more than two percent (2%) , the present value of the lower module to the tendon.

Joints between two pieces of string will not be accepted.

The prestressing reinforcements will be transported properly packed and protected against moisture, decay, pollution, grease, etc.

Storage is done in ventilated areas, protected from soil moisture and away from walls and areas where welds are made. They should be classified according to their types, classes and lots.

Before storing the reinforcements, must be checked that they are clean, no grease, oil, paint, dust, soil or any other deleterious material for their preservation and subsequent adhesion.

The state of the surface of the reinforcement will be reviewed prior to use on site to ensure no presence of detrimental alterations.
This material will separate subscription and paid according to the price indicated in the price tables of the present project.

On preparations, the cords will be measured by the ton (t) actually stockpiled.

ARTICLE 248. ACCESORIES FOR PRESTRESSED CONCRETE

248.1 -. Sheaths for active reinforcements

The pods must have sufficient crushing strength to not deform during handling on site, under the weight of concrete or accidental actions. They must withstand contact with vibrators without risk of perforation.

They should be tight enough to prevent penetration inside of the cement slurry during concreting.

Pods and accessories, drain pipes, nozzles, fittings, etc. to install will be accompanied by a certificate from the manufacturer indicating their characteristics and conditions of use.

The pods used in this project will consist of a strip of mild steel, minimum thickness of two tenths of a millimeter (0.2 mm), spiral wound so that corrugations present on its outer surface that favor their adhesion to concrete and increase their transverse stiffness.

They must meet the following conditions:

- Flexibility.
- The pods must withstand without any alteration three alternating pushups with radius of curvature of the project.
- Resistance to buckling.
- Place a piece sheath 1.00 m long on a rigid base, and applied to the top generator and between two grooves through a bed of mortar, whose end has the shape of a semicircle with diameter 12 mm the force indicated below depending on the diameter, inside the sheath, the sheath must withstand the application of these forces.

\[
\begin{align*}
D & \leq 25 \text{ to } 75 \text{ mm} & - F & = 75 \text{ Kp} \\
D & = 75 \text{ to } 85 \text{ mm} & - F & = 90 \text{ Kp} \\
D & = 85 \text{ to } 95 \text{ mm} & - F & = 105 \text{ Kp}
\end{align*}
\]

Sealing: To test water loss on the same sample, we will proceed to fill the casing with water to an internal pressure of 0.5 bar, which must be maintained for 5 minutes, water loss will not exceed the 1.5% of the tube volume.

Inside diameter tolerances shall be as follows:

- sheaths with D < 30 mm + - 2%
- sheaths with D > 30 mm + - 1%

Measurement and purchase of the pods will be in accordance with what is indicated in the work unit to which they belong.
On preparations, the pods will be measured by meter (m).

248.2 -. Devices Anchorage and splicing

The anchors must be able to effectively retain the tendons, its unitary resist and transmit tensile strength to concrete a load at least equal to the maximum that the corresponding tendon can provide.

The efficiency factor relationship between the tensile strength of the anchor tendon and the mean value of the maximum load that can withstand the tendon in the standard tensile test of steel shall be equal to or greater than 0.92.

Anchoring systems will be capable of retaining wedges tendons so that, once the wedge penetration, will not slippage occurs with respect to the anchor. The supplier shall supply the value of the whole movement of the armature and wedge adjustment and penetration for each type of tendon, this value will be checked on site and must be taken into account when setting the initial tension to be given to the tendons, to offset the losses.

The manufacturer or supplier of anchors shall justify and ensure the characteristics thereof, specifying the conditions that must be used.

All the elements of the anchor should be subject to stringent control and manufactured with such a tolerance that, within the same type and size the system of all the pieces result interchangeable. Also must be able to absorb, without prejudice to its effectiveness, the dimensional tolerances of the sections of the reinforcements.

The anchors shall be delivered suitably packed to avoid damage during transport, handling and storage on site. Be stored conveniently classified by size and the necessary precautions are taken to prevent corrosion, or contact with fats, insoluble oil, paint or any other harmful substance.

248.3 -. Measurement and purchase

The measurement and purchase of anchors and links will be in accordance with that stated in the work unit to which they belong.

On preparations, the anchors will be measured by units (units).

ARTICLE 280. SUITABLE WATER FOR MORTAR AND CONCRETE

The changes described in the order FOM/475/2002 (BOE March 6) will be taken into account.

The water used in the work, both in the manufacture of concrete and mortar as for the cure of concrete shall generally be sweet, clean and free of extraneous matter in solution or suspension, accepted as usable water, having been used in previous works, there has been no efflorescence or disturbance in the process of setting and hardening of concrete and mortars made with it.

In doubtful cases or when no history of its use is owned, the water should be analyzed. In that case, the waters that do not meet any of the requirements under Article 27 of the current
"Structural Concrete (EHE)" or superseding legislation, unless special justification that its use would not appreciably alter, shall be rejected the qualifications of mortars and concretes made with these properties.

ARTICLE 291. ELASTOMERS FOR SUPPORTS AND JOINTS

The characteristics of the elastomeric material shall be:

- Shore A hardness (ASTM D 676) of 60 to 70 will be taken into account
- Tensile strength (ASTM D 412) of 230 Kp/cm² will be taken into account
- Elongation at break (ASTM D 412) at 485%
- Modulus of elasticity 55 Kp/cm²
- Shear modulus 10 Kp/cm²

In accelerated aging tests shall meet the following specifications:

- Heat aging ASTM D 573 (70 hours at 100 °C) will be taken into account.
- Variation of hardness +15
- Change in elongation at break 40% max.
- Variation of tensile strength + 15% max.
- Ozone Resistance ASTM D 1149 shall not exhibit cracks.

The Contractor shall submit certificates of guarantee of origin of the product and provided the address of the work so requires.

ARTICLE 292. AGGREGATES FOR CONCRETE AND MORTARS.

The nature of the aggregates and their preparation will be such as to ensure adequate strength and durability of concrete as well as the other characteristics required of it in this Particular Technical Specification.

At least ninety percent (90%), by weight, of the thick aggregate shall be less than the lesser of the following two dimensions size:

a) The five-sixths of the free horizontal distance between pods or independent or between them and the edge of the armor piece, if such openings sieveed concrete pouring.

b) One-fourth of the width, thickness or minimum size of the part to be concreted.

The entire aggregate will be smaller than twice the smaller of the two limits a) and b) above.

The use of aggregates that contain or may contain pyrite or other sulfide is prohibited.

The amount of harmful substances that may present the aggregate shall not exceed the limits shown in the table below:
MAXIMUM AMOUNT% OF THE TOTAL WEIGHT OF SAMPLE

<table>
<thead>
<tr>
<th></th>
<th>Thin aggregate</th>
<th>Thick aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumps of clay</td>
<td>1.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Soft particles</td>
<td>0.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Fines passing through the sieve 0.080</td>
<td>5.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Material retained by the sieve 0.063 and floating in a liquid of specific gravity 2.0</td>
<td>0.50</td>
<td>1.20</td>
</tr>
<tr>
<td>Sulfur compound SO4 expressed in reference to the dry arid</td>
<td>0.50</td>
<td>1.20</td>
</tr>
<tr>
<td>Chlorides expressed as Cl and referred to the dry aggregate</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Fine aggregates which have a proportion of organic matter such as to produce a darker color than the standard substance color will not be used.

Aggregates will not present alcalisis with potential reactivity with cement.

The form factor of the thick aggregate shall not be less than 0.2. Otherwise, the use of the aggregate will be subject to the completion of previous laboratory tests. Arid's Shape Coefficient is understood as the obtained from a set of n representative of the aggregate grains by the expression:

\[ \alpha = \frac{V_1 + V_2 + \ldots + V_n}{\pi/6(d_1^3 + d_2^3 + \ldots + d_n^3)} \]

Where:

- \( \alpha \) = shape coefficient
- \( V_i \) = grain volume
- \( d_i \) = biggest dimension of each grain

Aggregates shall be stored and sorted by sizes so as to be protected from contamination by the environment, and especially for the field. They should also be taken precautions to eliminate the possibility of segregation, both during storage and during transport.

The Contractor shall submit for approval by the Department of Labor, plan selection, collection, processing, transport and storage of aggregates, ensuring the supply of the necessary amounts for the work, while retaining the qualitative and quantitative uniformity thereof.

ARTICLE 293. ADDITIVES FOR CONCRETE, MORTARS AND GROUTS.

It is not allowed the use of additives without prior approval of the Directorate of the Work. Not being punished for its use experience. Will be the responsibility of the Contractor all necessary tests that are performed to demonstrate its efficacy and safety.
ARTICLE 294. NON SPECIFIED MATERIALS.

The characteristics of unspecified materials are to be proposed by the Contractor to the Directorate of Works, which reserves the right not to accept if it is considered that do not meet the purposes for which they are intended.

Unspecified materials eventually become used in the work have to obey the instructions, regulations and quality controls in place.

Assays for determining the quality control of items must be made by an official laboratory and according to the instructions and regulations in force.

PART 3 LEVELLED AREA

ARTICLE 300. LAND CLEARING

It will comply with the revision of Article 300 of the PG3 included in FOM/1382/2002, with accompanying comments below.

300.2 -. Execution of works

300.2.1. Removal of materials from clearing

From the natural ground of the entire width of the area expropriated all stumps and roots shall be removed to a depth of eighteen inches (50 cm) below the natural ground surface.

300.3 -. Measurement and purchase

This unit will be paid per square meter (m2), actually executed, including stumps and roots, and excavation, measured on the ground.

ARTICLE 301. DEMOLITION

It will comply with the revision of Article 301 of the PG3 included in FOM/1382/2002, with accompanying comments below.

301.1. Definition

Possible demolition that may appear (fences, pipes, etc) That can be pulled with mechanical equipment normally used in earthworks, are considered to fall in the price of the excavation, or clearing not proceeding to pay it separately.

301.2 -. Execution of works

Its implementation will be set, in general, as indicated in the caption equal number of FOM/1382/2002 order.
301.2.2. Removal of materials

The Contractor shall carry the non-usable materials to the authorized dumps and make the usable materials available to the Administration, under orders of Site Manager.

301.3. Measurement and purchase

Manure removal of towers and power poles and telephone lines or traffic signals, including demolition of the foundation and the transport to the place indicated by the Project Execution Manager of the Work shall be deemed to fall within the units that replaced.

ARTICLE 302. SCARIFICATION AND CONSOLIDATE

It will comply with the revision of Article 302 of the PG3 included in FOM/1382/2002, with accompanying comments below.

302.1. Definition

It will consist of the disintegration of the existing pavement, made by mechanical means and subsequent consolidate.

302.2. Execution of works

302.2.1. Scarification

Scarification is carried out in the areas and depth that indicates the Project Execution Manager.

302.2.2. Consolidate

Consolidate of the scarified materials will be conducted as specified in Article 330 Embankments with. The density gain is equal to the required embankment area concerned.

302.3. Measurement and purchase

Shall be paid by the square meter (m2) actually executed in the required depth, measured on the ground.

ARTICLE 320. LEVELLED AREA. DIGGING AND LENDING

In matters not specified in this article will be to what is stated in the Order FOM/1382/2002 (BOE of 11 June) amending the relevant article of PG-3.

320.2. Classification of excavations

Only the following four (4) types of excavation defined earthworks:
Rock excavation: It will include the full amount of all bodies of rock, layered deposits and all those materials which exhibit characteristics of solid rock, which may only be excavated using explosives.

Excavation on land transit mechanically: It will include the full amount of the materials formed by rocks, very consolidate soils, and all those that excavation for the use of explosives is not necessary and accurate use of deep, heavy harrows.

Excavation of topsoil: dozing by mechanical means, including collection and transport of the products of the excavation to the dump, or place of employment.

Excavation on land except topsoil: It will include the full amount of all materials not included in the previous sections.

The units correspond to rock excavation, digging or excavating land transit on land, are as defined in the project. Any changes will be requested in writing by the Contractor and must be approved by the Project Execution Manager to take effect.

The Contractor shall transport to the will collect the goods from the excavation where the Project Execution Manager tells you, without considering any additional transportation.

320.3. Execution of works

The depth of the excavation of the dozing slopes shall be as indicated in Document No. 2 Plans and may be modified in the opinion of the Project Execution Manager Engineer Works, depending on the nature of the terrain, by written orders of the same.

Upon reaching the depth of excavation in cut on drawings, shall be checked by the relevant tests the type and characteristics of the materials to classify the levelled area resulting, according to Regulation 6-1-IC Highway Instruction. The resulting type levelled area, must equal or exceed that shown in the templates of the Project, in each case.

Failure to comply the stated condition, an additional excavation, minimum depth in accordance with the Standard 6.1.I-C for levelled area type required, and backfill with soil improved (improved levelled area) of the required features will be made to comply with Section structural drawings specified in the Project. Also, the additional excavation required for the construction of Levelled area E-2 and E-3 in the transition zones D / T and vice versa shall be appropriate.

All the operations must be carried out at all stages with precise topographical references and must have the approval of the Site Manager, which will decide on the additional minimum depth of excavation and soil category.

During the excavations, the best quality soils (selected) will be collected in suitable locations for later use in the coronation of embankments.

This unit includes the excavation itself with the means that are accurate, the precut rock, the load on truck transportation to dump, gathering, where appropriate, and place of employment, irrespective of the transport distance. Includes additional intermediate transport collection, if any, to final place of deposit.

The edges of the earthworks, slope intersection with the natural terrain and backgrounds of the edges of ditches, according to the plans and instructions from the Project Execution Manager will be rounded.
A smooth transition slope will be made in the areas of clearing step to fill the unsightly pit in the ground shall avoid and must ensure harmonization with the existing topography.

Forming ridges will not be accepted, and in any way the discharge of materials from the excavation at the edges of the grading is allowed. Therefore, the excess material must be carried directly to landfill. Landfills will always be authorized and shall not disrupt the flow of water and properties, and aesthetics of the environment and landscape. Sufficient for this purpose will be taken.

The Contractor shall take all appropriate safety measures against Sliding Slope and the progress of the excavation will as always stable slopes to reach the final situation.

On slopes that are to be visible and therefore may be revegetated, the area should not be smoothed or consolidated and not suffer any final treatment, unless risk of falling materials.

This topsoil will be used in sealing of berms, in gardens, plant displays and for slopes of cuts and fills obtaining adequate surface and the thickness indicated on the drawings, for later planting shrubby species that protect the slope off erosion and to facilitate the growth of the vegetation in the area.

Considered included in the unit Excavation dozing, the rest of inadequate topsoil and unusable, to be transported to landfill, unless decided otherwise by the Engineer Manager.

320.4. Measurement and purchase

Sufficient operations for digging and corresponding treatment of the resulting material are included in price depending on whether topsoil selected, adequate, tolerable or inadequate, especially with regard to its use in the various layers of fill and plantations.

The excavation of topsoil per cubic meter (M3) deducted by the difference between the actual terrain profiles before starting work and after removed only existing topsoil will be paid.

The excavation of the site preparation and land clearing will be measured and paid in cubic meters (M3) deducted by the difference between the cross sections taken before and after the excavation executed.

Excess excavation on the cross sections shown on the plans that are not expressly approved by the Project Execution Manager or consolidated fillers which may be necessary to reconstruct these excess shall be not paid.

In the case of excess of excavation for sub-grade improvement type substitution soils (as indicated in the previous paragraph 320.3), will be paid according to the units actually approved and implemented. Also, the volume of consolidated fill will join back the drive force (embankments) for purchase.

Prices include excavation to the sub-grade or deck or digging funds defined on the drawings and / or these Specifications, or those who indicate in writing Engineer Works Director, measures of sanitation, drainage and depletion if found necessary, loading and transport of the resulting products to landfill, place of employment, or collection facilities and, in this case, the subsequent loading and transportation to place of employment and how circumstantial needs required for the proper execution of the works, including measures security for the slopes.
Likewise, it is included in the price of the excavation design of landfills and eventual consolidate as indicated in section 334.

The topsoil spreading will be measured and paid by Section 922 of this Specification.

**ARTICLE 330. EMBANKMENTS**

Shall be applicable the specifications in Article 330 of the PG-3, approved by the Order FOM/1382/2002 (BOE of 11 June), with the modifications described in the following sections.

330.1. Definition

It consists of the extension and consolidate of soils from the excavation or loan extension in areas such as to allow the use of high-performance machinery.

330.2. Areas

Are defined according to Article 330.2 of the Order FOM/1382/2002.

330.3. Materials

Shall be applicable the Article 330.3 FOM/1382/2002 with the following amendments:

The filler material on the bottom of the excavation will be selected soil and stabilized soil Coronation type 3, for the formation of the leveled area, in order to get the type E2 and E3 of leveled area, in accordance with Section 6.1 and 6.2 IC.

As a general rule, the coronation of the embankments will have a thickness of thirty centimeters (30 cm) with stabilized soil type 3.

The core of the embankments will run with tolerable soil or selected with a thickness of 30 cm.

It is mandatory maximum use of the products from the excavation.

330.5.4. Consolidate

For consolidate purposes, the following requirements shall be satisfied:

- The foundation will be consolidateed to ninety-five percent (95%) of the maximum density obtained in Test Modified Proctor.
- The core shall be consolidateed to ninety-eight percent (98%) of the maximum density obtained in the Modified Proctor.
- The Coronation, in his fifty centimeters (30 cm) above the embankment, and fill selected on funds clearing excavation with a thickness of ten inches (25 cm) soils, consolidateed to one hundred percent (100%) of the maximum density obtained in the Modified Proctor test.
- The moisture content at the time of consolidate shall be between 85 and 100% of the optimum moisture corresponding to Modified Proctor Test.

330.7. Measurement and purchase
Measurements shall be taken by the cubic meter (m³) actually executed, if they have been according to the plans and specifications of the tender documents or written orders of the Project Execution Manager. The compost operations include scarifying and consolidate the foundation, the material, its size, moisture, consolidate and refining slopes.

No extra purchase will be stuffed due to, for example, excess of excavation or incorrect execution. The Contractor shall be required to perform such fillings.

The price for the foundation and core of embankment will be applied according to its origin. Different price will be applied to the coronation of the leveled area, which will consists of selected soil, depending on their origin.

ARTICLE 332. LOCALIZED FILLINGS

Shall be applicable the specifications in Article 332 of the PG-3, approved by the Order FOM/1382/2002 (BOE of 11 June), with the modifications described in the following sections.

332.1. Definition

This definition refers to the extent and soil consolidation from excavations or loan to fill ditches, wells, foundations and berms.

332.3. Materials

Fills, ditches, pits and excavations of foundations and walls of structures are made with selected soil material. The filling of small works will be made with material that meets the following characteristics:

- Will not have the elements over eight centimeters size and sieving through sieve 0.080 UNE be less than twenty percent (20%) by weight.
- The liquid limit is less than 30 (LL 30) and plasticity index less than 10 (IP 10).
- The index C.B.R. shall be greater than ten and not present in swelling test.
- It shall be free from organic matter.

332.5.2. Extension and consolidation

Shall be applied the paragraph 330.5.4. Thickness of tiers measured after consolidate shall be not more than twenty centimeters (20 cm.). However, the Direction of Work may amend this thickness in view of the resources available and the results of the testing done.

Filling foundations of small work will consolidate up to ninety-eight percent (98%) of the maximum density obtained in the Modified Proctor test.

332.7. Measurement and purchase

Measuring shall be made by cubic meter (m³) actually executed, measured by the difference between the profiles taken before and after work.

It is included in the price of input materials, extension, moisture and consolidate, and in general all the operations necessary for the development of the work.
Purchase shall be made by applying the price defined in Price Tables.

PART 5 PAVEMENTS

ARTICLE 510. ARTIFICIAL GRAVEL

510.1 -. Definition

Gravel is defined as the granular material, continuous grain used as firmly layer, consisting on wholly or partly crushed particles.

Its implementation includes the following:

- Preparation and checking the seating surface.
- Contribution of the material.
- Extension, if applicable wetting and consolidate of each tier.
- Refining the surface of the last tier.

510.2 -. Supplies

510.2.1 -. Conditions.

The materials come from crushing stone or natural gravel quarry. The rejection of the sieve 5 UNE must contain a minimum of fifty percent (50%) for T2 and other traffic cases, crushed submit items with at least two (2) fracture faces.

510.2.2 -. Chemical composition

The weight content of total sulfur compounds will be less than five per thousand where the materials are in contact with cement-treated layers, and less than one percent in any other case.

510.2.3 - Cleaning.

Materials will be free from clay lumps, vegetable matter, loam or other foreign matter. The coefficient of cleaning should be less than two (2).

510.2.4 -. Plasticity

The material shall be not plastic, according to the UNE 103104.

510.2.5 -. Resistance to fragmentation

The coefficient of Los Angeles for the artificial gravel aggregates shall not exceed thirty (30).

510.2.6 -. Shape

The flakiness index of the various fractions of thick aggregate shall be less than thirty-five.
510.2.7 -. Angularity

The minimum percentage of crushed particles shall be seventy-five percent.

510.3 -. Material type and composition

The grading curve shall be as specified below:

<table>
<thead>
<tr>
<th>APPERTURE OF THE SIEVE</th>
<th>AMOUNT RETAINED (ZA25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>75-100</td>
</tr>
<tr>
<td>20</td>
<td>65-90</td>
</tr>
<tr>
<td>8</td>
<td>40-63</td>
</tr>
<tr>
<td>4</td>
<td>26-45</td>
</tr>
<tr>
<td>2</td>
<td>15-32</td>
</tr>
<tr>
<td>0,500</td>
<td>7-21</td>
</tr>
<tr>
<td>0,250</td>
<td>4-16</td>
</tr>
<tr>
<td>0,063</td>
<td>0-9</td>
</tr>
</tbody>
</table>

510.5 -. Execution of works

510.5.2 -. Seat surface preparation.

The artificial gravel will not be extended until it is established that the surface on which it has been settling quality conditions and is planned to tolerances. This, plus the eventual repetition of the acceptance testing of the surface, the Project Execution Manager may order the works of the passage of a loaded truck, in order to observe its effect.

If the said surface develop defects or irregularities that exceeded the thresholds, they will be corrected before the implementation of the following lay, according to the requirements of Section 501.4.3.

510.3.2 -. Material preparation

The preparation of the artificial gravel will be in factory and not in-situ. The addition of water consolidate is also made in the factory.

The optimum consolidate moisture deducted from the essay “modified Proctor” according to Standard NLT 108/72, can be adjusted to the composition and modus operandi of the consolidate equipment, according to tests conducted at the test section.

510.5.4 -. Tier extension

Materials will be spread, once accepted the seating surface, taking precautions to avoid contamination and segregation in tiers with thicknesses between ten and thirty centimeters (10-30 cm).

Possible contributions of water will take place prior to consolidate. Then, the only permissible moisture will be designed to achieve surface moisture necessary for the execution of the next layer. The water is dosed properly, ensuring that in any case the same excess wash material.

510.5.5 -. Tier consolidation.
Shall be achieved the most suitable moisture, which must not exceed the optimum by more than one (1) percentage point. Proceeding to consolidation of the tier, will accomplish the density specified in section 501.4.1. of this Article.

510.6 -. Tranche test.

Before the use of a particular type of material, shall be mandatory to provide relevant test section to fix the composition and modus operandi of the consolidation equipment, and to determine the consolidate moisture under those.

Carrying capacity, and thickness of the layer that is going to make the test section will be similar to those that will be applied as an artificial gravel layer.

The relationship between density and number of passes achieved, for consolidate and the consolidate equipment assembly shall be established.

In view of the results obtained, the Project Execution Manager define:

- If it is acceptable or not the consolidate equipment proposed by the Builder.

In the first case, its specific mode of action and, if appropriate, the correction of the optimum moisture.

Then, the Builder shall propose a new equipment, or adding an extension or replacement consolidate.

Also during the execution of the test section will analyze the following aspects:

- Behavior of the material under consolidate.
- Correlation, if any, between the methods of moisture and density control "in situ" set out in the Technical Specification Sheets and other rapid methods of control, such as radioactive isotopes, calcium carbide, air pycnometer, etc..

510.7 -. Specifications for the completed unit

510.7.1 -. Density.

Consolidating the artificial gravel will continue until a density of not less corresponding to one hundred percent (100%) of the maximum obtained in the "modified Proctor" test as the standard NLT 108/72, making appropriate replacements of thick material.

The test for establishing the reference density will be performed on samples of material obtained "in situ" in the control, so that the value of this density is representative of it. Where reliable data that the material does not differ significantly in their characteristics, the approved study materials and there are reasons of urgency and appreciated by the Project Execution Manager, may be accepted as the reference density for that study.

510.7.2-. Support capacity

In artificial gravel layers, the values of E2 module, determined according to Standard NLT 357/86, shall not be less than one hundred eighty (180).

510.8 -. Limitations execution
Artificial ballast will be used whenever the weather conditions have not produced changes in material moisture such as to exceed by more than two (2) percentage points above optimum moisture.

Over the layers on newly executed action all traffic will be prohibited, while the next layer is built. If this is not possible, the traffic that necessarily had to go on them will be distributed so that the ruts are not concentrated in one area. The Builder shall be responsible for the damage caused, and must have it repaired under the instructions of the Project Execution Manager.

510.11 -. Measurement and purchase

The artificial gravel shall be paid in cubic meters (m3) actually executed, measured in accordance with the type sections indicated on the Drawings with. Will not be paid the side exceed material nor the consequent to the implementation of the compensation of reduced thicknesses of underlying layers.

ARTICLE 530. PRIMER IRRIGATION

530.1. Definition

Irrigation is defined as applying a primer hydrocarbon granular binder on a previously placement thereon of a layer or bituminous layer treatment.

530.2. Materials

530.2.1. Bituminous binders

Unless otherwise indicated, the type of binder shall be ECI

530.2.2. Aggregates coverage

530.2.2.1. Terms and Conditions

The aggregate coverage to eventually use irrigation primer will be a natural sand, or from crushing or mixture of both.

530.2.2.2. Granulometry

The entire aggregate shall pass through 4 mm sieve UNE-EN 933-2, and contain no more than fifteen percent (15%) of the particles below 0.063 mm sieve.

530.2.2.3. Cleaning

The aggregate shall be free from clay lumps, vegetable matter, loam or other foreign matter.

The sand equivalent of aggregate shall exceed forty (40).

530.2.2.4. Plasticity

The material should be "no plastic " according to UNE 103104.
530.3 . Provision of materials

The allocation of the binder will be defined by the amount the printed layer is capable of absorbing in a twenty-four hours (24 h . ) .
The allocation of the aggregate is necessary for the absorption of excess binder and to ensure the protection of the primer under the action of the circulation .

For budgetary purposes , the following provision is envisaged:

- 1.0 kg/m2 emulsion

The Project Execution Manager may modify this provision in the light of the tests performed.

530.4 . Necessary equipment for the execution of the works

530.4.1 . Equipment for the application of hydrocarbon binder

It shall be mounted on wheels , and should be able to apply the provision of the specified binder to the prescribed temperature. The irrigator device provide sufficient cross- uniformity in the Project Execution Manager, and must allow for the recirculation load binder . At inaccessible points for the equipment described above, can be employed portable ones provided with a hand lance.

If is necessary to heat the binder, the equipment shall be equipped with a heating system submerged in the tank, which must be thermally insulated . In any case, the feed pump of the binder must be motor operated, will be provided with a pressure indicator. Also must possess a team binder thermometer whose sensing element may not be situated in the vicinity of a heating element.

530.4.2. Equipment for the extension of arid

Mechanical spreaders, or incorporated into a self-propelled truck will be used. Solely to cover isolated areas in which there is excess of binder, the aggregate may be spread manually.

In any case, the equipment used should provide a homogeneous distribution of the aggregate.

530.5. Execution of works

530.5.1. Preparation of existing surface

Will be checked that the surface on which the primer irrigation will be done meets the conditions specified for the corresponding unit of work and it will not be found softened by excess of moisture. Otherwise, it should be corrected in accordance with the instructions of the Project Execution Manager.

Immediately prior to the application of hydrocarbon binder primed surface will be cleaned from dust, dirt, mud, loose or deleterious materials. To do so, mechanical sweepers or use pressurized air, in places inaccessible to these teams may use hand brooms. It will be paid especially care to clean the edges of the area to be primed. After cleaning the surface should be watered lightly with water without saturating.

530.5.2. Application of hydrocarbon binder
When the surface to be primed hold some moisture, hydrocarbon binder with the temperature envelope approved by the Project Execution Manager will be applied. This endowment may be divided into two (2) applications, where required by the proper execution of irrigation.

Application of hydrocarbon binder shall be uniformly, avoiding duplicate at transverse joints work. For this purpose, shall be placed under the diffuser strips of paper and other materials in areas where they can start or stop watering. When required by watering stripes, a slight overlap in irrigation will seek the union of two contiguous.

Shall be protected to prevent binder to spot them, how many elements such as curbs, fences, signs, beacons, trees, etc... May suffer such damage.

The application temperature should, in principle, provide binder viscosity not exceeding one hundred seconds (100 s.) Saybolt-Furol, according to Standard NLT-133/72.

530.5.3 -. Extension of the aggregates

The extent of the aggregate coverage shall be by mechanical means, evenly and with the provision approved. Upon extension, the aggregate should not contain more than two percent (2%) of free water when the binder used is not a bitumen emulsion.

Contact of the wheels with the paver uncovered by binder should be avoided.

530.6 -. Limitations of execution

Primer irrigation may be applied only when the room temperature in the shade exceeds ten degrees Celsius (10 ° C), and there is no fear of atmospheric precipitation established. This temperature limit may be lowered to five degrees Celsius (5 ° C) if the environment has a tendency to increase.

The movement of all traffic on the irrigation of primer shall be banned until it has absorbed all the binder or, if it had widespread coverage aggregate during the four hours (4 h) after the extension. In any case, the speed of vehicles shall be limited to forty kilometer per hour (40 km / h).

530.9. Measurement and purchase

The hydrocarbon binder used in irrigation primer shall be paid by tonnage (t) actually employed, as measured by direct weighing scales contrasted either by inference from its volume, measured in turn by methods approved by the Project Execution Manager. The subscription will include the preparation of the existing surface and the application of hydrocarbon binder. It will also include the aggregate eventually employed in irrigation primer.

ARTICLE 531. ADHESIVE IRRIGATION

531.1. Definition

Is defined as tack coat the application of a bituminous emulsion on a treated layer of hydro carbonate binders or hydraulic binders, prior to placement thereon of any bituminous layer that is not a surface treatment with gravel, or a bituminous grout.
Shall not be considered as tack coat as defined in Article 532 of this Specification as watering curing.

531.2. Materials

531.2.1. Bitumen emulsion

Unless otherwise indicated the type of binder shall be ECR-1

531.3. Scope of hydrocarbon binder

The endowment of hydrocarbon binder will be 0.5 kg/m².

The Project Execution Manager may amend the provision in the light of the tests carried out in the same conditions.

531.4. Necessary equipment for the execution of the works

It shall be mounted on wheels, and must be able to apply the provision of specified binder to the prescribed temperature. The irrigator device will provide sufficient cross-uniformity deemed by the Project Execution Manager, and must enable the recirculation in vacuous of the binder.

In case of inaccessible points for the equipment described above, can be employed portable ones provided with a hand lance.

If necessary heat the binder, the equipment shall be equipped with a heating system submerged in the tank, which must be thermally insulated. In any case, the feed pump of the binder must be motor operated, and be provided with a pressure indicator. Also must possess a team binder thermometer whose sensing element may not be situated in the vicinity of a heating element.

531.5. Execution of works

531.5.1. Preparation of existing surface

Will be checked that the surface on which it is to be made the tack coat meets the conditions specified by the corresponding unit of work, and it will not be found softened by excess of moisture. Otherwise, it should be corrected in accordance with these Terms and Conditions, the Particular Technical Specification and/or the instructions of the Project Execution Manager.

Immediately prior to the application of hydrocarbon binder primed surface will be cleaned from dust, dirt, mud, loose or deleterious material. To do so, mechanical sweepers or use pressurized air, in places inaccessible to these teams may use hand brooms. There will be a particular care to clean the edges of the treatment area.

When the surface is a bituminous pavement, excess of hydrocarbon binder will be removed and any damage that may prevent good adhesion be repaired.

531.5.2. Application of hydrocarbon binder

The hydrocarbon binder is applied to the envelope temperature and approved by the Project Execution Manager.
Application of hydrocarbon binder shall be uniformly, avoiding overlapping at transverse joints work. For this purpose, shall be placed under the diffuser strips of paper or other material in areas where irrigation start or stop. When required by watering stripes, a slight overlap in irrigation will seek the union of two contiguous.

The Project Execution Manager shall approve the allocation of works and application temperature of hydrocarbon binder. The application temperature should in principle provide the binder viscosity not exceeding one hundred seconds (100 s) Saybolt - Furol, according to Standard NLT-133/72.

531.6. Limitations of execution

The tack coat may be applied only when the ambient temperature in the shade is above five degrees Celsius (5 °C) and there is no well-founded fear of atmospheric precipitation.

The tack coat shall be coordinated with the laying of the bituminous layer to that lay, so that the hydrocarbon binding is broken, and does not lose its effectiveness as a connecting element. When the Project Execution Manager it deems necessary, shall be made another tack coat, which will not credit if the loss of effectiveness of this were part of the Contractor.

The movement of all traffic on the tack coat shall be prohibited until it has broken the emulsion.

531.9. Measurement and purchase

The hydrocarbon binder used in tack coats shall be paid by the ton (t) actually employed, as measured by direct weighing scales contrasted either by deduction from its volume, measured in turn by approved by the Supervisor of construction methods. The subscription will include the preparation of the existing surface and the application of hydrocarbon binder.

ARTICLE 542. HOT BITUMINOUS MIXURES

542.2. Materials

542.2.1. Binder

The binder to be used will be a bitumen 50/70, as specified in Article 211 of the OM of December 27, 1999 (BOE 22 -January -2000) for the surface lay, intermediate and asphalt base.

For the surface layer of the trunk (BBTM 11B 50/70) shall be used a type bitumen 50/70.

In any case, bitumen usage has to ensure good adhesion to aggregates.

At working temperature, the viscosity of the bitumen will be high enough, and little susceptible to temperature variations during manufacture and spread occurs.

The binder must have good characteristics of resistance to aging, high adhesiveness and passive to the action of water.

542.2.2. Aggregates
The minimum volume of stockpiles before starting production mixture and throughout the following process will be the equivalent of four days of production.

542.2.2.2. Thick aggregate

542.2.2.2.2. Thick aggregate angularity

The proportion of crushed thick aggregate particles shall meet:

<table>
<thead>
<tr>
<th>TIER TYPE</th>
<th>% OF MASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface layer</td>
<td>100</td>
</tr>
<tr>
<td>Interlayer</td>
<td>100</td>
</tr>
<tr>
<td>Base layer</td>
<td>≥ 90</td>
</tr>
</tbody>
</table>

542.2.2.2.3. Shape of thick aggregate

The flakiness index of the various fractions of thick aggregate must comply with:

<table>
<thead>
<tr>
<th>MIXTURE TYPE</th>
<th>FLAKINESS INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dens, Semidens and thick</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Draining</td>
<td>≤ 20</td>
</tr>
</tbody>
</table>

542.2.2.2.4. Fragmentation resistance

Coefficient of Los Angeles for thick aggregate must comply with:

<table>
<thead>
<tr>
<th>TIER TYPE</th>
<th>COEFICIENT DE LOS ANGELES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draining surface</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Conventional surface</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Interlayer</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Base layer</td>
<td>≤ 30</td>
</tr>
</tbody>
</table>

The coefficient of accelerated polishing of the thick aggregate to be used in surface lay should not be less than zero dot five (0.50).

542.2.2.2.6. Cleaning the thick aggregate

It shall be free from lumps of clay, plant material, loam or other foreign matter that may affect the durability of the coating.

542.2.2.3. Fine aggregate

542.2.2.3.2. Sources of fine aggregate

There shall be fine aggregate crushed.

542.2.2.3.3. Cleaning the fine aggregate

It shall be free from lumps of clay, plant material, loam and other foreign matter.

542.2.2.3.4. Fragmentation resistance
The material is crushed to obtain fine aggregate shall meet the required conditions to thick aggregate in section 542.2.2.4 Aggregates’ Shape Coefficient of Los Angeles.

542.2.2.4. Mineral powder

542.2.2.4.2. Origin of mineral dust

The proportion of mineral filler powder should be one hundred percent (100%) both in the surface layer, the intermediate base and the.

542.3. Type composition of the mixture

The type and characteristics of the mixtures to be used in the project are as follows:

- Type BBTM 11B 50/70: density: 2.4 t/m³, containing 4.75% bituminous type 50/70.
- Type AC22 bin 50/70 S: density: 2.4 t/m³, containing 4% bituminous binder type 50/70.
- Type AC32 based 50/70 G: 2.44 t/m³, containing 3.65% of bituminous binder type 50/70.

Density dosages are used only for budgetary purposes of the Project. The optimum binder content is determined from the materials used in the works by laboratory tests (Marshall Method) and the formula of work will be made subject to the approval of the Project Execution Manager.

The particle size for each type of mix will be the table 542.8

542.4. Equipment

The Contractor shall propose in sufficient time, the equipment to be used for manufacturing, and consolidate of detailing the types, standards and essential characteristics of such equipment mix.

542.4.1. Plant

The asphalt plant will be automatic with a minimum production of 150 t / hour.

542.4.3. Paver

The pavers will be propelled; it will be equipped with the necessary devices to extend the hot asphalt mix to the desired configuration. The capacity of the hopper and its power will be adequate for its size.

It shall be checked that the settings of the screed masterpiece comply with the mechanical tolerances specified by the manufacturer, and that such adjustments have not been affected by wear and tear.

The minimum width of widespread shall be equivalent to a lane (3.5 m) and the maximum equivalent to two lanes (7 m), unless the Site Manager authorizes any change.

The pavers shall be equipped with automatic leveling device and its use is mandatory in all layers of chipboard.
542.5. Execution of works

In compliance with Article 542.5 and the following additions:

542.5.1. Study mixture and obtaining the working formula

Bituminous mixtures for surface lay shall conform to the criteria of Marshall Method, according as described in Table 542.9 of the Statement of General Prescriptions.

542.5.6. Extension Mix

The Contractor shall work in a team to control the appropriate extension (thickness, earrings, etc.) formed by a surveyor and a pawn, independent of the rest of the personnel.

The spread generally run with two pavers working in tandem and closing the central board hot.

542.5.7. Consolidating the mixture

The Board remains left in the paver when for some reason the spread is interrupted and must be removed to not put it in play. The density obtained shall be at least ninety-seventy percent (97%) obtained by applying the formula of work provided for in the Marshall consolidate method, according to Standard NLT-159/75.

542.6. Test sections

Before starting work, the Contractor shall construct a test section with a width of 4.5 m and a length of 30 m. and a thickness equal to that indicated on the drawings for each type of mixture.

About this section test samples were taken to determine the following: layer thickness, grain size of the consolidated material, density and binder content.

In view of the results obtained, the Site Manager will decide whether to accept or modify the working formula, although the machinery equipment, then the Contractor must study and propose the necessary corrections.

The test section is repeated again, under the Contractor, after each set of corrections to final approval.

542.11. Measurement and purchase

The Manufacture in work of the hot mix asphalt shall be paid by tonnage actually manufactured and set into work, including the filler.

The measurement can be made of the two methods below to choose by the Project Manager:

1st: From geometric verification of the length and width dimensions, cambers surface regularities. The thickness and specific weight will be determined by the volume extracted witnesses layer Bituminous Mixture executed every day, at a rate of one for each track every hundred meters (lagged those in adjacent lanes fifty meters away, so that in the roadway extraction will every fifty meters staggering) notwithstanding that the Engineer Manager is available to a greater number of extractions on other sites. Thickness shall be taken for the measurement, as the average of all witnesses and, as density, similarly, the arithmetic average.
of all witnesses. The volume and density and resulting multiply to get the weight in tones (t) actually executed.

The bituminous binder used in the manufacture of hot mix asphalt shall be paid by tonnage actually used in work, making the measurement from coring tests with recovery of bitumen and filler made daily and as provided in Section 211 of this Technical Specifications and the PG3.

2nd: By weighing scales properly contrasted.

In any event and regardless of the way of measurement, excess the thickness on the type specified in the sections of the planes will compost.

Prices include aggregates, grading, equipment, machinery, study, testing commissioning and obtaining the work formula, transportation, loading and unloading, manufacture, laying, consolidate, signage, traffic management, joint preparation and means and operations involved in the correct and complete execution of the unit.

All tests necessary tuning of the formula are working on behalf of the contractor, ie, non-purchase, as well as the preparation of the existing surface.

### TABLE 542.8
**GRANULOMETRIC SPINDLES FOR HOT BITUMINOUS MIXTURES**

<table>
<thead>
<tr>
<th>TYPE OF MIXTURE</th>
<th>SIEVES AND SIFTES UNE-EN 933-2 (mm)</th>
<th>AMOUNT RETAINED (% of mass)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>DENS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D12</td>
<td>100</td>
<td>80-95</td>
</tr>
<tr>
<td>D20</td>
<td>100</td>
<td>80-95</td>
</tr>
<tr>
<td>SEMIDENS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S12</td>
<td>100</td>
<td>80-95</td>
</tr>
<tr>
<td>S20</td>
<td>100</td>
<td>80-95</td>
</tr>
<tr>
<td>S25</td>
<td>100</td>
<td>73-88</td>
</tr>
<tr>
<td>THICK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-20</td>
<td>100</td>
<td>75-95</td>
</tr>
<tr>
<td>G-25</td>
<td>100</td>
<td>75-95</td>
</tr>
<tr>
<td>DRAINING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA1</td>
<td>100</td>
<td>70-100</td>
</tr>
<tr>
<td>PA2</td>
<td>100</td>
<td>70-100</td>
</tr>
</tbody>
</table>
PART 6 BRIDGES AND OTHER STRUCTURES

ARTICLE 600. REINFORCEMENTS TO BE USED IN REINFORCED CONCRETE

600.1 -. Definition

They will comply generally the specified in Article referred PG-3/75, with a corresponding adjustment to the EHE, taking the shapes for the items that are projected and following stipulations.

600.2 -. Supplies

The shape, size and type of nods shall be as indicated in Document No. 2 Plans.

Passive reinforcement shall consist of corrugated round bars (high adhesion) steel of the following types in accordance with Article 9.3 of the EHE.

- B-500-S

Both in transport and storage, the bar shall be adequately protected against rain, soil moisture and eventual aggression from the atmosphere. It should be conveniently separated by types, grades, diameters and backgrounds. Before use, their status should be checked to make sure that it has no harmful alterations. In particular, the use of bars with its oxidized surface will not be admissible and in this case they shall be brushed with wire brush to knock off the rust completely and then check the resulting surface of the operation.

600.5 -. Placement

Steel bars for reinforcing steel must be submitted free of zinc, paint, tar, oil, loose rust and are not present surface defects, cracks, blowholes and shrinkage section.

600.6 -. Quality Control

The manufacturer's certificate that guarantees its following features will be required for each lot with the following information:

- Yield strength fy (Kp/cm²) above:
  B-500-S 5.100 Kp/cm²

- Charging unit than break fs (Kp/cm²):
  B-500-S 5600 Kp/cm²

- Elongation, based on Diameters (%) greater than:
  B-500-S 12

- Suitability for welding.

- Diameter core, diameter in corrugations and area. The equivalent section of each bar shall not be less than 95% of its nominal section diameters less than 25 mm in 96% for diameters from 32 mm.
The reinforcement should be free of cracks after simple bending tests at 180° and bending and unbending at 90° made in accordance with the UNE 36.088/I/81.

600.7 - Measurement and purchase

Purchase of joints as well as the proportional parts of cuts and trimmings shall be included in the reinforcement measurement.

The measurement is done by the weight in kilograms (kg) for the diameters and lengths of the bars deducted from the plans. For these purposes, shall be counted only overlaps defined in them, as the price includes the proportionate share of losses, edgings and seams undefined.

The price also includes the placement of reinforcements.

Shall be applied the prices of the Tables Price in kg in corrugated steel bars to build, type B-500-S.

ARTICLE 610. CONCRETE

610.2 - Materials

610.2.1. Cement

It shall accomplish the stipulated in Article 202 of the PG-3/75 and amendments included in FOM/475/2002 order.

Cements of the type indicated in Section 202 of the present Technical Specification, unless stated otherwise or express authorization of the Site Manager shall be used. The change of type of cement, even authorized, will not change the price of units of work that is agreed.

610.2.2. Water

It shall accomplish the stipulated in Article 280 of the PG-3/75 (and modifications FOM/475/2002 order).

610.2.3. Fine aggregate

Regardless of the requirements of these rules, at least one (1) test sieve, one (1) test for determining organic matter, and one (1) trial of fines passing the 0.080 sieve UNE 7050, per 100 m3 will be made.

610.2.4. Thick aggregate

For use in the dosage and concrete work will differentiate the following types:

- Type I. Aggregate sizes between five millimeters (5 mm) and two centimeters (2 cm).
- Type II. Aggregates with sizes ranging from two centimeters (2 cm) and four centimeters (4 cm).
- Type III. Aggregate sizes between four centimeters (4 cm) and six centimeters (6 cm).
Thick aggregate characteristics prescribed in Article 610 of the PG-3/75 will be checked before use by running the complete series of tests deemed appropriate by the Project Execution Manager.

Also it will be made at least one sieve (1) test per 100 m3 or fraction of thick aggregate to be used.

610.2.5. Addition products

None water-repellent additives will be employed.

Super plasticizer for concrete post-tensioned slabs and beams additive, piles of the viaduct will be used and those by the Project Execution Manager.

Additives in concrete must obtain the "mark of quality" in a laboratory that deemed by the Project Execution Manager who must meet the facilities and expertise to perform the analysis, testing and tests necessary to determine their properties and favorable and detrimental effects on staff concrete.

Any additive that has not been previously approved by the Site Manager shall be employed.

610.3 -. Types of concrete

The types of concrete used, according to the denomination of Article 610.3 of PG-3 are:

- Mass concrete. Cleaning HM-15
- Concrete for arming HM-25 in foundations and sills

The workability of concrete will be needed so that, with the methods of placing and consolidation are taken, no voids are produced and the paste does not flow back at the end of the operation.

Concretes employing fluid consistency shall be permitted. In no case shall concrete be used with higher water content corresponding to the fluid consistency.

610.4 -. Finishing Concrete

The tolerances of finished concrete surfaces are those specified in the corresponding paragraph of Article 680, formwork and molds.

Formwork surfaces will be smoothed by template or trowel, fresh concrete being, not admitting a later extension of concrete. The maximum tolerance shall be six millimeters (6 mm), for a ruler or straightedge two meters (2 m) in length, measured in any direction.

610.5 -. Study mixture and obtaining the working formula

The permitted tolerances (plus or minus) on the dosage will be accepted:

- One percent (± 1%) in the amount of cement.
- Two percent (± 2%) in the amount of aggregate.
- One percent (± 1%) in the amount of water.
In any case the water / cement ratio won’t exceed the value zero dot forty-five (0.45).

To verify that the dosage employed provides concrete that meets the conditions required six (6) representative samples of different dosages will be checked being molded at least seven (7) type specimens for each of the six (6) kneaded.

In order to meet the normal curve of hardening one (1) specimen from each batch of the seven (7) days, another fourteen (14), and four (4) of twenty (28) will be broken, and the remaining, ninety (90 days). The results of the corresponding 28-day characteristic strength shall not be less than that required for the Project.

610.9 -. Consolidation

The consolidating means to be employed shall be informed to the Site Manager and be submitted to its approval. Likewise, the Project Execution Manager shall determine the form of commissioning work, consistency, transport and dumping and consolidation, and provide opinion on steps to take for concreting under special conditions.

Consolidate by mincing or tamped shall be permitted.

610.12 -. Cure

During the first period of curing the concrete moisture shall be maintained and prevent all external actions, such as overloads or vibration, which can cause cracking of the same causes.

The surfaces shall be kept wet for three (3) seven (7) to fifteen (15) days at least, depending on the binder used is high early strength Portland cement normal or slower rates than previous hardening respectively.

610.16 -. Measurement and purchase

Concrete is paid per cubic meter (m3) placed in work actually measured on the Drawings, except where otherwise indicated. They will include additives if the Project Execution Manager authorized the use.

The prefabricated concrete parts are not subject to independent purchase and which are included in the unit.

To each type shall be applied prices corresponding what provided in Table of Prices.

ARTICLE 630. MASS AND REINFORCED CONCRETE WORKS

630.1 Definition

Shall be applicable what stipulated in the Article 600 and 610, the PG 3 (1975) and the quoted therein, as applied. The concrete to be used will be required whenever by the Project Execution Manager, without these implying additional costs.
630.2 Execution Control

The level of quality control will be intense.

630.3 Measurement and purchase

The works of reinforced concrete will be paid according to the different work units within them.

ARTICLE 680. FORMWORKS

680.1 - . Definition

Materialization of the different types of formworks shall respect the indicated in the PG 3/75

- Regular: formwork surfaces that are to be hidden within the concrete mass, either by any coating and drainage works, do not require a special finish.
- Lost: this formwork is formed by pieces of expanded polystyrene board used for lightening in slab "in situ" concrete.
- Viewed formwork: views of flat surfaces or where a quality finish is required, either flat or textured such as overhangs, sidewalks, precast, etc.
- Curved: formwork curved surfaces, viewed, such as curved shafts. In these a similar level of quality seen formwork is required.

Are also considered, based on special formwork for vertical pieces:

- Climbing: formwork fitted with working platforms, for a slice of a vertical piece, which is anchored in the concrete section and, using a crane to progression (lifting or climbing).

The following operations are included in this unit:

- Preparation and submission of design calculations of the formwork.
- The collection and preparation of the constituent elements of the form.
- Installation of formwork.
- The product release agent and its application.
- The stripping.
- Any work, machinery and auxiliary operation necessary for the proper and speedy implementation of this unit of work.

680.2 -. Execution

The formworks, with their joints, supports or false work, shall have the stiffness and resistance necessary to withstand the concrete without movement above the thousandth of the light assembly.

The supports shall be so arranged that never occur on the upper part of already performed forces that overtake a third of its strength resistance.

The Project Execution Manager may require the Site Manager sketches and calculations for formwork and false work to ensure compliance with these conditions.
The joints of the formwork will not suffer from cracks in more than two millimeters (2 mm) to prevent loss of grout, but will leave the clearance necessary to prevent the effect of moisture during concreting compress and distort the boards.

Surfaces left without inequalities or ridges greater than two millimeters (2 mm) to the exposed faces of the concrete (measured with a ruler or straightedge two meters (2 m) in length, in any direction).

It may not be in placement and alignments greater errors of one centimeter (1 cm).

In cells to be placed fifteen meters (15 m) high, placement tolerance shall be one per mil (1‰).

The Project Execution Manager may, however, increase these tolerances when, in his opinion, do not harm the purpose of construction, especially in foundations and abutments.

In placing lightening proper attachment to the reinforcement for separations less than 0.50 m will take care to avoid excessive or flotation phenomena. For this purpose the convenience of installing additional bands or fasteners is considered.

It should also have spacers to maintain minimum reinforcement distances, as indicated in Article 600 of this Specification.

**680.3 - Materials**

The formwork may be metal, wood, chipboard products, etc., which in any case shall meet the requirements of the EHE and approved by the Site Manager.

Materials, depending on the type of formwork, shall be:

- Regular: boards or planks and may be used without long broad brush and not necessarily uniform.
- Viewed: will tables, wood or steel plates and sheets used as directed by the Site Manager. Tables must be brushed and dovetailed with a thickness of twenty-four inches (24 mm) and a width that will range between ten and fourteen centimeters (10 and 14 cm). The plates must be pressed wood chip, plastic or plywood or similar, treated or plated with a waterproof wood products.

In the formation of joints are used as permanent formwork, polystyrene foam slabs whose thickness is shown on the plans that meet specified in Article 287 of the PG-3/75.

**680.4 - Measurement and purchase**

The formwork shall be paid by the square meter (m²) of concrete formwork surface, measured on the plans according to the following prices contained in the box price:

- Climbing viewed Formwork surfaces
- Formwork plane hidden surfaces
- Formwork plane viewed surfaces
- Formwork curved viewed surfaces

For flat surfaces of fundaments and removing gable ends, purchase prices are defined according to their use (shoes and elevations) for the full set formwork hidden surfaces.
The lids shall be paid to the form of the corresponding surface that limit price.

Shall not be considered the purchase of clogged executed in joints not defined in the project.

All prices cover the range of materials, labor, and means to properly support all the operations described above.

In slab bridge decks cast-in-situ, purchase of the formwork is done separately, regardless of purchase of the formwork or the method used for the maintenance thereof.

**ARTICLE 681. SHORING**

681.1 - Definition

Shall meet the requirements of Article 681 of the PG-3 and EHE.

681.2.1 - Construction and assembly

The installation or construction of the false work will be made with materials, available under precamber and calculations submitted to the Project Execution Manager for approval, once obtained it.

681.3 - Measurement and purchase

It shall be purchased by cubic meter (m3).

Measurement will be obtained by considering the volume enclosed by the ground, the bottom of the board and two vertical planes at the edges of the board.

Excess formwork made to extend the working platform shall be paid.

This price includes all costs related to the design, manufacture, transport, installation, operation and dismantling of false work stands and auxiliary elements, as well as preparing the ground for support and the eventual construction and demolition of temporary foundations.

Shall not be performed the correction of the price refund if work requirements would increase in lower proportion to fifteen percent (15%) of the projected, nor if interest and by Contractor's proposal would be authorized by the Project Execution Manager for extending the clearance work in any proportion.

**ARTICLE 690. WATERPROOFING WALLS**

690.1. Definition

It consists of the waterproofing of works for pre-cast walls of concrete, or other materials, stirrups, piles, panels, domes, fins, walls, etc.

Project areas to be waterproofed for being in touch with the land fill and its common treatment shall be done with the same product.
690.2. Materials

The material to be applied will be a pitch-epoxy paint of two components TCN 300 type company "Sigma Coatings" or similar.

Key Features:

The compound will be designed especially for surface protection of concrete and steel, being resistant to water, aqueous solutions of alkalis or acids, salts thawing, petroleum, mineral oils and atmospheric agents, will have a high mechanical strength to withstand the direct passage of traffic on it, and thanks for spreading mineral aggregate, shall provide a lasting wet slip resistance.

Basic information about the material components (for mixed product at 20 °C):

<table>
<thead>
<tr>
<th></th>
<th>Base + hardener + mineral</th>
<th>Base + hardener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass density</td>
<td>aprox. 1,9 g/cm³</td>
<td>aprox. 1,49 g/cm³</td>
</tr>
<tr>
<td>Solids content</td>
<td>100% / volume</td>
<td>100% / volume</td>
</tr>
<tr>
<td>Flash point</td>
<td>base &gt; 65 °C</td>
<td>hardener &gt; 65 °C</td>
</tr>
</tbody>
</table>

The mineral aggregate to be used will be "Mandurax" or quartz sand, with a suitable grain size and the type of use recommended by the manufacturer of the compound.

Additional Information:

- Drying Film and theoretical performance (base + hardener + mineral aggregate):
  - Performance (m²/kg) 0.35
  - Theoretical (m²/kg) 0.40
  - Film Thickness (mm) 2.50

Mineral aggregate expenditure may vary between 1.5 and 8 kg/m² depending on the size of the particle used.

Cure table

<table>
<thead>
<tr>
<th>Substrate temperature</th>
<th>Touch dry</th>
<th>Total cure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To step</td>
<td>For traffic</td>
</tr>
<tr>
<td>10°C</td>
<td>24 hours</td>
<td>72 hours</td>
</tr>
<tr>
<td>20°C</td>
<td>16 hours</td>
<td>40 hours</td>
</tr>
<tr>
<td>30°C</td>
<td>12 hours</td>
<td>24 hours</td>
</tr>
</tbody>
</table>

Physical properties of the cured material

<table>
<thead>
<tr>
<th></th>
<th>Base + hardener + mineral aggregate</th>
<th>Base + hardener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum breaking load</td>
<td>23 MPa</td>
<td>25 MPa</td>
</tr>
<tr>
<td>Breaking elongation</td>
<td>0.6%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Elasticity Modulus</td>
<td>10.000 MPa</td>
<td>3.000 MPa</td>
</tr>
</tbody>
</table>
690.3. Execution

Before application of the paint an abrasive blasting of the concrete surface shall be made to remove the top grout and the particles of dirt that may be adhering. If the walls would be smeared with grease or oil, they must be properly cleaned with alkaline solutions, then allowed to dry prior to blasting.

The paint layer to be applied will have a minimum thickness of 300 microns of dry film.

690.4. Measurement and purchase

The waterproofing of walls will be measured by square meters (m²) actually executed. Shall not be performed the separate purchase for being included in other work units. Included on the price are materials used, surface preparation and all the work necessary for the complete termination of the unit.

ARTICLE 692. ELASTOMER SUPPORTS

692.1 -. Definition

Are subject of this article the supporting items consisting of elastomeric material strapping plates and bands of elastomeric material.

Assistive devices which consist of a system of metallic plates by sliding lubricated PTFE sheets, by guided or fixed, including generally confined neoprene plate inside are also considered in this article.

692.2 -. Materials

The plates and strips of elastomeric neoprene type material must have been molded under heat and pressure with veneers hooping.

The following initial physical properties are required:

- Hardness Shore 69
- Tensile strength to strength> 175 kg / cm²
- Elongation at break > 450%
- Shear modulus for loads of long duration > 6 kg / cm²
- Shear modulus for instantaneous loads > 20 kg / cm²

Also after subjecting the material to an aging oven for seventy hours (70 h) to one hundred degrees (100 º C) temperature, the following conditions must be met:

- No cracks appearing in the ozone test.
- Not experience a change in hardness than fifteen (15) degrees Shore.
- Not experience a change in the breaking load in traction superior to fifteen percent plus or minus (± 15%).
- No experience decreased elongation of greater than forty percent (40 %) rupture.

If the material proposed does not meet some of the conditions indicated, the values of which are inspired by the ASTM standards, the Site Manager shall decide on the acceptance, taking into
account the guarantees provided by the supplier house and in view of other European standards of the specific case.

Since these types of devices are generally subject to various manufacturing patents it will be acceptable any brand that offers the Contractor, provided that they meet the characteristics and qualities required and accepted by the Project Execution Manager.

Metallic elements required for limiting displacement (creep or loss of contact) plates strapping neoprene, which do not protect this material will be made of stainless steel whose characteristics are, at least those mentioned in Art 255 of this document, and to be supplied to work in a polished finish and protected with plastic sheets.

The neoprene strapping supports shall conform to the types and dimensions shown on the plans.

For leveling devices to the supporting screeds, type M 450 will be used.

**692.3 -. Execution**

All types of assistive devices will be placed according to the manufacturer's instructions and orders of the Project Execution Manager.

The size and placement shall be as shown on the Drawings.

The side surfaces of the support will be cleaned and all contact with grease, oil, gasoline, benzene, or other substances that could harm will be avoided. The bank support, when not built with a sloping side, will be equipped with a drain.

Written authorization from the Site Manager prior to placement of concrete or board is required.

The grout will have a consistency as dry as possible consistent with proper putting in work to get a minimal retraction.

Its height will be less than six centimeters (6 cm). If necessary a greater thickness will be armed and special measures to ensure his good behavior will be taken.

Tolerances for placing support equipment will be about two centimeters (± 2 cm) in plan and roughly one centimeter (± 1 cm) in height.

**692.4 -. Measurement and purchase**

The purchase of simple supporting devices of neoprene and strapping bands support fee for cubic decimeter (dm3) apparent volume of each instrument or band, actually installed, measured on the planes.

The Price Table for each case will be applied.

The unit price includes staking, plates and stainless steel anchors, mortar or metal and any material or labor required for proper installation.

Supports with Neoprene confined (pot type) will be measured and paid for units (units) of each of the types indicated on the drawings, to the prices of the Price Table. That price includes
labor, materials and all operations required for installation, adjustment and attachment as well as all kinds of studs, brackets, welds or auxiliary fasteners both provisional and definitive.

ARTICLE 694. EXPANSIVE JOINTS

694.2 - General conditions

694.2.1 Choice of joint

Neoprene joints with metallic reinforcements will be used.

The Contractor shall notify the Site Manager, in time, the board proposed to be used, providing all information as requested for the corresponding acceptance. Any meeting without the final approval of the Project Execution Manager shall be placed.

The type of joints shall be as defined in the Report of the Project.

694.2.2. Primary materials

The Contractor shall notify the Site Manager, in time, about the origin of the materials proposed to be used, providing data and samples as requested for the corresponding acceptance, and no material is placed without approval of the Project Execution Manager.

694.2.2.1. Neoprene

Neoprene gaskets shall meet the following characteristics:

<table>
<thead>
<tr>
<th>Properties</th>
<th>ASTM test method</th>
<th>Physic requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength, minimum (kg/cm²)</td>
<td>D-412</td>
<td>141</td>
</tr>
<tr>
<td>Elongation at break %</td>
<td>D-412</td>
<td>250</td>
</tr>
<tr>
<td>Toughness. Type A</td>
<td>D-2240</td>
<td>55 ± 5</td>
</tr>
<tr>
<td>Maximum settlement at break (%)</td>
<td>D-412</td>
<td>10</td>
</tr>
<tr>
<td>Aigning test (70 h a 212 ° F in heat)</td>
<td>D-573</td>
<td>+10 a -20</td>
</tr>
<tr>
<td>Tensile strength (maximum change in %)</td>
<td>D-1149</td>
<td>-20</td>
</tr>
<tr>
<td>Elongation (maximum change in %)</td>
<td>D-471</td>
<td>0 a +10</td>
</tr>
<tr>
<td>Thoughness type A</td>
<td></td>
<td>Without cracks</td>
</tr>
<tr>
<td>Ozone resisstance (20% of deformation, 300 pphm in air, 70 h at 104 °F)*</td>
<td></td>
<td>+45</td>
</tr>
<tr>
<td>Oil swelling (oil ASTM nº 3, 70 h at 212 °F)</td>
<td></td>
<td>+80</td>
</tr>
</tbody>
</table>

694.2.2.2 Epoxy mortar

It will answer formulations sanctioned practice as appropriate. Not be alterable by atmospheric and chemical agents.

The minimum proportion of epoxy resin aggregates shall be one to six point five (1: 6.5).
694.3 - Execution

The cut of the asphalt coating should be done with a diamond blade saw, to either side of the axis of the joint, cutting a width equal to the width of the board, plus twenty centimeters (20 cm).

During the cutting operation, it is necessary to pour water on the blade so as not to heat the asphalt, an amount not less than twenty-five liters per meter (25 l / m) is recommended.

For the preparation of special boxes and anchors supplied template will be used by the manufacturer of the board profile.

Cleaning cages are made with compressed air and mechanical means to ensure perfect adhesion between concrete. The Site Manager of the work shall give the nod to these operations before beginning assembly.

For leveling epoxy mortar joint profile will be used.

Joints shall not be placed in temperatures below ten degrees Celsius (10 C) or with relative humidity greater than eighty percent (80%).

Tolerance for leveling asphalt together and stuffed respect to pavement boards, shall not exceed one millimeter (1 mm).

694.4 - Measurement and purchase

Board meetings shall be paid by the meter (m) of each type actually placed, net of the planes, according to the corresponding unit price of the Price Table.

The subscription price includes delivery, surface preparation, guardacantos epoxy mortar, concrete restoration, layout and installation, with all materials, labor and equipment necessary for the proper installation of the sealing profile.

ARTICLE 695. LOAD TESTS

695.2 - Execution

Load tests shall be as indicated in the RECOMMENDATIONS FOR THE DESIGN AND IMPLEMENTATION OF LOAD TESTS HIGHWAY BRIDGES (Highways Agency 1988). It is planned that the train corresponding to the test loads will be placed in split position in two steps, the composition in number and type of trucks and location fits as described in the test project load content on Schedule STRUCTURES, or to be approved for the Project Manager.

No element of the structure can be tested while the concrete has aged less than thirty days (30 d).

Before, during and after completion of the test, the arrow will be measured for each of the load steps. Half minutes (30 min). These measures shall be made after completion of each load stage, during which readings of the devices will be located at mid-span. The increase of the measures taken in an interval of fifteen minutes (15 min) should not exceed five percent (5%) of the corresponding total. Achieved full load, is maintained for a period of not less than two hours (2 hours).
Measuring vertical displacements will be made with flexometers. In cases of particular difficulty for the use of these devices may be used for high precision levels.

Whatever the equipment used, its accuracy is not less than zero dot zero two millimeters (0.02 mm).

When the pre-load or after the first load stage inspection appreciate cracks in the boards, they shall be testified, to know its evolution through the process of load testing.

The removal of the overload test shall be performed following the steps outlined in the draft load test included in the Schedule of Structures or determined by the Project Management. At each stage the arrows will be measured and the same periods of rest will remain. After twelve hours (12 h) of the total discharge, the remaining arrows shall be measured.

The flexometers and other recording instruments are placed on fixed bases exempt of vibration that may affect the accuracy of the measurements. The inclinometers, for its special nature do not require these precautions, being enough exempting them from the wind that may affect its operation or distorting indications.

The bases used for the high precision leveling in any case shall be located outside the influence of the structure, permanently established so that they are protected for possible use during the lifespan.

695.4 -. Measurement and purchase

The load test of each span of the bridge will be measured and paid for one unit of load test, including scaffolding, instrumentation, auxiliary means, fixed points, leveling bases and few works are necessary for carrying out the load test the provision shall apply trucks needed for implementation is included.

ARTICLE 696. PAVEMENT OF STRUCTURES

696.1 -. Definition

The pavement structures are defined in layers.

696.2 -. Materials

Aggregates and bitumen are analogous to those for bituminous mixtures, so it is covered by Article 542 of this Specification.

696.3 -. Measurement and purchase

Measurement and purchase of these items are made according to what is specified in Article 542. Therefore, this unit is not purchased independently.
ARTICLE 697. RIGID BARRIERS FOR STRUCTURES

697.1 -. Definition.

The definition of the barrier to be used in the structures is in the plans.

697.2 -. Measurement and purchase.

Measurement and purchase for this unit shall be made, independently, by meter of barrier actually executed.

PART 7 SIGNALING

ARTICLE 700. ROAD MARKS

In addition to the requirements in Article 700 of the PG-3/75 and the modifications included in the ministerial order OM of 28 December 1999, they shall attend to what is exposed in this Document.

Conventional road markings, hot and cold thermoplastic (two-component) are defined.

The specifications in this section is applicable to all road markings, being subsequently considered the special conditions of each indicated in the relevant articles of the present Terms.

In matters not covered in this article or other corresponding to road markings shall be applied what provided for in the "Service Note" on "projects to draw road markings for the biennium 94-95", approved by the General Direction of Conservation Operational and Highways MOPTMA dated 10-3-1994, or, alternatively, in the tender PG-3/75.

700.2 -. Materials

The characteristics to be gathered by the materials are specified in the UNE 135 200 (2), paint, hot-applied thermoplastic and cold applied plastic, and the UNE-EN-1790 in the case of road markings prefabricated.

Also, Drop-on glass beads to use in reflective road markings shall meet the specifications indicated in the UNE-EN-1423. The grain size and method of determining the percentage of defective equipment are given in the UNE 135287. When premix glass microspheres are used, shall apply to the UNE-EN-1424 approval of the particle size thereof by the Project Execution Manager.

If it is necessary special surface treatments on glass microspheres to improve their flotation characteristics and / or adhesion, these will be determined in accordance with the UNE-EN-1423 protocol or by the manufacturer's declared analysis.

Furthermore, the materials used in the application of road markings shall comply with the specifications for durability as specified in the "Method B" of the UNE 135 200 (3).

Quality assurance of the materials used in the implementation of the road marking shall be payable in all circumstances to contractor who was awarded of the works.
700.3.2 Selection Criteria

The selection of the class most suitable for the application of road marking material is carried out by determining the "Wear factor", defined as the sum of the four individual values in Table 700.1 assigned to each and every one of the characteristics of the road in that table (position of the road marking, surface texture of the pavement, road type and width and average daily traffic of the section) are made explicit.

Retrieved wear factor, the best kind of material is selected according to the criteria specified in Table 700.2 of MO 2/12/99.

After selecting the type of material, between the products of that kind, the Project Execution Manager shall, depending on the substrate and environment properties, nature and quality of them as well as their allocation unit in every of the sections or areas in which it can differentiate signaling the complete work.

700.4 -. Execution

The initial value of retro reflection measured between 48 and 96 hours after application shall be at least 400 lux/m2. Geometry 86 ° 30 '/ 1.

The value of retro reflection at 6 months of the application shall be at least 225 for lux/m2 with the above geometry.

The degree of deterioration of road markings measured at 6 months of the application shall not exceed 15% of the axis lines separating lanes nor 10% in the border lines of road.

If the tests performed give incorrect results, the materials are not applicable and if the Contractor had proceeded to apply road markings with these materials must be repeated the implementation of suitable materials at his expense, within the time and date fixed by the Engineer Project Execution Manager.

In the implementation no accumulated deviations are permitted in road markings on the correct path more than ten (10) centimeters in one hundred (100) meters, measured deviations in absolute value; serving of the reference points located ten meters (10 m.) in areas of solid line, and dashed the three points on each line, in the center and ends.

The spacing between vain and painted section shall be fixed by the Site Manager of the work.

If some road marking have to delete on the road surface mechanical or chemical procedures not dwindle firm resistance or adversely affect to its texture expressly forbidden to refinishing with paint or asphalt emulsion will be used.

The slip resistance of Aggregate Shape Coefficient of road markings completed at the standard temperature of 20 ° C, CRD, measured with the SRT pendulum (Skid Resistance Tester) will not less than 0.45 units.

In matters not stated in this article shall be as stated in Article 700 of the said OM.
700.4.1 -. Organization

Pavement markings are provisional and intermediate layers on or diversions, and final, they rethink topographically the same day on which it is laid the asphalt layer (mixture or treatment) in which they apply

The stake will consist of identifying and marking surface of axis points and edges as well as complementary lines (boundaries of middle lanes, ways to slow vehicles, etc.) With maximum separation lengthwise to the road ten meters (19 m) in straight alignment, five meters (5 m) in curved alignments with radius of curvature greater than five hundred meters (500 m) level, and two meters (2 m) on curved alignments with radius of curvature in plan exceeding five hundred meters (500 m).

The stake will consist of a mark on surface may be alkyd painted, with no separation between them more than fifty centimeters (50 cm).

After daily retargeting will take place the painted road markings on the last working day of each week affecting brand everything lying on the week.

The Construction Manager will indicate which road markings should be executed, and may be all or only part of them (axis, borders, etc).

For weekday holidays or work stoppages by singular traffic control operations, road markings will be on the eve of a holiday or at the time of interruption of road work by the special operation, in addition to the sequence weekly ordinary.

700.6 -. Measurement and purchase

Where road markings are constant width, shall be paid by the meter (m) actually applied, measured along the axis of the same on the pavement. Otherwise, the road markings will be paid per square meter (m2) actually executed, measured on the pavement.

Necessary for surface preparation and application predialing operations, which will included in the purchase of road marking applied will not be paid.

The removal of road markings constant width, shall be paid by the meter (m) actually removed, measured along the axis of the pavement. Otherwise, removal of road markings shall be paid by the square meter (m2) actually executed, measured on the pavement.

ARTICLE 701. RETROREFLECTIVE VERTICAL POSTERS AND SIGNALS

As provided in the new Article 701 of the Decree OM of December 28, 1999 (Official Gazette of January 28, 2000) will be followed, with accompanying comments.

701.3 -. Materials

The quality, composition and colors of the paintings to be employed in the manufacture of the signs shall be as specified in the General Technical Requirements for both primers as for finishing.
The minimum level of retro reflectivity will be 2 in the code signals and level 3 complementary posters and panels.

The geometric conditions for the evaluation of these coefficients retro reflection shall be:

- Viewing angle ($\alpha$) = 0.2°
- Angle ($\beta_1$, $\beta_2 = 0°$): 5th

The banners and posters placed in frames shall consist of extruded aluminum, and high intensity reflective with applied with vacuum machine.

The posters will be side galvanized steel profiles. Shall not be performed splices upper 7.00 m of reflective sheet.

701.3.1 -. Tests and trials

The Contractor shall include the pre-treatment, as well as primers and enamels to be used in the manufacture of signs.

The Directorate works have free access to the production shops of the plates and means of support, and may take samples at any time it deems necessary, for shipment to the laboratory and control every phase of execution in the manner it deems appropriate.

If the finished signs or some of its elements do not meet the requirements in this Specification, the Directorate of works may reject the delivery.

701.4 -. Shape and dimensions of the signals

Following the instructions given by the Standard 8.1.-IC, the final signal will be adjusted to the shape and dimensions:

<table>
<thead>
<tr>
<th>SIGNALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
</tr>
<tr>
<td>Triangular</td>
</tr>
<tr>
<td>Triangular</td>
</tr>
<tr>
<td>Triangular</td>
</tr>
<tr>
<td>Circular</td>
</tr>
<tr>
<td>Circular</td>
</tr>
<tr>
<td>Circular</td>
</tr>
<tr>
<td>Octagonal</td>
</tr>
<tr>
<td>Rectangular</td>
</tr>
</tbody>
</table>

POSTERS

Variables, fulfilling the provisions of the draft Standard 8.1.-IC

Signaling works will comply as indicated in Rule 8.3-IC.
701.6 -. Construction of support members and anchor

701.6.1 -. Overview

According to the provisions of the Order Circular 318/91 Type shall comply, both in terms of features like sampling and testing to what by said in the UNE 37.508.

The hardware is also abided by the requirements of the UNE 37.508.

The posts to support the signs galvanized steel, rectangular section. The dimensions of the section and the length will vary depending on the signs support agreement and as described in the plans. The posts are inserted in a sheath of galvanized steel shall be recessed as concrete foundation.

The posters will be underpinned notice on IPN type of galvanized steel and the dimensions indicated in the draft Standard 8.1.-IC as well as planes.

Urban information signs will be supported by staffs of 2 and 4 modules according to the number of plates is 3 or more.

The porches and banners profiled galvanized sheet steel, as detailed in the relevant drawings and shall have the dimensions and thicknesses indicated on them.

701.8 -. Measurement and purchase

Posters and galvanized steel frames will be measured and paid per m2 installed the corresponding to the Price Table no. 1 being included in the price necessary poles, the foundation of these posts, excavation, concrete and all parts and fixing cartel operations to posts.

Signals are paid by the number of units of each class actually placed on site, the corresponding price Price Table no. 1, including the posts and foundation and few elements, equipment and labor necessary for the placing and final completion of the unit. Will include the cost of the sheath for insertion post that, therefore, not be subject to separate subscription.

The banners, directional panels and supplementary plates will be measured and paid per units actually placed at the prices listed in the price table no. 1, including rolled steel, poles, foundation and all the elements necessary for full completion.

ARTICLE 702. RETROREFLECTIVE REFLECTORS TO BE USED IN HORIZONTAL SIGNALING

Will be followed the indications in the Ministerial Order of December 28, 1999, with accompanying comments.

702.3 -. Materials

The reflector shall be of the type 3 and permanent employment.

The number of retro reflective faces shall be a unidirectional branch and two bidirectional edges of roads and road two lanes, one in each direction.
The dimensions of the reflector shall be of 98 mm square at the base and 18 mm in height. Fixing the reflector to the road surface shall be by adhesive.

ARTICLE 704. SECURITY BARRIERS

704.1 Definition

For this unit we have followed the recommendations of the OC6/01 (Amendment of OC 321/95 T and P in terms of safety barriers for single carriageway) and OM of December 28, 1999 (updated PG3).

Safety barriers shall consist of corrugated iron fences, supported by poles, the top of the wall and the end bear a terminal piece.

The barriers used:

- Simple metal barrier BMSNA4/120b:

Simple metal barrier separating, one fence, with separation of 4 m. between its poles being of a tubular profile with maximum transverse dimension of 120 mm.

704.2 Materials

704.2.1 Poles

The posts shall be 120x55 mm hollow sections, steel A 42 b (Article 250 PG 3 1975).

The pole length tolerances will be ten millimeters (10 mm) more and none less respect than indicated on the Drawings.

In the event that the poles are to be placed on work by piling its lower end should finish bevel to forty-five degrees (45 °), and in addition have longitudinally welded in the shape and the dimensions that indicate the Plans, a "wide flat "rolled equal steel which is the goal.

The posts will galvanize a whole, in accordance with the requirements set out below.

If during reception of an item is presumed that the rejected fraction exceed twenty percent (20%) of the total, the Site Manager may reject the entire batch.

704.2.2. Waveform double barrier

The double wave barriers used for the construction of traffic barriers shall be of 52b A steel plate (PG 3 Article 250 of 1975), from melt or open electric furnace.

The weight of each element four-meter fence with three hundred and eighteen millimeters (4,318 mm) in length shall not differ from the theoretical forty-eight kilograms with five hundred seventy grams (48,570 kg), more than six percent (6%), in less, for the average effective sample ten (10) or in more than ten percent (10%), at least for a single element.

The barrier must be able to withstand these stresses, even though the tested segment comprising a splice.
FLEXION  
45 t not breaking

Face exposed to traffic up
750 Kg with arrow not exceeding 70 mm
1,100 kg with arrow not exceeding 140 mm

Exposed side traffic
600 Kg with arrow not exceeding 700 kg
850 Kg with arrow not exceeding 140 mm

The bend test shall be made by simply placing the fence (where appropriate, with the joint in the center of the light) with a free span of three meters sixty centimeters (3.60 cm), and the load applied at the center of light through a flat surface of seventy-five (75 cm.) long.

The plate shall be galvanized in accordance with the requirements below. It can be cut, drilled and formed after plating, but the court will not be permitted, bored, nor welding of the fence work. In addition, at the time of placement, the fence shall be free from defects in whole and individually. For this purpose, sufficient effect is considered for rejection the presence of any of the following:

- incorrect dimensions
- incorrectly
- jagged edges
- Irregular shaped holes or separation
- Galvanized dented, peeling or released

Be tested at the Contractor’s expense, one (1) be fence for each game of two hundred (200) or less, if the sample did not fulfill the requirements shall be tested other two (2) of the game itself, and if either party does not fulfill , the entire batch is rejected.

704.2.3 End pieces

The end pieces shall be of rolled steel sheet a34b (Article 250 PG 3 1975).

The end pieces will be galvanized according to the requirements below. It can be cut, drilled and formed galvanized after, but will not allow his court, bored, nor welding work. In addition, at the time of placement, shall be free from defects in both whole and individually. For these purposes, shall be deemed sufficient develop defects for rejection, the following:

- incorrect dimensions
- incorrectly
- jagged edges
- Irregular shaped holes or separation
- Galvanized dented, peeling or released
- Dents or bumps

Be tested at the Contractor, one (1) terminal per each batch of two hundred (200) or less, if the sample does not meet the requirements will be tested other two (2) of the game itself, and if any of these does not meet , the entire batch is rejected.
704.2.4 Screws, nuts, washers, bolts

In addition to the requirements of Article 622 PG 3 (1975) the following must be met:

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Diameter traction nominal (KGF)</th>
<th>Minimum Length</th>
<th>Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint screws</td>
<td>5/8 &quot;</td>
<td>1.5 5650/16&quot;</td>
<td>32 mm</td>
</tr>
<tr>
<td>Attachment bolts of</td>
<td>5/16 &quot;</td>
<td>1,800</td>
<td>40 mm</td>
</tr>
</tbody>
</table>

(*) Minimum Brinell hardness 104

All screws, bolts, washers and nuts shall be galvanized in accordance with the requirements set out below, and shall withstand four (4) dives on a standard copper sulfate solution without any trace of copper is deposited on steel.

In each lot will be tested at the Contractor's samples following cash:

<table>
<thead>
<tr>
<th>Nº of pieces of the lot</th>
<th>Effective of the sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>1</td>
</tr>
<tr>
<td>801 a 8.000</td>
<td>2</td>
</tr>
<tr>
<td>8.001 a 22.000</td>
<td>3</td>
</tr>
<tr>
<td>22.000</td>
<td>5</td>
</tr>
</tbody>
</table>

Otherwise, the item will be rejected, if the sample did not meet any of the requirements two (2) other samples must meet both these requirements will be obtained.

704.2.5 Galvanized

The hot dip galvanizing will performed by immersion in a bath of molten zinc. Crude zinc ingots shall be used first fusion, with the following maximum impurity:

- Lead 1.6%
- Iron 0.8%
- Luminum 0.001%

The average mass of zinc deposited per unit area will not be less than six and a half grams per square decimeter (6.5 g/dm2) in any individual result. The zinc coating shall be uniform, smooth, continuous and adhesive without presenting pellets, bubbles, erosions, or sheaths discontinuities, in those parts where the crystallization of the coating can be seen with the naked eye, check that has a regular appearance throughout surface. Subjecting a workpiece to the adhesion test, it should do not be observed any peeling of the coating, nor should appreciate discontinuity in the coating after five (5) dips.

704.3 Execution of works

Excavation for solid anchors and possibly foundation of the posts will be held by hand or by mechanical means to achieve the depth indicated on the Drawings, in cases of anchors, it will ensure that the bottom of the excavation to provide a firm seat and undisturbed. Nor disturb the soil between the anchor and the adjoining more than what is necessary to install the anchor post.
704.3.2 Placement of poles

The poles are placed in the location indicated on the drawings, so that they are normal to the surface of the adjacent shoulder. The tolerances in position with respect to the theoretical, and referred to the head of the post will be five millimeters (5mm) more or less. The driving of posts shall be permitted provided that the heads of the posts are not deformed and that those tolerances are respected, otherwise, the excavation required for installation will be filled with concrete HM 15, consolidated in successive layers of thickness do not be than ten centimeters (10 cm).

704.3.3 Cleaning

Excess excavated material shall be aligned to the satisfaction of the Site Manager.

704.4 Measurement and purchase

The rigid safety barriers shall be paid according to its type on the Plans, by the meter (m) measured. In such purchase shall be deemed also including poles, bolts, foundation, anchors and reflector.

PART 8 ENVIRONMENTAL INTEGRATION

ARTICLE 801. TEMPORAL PROTECTIVE STAKING

801.1 - . Definition and Conditions

This unit is intended to define the scope of work activity by temporarily staking so that trafficking machinery, ancillary facilities and roads work is necessarily adhere to the inside of the enclosed area. The execution of the work unit includes the following:

Staking  
Supply and transportation to the work of the necessary materials  
Thumbnail tape media and signaling  
Review and systematic replacement of deteriorated staking  
Removal thereof to the completion of the works

The staking shall consist of angular metal supports 30 mm long, being the upper 20 cm covered by a red paint and glued to 30 cm below the ground. These supports, placed every 8 meters, will be joined together by an orange mesh or network of about 70 cm high, tied under the paint the metal angle.

801.2 - . Conditions of the implementation process

The staking will be installed following the expropriation limit for drawing and replacement of easements, as well as the limits of the areas of temporary occupation, including loans, landfills, facilities and access roads. Regarding vegetation of greater value, particularly riparian vegetation indicated on the plans, as well as those reported by the Environmental Construction Manager will mark out.
It shall be the responsibility of the Project Manager the identification of new areas requiring stake out, to signal the prohibition of access by machinery or even the personnel involved in the execution of works.

The staking should be completely installed before clearing tasks or other earthmoving start. The contractor shall be responsible for the proper maintenance of the Act to issue reception of works, and dismantling and subsequent withdrawal.

801.3. Measurement and purchase

These units, reflected then be paid in accordance with the corresponding unit price Price Table.

The price includes the supply of materials, layout and staking implementation, maintenance and removal at the end of the works.

ARTICLE 802. STORAGE AND SPREADING OF VEGETAL SOIL

802.1 -. Definition and Conditions

The execution of the work unit includes the operations required for the supply and placement of topsoil or soil collection from similar work carried out during the execution of the excavation unit. The widespread is made on the surfaces to restore.

Topsoil removal and has incorporated nutrients and seeds and is able to support the growth of the species, so if reused in the restoration of the land, promote the effectiveness of proposed treatments plants and colonization spontaneous vegetation.

For the purpose of this construction project topsoil should be considered all the material from excavation whose physical -chemical and granulometric composition allows the establishment of a permanent grass cover and is capable of natural recolonization. It should be noted that, in general terms, it simply aims to create the right conditions so that it can penetrate the natural vegetation, whose genetic material is in the vicinity. This vegetation is which is more likely to resist and remain on land which are not possible maintenance care.

Those materials whose physical -chemical and granulometric characteristics are clearly unfavorable for the purpose described topsoil or whose grain size is too consolidate will be rejected.

The suitability of the material considered topsoil depends on compliance with the following rejection criteria:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>REFUSING VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>Between 5.5 y 9.0</td>
</tr>
<tr>
<td>Carbonates</td>
<td>&gt;30%</td>
</tr>
<tr>
<td>Soluble salts</td>
<td>&gt;0.6% with CO$_3$Na (&gt;1% without CO$_3$Na)</td>
</tr>
</tbody>
</table>
PARAMETER | REFUSING VALUE
--- | ---
Conductivity (25ºC, sat.) | >4ms/cm
Texture | Fine clay (<60% clay)
Structure | Solid or molten (consolidated clay or silt)
Thick elements (>2 mm) | > 30% in volume

Additionally, for the determination of soils by their deep and features may be considered topsoil is generally subject to the provisions of the Environmental Works Project Execution Manager.

802.2 . Conditions of the implementation process

The contribution and topsoil will be spread with equipment that causes minimal consolidate and thickness indicated in the previous section.

Maintaining topsoil ridges 1.5 m, including fertilizers, planting and watering if necessary and spread

After removing the topsoil stockpiles, the occupied lands must be clean and in a similar situation to what it was before the collection. This situation must be approved by the Environmental Works Project Execution Manager.

802.3 . Measurement and purchase

These units, will be paid in accordance with the corresponding unit on the Price Table.

Price includes cargo storage, transportation from any distance, download, spread, as directed by the Plans or instructions of the Price Table

ARTICLE 803. SOWING

803.1 - . Definition and Conditions

Planting by hand is to distribute seeds implanted. The provision of seeds carried by his purchase at official centers or similar institutions or, in any case, well established companies. A preliminary examination must show that they are free from impurities, broken, defective or diseased grains and beans to the particular species. In general, it must meet the specifications of the “Regulations of the International Seed Testing Association.”

In particular shall be checked by the Environmental Manager to prove that is not parasitized by insects, there is no mold contamination or signs of mycological illness are suffered.

Each species will be delivered in sealed containers or sewn acceptably identified and labeled bags, to certify seed characteristics.

When the Environmental Project Execution Manager considers appropriate samples will be taken for analysis, the sample has to be performed with a probe type Nobbe.
Sowing shall be applied across the slopes and re-vegetate as auxiliary to the plane of remedial measures outlined areas.

They distinguish between planting and sows in landfill dumps and landfills.

In the latter case sowing will be formed from 300 kg / ha of seeds, including me crumbling, covered with 50 kg seed / ha of mulch or similar and subscriber

803.2 -. Conditions of the implementation process

Plantings should be made during the months of October, November, February or March. Is, or in autumn, when there is sufficient water in the soil or late winter, when there is still enough moisture and enough from the summer. However, if development imperatives of the work necessary to finish slopes outside these months, will hydro sew immediately after termination of the banks and back into the optimum months.

803.3 -. Measurement and purchase

These units, as reflected then will be paid in accordance with the corresponding unit price of Price Table.

Treatments, planting, shall be measured and paid per surfaces actually executed, if they have been under this project and / or written orders of the Environmental Project Execution Manager of the Work. Prices include all materials, labor and aids, as well as immediate sowing irrigation. Are not included irrigation maintenance considered separate work unit.

ARTICLE 806. HIDROGRAPHIC SYSTEM PROTECTION

806.1 -. Definitions

This is to minimize water consumption and preserve the area from the contamination of surface water

807.2 -. Conditions of the implementation process

a) Discharges

Caution should be exercised to control discharges during the construction phase. This control is exerted mainly on Machinery Park.

The reprising engines and machinery will be respected and should be centralized fueling and oil changes to totally waterproofed platforms that can be collected to waste and carried to landfills, for transport to the recycling plant. In any case, these waste products are managed in accordance with current legislation in the region.

Special attention to washing machines, which will be held exclusively in places intended for that purpose, equipped with waterproof floor will also be provided. In any case, the necessary equipment will be installed in areas where the risk of water pollution is zero.
All these actions will be governed under the legal framework of the Public Water Regulation and Water Act and waste products that are administered in accordance with regulations in the region.

Spills of oils, fuels, cement and other solids from the areas of facilities shall in no case be discharged to water lays. The management of these waste products will be according to the rules applicable in each case (solid waste, toxic and hazardous waste, inert waste, etc.)

The regulatory framework within which the efforts of waste oils is carried out as follows:
- Order of 28 February 1989 on Waste Oil Management.
- Order of June 13, 1990, by amending the Order of 28 February 1989 laying down the used oils management is regulated.

b) Pond settling

In the area of facilities a raft of provisional slop shall be excavated in the soil, and an associated perimeter drainage system will be constructed. The fund will be sided with a geotextile of the following characteristics:

- Minimum density of 150 g/m2
- Elongation at break of greater than 30 %.
- Good resistance to tearing and puncturing.
- High initial module.
- High energy work.
- Low pressure influence on soil permeability.
- No tendency to clogging your pores.
- Good chemical resistance.

The minimum required properties are as follows:

- Tensile strength of 400 N / 5 cm. (DIN 53.857 )
- Elongation at break > 30 %. (DIN 53.857 )
- Secant modulus at 10 % elongation > 1500 N / 5 cm . (DIN 53 857 )
- Tear resistance > 400 N. (ASTM D1117 )
- Water permeability K> 10-4 .

- DIN 53.857 : Sample of 5 cm wide and 20 cm long.
- ASTM D1117 : trapezoidal tear .

The raft finally has a projected base 5m long , 1m wide and 0.5m deep . The inner and outer slopes, both in cut and embankment are 2 (H ) : 1 ( V ) , with a crown width of 2 m , built with an all- one and impermeable geomembrane. The slopes provide a surface that insures length calculations.

The maintenance of the ponds will be necessary to ensure the efficiency of purification. Extraction, drying, transport and deposition of settled solids are included. Be provided by the raft of a surface of 10 m2 for the deposit of sludge removed for drying. Once dry, this sludge will be transported. If its physical and chemical characteristics that will enable your destination will be the addition in filling landfills. Otherwise it will be transported to an authorized landfill.
At the end of the useful life of the decantation facilities, the dismantling of the geotextile is made, the pond is filled and this fill will be consolidated and subsequently re-vegetated. The filling is made with the material excavated for the construction of the raft.

Within the environmental monitoring program control and analytical monitoring of the water discharged from the settling basin, thus preventing will join the impact from potential pollutant discharges on rivers and streams.

806.3 - Measurement and purchase

Measurement and purchase of the actions included in this chapter shall be charged against the following units of work actually executed, which include the provision of all materials, equipment and resources necessary to fully execute.

Retention pond
Mechanical excavation, geotextile even with waterproof coating

Shall be paid according to the prices included in the Price Table N°1.

The price includes cleaning and maintaining accurate for the proper discharge of their duties.

The settling basin area facilities will be measured and paid according to the measurement of the different work units that compose it.

ARTICLE 809. ATMOSPHERIC EMISSIONS

809.1 - Definition and Conditions

To prevent the emission of dust into the atmosphere daily watering will be arranged for those situations is necessary.

809.2 - Conditions of the implementation process

It concerns the surface of the areas of facilities and platforms. Shall be provided a daily irrigation of facilities of the area during the dry period lasts while works on the platform and in the places and times that are necessary are being carried out.

809.3 - Measurement and purchase

This unit shall be paid in accordance with the corresponding unit price of Price Table.

- Part of appeals to reduce dust emissions during summer period according to weather needs
PART 10 VARIOUS

ARTICLE 1002. CLEANING AND FINALIZATION OF THE WORKS

1002.1 - . Definition

As work is performed, the Contractor shall proceed on its own, the withdrawal of the collected materials that are no longer in the same job.

Once the work is finished and before provisional reception, it shall be general cleaning, removing materials, surplus or discarded debris, ancillary works, facilities, warehouses, and buildings that are not required for conservation during the period of warranty. This cleaning will extend the domain areas, bonded and condition of the track, as well as the lands which are temporarily occupied, must meet each other in a similar situation as they were before the start of work or similar to its environment.

1002.3 - . Measurement and purchase

Heading shall be payable for full purchase of lump according to the quantity in the Prices Table. The purchase will be made in the liquidation of the work, once the certificate has been issued by reception that has made cleaning and finishing.

P. A. cleaning of full purchase and completion of works.

SIGNATURES

ENGINEER AUTHOR OF THE PROJECT

ENGINEER DIRECTOR OF THE PROJECT