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Thesis Submitted to Obtain the Bachelor in English with concentration in Translation

Translation and Analysis of the Documents Propuesta dique de cierre sector este from Spanish into English and Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis from English into Spanish for Insuma.

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Chapter I

Introductory Framework

This investigation considers the different aspects that are needed when doing a translation; these aspects include, but are not limited to, the style and function of the text, and readership. On the other hand, it will also explain all the translation methods that currently exist.

1.1 Problem Statement

When doing a translation, regardless of the language~~s~~, the primary objective is to render a translation as efficient and faithful to the original text as possible. There are far too many aspects that need to be taken into account when doing a translation: style of the text, translation methods, function, and stylistic scales. If ignored, it will not only be really difficult for the translator to work, but the final product will be so different from the source text that it will be completely useless. The question this investigation will answer will be What are the different effects of the procedures and methods used to translate the documents *Propuesta dique de cierre sector este* from Spanish into English and *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis* from English into Spanish for Insuma?

1.2 Objectives

1.2.1 General objective

To analyze the effect of the procedures and methods used to translate the documents *Propuesta dique de cierre sector este* from Spanish into English and *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis* from English into Spanish for Insuma.

1.2.2 Specific objectives

- To translate the documents *Propuesta dique de cierre sector este* from Spanish into English and *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis* from English to Spanish for Insuma.
- To apply various translation techniques to the documents in order to achieve natural, cohesive, and accurate texts.
- To evaluate the effect of the translation techniques applied on the documents.
- To create a glossary with the most relevant terminology found in both texts.

1.3 Justification of the Study

The importance of this investigation lies on the lack of awareness that a big portion of the population has regarding something that occurs pretty much every day, and it is involved with every single member of society in such different ways that most of the time escapes the thought. It will also be explained what is involved in the process of translation, the different stages that have to be followed when translating a document goes through, and the fact that translation entails far more than just speaking a foreign language fluently. Moreover, it seeks to help new translators to have a clearer idea of what translating is, and what it truly represents to become a translator, and that the importance behind it is much bigger than what is known.

This investigation also seeks to spread insight regarding not only the profession itself, but of the aptitudes of those who aspire~~s~~ to be a translator must have, and what the profession demands from its practitioners, as well as what are some of the most vital actions a translator or student of translation must do in order to expand his capabilities in order to provide better services and higher quality work.

This investigation seeks to benefit current, soon to be and future translators, by developing not only the needs, but also by explaining and expanding the many stages of the translation process, what it is needed to be prepared for in this career, the different benefits it provides, its role in today's world, and what should be the abilities that those who desire to start this career must have. It will further prove its benefits by deepening into the current four main types of translation, which are: literary, professional, technical, and administrative translation, as well as the different procedures that may exist within the translation itself. Moreover, the researcher will also mention that translators need to take into account the objective of the text that is being translated, the type, and how it must be approached depending on those factors.

The information presented to the reader will be based on a compilation of multiple investigations done in the past, analyzed with the addition of a different and more recent point of view that deals with problems that have been noticed during the mayor, and the most common misconceptions and shortcomings people have dealt with in the past. The practical application of this investigation will be reflected on ~~in~~ the supply of information regarding all the types of procedures that exist within the profession of translation, all of its varying forms and how to know when to use one type regarding the text, and to value the service that is being provided by the translator.

Many future translators will also be provided with knowledge regarding new tools that are available both, online and offline, but mainly online, as they are meant to make the work of a translator easier and more efficient, and disregard some of the mysticism around using some of the most basic tools, mainly referring to google translate or online dictionaries. Furthermore, it will give starting translators an idea about what must be taken into account when accepting a work, mainly: which language should you always translate to, the amount of time you should ask for to translat~~ing~~ a document, the need of a grammar checker when translating, and be sure to read he document before accepting the job, among others. This investigation seeks to expand the current knowledge regarding the process of translation by providing a point of view that is more familiarized with the use of online and technological programs, which have been improved drastically in the current years, without ignoring or belittling the bases and core of translation itself and its purpose. It will also try to provide plenty of information regarding the multiple ways and procedures that are present in the process of translation, and the meaning behind them.

1.4 Antecedents

-*A History and Overview of Translation Techniques* by UKEssays (2018)

The article mentions how old the art of translation is, as reaches the times of antiquity; therefore, it can be said it as old as the introduction to writing. First writings, however, were written mainly in Latin or Greek and introduced to educated people. Such article mentions how over the past three decades; serious attempts were made to create a translation theory which could have included all answers connected with the human language. As Korzeniowska and Kuhiwzak (2006, p. 28) have stated, all of the previous translation theories were based chiefly on structuralist linguistics. The aim of the theories was not to present a detailed description of the translation phenomena, but to provide scholars with sentence structure rules. The 70s and early 80s brought a breakthrough in understanding the language universals, which in turn influenced in perceiving it as a tool helpful to understand languages.

These major changes occurred due to the work of Wilhelm von Humboldt and the introduction of the Sapir-Whorf hypothesis. Sapir's famous statement "no two languages are ever sufficiently similar to be considered as representing the same social reality," gave straightforward answer that the translated text will not match with the source text, which led to neglecting translation and, simultaneously, to raising scholars' interest in linguistic studies. Scholars devoted to the field of translation studies, have failed to establish the most accurate definition of the translation theory. The reason is that a great number of-academic teachers are still engrossed with the linguistic approach towards translation theory. Therefore, all aspects concerning translation theory are examined by means of linguistic theories. Those theories aim to create view that translation theory is an integral part of linguistics and must be used in accordance with linguistic rules and theories. It concluded that it depends on the personal preferences of the translator to coin their own theory, which corresponds to their work as professionals and that will lead eventually to the multiplication of translation theories.

-*Trajectories of Research in Translation Studies* by Maria Tymoczko, journal Meta (2006)

The article sums up the principal trajectories of research in translation studies that are likely to be productive in the coming decades. It focused on six broad areas: defining translation, internationalization on translation, changes in translation theory and practice, application of translation based on frames from other disciplines, and the relationship of translation studies to cognitive science and neurophysiology. It mentioned many different approaches that have been done in the past in order to define translation, and that instead of viewing them as antithetical, should be viewed as contributing in complementary ways in order to define translation. Early research focused on linguistic aspects, exploring the nature of translation in relation to language and linguistics, looking at linguistic asymmetries and anisomorphisms in translation interface.

In a similar way, literary or poetic approaches to translation focused on the parameters pertaining to literary questions and questions raised by complex and extended texts, as well as their intertexts and context. Thus, that school of research investigated issues such as how translation gets shaped or determined by the nature of literature. Still, another research cluster attempting to define translation concentrated on the investigation of the cultural aspects in translation. It became clear early on that translation could not just be defined in terms of language or text type, but that it was essential to consider culture, as well. Such approaches could not be fully separated from either linguistic or literary approaches to translation, for language is central to constituting any human culture and literature. It came to the conclusion that old traditional divisions and old rivalries faded in importance in light of new approaches to translation studies and emerging areas of research, and the investigation made possible to see what has been accomplished in the past decades and what needs to be addressed in the future.

-*Caveat Translator: Understanding the Legal Consequences of Errors in Professional Translation* by Jody Byrne, University of Sheffield

This investigation revolved around the issues of translation quality. While there are numerous methods for assessing the quality of translations, little is known about what happens when a translator produces a bad translation. Byrne investigated that translation error, as a whole, could have significant consequences for both the translator and the client, by examining a number of case studies gathered from official reports and communications, court records, newspapers articles, and books, so it could illustrate the diversity of situations that could arise as a result of translation errors. The aim of his investigation was to show that, despite the lack of precedents, the possibility of being found liable for one's translations is very real and the implications of substandard translations must be treated seriously.

In 1999, Ansaldi conducted a review of federal and state court rulings in the US, spanning the precedent ten years, but failed to find a single court case or ruling in which a translator was found liable as a result of poor translation. Similar searches covering 20 years of articles in legal journals failed to uncover any article on the issue. Even if including Ansaldi and this researcher's extensive investigation of various legal catalogues and databases, along with a wide range of internet searches, both came to similar negative results. Moreover, Byrne gave two examples to prove his point, the first one dated back to 1996 and involved two cases where a bread making machine in Germany produced toxic fumes when used and placed numerous users at risk. The Regional Health and Safety in Düsseldorf investigated the matter and found that the instruction manual had been translated incorrectly and was to be blamed for the cases. It transpired that the original English instructions informed users that steam would be released from the machine and that this was perfectly normal. However, when translated into German, the translator somehow confused the word steam (Dampf) with smoke (Rauch). Unfortunately, a defect in the product meant that it overheated when used, releasing clouds of poisonous smoke.

The second example, more dramatic, dated also to 1996, and involves a gas explosion in an office in San Juan, Puerto Rico where 33 people died and more than 80 were injured

(National Transportation Safety Board, 1997). It emerged from the investigation by the NTSB that the explosion was due to a gas leak that was not detected by the staff due to deficiencies in the training they were given by the owners of SJGC. He came to the conclusion that translation error, in translation, are a real-world phenomenon which has real world implications for everyone who comes into contact with translations. His examples of errors in technical translation serve to reinforce the gravity of this issue and show that translation errors can have disastrous fatal consequences.

-*Translation at the United Nations as Specialized Translation* by Deborah Cao and Xingming Zhao, Griffith University, Australia (2008)

Such investigation argued that UN translation is a specialized area of translational activity and has its own characteristics and special demands, necessitated and dictated by the nature of the work of the UN and the international diplomacy developed over sixty years of history. Thus, UN's experience in translation can provide an important insight and lesson for translators, translation organizations, and translation educational institutions. The article focused on the nature of translation at the UN, as a specialized activity, and describes and discusses some linguistic and institutional features of UN translation. In addition, the study mentioned that translation at the UN has its own characteristics in many aspects, which go from determining what documents to translate to the actual translation and final publication, which forms a system of its own.

The different types of documents of the UN and their writing and production have their own peculiarities and specific technical and stylistic requirements. They are determined by the UN and its work. All these factors have had a major influence over UN translation, including the professional requirements of the translator, translation methods, process, and quality. The UN uses and operates in six official languages in its intergovernmental meetings and documents. The UN secretariat uses two working languages: English and French. Statements made in an official language at a formal meeting are interpreted simultaneously into the other official languages of the body concerned by UN interpreters. Moreover, it is stated that the provision of documents involves 9 steps: documentation programming and monitoring, documents control, editorial control, reference and terminology, translation, text processing and typographic style, official records, copy-preparation and proof reading, and finally publishing.

They concluded that due to the nature of the work of the UN and the linguistic nature of the documents, the common difficulties for the translator include technical demands, consistency, working as a team, turn over time (short deadlines), and the need to keep abreast of world changes, which are invariably reflected in the discussions at the UN. The multi-racial, multi-cultural environment at the UN and its various bodies bring unique complexities to document writing; hence, special difficulties to translators in all the six official languages/section. While being able to draw on the wealth of experience accumulated in the 60-plus years' history and the well-established working norms and procedures, translators at the UN are under constant pressure to meet the quality and quantity requirements in order to provide translations of the highest standards possible to the most universal international organization.

- *Un pájaro azul en Costa Rica: la función de la traducción L'Oiseau* bleu *en la Costa Rica de 1912* by Francisco Javier Vargas Gómez (2009)

This study sought to describe the role of *Un pájaro azul* (translated by Roberto Brenes Mesén) when it first appeared in Costa Rica in 1912. A description of the ideological, social, and literary features present in the context, as well as of the agents and texts involved in the production of El pájaro azul, were provided. The analysis of these features makes it possible to state that the text is likely to have been an instrument used to promote ideological, social, and aesthetic changes within the 20th century Costa Rican society. Regarding the methodology, it was opted a sociological-cultural analysis (Lepinette) realized in three phases (Pym; López Alcalá). In the first phase, it was done a recompilation and description of data of historical character linked to contextual, extra textual, and textual spheres related to the object of the study. The second phase consisted of a critic analysis of the compiled data destined to create relationships among the data and generalization of the behavior based upon those relationships. Finally, the last face is established, on one hand, the function of the text that is being studied in its own context and, on the other, the reasons or conditionings that made it fulfill such function in such specific moment and time.

There were used a variety of resources, mainly of bibliographic and electronic nature, among them the study made by Ana Cecilia Barrantes, which it was carried out a detailed description of the specificities of Costa Rica's modernist context at the beginning of the last century as well as of its main figures. It is also fundamental, this time regarding the aesthetic field of modernism in Costa Rica, the doctoral thesis of Carlos Francisco Monge, in which there were analyzed the specificities of the aesthetic of Costa Rican modernists. Monge came to the conclusion that within the historical context that represents the Costa Rica of 1912, Un pájaro azul functioned as a mean of propagating modernist and idealist ideas of those who were behind its production and publication among a sector of the population belonging to the low and middle classes that were at the time dissatisfied with the conduct of the ruling class, with the ultimate goal of promoting ideological, social and aesthetic-literature changes within society, at the same time being a small part of a bigger, pedagogical project. As foreign literature and translation, El pájaro azul must have been an instrument of dissidence and ideological, social, and aesthetic-literature transformation.

1.5 Scope

- To fully explain the many steps a translation goes through.
- Provide proper examples to give a clearer idea of translation.
- Reflect the different effects the different procedures can have on a text.
- Satisfy the questions regarding the concept of translation.
- Provide the reader with enough information regarding the different concepts of procedures, styles, methods and functions that currently exist in translation.

Chapter II

Theoretical Framework

2.1 Text Analysis

A text Analysis is the part of the translation process where a translator reads the source text to have a better understanding of it, while at the same time rendering an acceptable translation. The analysis shall also provide the translator with internal and external textual factors of the source text that should give a clearer image of the source text; that is, the aim and the function the client aspires to convey, so that the translation fully meets its main objective.

2.1.1 Text Styles

To translate a whole text in an accurate way, it is required careful consideration of both its context and features, such as the style. At the same time, according to Nida (2000), when trying to reproduce the style of the original one, the translator must be aware of producing something which is not entirely equivalent. According to Nida, there are four types of literary and non-literary texts:

- Narrative: A dynamic sequence of events, where the emphasis is on the verbs or, for English, ‘dummy’ or ‘empty’ verbs plus verb-nouns or phrasal verbs (‘He made a sudden appearance’, ‘He burst in’).
- Description, which is static, with emphasis on linking verbs, adjectives, adjectival nouns.
- Discussion, a treatment of ideas, which emphasis on abstract ouns (concepts), verbs of thought, mental activity (‘consider’, ‘argue’, etc.), logical argument and connectives.

- Dialogue, with emphasis on colloquialisms and phaticisms. (Newmark, 1988, p.13)

2.1.2 Stylistic Scales

The stylistic scale is one of the main aspects that translators need to take into account when analyzing a text; this because it helps the translator to identify the type of readers the text will be addressed to, as well as the vocabulary that will be needed in the translation.

2.1.2.1 Scale of Formality

According to Newmark (1988), a scale of formality is how much a text follows what is considered 'standard' English, and how slang or idioms are included in the writing form. Newmark (1988) mentions the scale of formality consists of a total of eight different categories: officialese, official, formal, neutral, informal, colloquial, and slang.

Officialese: texts that contain this type of formality are the ones who deal with laws or strictly governmental documents, ex: "the consumption of any nutriments whatsoever is categorically prohibited in this establishment."

Official: this type of formality is almost the same as officialese, except for the fact that officialese has a more informative purpose, ex: "the consumption of nutriments is prohibited."

Formal: this is known for being used notoriously in fields where it is required a more complex language like business or company documents, ex: "you are requested not to consume food in this establishment."

Neutral: the main use of this formality is when the purpose of the text is to spread a message among the population with a language that is familiar to everyone, without interfering in their level of education, ex: “eating is not allowed here.”

Informal: informal is very similar to neutral formality, with the only difference that is has a lower level of education, ex: “please don’t eat here.”

Colloquial: this can be considered as a part of informal formality; however, as its name indicates, contains colloquialisms in its structure, ex: “you can’t feed your face here.”

Slang: this differs from the informal mainly because it is directed to a part of the population that uses that specific type of language, ex: “lay off the nosh.”

Taboo: this type of formality is only used in groups where there is no need to be formal at all, and can even be considered rude, ex: “stop fucking around.” (Newmark, 1988, p.14)

2.1.2.2 Scale of Generality or Difficulty

The scale of generality or difficulty determines the complexity of the vocabulary that will be employed in the document or text. According to Newmark (1988), these can be divided into:

Simple: As its name implies, the vocabulary used is simple, without a lot of terminologies, ex: “the floor of the sea is covered with rows of big mountains and deep pits.”

Popular: This type of difficulty is the same as simple, with the small difference that it uses current vocabulary, ex: “the floor of the oceans is covered with great mountain chains and deep trenches.

Neutral: this complexity uses basic vocabulary only, ex: “a graveyard of animal and plant remains lies buried in the earth’s trust.

Educated: this type, as its name implies, is used by those who have an average educated level, and it is mostly used in universities or schools, ex: “the last step in vertebrae evolution was the tool-making man.

Technical: texts that contain this type of language are reserved for individuals who have high knowledge on a specific career, as it uses a lot of technicalities (specific terms belonging to a particular filed), ex: “critical path analysis is an operational research technique used in management.

Opaquely technical: this type of language is comprehensible only to an expert, ex: “neuraminic acid in the form tis alkali-stable methoxy derivative was first isolated by Klenk from gangliosides.

2.1.2.3 Scale of Emotional Tone

The scale of emotional tone is the type of vocabulary employed by writers in order to transmit certain emotions to their readership. According to Newmark (1988), there are three emotional tones:

Intense: profuse use of intensifiers: “absolutely wonderful, ideally dark bass, enormously successful, superbly controlled, gentle, soft, heart-warming melodies.”

Factual: ‘cool’: “significant, exceptionally well judged, personable, presentable, considerable.”

Understatement: “not…undignified”

2.1.3 Text Function

In reading, you need to search for the function of the text, as you cannot isolate it from understanding the text, since it is possible that the title may be completely distant from the content, as well as its intention. Two texts may describe a historical event, stating the same facts and characters, but the language used and, even its grammatical structure could be completely different, and there might be evidence of a different usage of point of view. The intention of the text represents the SL writers' message, intention, and even attitude to the subject matter.

2.1.3.1 Informative

The objective of the informative function of language is the events that take place outside the text itself, the different facts of a topic, life outside the language, which often include ideas, theories, and even events. For the process of translation, an average 'informative' text is concerned with any topic; however, texts regarding literary subjects, more often than not, express value-judgements, which are prone to lean towards 'expressiveness.' The design of an informative text is, most of the time, the same: a textbook, a technical report, an article in a newspaper, a scientific paper, a thesis, or even the agenda of a meeting.

It is normally assumed that a modern, non-regional, non-idiolect style will have around four points or varieties in a scale of language: (1) a very formal, non-emotional, technical style for academic papers, which is vastly characterized in English by present and perfect tenses, passives, literal language, jargon; (2) a neutral or informal style with defined technical terms for textbooks, characterized by first person plurals, present tenses, dynamic active verbs, and basic conceptual metaphors; (3) an informal friendly style for popular art or science books (i.e., magazines or coffee-table books), characterized by relatively simple grammar structures, with a wide range of vocabulary to incorporate definitions and numerous illustrations at the same time, and metaphors with also a simple vocabulary; (4) a familiar, non-technical style for journalism, characterized by surprising metaphors, short sentences, American slang, unconventional punctuation, adjectives before proper names and colloquialisms. (it should be noted that the usage metaphors can be used as a criterion for the formality a text might possess). In Newmark's experience, English is likely to have a far greater variety and distinctiveness in the aforementioned styles, because it is the lexical product of several language groups (Saxon, Norse, French, Classical), and it has also been in intimate contact with a variety of other languages; being 'carried' or spoken over most parts of the world. Moreover, it has also become important in technology and has had little authoritative pressure exercised on its growth, as speaking English has naturally become a necessity, yet not an obligation, apart from a short period in the eighteenth century. However, there are two points that remain important: first, 'informative' texts constitute the vast majority of work for the staff that is responsible for translation in international organizations, multi-national organizations, private companies, and translation agencies. Secondly, a very high proportion of those texts are poorly written and sometimes even inaccuracy; usually, falling in the translator's work to also 'correct' their facts and style.

2.1.3.2 Expressive

The core objective of the expressive function is the mind of the speaker, what the writer feels and desires to transmit. Writers use the expressive function to express their feelings without caring of any response. For the purposes of translation, Newmark (1988) considers the characteristic 'expressive' text-types to be:

- Serious imaginative literature. Of the four principal types –lyrical poetry, short stories, novels, and plays – lyrical poetry is the most intimate or ‘closer’ expression, while plays are more evidently addressed to a larger audience, which, in translation, is entitled to some assistance with cultural expressions.

- Authoritative statements. These are the texts of any type that gain their authority or relevance from the high social status and linguistic competences of their authors. Such texts have the personal ‘stamp’ of quality of their authors. The typical authoritative statements are political speeches, documents etc. by ministers or party leaders; statuses and legal documents; scientific, philosophical, and ‘academic’ works written by acknowledged authorities.

- Autobiography, essays, personal correspondence. These are expressive when they include personal events or when the readers are the emote background.

2.1.3.3 Vocative

The core or main objective of the vocative function of the language is the readership, the addressee. Newmark (1988) uses the term ‘vocative’ in the sense of ‘calling upon’ the readership; in other words, to act, think, or feel in a specific way, or even, to ‘react’ in the way intended. This because the vocative function is the way some inflected languages address their readership (inflection is the process of word formation in which a word is modified in order to express a different grammatical category). This particular function of the language has been given many other names, such as: ‘conative’ (endeavor or effort), ‘instrumental,’ ‘operative,’ and ‘pragmatic.’ However, it should be noted that nowadays the vocative texts are more focused on a readership than on a reader. According to Newmark (1988), for the purposes of translation, these kind of text can be notices, instructions, publicity, propaganda, persuasive writing (requests, cases, theses), and possibly even popular fiction, whose purpose is to sell the book/entertain the reader, as the typical ’vocative’ text.

There are two factors that need to be considered in a vocative text. The first one is the relationship between the writer and the readership, which, according to Newmark (1988), is realized in various different types of social or personal grammatical relations or forms of address: T (*lu, du*) and V *(vous, Sie*, *usted*) and other forms, such as infinitives, imperatives, subjunctives, indicatives, impersonal, passives; first and/or family names, titles, hypocoristic names; tags, such as ‘please.’ All of these play their part in determining both symmetrical or asymmetrical relationships, relationships of power or equality, command, request, or even persuasion. The second factor is a grammar or language that is completely comprehensible to the readership. Thereby, for translation, both the linguistic and cultural level of the SL has to be reviewed before it is given its proper pragmatic impact.

Very few texts are completely expressive, evocative, or informative, as most texts include all three of these functions, but emphasize one of the three. However, according to Newmark (1988), the expressive function has no place in a vocative or informative text, as it is there only unconsciously, as ‘hidden’ or ‘secret.’ Most of the informative texts will have either a vocative message encrypted through them (it is very important the translator manages to pick it), or the vocative function will be completely separated in another section of the text; a text can hardly be purely informative, i.e., objective. An expressive text will usually carry information; although, the level of its vocative component will vary. This subject is a concurrent topic of conversation among both critics and translators, and will depend, at least partly, on the size of the ‘universal’ and ‘cultural’ components. According to Newmark (1988), “the epithets ‘expressive,’ ‘informative,’ and ‘vocative’ are used only to show the emphasis or ‘thrust’ (Schwerpunki) of a text.”

2.1.4 Translation Methods

The biggest and most recurring problem in the field of translation has always been whether to translate freely or literally. This argument has been going on for at least 2100 years. According to Newmark (1988), many writers favored some kind of symbolic tree of translation: the spirit, not the letter; the sense, not the words; the message rather than the form; the matter not the manner. This was the revolutionary slogan used by the writers who wanted the truth to be read and understood. The argument has always been considered theoretical, as the purpose behind the translation, the nature of the readership, and the type of the text was never discussed. According to Newmark, far too often, the writer, translator, and reader were implicitly identified with each other. After too much time, the context finally changed, yet the problem is still the same.

2.1.4.1 Semantic translation

The only difference between semantic translation has from what is known as ‘faithful translation’ is that it must take into account the aesthetic value (the natural sounds of the SL text) putting on jeopardy the ‘meaning’ when it is appropriate, so there is not any assonance, wordplay, or unnecessary repetition in the final, fully translated version. Furthermore, this type of translation may substitute what may well be considered less important cultural words with culturally neutral or relatively functional terms, but never with cultural equivalents. – *La belleza intangible de la naturaleza* may become ‘nature’s untouchable beauty’ – and it could also make other small modifications in order to appease the readership. According to Newmark, the little difference that exists between ‘faithful’ and ‘semantic’ translation is that the primary is rigid, inflexible, and dogmatic, while the other one is more flexible, allowing the translator creative exception, relatively 100% fidelity, and allows for the translator’s intuitive empathy with the SL text.

2.1.4.2 Communicative translation

The main objective of the communicative translation is to convey the exact way (words) and context of the SL into the desired TL. It is employed in order to give a more ‘natural’ style, while also making it easier to understand to the foreign audience. It should be noted that when using this method, it requires extensive knowledge in grammar, vocabulary, and punctuation in both languages. This method was created by Newmark.

2.2 Translation Procedures

Translation procedures are known as the technical devices used by translators to transfer the meaning of a text into a text in another language. Translation procedures are used when it is needed to formulate equivalence from the source language into the target language**.**

2.2.1 Transposition

The procedure called transposition involves replacing the category or type of one word with another, but without changing the meaning of the message. Aside from being considered a special translation procedure, transposition can also be applied within a language; for example: “Los estudiantes participaron con entusiasmo” can be re-expressed by transposing a noun with an adverb, thus “The students actively participated.” In contrast to the first expression, which is named the ‘based expression,’ the second expression is referred to as the ‘transposed expression.’ According to Vinay and Darbelnet (1958), in translation, there are two distinct types of transposition: obligatory transposition, and optional transposition. From a stylistic point of view, the base and the transposed expression are not considered equal, they do not possess the same value. Therefore, it depends entirely on the translator to choose either to carry out or not a transposition if the translation obtained fits better into the expression or if it allows a specific nuance of style to be retained. Although, the transposed form is usually considered more literary in character. A special and regular known case that uses a lot of transposition is the interchange.

2.2.2 Modulation

Vinay & Darbelnet (1958) explained that this translation procedure is known for possessing a variation in the form of the message, obtainable by realizing a change within the point of view. This abrupt change can be justified when, although literal or even rearranged the translation ends up in a grammatically correct utterance, remains considered unsuitable, or maybe awkward within the TL. Like transposition, we are capable of distinguishing between free or optional modulations and those that are a must or obligatory. A classic example of an obligatory modulation is the phrase, “The time when…”, which must be translated as “El momento en que…”.

The type of modulation that turns a negative SL expression into a positive TL expression is more often than not optional, although this varies with the structure of every language, e.g.:

It is not difficult to show… Es sencillo demostrar…

The main difference between fixed and free modulation is the degree. In the case of fixed modulations, translators who do possess a good and vast knowledge of both languages are going to be capable of using this method freely, as they will be well aware of the frequency of use, the overall acceptance, validation, and the confirmation provided by a dictionary of the preferred expression. Cases regarding free modulation are isolated events that have not yet been fixed or sanctioned by usage, so the procedure must be redone on every occasion. However, this is not qualified as optional; when it is carried out as it should be, the resulting translation should be compatible perfectly with the situation indicated in the SL. To give an idea regarding this point, it could be said that the outcome of a free modulation should conduct to an after effect that makes the reader exclaim, "Yes, that's exactly what one would say." Consequently, free modulations tend towards unique solutions that lay upon a frequent train of thought and which are more necessary than optional. As a result, it is evident that there is a very small grade of difference between fixed modulation and free modulation, and that as soon as someone starts using free modulation often enough, or is felt that is the only one to offer the only possible solution (according to Vinay and Darbelnet, this usually results from the study of bilingual texts, from discussions at a bilingual conference, or from a famous translation which claims recognition due to its literary merit), so it may become the predetermined approach. However, a free modulation does not actually become predetermined until it is referred to in dictionaries and grammar, and it is regularly taught. A section not using such modulation would then be considered inaccurate and end up being rejected. According to Vinay and Darbelnet, in his M.A. thesis, Panneton, from whom has been borrowed the term modulation, correctly anticipated the results of a systematic application of transposition and modulation.

2.2.3 Omission

According to Vázquez-Ayora (1977), this type of procedure is most of the time both ignored or misused; however, this is a procedure that also allows the translator to create an oblique translation (translation used when the structural or conceptual elements of the SL cannot be directly translated) through a process not of expansion, but on the contrary, of omission. It should be noted that, despite the notions translators have been taught through the years as students about conciseness, the mediocre translator does not dare to eliminate certain unnecessary segments of a statement. There is the popular belief that, when translating, every single word that was in the SL text must be translated, without ignoring a single word, article, or adjective; although, the result would be overloading the TL translation with pleonasms (usage of more words than necessary to convey the meaning).

Omission is a procedure as any other, and as many of them, sometimes it is a necessary action. It has been noted that in some previous procedures, in Spanish it must be further developed what in English is expressed in a 'synthetic form;' however, with this procedure, Spanish gets rid of all verbosity, external elements of its language, and any obstacle when searching for the assimilation of the message. Moreover, omission follows not only the linguistic principle of 'economy,' but also the need of equal 'naturalness' that must be conveyed in the TL. In this particular notion of equivalence taught by the School of Prague (specially, Vladimir Prochazka) and followed by Eugene Nida and other famous translators, there is a particular aspect that, even though it is relatively easy to understand, it is also very difficult to apply. This specific aspect is the aforementioned 'naturalness.' An equivalence would not be natural if it contained usually unused elements or was grammatically or structurally wrong in the TL. In addition, the style would not be natural, if a sentence were to be extended far more than necessary until it became wordy and 'extravagant.'

The concept that underlies all of this is the ‘particular preference’ that every language possesses. In the study of redundancy, it was noted that there were certain aspects of the Spanish language, as for example the affective, that required an ‘analytic expansion.’ It must be also taken into account that the intellectual side that Spanish language tends to act on forces it to be ‘sober’ or not to explain unnecessarily the same aspects over and over again. As it was mentioned, there are many aspects that need to be taken into account when translating; consequently, certain aspects, on one hand, will demand the omission of verbosity and, on the other before applying any type of amplificatory procedure, it must be remembered that there are a lot of differences among languages and their structures. When translating, one must be well aware of not ‘over-translating,’ as the main idea is that, with omission, you do not disrupt the feeling of naturalness in the TL just due to an idea of translating every single component of the SL text, for example:

The committee has failed to act. The failure to act on the part of the committee.	La comisión dejó de actuar. El haber dejado de actuar de la comisión

Considering the example above, it can be stated that some people might be unaware of the fact that there has been a massive distortion in the message when translated into Spanish. This happened because not a single aspect was omitted, leading to a literal translation that lacks naturalness and meaning, and even worse, it was changed the meaning of the SL text. According to this, what it was said in the SL was that the committee was actually acting (taking action) yet ceased to do so. The need for attaining such loyalty led the translator into becoming its worst enemy. If this message is analyzed, it can be noticed that the style of the message is very natural and lacks any formality, yet there are certain elements that need to be omitted in order to both maintain the original message and attain naturalness. If the elements that cause the distortion in the message are omitted, in Spanish the idea would be fully understood. The main point that must not be forgotten is that these types of mistakes occur when there are two processes of thought when, originally, there was only one, resulting in the translation of more information than it originally existed, leading to the phenomenon of 'over-translating.'

2.2.4 Amplification

According to Newmark (1988) and Vázquez-Ayora (1977), this type of procedure, also named expansion, is known for complementing other procedures, and it is often combined in the dynamic process of both transferring and maintaining the integrity of the message in the SL to the TL. Contrary to omission, this procedure adds extra words (verbs, adverbs, adjectives, pronouns, compound nouns) in order to reinforce or clarify the message of the SL text when translated, mainly due to a lack of equivalence to express the same sentiment of the SL in the TL. Although, it is the complete opposite to omission, both can be used in the same text, due to either a poor grammar from the author, lack of linguistic context, or other aspects that might force the translator to modify the style or lexicon in order to convey a fully comprehensible text for the TL readership. According to Newmark (1988) amplification is a "not uncommon shift, and often neglected."

2.2.5 Explicitation

In the previous section, it was explained what is considered one of the most important aspects in the function of linguistics: amplification. It is an analytic process, in which a lexeme in the SL can be represented by a sequence of phonemes in the TL. In the opposite process, with a lexeme in the TL it can be expressed what in the SL had been conceived as a sequence of phonemes, and it is what constitutes the focus. According to Vázquez-Ayora (1977), there is a specific ‘expansion’ that specially obeys the laws of semantics. This is the process known as ‘explicitation’ and with it, as its name implies, it can be expressed in the TL what is only implicit within the context of the SL text. There are, with a constant frequency, important semantic and metalinguistic indices misunderstood in the Anglo-Saxon language; therefore, the translator must make them explicit in Spanish. It is well-known the advantage English has regarding the power of linguistic focus in thought and if they cannot make clear certain elements, the message of the SL would end up being unclear or lost. This method has an explanatory and specific purpose. Such elements could already have been implicit either due to linguistic habits, own characteristics of the language, or due to the familiarity the readership of the SL has with the aspects of its own culture, or the experience being transmitted. Ex:

The Secretary of State testified against the provision that automatically excludes all OPEC members.	En las audiencias previas el Secretario de Estado argumentó en contra de la disposición que excluye ipso facto a los miembros de la OPEP.

If it was employed the same English lexeme ‘testified’ in Spanish, there would be major confusion for someone who is not related with the stages that follow a law project of the Congress of the US. At first sight, a Spanish speaker would believe that the Secretary of State testified, as in a witness in some court; however, in the SL, all of these elements are implicit because the original speaker has the needed knowledge regarding the process.

There are some cases in which, due to the need for the comprehension of the message, both procedures are obligatory.

As in all procedures, it is of most importance not to lose sight of the global effect of communication and, in this case, as with amplification, it must be reiterated the importance of ‘stylistic equivalence.’ When it is mentioned that it is necessary to make explicit some elements the SL could have implicit, it is not meant that it must be expressed out loud what is ‘subtle’ or ‘disguised’ in the SL text, as it has that specific intention of being ‘subtle’ or ‘disguised.’ Consequently, it must be respected that reticence, ellipsis, opacity, multiple voices, and all the effects of a play. What is pursued with the dynamic of explicitation is to faithfully transmit the original message without allowing the loss of context in favor of form.

2.2.6 Literal Translation

Literal translation, is the procedure of directly translating the SL text into a grammatically and idiomatically correct TL text; therefore, the translator’s task is limited to just adapting as natural as he can in the TL. In principle, a literal translation is, on its own, a unique solution which is reversible and also complete. According to Vinay and Darbelnet (1958), it is most normal when translating between two languages of the same family (e.g., between French and Italian), and especially when they share the same culture, too. If literal translations rise up, it is because common metalinguistic concepts (relationship between language and other cultural factors in a society) also reveal physical coexistence, i.e., periods of bilingualism. It can also be justified by a certain convergence in the thought and sometimes even in the structure, which are certainly present among the European languages (cf. the creation of the definite article, the concepts of culture and civilization), and which have motivated interesting research in General Semantics.

In the preceding methods, translation does not require or involve any special stylistic procedures. If this were always the case, then the process of translation would lack any justification, and translation itself would lack any intellectual challenge, since it would be reduced to just being an unambiguous transfer from the SL to TL. The exploration of the possibility of translating scientific texts completely by the usage of a machine, as has been proposed by many research groups in universities and industries in all major countries, is largely based on the existence of parallel passages in many SL and TL texts, corresponding to parallel thought processes which, as would be expected, are particularly frequent in the documentation required in science and technology. According to Vinay and Darbelnet (1958), the suitability of such texts for automatic translation was recognized as early as 1955 by Locke and Booth.

If, after attempting the first three procedures (borrowing, calque, and literal translation), translators consider that conducting a literal translation is unacceptable, they must turn to the methods of oblique translation. By unacceptable, it is meant that the message of the text, when translated literally: gives a completely different meaning, has no meaning whatsoever, is structurally impossible, or does not have a corresponding expression within the metalinguistic experience of the TL. The equivalence of the messages ultimately relies upon a variety of situations, and these conditions alone allow to tell that the TL may retain certain characteristics of reality that are nonexistent to the SL.

If only there were conceptual dictionaries with bilingual signifiers, translators would have to only look up the proper translation under the entry corresponding to the situation identified by the SL message. However, such dictionaries do not exist. Therefore, translators start off with words or units of translation to which they apply particular procedures in order to identify their specific meaning with the intention of conveying the desired message of the SL author. Vinay and Darbelnet explained that "since the positioning of a word within an utterance has an effect on its meaning, it may well explain that the only solution results in a grouping of words that is so far from the original starting point that no dictionary could ever give the proper equivalent." Given the infinite number of combinations of signifiers alone, it is completely understandable, and even acceptable that dictionaries cannot provide translators with ready-made solutions to all the problems they face regarding equivalence. Only translators themselves can be fully aware of the totality of the message, which determines their decisions. According to Vinay and Darbelnet, "in the final analysis, it is the message alone, a reflection of the situation, that allows to judge whether two texts are adequate alternatives."

2.2.7 Punctuation changes

A very important aspect, most of the time overlooked, is the differentiation of punctuation. Newmark (1988) strongly advices translators to do a comparison between their version and the original, as a translator must be very careful when deciding what punctuation to apply. It is said that when translating one must, most of the time, retain the punctuation style used by the original author. Punctuation is an essential aspect of deep analysis, as according to Newmark (1988) "provides a clear semantic indication of the relationship between sentences and clauses, which may vary according to the language; e.g. French suspension points indicate a pause, when in English they indicate an omission of a passage; exclamation marks in German are used as attention gatherer, for emotive effects and emphasis; semi-colons indicate a union between sentences; French tends to use commas as conjunctions."

2.3 Glossaries

In translation, a glossary explains or clarifies the most difficult vocabulary in the respective filed or profession the text is focused. Although, a glossary will not only help the translator understand the complex or awkward vocabulary he may find when first analyzing the text, it will also help the TL readers of the document to understand the aforementioned document.

Some of the aspects one must have when creating a glossary must be:

- Relevance for the translator
- Relevance for the translation process
- Reliance on the vocabulary sources
- Selection of terms

Glossaries are particularly useful in highly technical fields like medical device, manufacturing and legal. Their relevance lies in the fact that it provides the clarity and consistency required in such industries. In the global marketplace, translation glossaries are a high-value tool with uses that extend far beyond just content development. According to Gapper (2008), when first creating a glossary, one must first think what the nature of the glossary will be. This can be identified by doing these questions: who is the glossary for? who is the foreseen customer? what will be the main use of this glossary? where and under what circumstances will it be used? Type of terms that can be included in a glossary: terminology of a specific profession or field, definition not found on common dictionaries, and fundamental terms for a complete comprehension of the topic/document. Information that can be added regarding each word: the terminology (word or phrase), grammatical category, definition, or explanation (determine the most convenient definition), equal term/s in in the SL, equal term/s in the TL.

A key phase when making a glossary consists of creating a preliminary selection of important terms for both the employer and the future users of the final product. The first step is, alongside the employer, setting the selecting criteria for these terms, in which some of the most important aspects are the extension of the final product and the type of information that will be included. Some of the most common aspects are: terminology for international translations, terminology for advanced level, terminology for reading comprehension specialized in foreign languages, terminology required for the purchase of material, specific terminology for both the publicity and purchase of products, problematic terminology in the scenario that they refer to more than one object, ambiguous or confusing terms due to the possibility of more than just one term for the same object or concept in different departments or countries, and specialized terminology of frequent use in a specific department. In this phase, it is advisable to compile terms without being too selective; even though, if some of these words may be discarded later on, as these ignored or omitted terms could actually require special attention or the translator might end up causing a lot of confusion due to lack of terminology. Considering that this is very flexible and that it can be modified at any time at the behest of the needs of the translator.

A very important aspect when creating a glossary is the identification of the main and secondary topics in the document, so that there is an idea of the type of printed, oral, or online terminology sources that must be consulted according to the project. Once the needed information has been localized, it must be sorted out the relevance and assistance provided according to the specific objectives of the document. These reference sources will constitute the basis when taking a decision regarding the terminology employed. It must not be discarded any type of oral or written sources, as according to the specific aspects of a project, it could end up being useful having different types of texts.

Chapter III

Methodological Framework

The main goal of this chapter is to fully explain the methodology used by the researcher in the development of this investigation, as well as the source materials, approaches used in the analysis of the documents to be translated, and the different instruments and techniques used to collect data/information. All the information is gathered to develop a successful and natural translation of the needed documents. In addition, this section of the investigation provides the material used by the investigator to obtain the results and conclusions. This hopefully will assist the reader in understanding the course of the investigation. Furthermore, it helps future students to understand the importance of the different instruments in the process of doing a thesis. As a result, the investigator hopes to provide the reader with a clear idea of what it must be done in the process of rendering a good and fluent translation.

3.1 Research Approach

When doing a research, there are three types of approaches that can be used; yet their compatibility varies with the topic of the research itself. If the researcher uses numbers, it involves a quantitative approach, if they apply a descriptive framework, it is a qualitative approach, and if it lies in between, it is known as a mixed approach.

Qualitative type researches are the ones related to the 'qualities.' This type of information is related with adjectives as it is most utilized as a compilation for opinions and motivations. The methods used for data-gathering, in this type of research, are usually focus groups and open-ended questions; on the other hand, qualitative data-gathering methods vary their methods by changing their focus groups, polls, and observations. Moreover, the volume of the information collected could make that both the analysis and interpretation, end up consuming too much time, and the presence of the researcher could affect the answers provided by the subjects of the study.

Furthermore, in quantitative type researches, everything is related to numbers, as it is the process of collecting and analyzing numerical data. This approach can be used to find patterns, averages, and generalize results for a wider population. In addition, quantitative research is used in a variety of professional fields, such as economics, psychology, biology, marketing and so on. Regarding the analysis process of the data obtained in this type of research, the information obtained through surveys and tests, will be transformed from words into numbers, and then, the application of statistical analysis (investigation of trends, patterns, and relationships) to answer the answer proposed in the investigation. On the other hand, the mixed approach is the compilation of both qualitative (opinions, thoughts, behaviors) and quantitative (numbers, statistics) information to answer the reason for the investigation.

3.2 Research Design

The design of this research will be descriptive. Such research is defined as a research method that describes the specific characteristics of either the population or phenomenon studied. This type of methodology focuses on the “what” instead of the “why” of a research; and it describes the topic of the research, without being too interested in why it happens in the first place, as it aims to describe both accurately and systematically a population, situation or phenomenon. The term “descriptive research” refers to the research question/s and the data analysis conducted on that specific topic. Some of the distinctive characteristics of descriptive research are:

- Qualitative research: Descriptive or qualitative methods conduct experiments in order to determine the cause-and-effect relationships, and it uses: surveys, archival research, observation methods, and the study of the case itself to obtain the answer.
- Cross-sectional studies: A descriptive research is generally a cross-sectional study (interview a new group of people each time, only once) where different sections of the same group are studied.
- Uncontrolled variables: In descriptive research, none of the variables are influenced in any way, as it is used observational methods to fulfill the research. Therefore, the behavior of the subject/s or nature of the variables is not in the hands of the researcher.

Some of the advantages when using the descriptive research are:

- Natural environment: Descriptive research allows the research to be conducted in the respondent's fully natural environment, ensuring honest and top quality data.
- Variety: Since the data collected is both qualitative and quantitative, it allows an all-round understanding of the research topic, as the information is varied and diverse.
- Data collection: Descriptive research can be used with specific methods like the observational method, case study method, and survey method. With these three, all primary data collection methods are covered, which ensures a lot of information. This data can be used for both a future research or developing a hypothesis for your research topic.

In addition, there are three distinctive methods to conduct descriptive research, these are: observational method, case study method, and survey method. The observational method is the most effective method, as researchers can make use of both qualitative and quantitative observations.

3.2.1 Quantitative Approach

A quantitative observation or approach is the objective collection of data, heavily focused on numbers and values. Results of quantitative observation are obtained using statistical and numerical analysis methods, observing any characteristic related to numbers, such as age, weight, shape, volume and so on

3.2.2 Qualitative Approach

A qualitative observation or approach involves just observing characteristics, not numbers. The researcher observes the respondents from afar, creating a natural environment, giving comfort and ensuring natural and effective behavior. A researcher can be a full observer, an observer as a participant, a participant as an observer, or a full participant.

3.2.3 Case-Study Method

The case study method involves deep research and study of individuals or groups. Case studies allow for an elaboration of a hypothesis and widen even further the scope of studying a phenomenon. However, case studies should not be used to determine the cause and effect, as there could be a certain prejudice from the researcher; therefore, making the predictions inaccurate.

3.2.4 Survey Research

In survey research, respondents answer through surveys, polls, or questionnaires. It should have a balanced mix of open-ended questions and closed-ended questions. The survey method can be conducted either online or offline, making it the preferred option when the sample size is extensive.

3.3 Information Sources

An information source is a source of information for somebody, i.e., any type of material that might inform a person about a certain topic or provide knowledge to somebody. Information sources may be observations, speeches, documents, books, pictures, etc. They can be divided into primary, secondary, and tertiary sources.

3.3.1 Primary Sources

A primary source is a first-hand account of an event or a topic, data from a study, or an original work. The primary sources have not been modified by any interpretation and offer an original thought. They include books, documentaries, autobiographies, data from studies and studies, and so on.

3.3.2 Secondary Sources

A secondary source is a complement or analysis of a primary source. These sources often present a primary source information with the addition of a different point of view or hindsight. Examples of this type are: news articles, stories, criticisms of a fact.

3.3.3 Tertiary Sources

A tertiary source is an even more developed secondary source, which mainly summaries information found in the aforementioned first two sources but can also be a compilation of many sources; they include encyclopedias and textbooks.

3.4 Analysis Categories

Translation techniques: Translation techniques are the different elements used by a professional translator to render a given text.

Glossary: an alphabetical list of terms or words found in or relating to a specific subject, text, or dialect, with explanations; a brief dictionary.

3.5 Data Collection Instruments

In this investigation, an arrangement of instruments was carried out in order to fulfill the results expected from the previously mentioned objectives. As part of this investigation, one of its main objectives is to fully achieve a complete and natural transfer of the original message into the target language without distorting any aspect of it. Taking this objective into consideration, the instruments had both a qualitative and quantitative approach. *"The tools used by researchers to actually collect data in the research process. The common data collection instruments in research include interviews, questionnaires, documentary analysis and observation"* (IGI Global, n.d.). As mentioned, in order to gather this information, five data collection instruments were employed, but most of them come from an attentive and intensive reading from the document to be translated.

3.5.1 Text Style

As it has been previously mentioned, the first objective is to successfully translate the documents from the source language into the target language. In order to fully convey the message, one needs to have knowledge on the text style employed in the document translated. According to Nida (2000), when trying to reproduce/imitate the style of the author, one must also be careful to just not creative something entirely equivalent. There is a total of four types of texts: Narrative, Descriptive, Discussion and Dialogue.

3.5.2 Text Function

When translating, the translator needs to take into account the function the text, as its intention message, and even attitude of the original writer. Hence, a good reading of the document shall shed some light into its intended purpose. There are three functions a text may fulfill: expressive, informative and vocative.

3.5.3 Formality

As it has already been mentioned, one of the main objectives of this investigation is to apply various translation techniques in order to achieve a successful communication of the original message, and one key aspect of that process is the formality involved in the text. The formality is the type of language employed in the original document: for example, technical, slang, idioms, etc. This aspect is fundamental in order to successfully convey the original message in the same way in the target language.

3.5.4 Generality or Difficulty

The generality or difficulty is the complexity of the language employed in the document or that the text possesses, and the necessary knowledge needed in order to fully understand what is trying to be conveyed by the writer. This vocabulary can be divided into: simple, popular, neutral, educated, technical and opaquely technical.

mall example of this entry:

Text Analysis	Informe N° 1676-21 (Completo)	Standard Test Methods for Partcile-Size Distribution (Gradation) of Soils Using Sieve Analysis
Text Style		
Text Function		

Formality		
Generality or Difficulty		

This chart is meant to give a small insight on some of the changes a text undergoes in the process of a translation, the aspects that go into this chart are up to the translator.

3.5.5 Glossary

Another crucial aspect that needs to be collected by the translator is a glossary, all the terminology employed in the text needs to be fully known by the translator, in order to avoid any mistranslation or complete loss of meaning due to lack of knowledge. The creation of the glossary varies from individual to individual and technicality of the text, yet a glossary must be present at all times. A small reading should be done before translating to identify complex vocabulary. A glossary can be created by the translator, or be provided by the employer.

3.5.6 Color Coding

Another important aspect when translating is the numerous changes a translator does to the document when adapting it. This instrument allows to highlight these changes and visualize how many take place in even just one paragraph.

Transposition
Modulation
Reduction and expansion
Explicitation
Literal Translation
False Cognates

This table shows the color that represents each technique in the color coding instrument

3.6 Collection Data Process and Data Analysis

In this investigation, the data collected was obtained mainly from the instruments created for this study. The process of analysis with the documents was smooth and fast, starting with a general reading of the document, and then a specific reading, in order to identify beforehand the complex vocabulary (if any) present in the document. The language employed by the writer was not excessively formal; yet one of the documents was rather technical, raising the difficulty and demand for a proper glossary. Moreover, the creation of the glossary was carried out in order to fully experience the process behind its creation. Nevertheless, the confirmation of proper translation was provided by the employer in order to maintain the intention/message of the document and fulfil the objective of this investigation.

Finally, the investigator used external documents as inspiration, as they helped to create a guideline for this work. Previous points of view and a different analysis allowed this investigation to be carried in the most efficient way possible. This investigation was performed principally with internal sources, such as the documents to be translated, the different aspects of the original document, and its message, which are the main focus points. As a result, this investigation was primarily treated as a close and personal event for the investigator.

Chapter IV

Document's Translation

GEOTECHNICAL STUDY

EAST SECTOR CLOSURE DIKE PROPOSAL

PTA LA URUKA

LA URUCA

SAN JOSÉ PROVINCE

INSUMA S.A.

Consulting Engineers & Geologists

July, 2021

Apartado: 2128-1002 Paseo Estudiantes · Tels.: (506) 2234-5070 · Tel.Fax: (506) 2234-9290 San José, Costa Rica
E-mail: insuma@racsa.co.cr

INGENIERIA SUELOS Y MATERIALES
insuma s.a.
INGENIEROS Y GEOLOGOS CONSULTORES

San José, July 1st, 2021

1676-21

Mister
Engineer Oscar Guzmán Coto, M.Sc.
EBI of Costa Rica S.A.
S.A. Present

Estimate Engineer:

We present the report of the Geotechnical Design carried out in the eastern sector of La Uruka PTA, located in the town of La Uruca, canton of San José, Province of San José, where the construction of a closure dike is projected, for the expansion of the area of operations.

The objective of the investigation was to provide geotechnical recommendations for the design and construction of the foundation of the dike. Additionally, the dike section is proposed to guarantee the stability of the area.

This report presents, among other things, the collected field information that allowed knowing the soils present in the site, complemented with previous INSUMA investigations of the area, which provided characteristics of the materials and their physical-mechanical properties. Based on all the available information, the engineering analysis was carried out and the pertinent geotechnical recommendations are proposed.

We hope that this study is to your satisfaction and we remain at your service for any questions.

Sincerely,
INSUMA S.A.
Consulting Engineers & Geologists

JOSE RODRIGUEZ BARQUERO (SIGNATURE)
Digitally signed by JOSE RODRIGUEZ BARQUERO (SIGNATURE)
Date: 01.07.2021 14:21:25 -06'00'

Engineer José A. Rodríguez Barquero

JOHNNY RODRIGO LOPEZ GARCIA (SIGNATURE)
Digitally signed by JOHNNY RODRIGO LOPEZ GARCIA
Date: 01.07.2021 13:18:36 -06'00'

Engineer Johnny R. López García

C: Engineer Gustavo Acuña – EBI OF Costa Rica S.A.
Archive

1. TABLA DE CONTENIDOS

2. INTRODUCTION

Responding to the request of the engineer Oscar Guzmán Coto, technical manager of the EBI company of Costa Rica S.A, INSUMA realized a geotechnical investigation on the East sector of PTA La Uruka, in the town of Uruca, province of San José, where the expansion of the area of operations is projected.

PTA La Uruka is located on the topographic sheets of San Antonio and Real de Pereira, on the scale 1:10.000, of Instituto Geográfico Nacional (National Geographic Institute), approximately between grid coordinates Lambert Costa Rica Norte (North) 518.81 to 519.35 Este (East) and 216.67 Norte (North) (see figure N° 1)

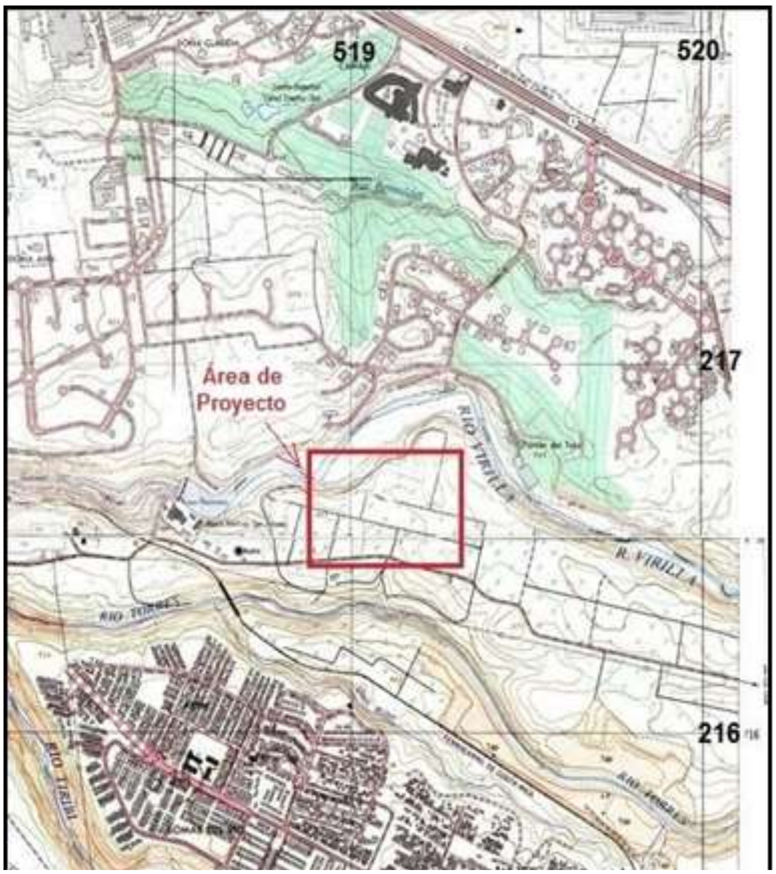

Figure N° 1: location of PTA la Uruka, sheets San Antonio and Real de Pereira, scale: 1:50.000, IGN.

The actual area of interest is located on the East sector of PTA La Uruka, which corresponds to the sector through which the trucks previously entered towards the romana, but currently the entrance of these has been changed in order to take advantage of this area in which waste can be placed.

In the photo N° 1 its presented a general view of the zone where is located the area of interest. This picture was taken from the website Google Earth.

Photo N° 1: Aerial view of the zone where is located the area of the project. Source: Google Earth.

The photography N° 2 shows a detailed aerial view, this one has also been taken from the website Google Earth.

Photo N° 2: Detailed aerial view of the area of interest. Source: Goggle Earth.

As of the date of completion of the fieldwork for this study, waste is beginning to be placed on the site, waiting for the closure dike to be able to conform the area. On the photographs N° 3 and 6, its presented some views on the date of the visit of the drilling crew,

***Photo N° 3: East zone of PTA La Uruka, where the closure dike will be built. On the left the rock slope would finish the dike*.**

Photo N° 4: Sector where the closure dike would begin, at internal road level of PTA La Uruka.

Photo N° 5: Detailed rock slope where the dike would end.

Photo N° 6: Internal road zone (beginning of dike).

The materials to be used for the closure dike correspond to large blocks of rock, coming from diggings that EBI realizes as part of their work on another PTA named 'el Huazo'. On the photographs N° 7 and 8, the material to be used is shown.

Due to the East sector of the PTA still having enough space for waste to be placed an additional period of time and due to not being other places approved yet by the government entities in charge of regulating waste in the country, arises the need to evaluate the possibility of taking advantage of the areas mentioned, and therefore the volume still available in the landfill, this in the view of a technical closure in order to extend the life of PTA La Uruka.

For that end, it is planned to build a landfill area located on the East side of the PTA, between a rock slope in this abutment and the current slopes of the existing cells. For that end, a closure dike must be built on this zone, as it is the objective of this study.

Photos N° 7 & 8: Details about rock blocks brought from another project in which the EBI is carrying out work, to form the closure dike.

It should be noted at this point that it was realized additional digging with a power shovel excavator by EBI on this site to explore the zone. INSUMA knows very well the conditions of PTA La Uruka because in the month of September in 2017 carried out a Geotechnical and Slope Stability Study for the same (report Nº 3051-17, with date September 6, 2017).

Due to the aforementioned study, it contemplated the execution of perforations, geophysical exploration, literature review, field reconnaissance, etc. there is a clear model about the conditions of this PTA.

Below is a description of the activities developed during the fieldwork and laboratory phases. Subsequently, a brief description of the geology of the zone and soil profile of the site is presented. Finally, the engineering analysis is presented with the recommendations of the dike and foundation section.

3. WORK DONE

The geotechnical investigation realized on the terrain consisted on two phases: 1) Fieldwork and 2) Cabinet analysis. A detailed description of each of these phases is presented below.

3.1 Fieldwork

The first activity of this phase consisted of carrying out two inspections to the area. The first one was carried out by the engineer José A. Rodríguez Barquero, an official of INSUMA, in the company of Mr. Oscar Guzmán, engineer of EBI, and whose objective was to have a preliminary idea of the zone where the project will be located and the idea people had of it.

Subsequently, on June 7, 2021, a second inspection visit was carried out by engineer Johnny López García, official of INSUMA, in which he met with enginner Gustavo Acuña from EBI. The purpose of the visit was to get to know the topographical information that was available in that area, as well as the idea that was being handled of the project, in terms of the heights of the dike, special foundation conditions (pipes passing beneath it), the materials to use, etc.

On this second visit, a tour of the area planned for the work was carried out and it was agreed with engineer Acuña to carry out several exploratory excavated with project machinery, with the aim of verifying the type of materials that would intervene the foundation of the dike.

The specific points of the investigation were pointed out by engineer López of INSUMA, so that the excavations will be carried out later. In figure N°2, a location in the topography of the area of the points explored with a power shovel excavator is presented.

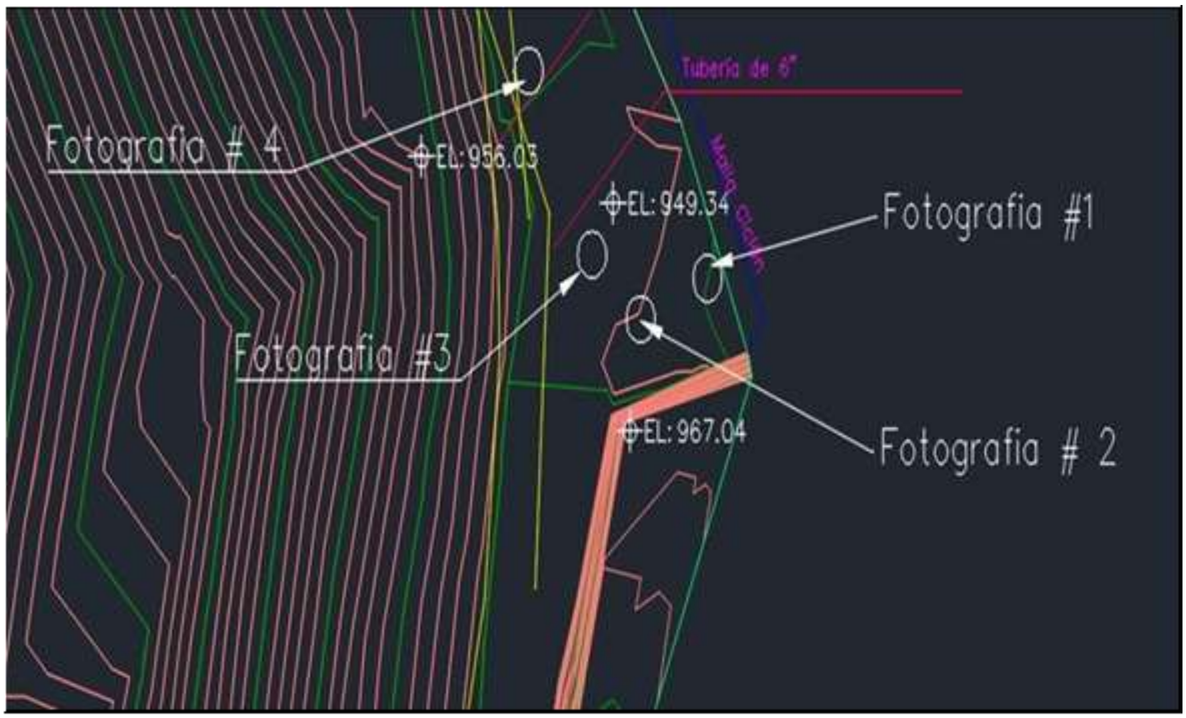

Figure N° 2: Location in plant of exploratory trenches with power shovel excavator, made in the dike area. Source: Engineer Gustavo Acuña – EBI, Costa Rica.

3.2 Cabinet Analysis

The last phase of investigation consisted on analyzing and integrating all the obtained information on the fieldworks. Based on this information, and complimented with INSUMA´s experience, the corresponding engineer analysis was carried out and the soil mechanics calculations were carried out, which allowed giving recommendations associated with the works planned for the site (closure dike).

4. GEOTECHNICAL RESULTS OBTAINED

Below a brief description of the geological conditions of the area is presented. Subsequently, the exploratory trenches carried out with a power shovel excavator are presented.

4.1 Geology of the Zone

Below, certain aspects related to the geological conditions to the area where PTA La Uruka is located. This in order to have an idea of the general geological context of the area.

The area of interest corresponds to forms of volcanic origin, as indicated on the geomorphologic map of GAM, Scale 1:200.000 (Madrigal y Salazar, 1993), as it is shown in fig. N° 3.

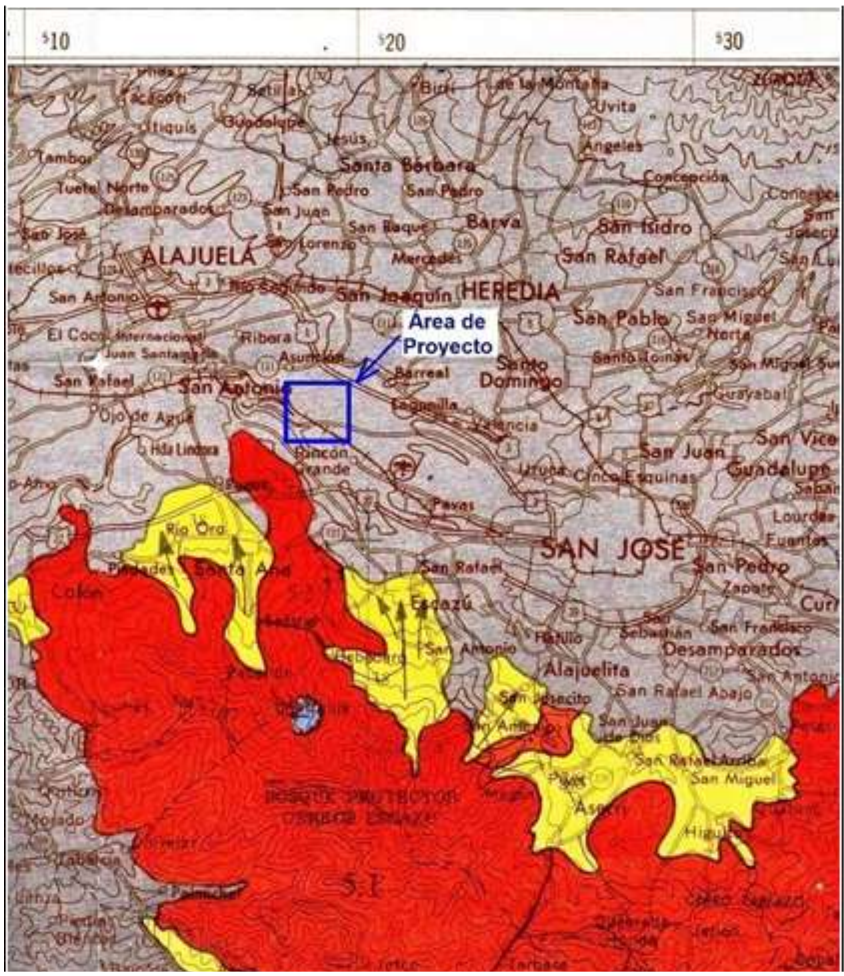

Figure N° 3: Location of the project's area on the geomorphologic map of GAM, (Madrigal y Salazar, 1993).

From the geological point of view, the materials present at the site belong to Ignimbrite rocks (Qv5), present at various points in the Virilla River canyon. This can be seen in the geological map of the Great Metropolitan Area, Scale 1:200.000 (Arias & Denyer, 1990), which is presented in figure Nº 4.

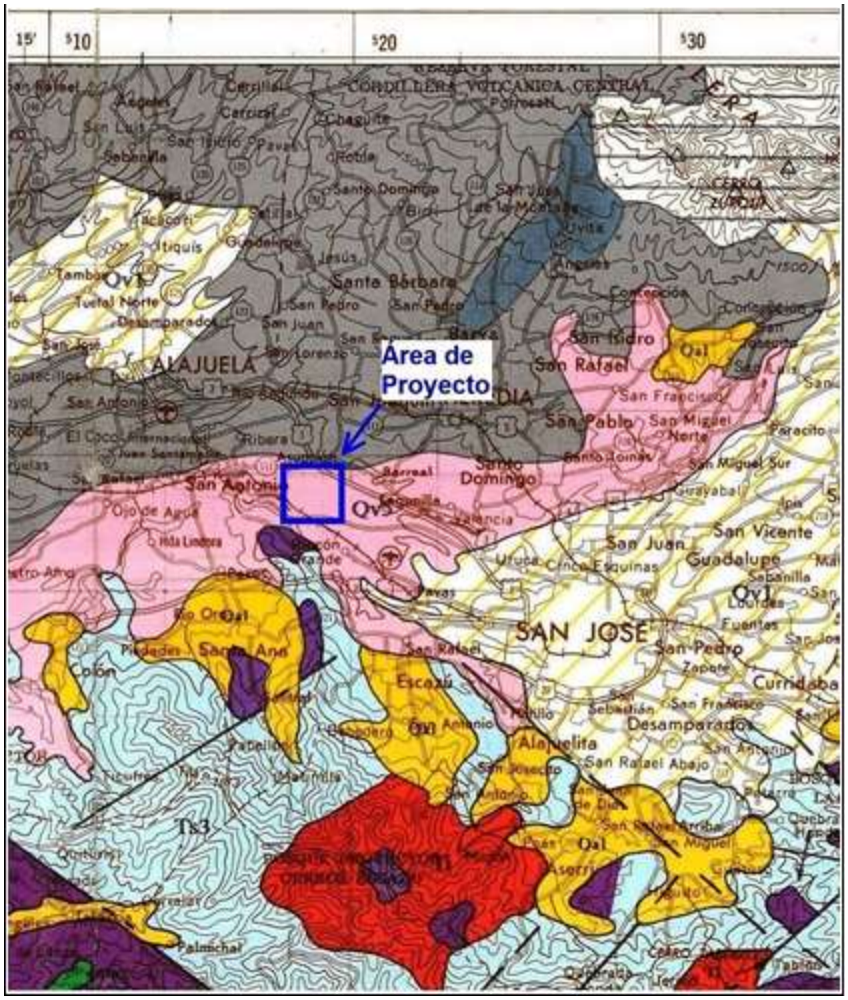

Figure Nº 4: Location of the project's area on the geologic map of GAM, Sale 1:200.000, (Arias & Denyer, 1990).

Based on the geological investigations consulted, there are no significant volcanic risks (Paniagua, 1993). In the vicinity of the land there are guidelines suggestive of being faults, as well as fully identified faults, such as: Aguacaliente, Coris, Guarco, etc.

In the past, accelerations in the order of 0.45 g with intensities on the scale of Mercalli the VIII have been detected, with three historical earthquakes recorded in nearby areas. The first two earthquakes occurred on December 30, 1888 and March 28, 1851, both located in the Dulce Nombre area, about 15 km northwest of the site of interest, and the third was recorded on December 22, 1990 in the Piedars Negras area, about 17 km southwest of the landfill.

The location of these historical earthquakes indicated in the previous paragraph is presented in figure Nº 5 shown below, in which it has been located the area of the project in a blue square, in order to make it easier to reference the area of interest on the map.

Figure Nº 5: Location of the project's area in the seismological and Neotectonic map of GAM, scale 1:200.000, (Montero, 1993).

Several fault lines can be seen on the map, among the main ones are the Higuito fault, the Alajuela fault, and the Pacacua fault.

4.2 Excavation Results

As previously mentioned, in the area destined for the construction of the closure dike, 4 exploratory trenches were dug with a power shovel excavator. In the photographs from No. 9 to 12, photos of these shovels are presented, as well as the description of the materials found.

Photo N° 9: Trench T-1 near the cyclone mesh, property boundary. Rock material. Hard.

Photo N° 10: T-2 between the trench T-1 and the road. Earth fill, depth excavation 2.5 m. saturated clays

Photo N° 9: view of the T-3 survey, located on the road. 1.0 m layer of soil, then ballast. Compacted.

Photo N° 10: Trench T-4 located above the sanitary landfill cell. Trash

4.3 Soil Consistency

As It was previously mentioned, INSUMA is aware of the conditions of the zone's soil, as a result of previous investigations. The NSPT/NCPTdin values obtained in drilling in the area are summarized below.

Table Nº 5: Summary of** N_{SPT}/N_{CPTdin} **values obtained in the exploratory probes

Depth (m)		N_{SPT} / N_{CPTdin} values							
De	A	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8
0.00	0.45	1	13	7	5	6	10	0	3
0.45	0.90	4	4	5	6	4	6	7	5
0.90	1.35	5	4	10	4	17	13	10	4
1.35	1.80	13	5	18	29	6	8	11	11
1.80	2.25	16	28	9	6	5	6	13	13
2.25	2.70	21	25	8	10	8	6	13	9
2.70	3.15	5	12	7	11	9	9	4	15
3.15	3.60	9	11	11	14	10	14	8	17
3.60	4.05	27	16	14	18	14	22	11	18
4.05	4.50	72	24	9	17	10	13	9	98
4.50	4.95	100	20	12	16	17	14	11	38
4.95	5.40	17	66	12	18	27	18	10	29
5.40	5.85	14	16	17	20	16	18	10	30
5.85	6.30	10	17	19	23	21	24	11	33
6.30	6.75	13	20	17	24	34	30	18	34
6.75	7.20	31	23	15	29	30	28	14	34
7.20	7.65	46	18	21	33	31	32	18	64
7.65	8.10	17	17	27	34	44	27	20	34
8.10	8.55	30	20	75	37	34	30	48	57
8.55	9.00	26	27	22	42	30	30	26	66
9.00	9.45	24	19	29	38	30	27	22	48
9.45	9.90	23	27	39	42	38	30	25	41
9.90	10.35	28	40	29	38	39	45	36	48
10.35	10.80	22	24	28	42	55	36	40	61
10.80	11.25	16	25	30	42	52	46	36	77
11.25	11.70	19	25	43	43	85	44	46	75
11.70	12.15	25	22	30	55	66	70	80	72

Color symbology		
Cape A		Porous and less compact drained solid waste.
Cape B		Zona transición desechos recientes y zona de saturación de lixiviados.
Cape C		Zone of saturation or under-saturation of leachate in older waste..
Cape D		Possible denser compact and impermeable debris.

5. EVALUATION OF RESULTS

Below are the geotechnical recommendations for the closure dike foundation works.

5.1 Dike Foundation

As it can be seen in the results of the exploratory trenches, in the area where the dike will be located there are several types of materials, ranging from ignimbrite-type rock, ranging through plastic clays, to touching on the west side, part of a cell, and therefore the foundation would be in waste.

Based on the type of work that is planned (closure dike for an expansion of the work area), it is considered that the loads that are transmitted to the foundation are high, given the height of the dike that is required (up to 18 m) and the type of material with which it would be formed (large rock blocks).

Due to the heterogeneity of the materials present in the area, the support capacity must be significantly reduced, since the materials are not all highly resistant, and although to the east the materials are rocky, what lies on that side is waste and therefore the capacity is low.

The recommended ground level for the dike is 2.0 m with respect to the current floor level (level 949 m.a.s.l.) that is, at a height of 947 m.a.s.l. approx. As mentioned, the closure dike can be built either by placing large blocks of rock in different layers, and tied with granular materials such as ballast or sand, that allow for a better accommodation between them, or with the soils of the area used as loan material and that must be placed in duly compacted layers, although this last option is slower and considered less secure…

The recommended allowable support capacity for the designs at the indicated levels is 10.0 Ton/m^2, considering that the support materials are clay or old solid waste. If the dike rests on the rocky basement of the area, the admissible support capacity increases to a value of 40.0 Ton/m^2. These capacities consider a safety factor of 3, as recommended by the Foundation Code of Costa Rica.

During the construction process, an adequate inspection must be carried out to verify that there is an adequate support capacity. Verification by manual penetrometer tests is recommended. These tests are relatively simple, and correlate fairly well with the site's conditions.

5.2 Foundations

Based on the recommendations made for the levels of rudeness and indicated support capacity, it is estimated that settlements will occur as a result of the consolidation of soft soils due to the imposition of loads or due to the presence of pipe passages (with diameter 6” and 12”) for leachate evacuation, which as they indicate, are currently located a couple of meters below ground level. These pipe passages are items with different stiffness than that of the ground, and therefore possibly reflect settlements in the future that need to be repaired.

In the photographs from N° 11 to 12, some views provided by EBI of Costa Rica are presented, of the way in which the pipeline passages were built in this area.

es
under the closure dike

Photo N°12: Trench for a 12” pipe that passes under the closure dike.

The pipes, as indicated, are wrapped with 1.0 m of sand and encapsulated with a high-density geomembrane around the perimeter.

Due to the foregoing, it is very possible that when the dike is formed, and because it is filler material, it will experience deformations at the crown level, as a result of the accommodation of the layers with the weight of the upper layers. This aspect must be kept in mind since it will imply that it must be intervened to reshape the geometry.

6. LEEVE PROPOSAL

The proposal for the conformation of the closure dike in the eastern sector of PTA La Uruka, consists of the dike supported directly on the soils of the area. For this purpose, an excavation of at least 2.0 m must be carried out, trying to find a good embedding of the dike to be built on the ground.

The dike will be made up of large rock blocks, possibly mixed with finer materials such as ballast, to provide a mooring between the blocks, or to fill the gaps that are generated between them. It is emphasized at this point that the dike could also be made with good-quality soil with blocks (properly compacted), or with ballast-type materials, dirty ballast or gravel. This depends on the availability of materials on the site.

The maximum elevation level of the dike at the eastern must be 967 m.a.s.l., while at the western end the elevation level will be the internal road of the PTA at an elevation of 956 m.a.s.l. The current floor of the land where it will be located is at a height it at a height of 949 m.a.s.l., which means that it will have a height of 18 m at its highest point and 7 m at its lowest point. The dike would have an approximate length of 50 m.

The dike is planned in a curved shape so that this geometry contributes to laterally transmitting the loads resulting from the thrust of the waste to be placed behind it. Figure Nº 6 shows a plan view of the proposed dike, it has been prepared based on the topographical information of the area, provided by EBI of Costa Rica.

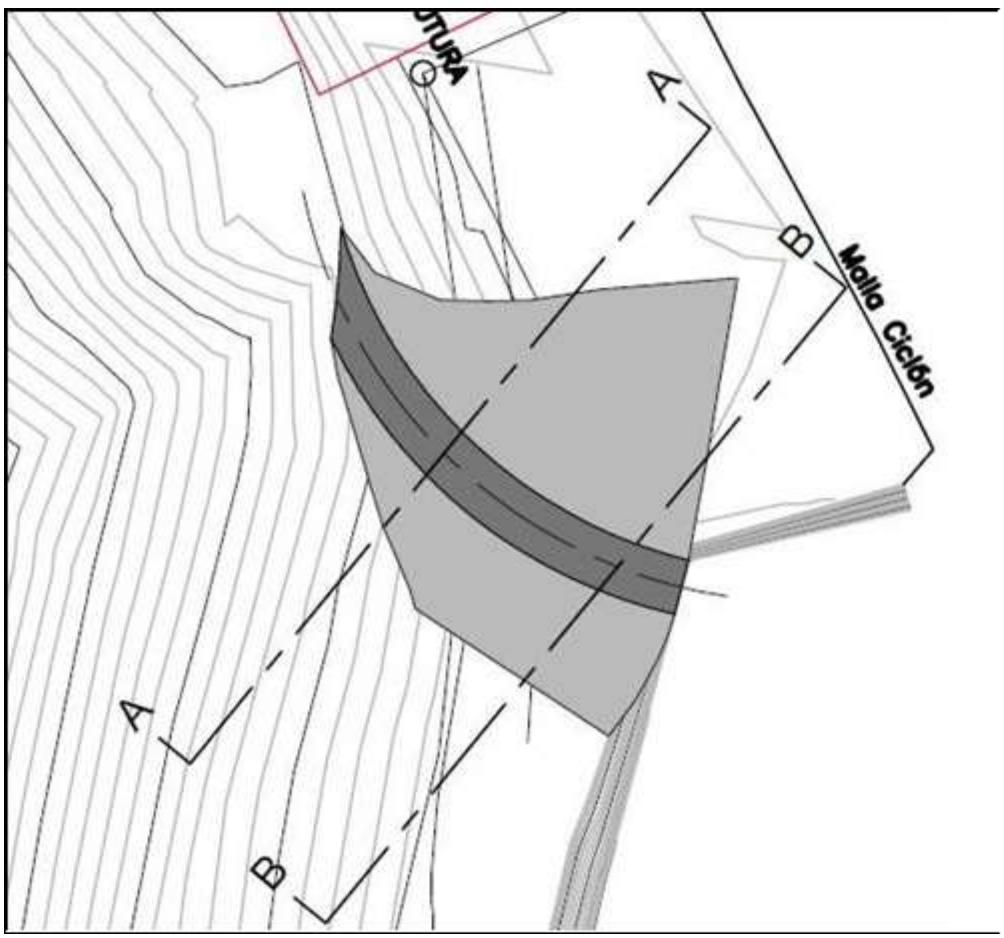

Figure N° 6: Plan view of the closure dike proposed for PTA La Uruka

A longitudinal profile along the dike is presented in figure Nº 7, in order to appreciate the proposed crest levels, as well as the contour of the and where it would be founded. It is also possible to appreciate that in the eastern end the dike would hit a practically verbal slope, while to the west, the topography is more flat.

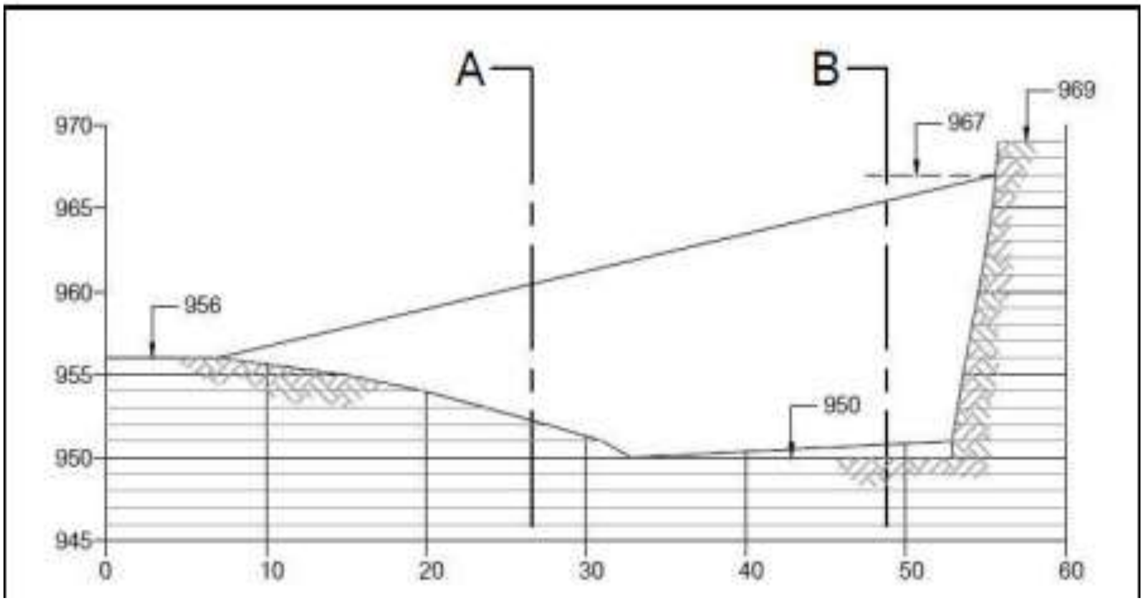

Figure Nº 7: Longitudinal profile of the proposed closure dike

The dike must have a width at the crown of 6 m, with lateral slopes of 2H:1V for the external face of the dike and 1.0H:1V for the internal face. The proposed excavation for the dike foundation would have an excavation slope of 1H:1V, with horizontal segments vertically separated by slopes, with the mentioned slope having a height between 2.0 and 3.0 m. In the figures Nº 8 and 9, a couple typical sections of the proposed dike are presented. The floor location of these sections is presented in figure Nº 6.

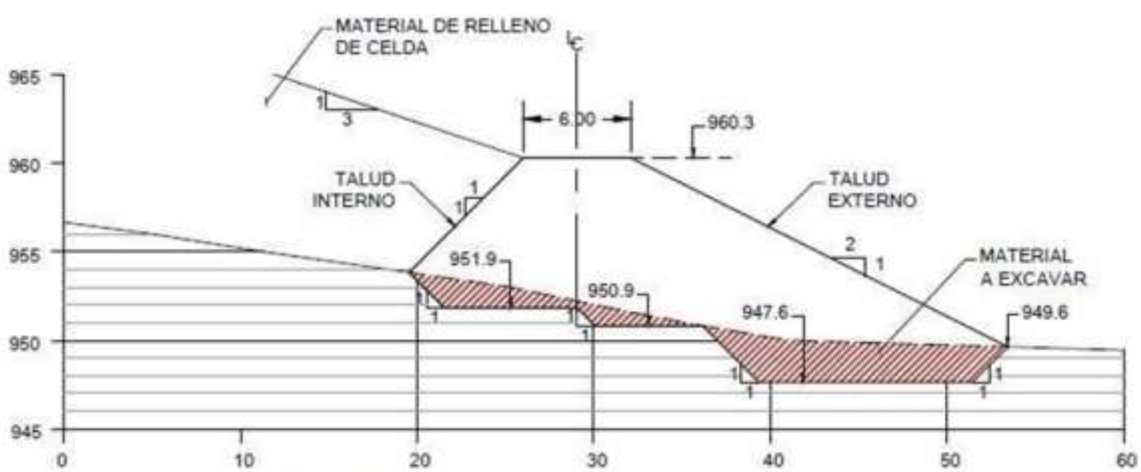

Figure Nº 8: Schematic section A-A of the proposed dike.

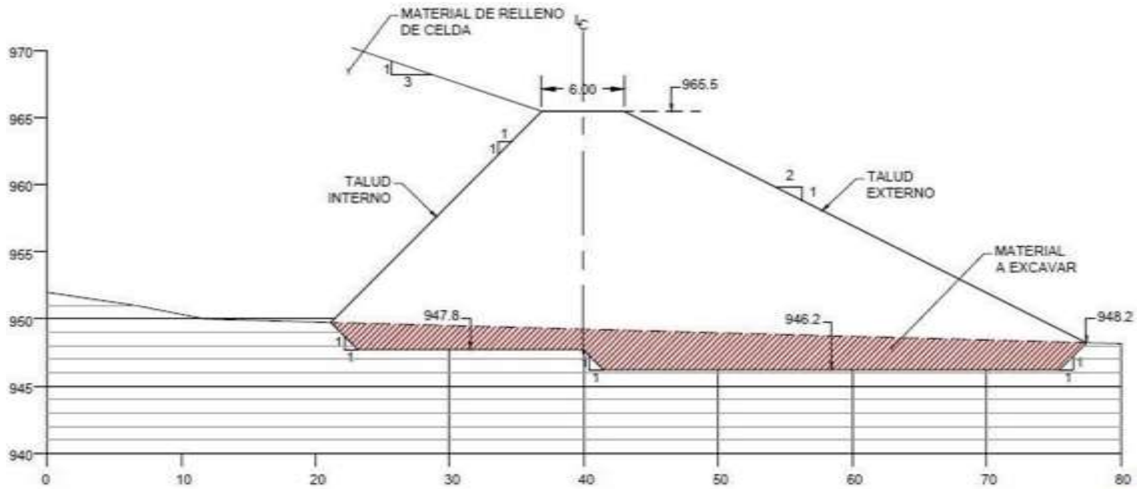

Figure Nº 9: Schematic section B-B of the proposed dike.

Based on the proposed dike proposal, the stability verification of both the dike and the entire section that involves the dike and the entire section that involves the dike and new waste to be placed is carried out.

7. STABILITY ANALYSIS OF THE PROPOSED DIKE

7.1 Model Definition

The geotechnical model of the closure dike in the eastern sector of PTA La Uruka was based on the topographic information provided by EBI of Costa Rica and on the geotechnical information known by INSUMA, as a result of studies previously carried out in the area.

The geotechnical model used for the two profiles analyzed in this study is made up of three or four layers of materials (depending on the profile in question), namely: Closure dike (Layer Nº 1), Foundation (Layer Nº 2), Old Solid Waste (Layer Nº 3), and Recent Solid Waste (Layer Nº 4).

The characteristics of these materials and the resistance parameters chosen by INSUMA are as follows:

Table Nº 4: Resistance parameters for the layers that make up the profiles.

Layer No.	Description	Volumetric Weight (KN/m^3)	Cohesion (kPa)	Friction Angle (º)
1	Closure Dike	20.0	15.0	35
2	Foundation (Ignimbrites)	20.0	50.0	35
3	Old solid Waste	9.0	10.0	32
4	Recent Soild Waste	9.0	10.0	28

Figures Nº 10 and 11 show the geotechnical models interpreted from the 2 analyzed profiles, which corresponds to section A-A and B-B.

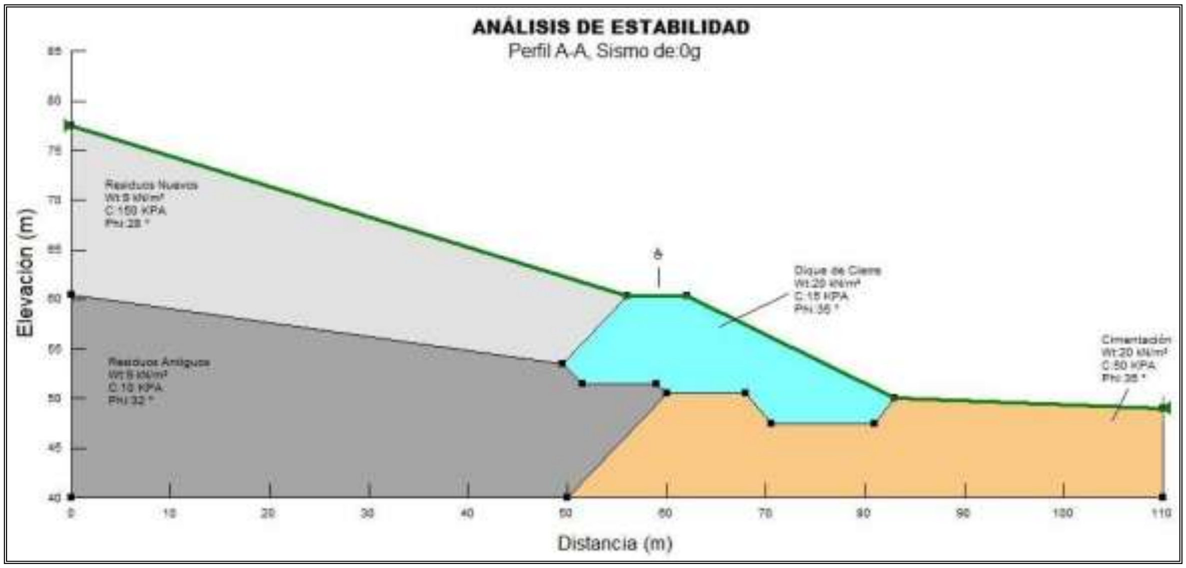

Figure Nº 10: Geotechnical model interpreted for profile A-A.

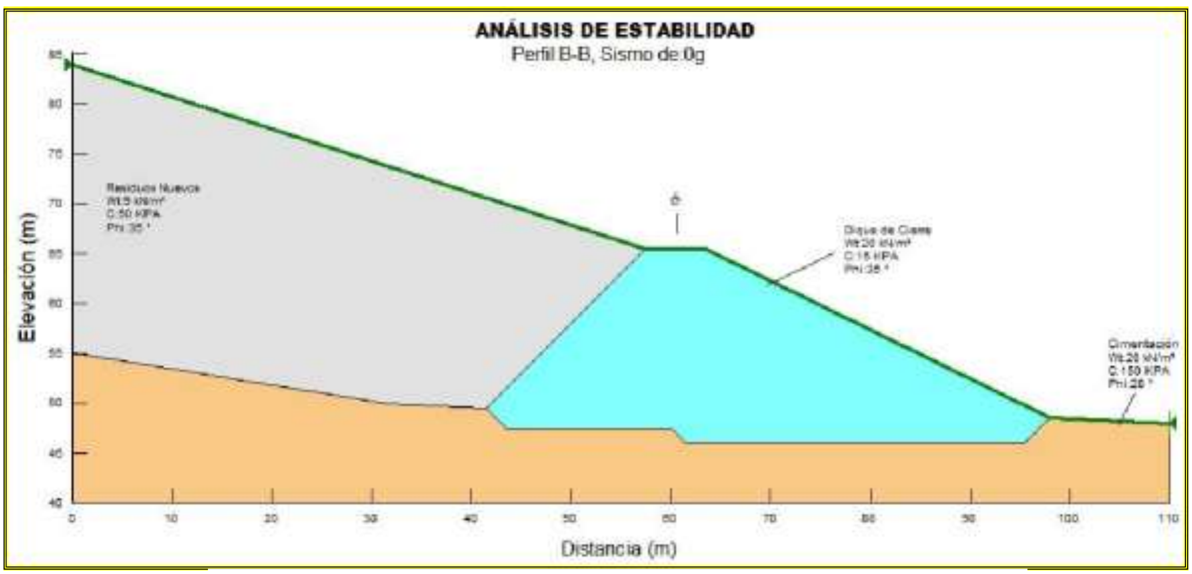

Figure Nº 11: Geotechnical model interpreted for profile B-B.

7.2 Stability Analysis

To study the sbality of the slopes, the limit equilibrium method was used under the Morgenstern-Price methodology, which, being a fairly rigorous method, leads to a good determination of th true value of the safty factr.

The study used as a methodology the use of a computer that allows to propose a geotechnical model of the conditions of the projected slopes. It sould be noted again at this point that to deermine the properties of the materials that constitute these slopes, the available bibliographic information and the results of studies carried out by Insuma were used, both in this landfill and in other similar projects.

The analysis was performed using the GeoStudio 2012 version.15 program, which has a specialized version for stability analysis called Slope/W. The program is widely used worldwide for the study of slopes.

This program is designed for the program Windows and it allows the automatic generation of rupture surfaces and the determination of the safety factor associated with each of them. This program was developed bt the company Geo-Slope International, based in Calgary, Alberta, Canada (www.geo-slope.com).

Through the use of this tool is possible to carry out exhaustive analyzes of the variations of the parameters involved and their influence on the stability of the slopes. Within the parameters that allow the program to analyze, the following are mentioned: slope, geometry, earthquake, loads, water table, defined rupture surfaces, anchors, geotextiles, etc.

For each run of the program, more than 100 possible random rupture surfaces were analyzed, obtaining at the end the critical safety factor (the minimum of all the surfaces analyzed).

Once the geometry of the slopes in their current condition, as well as the resistance parameters indicated in table Nº 1, were implemented, computational runs were carried out. Within the analyzed aspects, the static and dynamic condition in the profiles were considered in the first instance. Additionally, the cases of leachate (ideal operating condition) were analyzed. Both local faults (low volume ailing the dike) and global faults (large volumes of material) were studied.

7.2.1 Case Analyzed Profile A-A

The results of the analysis carried out for the case of Profile A-A, are summarized in table Nº 5.

Table Nº 5: Safety Factors for Profile A-A.

Profile Nº	Fault Type	Seism de 0.15 g		Safety Factor			Figures Nº
		No	Yes	Sin Lix.	Con Lix.	Mínimum	
A-A	Local	X		**2.58**	**1.52**	1.50	12 y 13
			X	**1.83**	**1.08**	1.10	14 y 15
	Global	X		**6.68**	**3.68**	1.50	16 y 17
			X	**3.73**	**1.89**	1.10	18 y 19

Figures Nº 12 to 19 show the graphic representations of the local and global failure surfaces for profile A-A, with and without leachate level, which correspond to the most critical of all those analyzed and whose safety factor is clearly in table Nº 5. The leachate level (assumed at a high level in the cell for modeling purposes) has been represented in the figures with a blue dotted line.

Figure Nº 12: Profile A-A local fault, without earthquake and without leachate

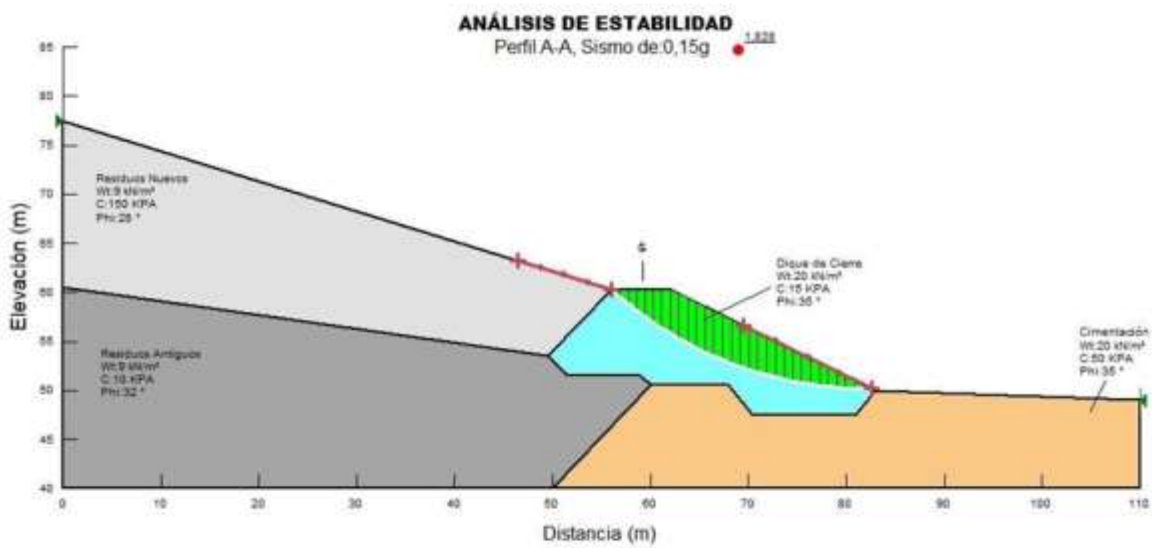

Figure Nº 13: Profile A-A, local fault, without earthquake and with leachate (F.S.=1.52).

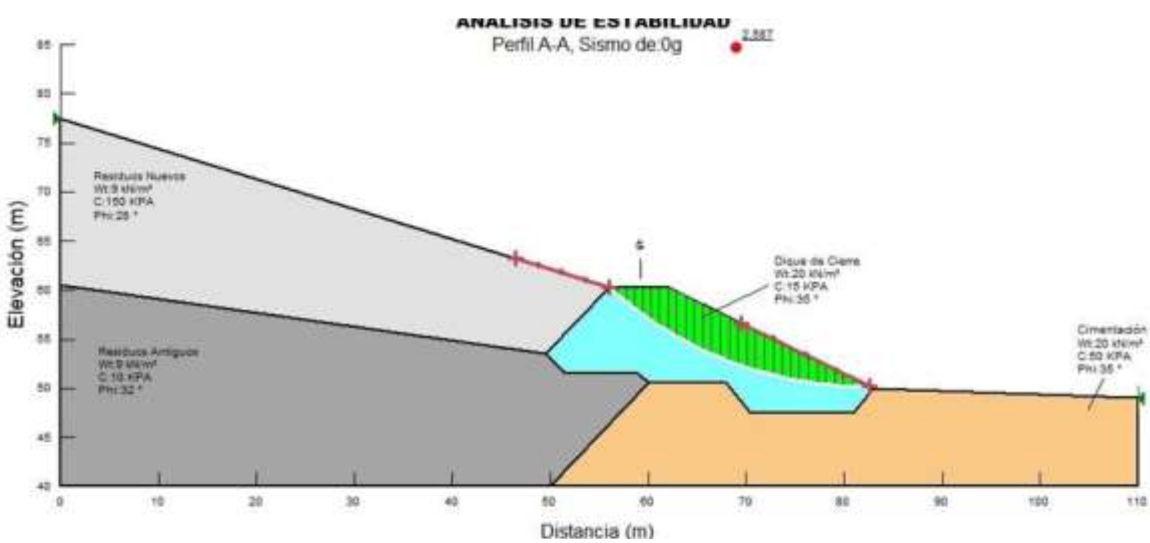

Figure Nº 14: Profile A-A, local fault, with earthquake and without leachate (F.S.=1.83).

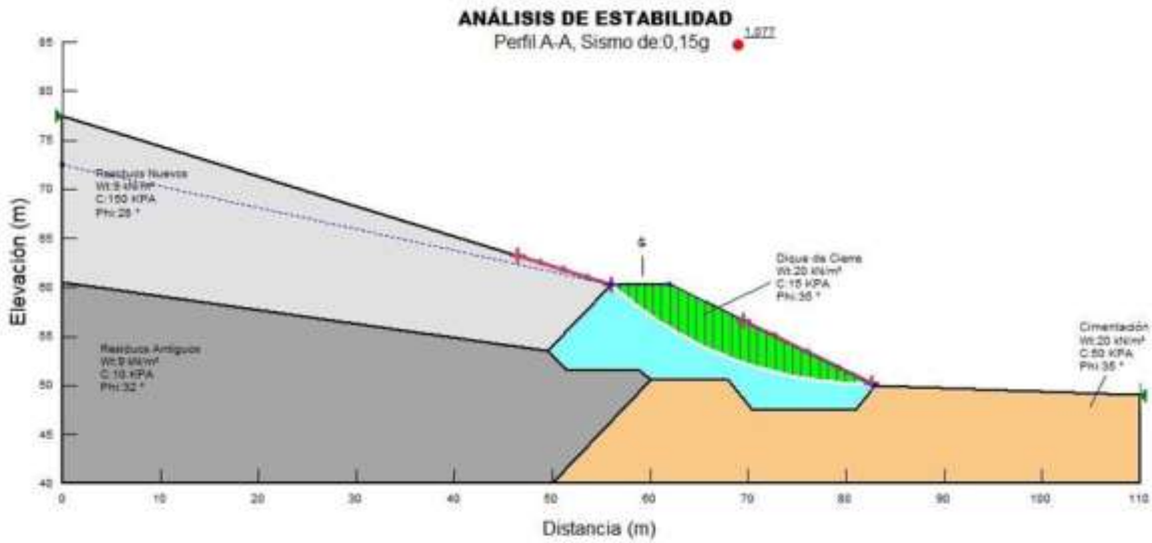

Figure Nº 15: Profile A-A, local fault, with earthquake and with leachate (F.S.=1.08).

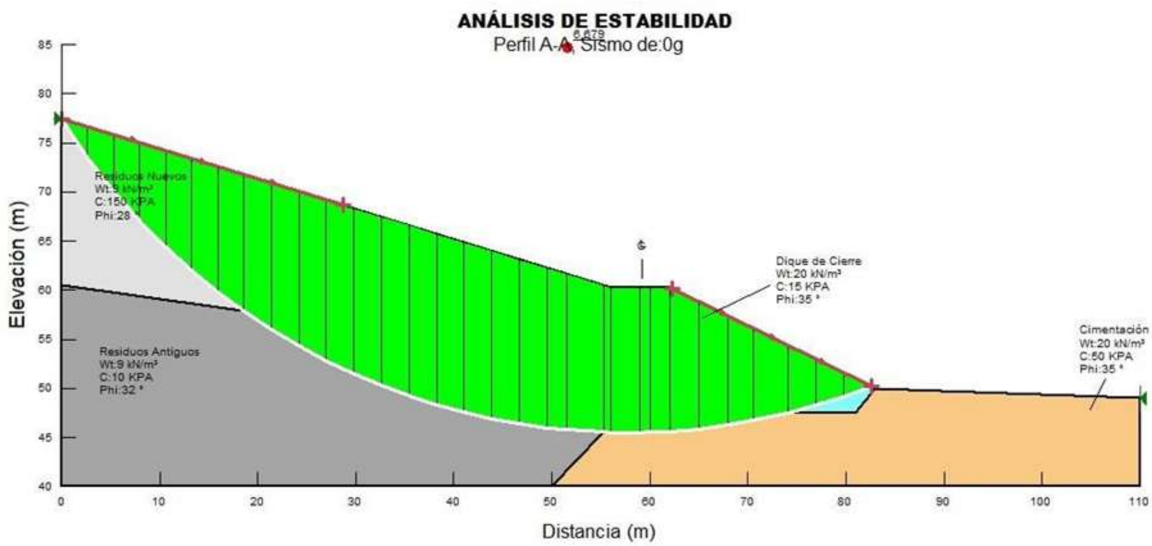

Figure Nº 16: Profile A-A, global fault, without earthquake and without leachate (F.S.=6.68).

Figure Nº 17: Profile A-A, global fault, without earthquake and with leachate (F.S.=3.68).

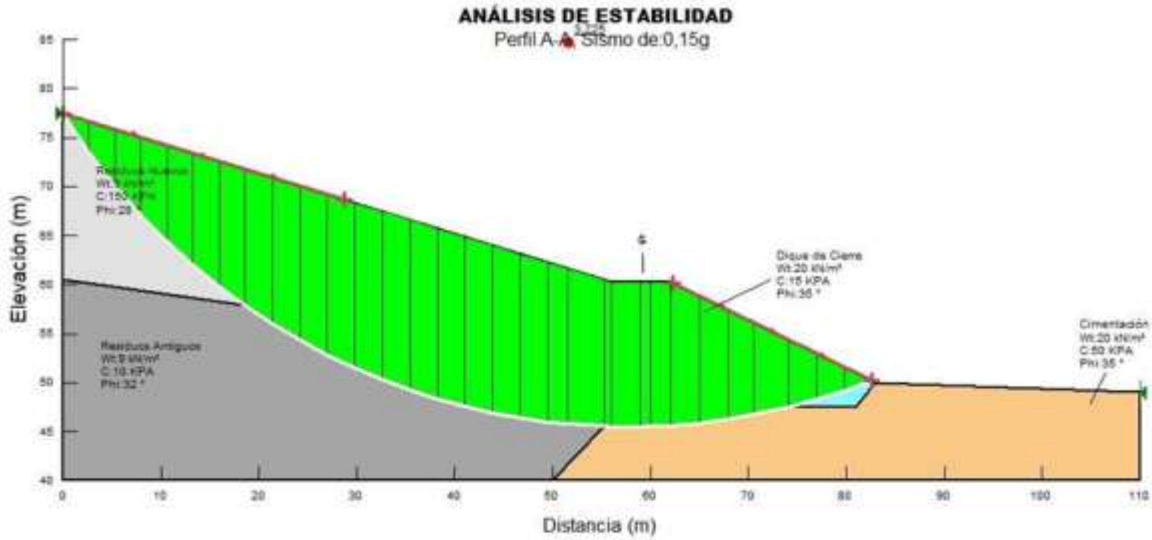

Figure Nº 18: Profile A-A, global fault, without earthquake and without leachate (F.S.=3.73).

Figure Nº 19: Profile A-A, global fault, with earthquake and with leachate (F.S.=1.89).

At this point we wish to emphasize that both for the case of global fault, in static and dynamic conditions, with and without leaching in the mass of waste, values are obtained that meet the minimum values require by both national and international codes. Namely a safety factor greater than 1.50 for the static condition and greater than 1.10 for the dynamic condition. In the case of local faults without earthquake, acceptable safety factors are obtained (FS=2.58 and 1.52), but for the earthquake and leachate condition, the safety factor drops to a value of 1.08, which does not imply the fault but also does not comply with what the codes request.

7.2.2 Analyzed Case Profile B-B

The results of the analysis carried out for the case of profile B-B are presented below, summarized in table Nº 6.

Table Nº 6: Security Factors for Profile B-B.

Profile Nº	Fault Type	Seism of 0.15 g		Security Factor			Figures Nº
		No	Yes	Sin Lix.	Con Lix.	Mínimum	
B-B	Local	X		2.18	1.18	1.50	20 y 21
			X	1.58	0.86	1.10	22 y 23
	Global	X		4.35	3.00	1.50	24 y 25
			X	2.89	1.96	1.10	26 y 27

Figures Nº 20 to 27 show the graphical representations of the local and global failure surfaces for profile B-B, with and without leachate level, which correspond to the most critical of all those analyzed and whose safety factor is indicated in table Nº 6.

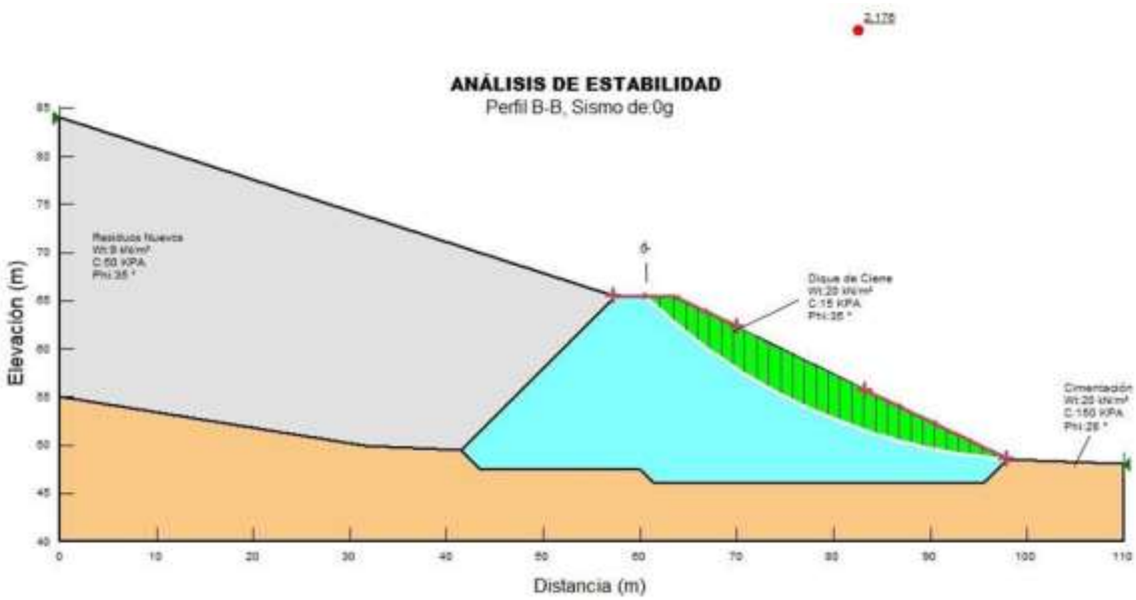

Figure Nº 20: Profile B-B local fault, without earthquake and without leachate (F.S.=2.18.)

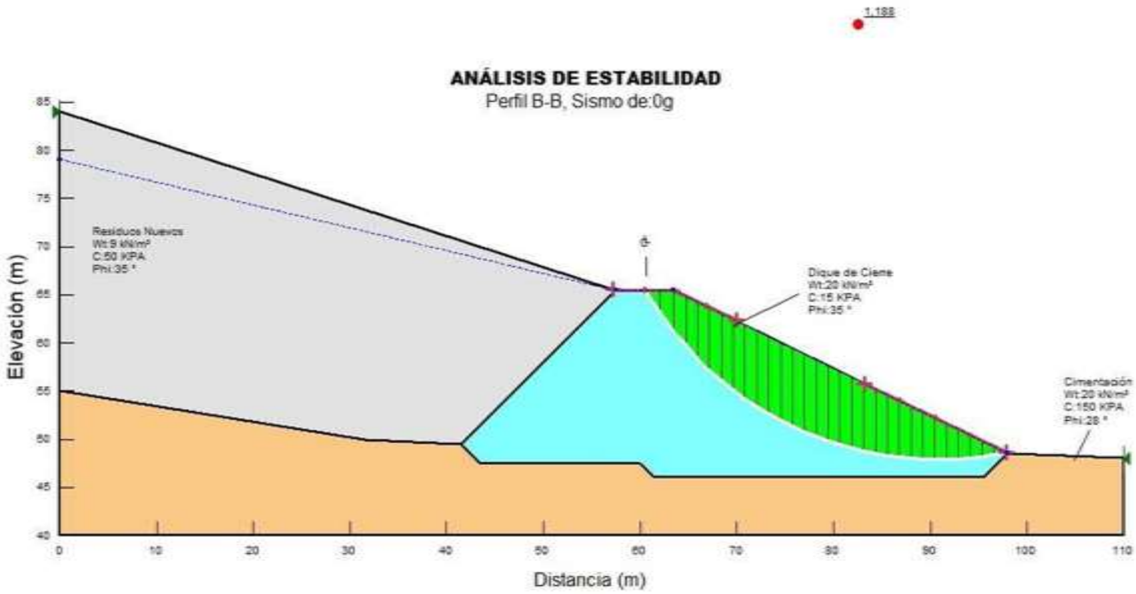

Figure Nº 21: Profile B-B, local fault, without earthquake and with leachate (F.S.=1.18).

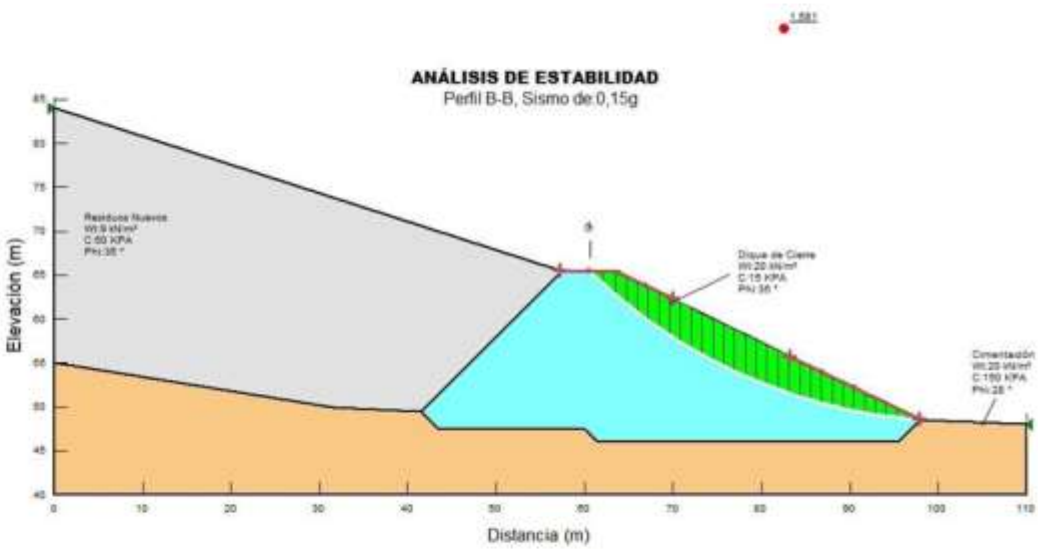

Figure Nº 22: Profile B-B, local fault, with earthquake and without leachate (F.S.=1.58).

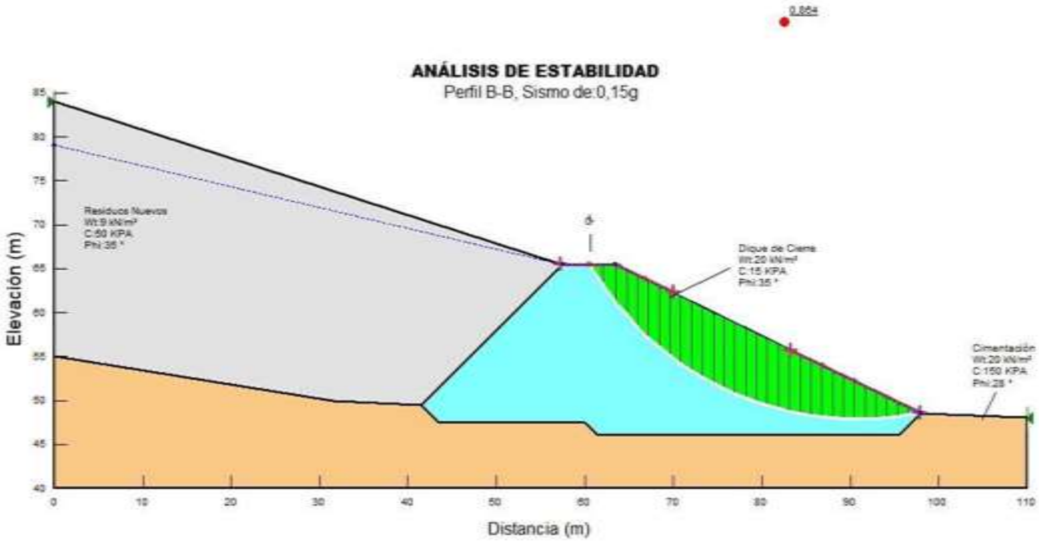

Figure Nº 23: Profile B-B, local fault, with earthquake and with leachate (F.S.=0.86).

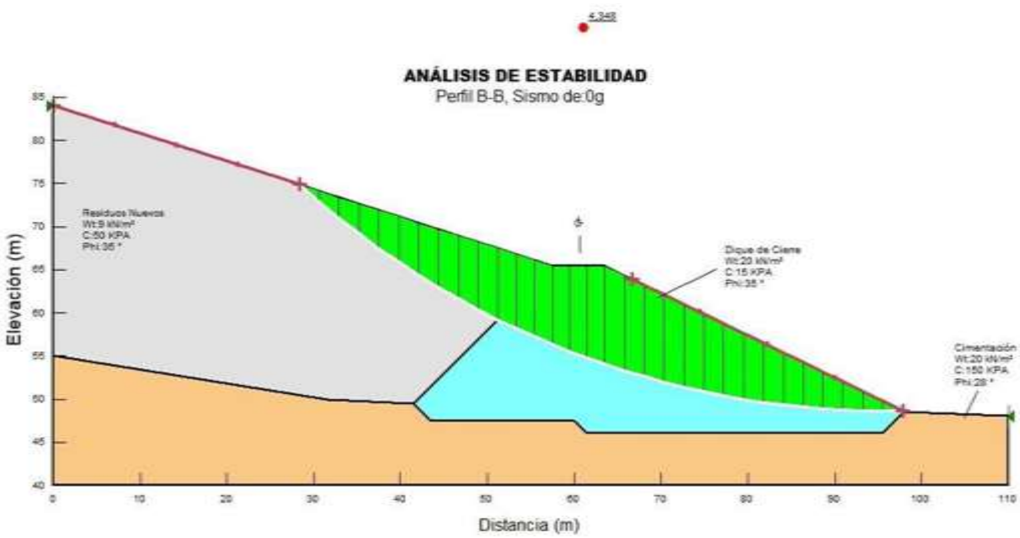

Figure Nº 24: Profile B-B, global fault, without earthquake and without leachate (F.S.=4.35).

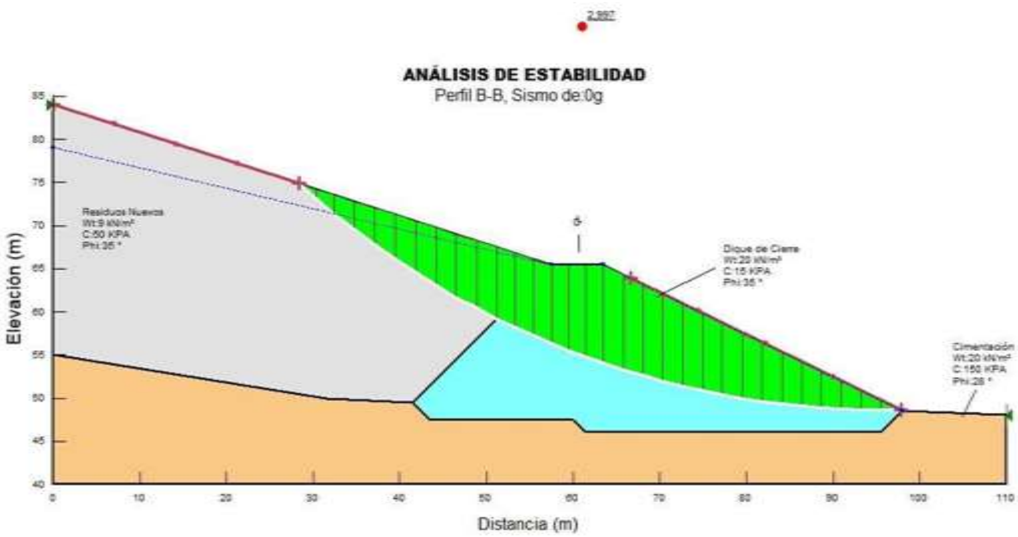

Figure Nº 25: Profile B-B, global fault, without earthquake and with leachate (F.S.=3.00).

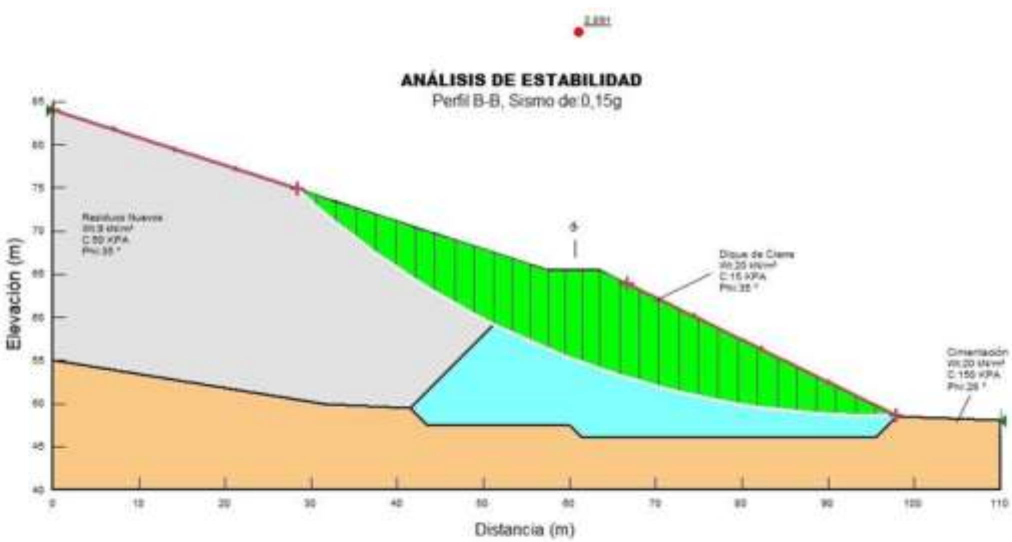

Figure Nº 26: Profile B-B, global fault, without earthquake and without leachate (F.S.=2.89).

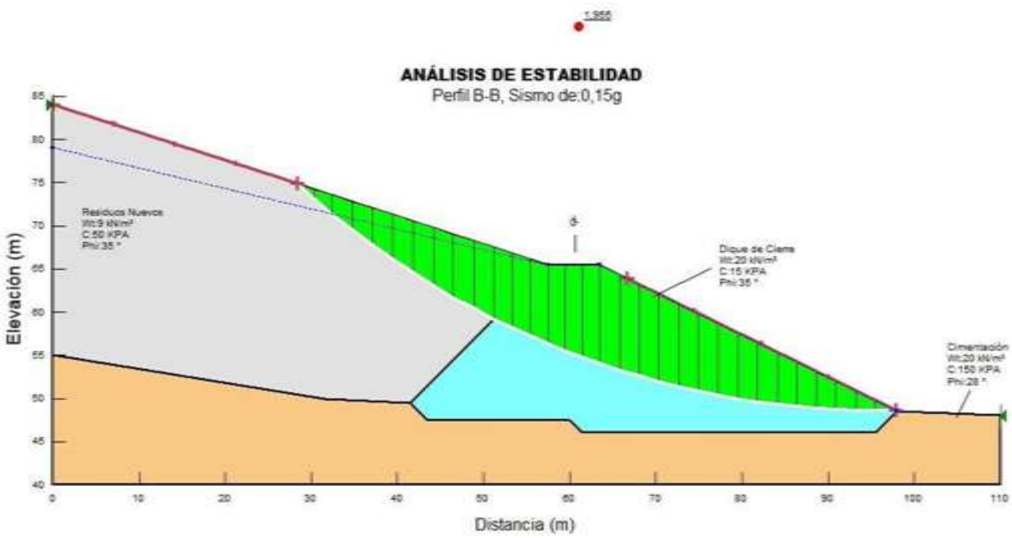

Figure Nº 27: Profile B-B, global fault, with earthquake and with leachate (F.S.=1.96).

The analyzes carried out for profile B-B are very similar to those obtained for the case of profile A-A, that is, for Global Failures, Safety Factors are presented that meet the minimum values required by national and international codes. Namely a Safety Factor greater than 1.50 for the static condition and greater than 1.10 for the dynamic condition. In the case of Local Fault, only for the condition leachate (with and without earthquake), the minimum requested by the codes is not reached, since there are safety factors of 1.18 and 0.86

8. General Conclusions

Once the analysis of the information collected for this study has been carried out, the following can be concluded:

- Based on the information obtained from this study and if the recommendations in the corresponding sections are followed, it is considered that the land is acceptable from the geotechnical point of view for the construction of a structure such as the one projected.

- The stratigraphic profile of the subsoil in the area of the future dike, detected from the exploratory trenches, consists mainly of two types of material, namely: basement rock corresponding to ignimbrite and an area of ancient debris corresponding to a cell of the PTA. Ideally, the material on which the dike should be supported is the basement rock of the site, since it is the one with the greatest resistance and least compressibility. But, given the presence of a cell and some clay areas, this will not be possible along the entire length of the dike, so the possibility of settlements in the foundation must be accepted, which will be reflected in the dike in the future.

- In order to consider an adequate embedment of the dike in the foundation materials, it is recommended to consider a foundation depth of between 2.0 and 3.0 m. These depths should be measured from the current ground level.

- The recommended allowable support capacity for the designs at the indicated levels is 10.0 Ton/m^2, considering that the support materials are clay or old solid waste. If the dike rests on the rocky basement of he area, the admissible support capacity increases to a value of 40.0 Ton/m^2. These capacities consider a Safety Factor of 3, as recommended by the Foundation Code of Costa Rica.

- The proposed backwater would have a maximum crown elevation of 967 m.a.s.l., at the eastern end, while at the western end the elevation the crown elevation will be at 956 m.a.s.l. With a crown width of 6.0 m and with lateral slopes with a slope of 2H : 1V for the external slope and 1H : 1V for the internal slope. The breakwater would have an approximate length of 50 m and could be made up of rock blocks, soils with good quality blocks, ballast, dirty ballast, gravel, etc. This will depend on the availability of materials available in the area.
- The safety factors obtained are suitable for global failure in any condition, either with or without an earthquake, as well as for the case of with or without a leachate.

- In the case of local faults in the two profiles analyzed, the condition with an earthquake and leachate does not meet the safety factor (FS= 1.08 and 0.86, when the minimum value should be 1.50), while for profile B-B it is also the local fault condition without an earthquake and with leachate did not present an adequate safety factor (FS= 1.18). This, as can be clearly seen, indicates that special attention should be paid for keeping the garbage mass drained, since it is the high leaching condition in the mass that significantly reduces the safety factors obtained in the analyzes.

- A correct and adequate process of intervention of the land, translates into an appropriate security for the works that are required to be built, therefore, a detailed planning, forecast and execution of the works is necessary, in order to avoid problems.

- During the construction process, an adequate inspection must be carried out to verify that there is an adequate support capacity. Verification by manual penetrometer tests is recommended. These tests are relatively simple, inexpensive, and correlate fairly well with site conditions.

- For seismic design purposes, it is recommended to consider the site as soil type S_1, if the dike is supported by the basement rock (ignimbrite) and soil type S3 if the support is in another type of material (clay or garbage cells), as established by the Seismic Code of Costa Rica (2010).

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10. ANNEX

Anexo A: Plano con Propuesta de Dique

Ámbito.

1.1 Los suelos consisten en partículas con varios tipos de tamaños y formas. Este método de prueba es usado para separar las partículas en distintos rangos de tamaño y determinar cuantitativamente la masa de las partículas en cada rango. Esta información se combina para determinar la distribución partícula-tamaño (gradación). Este método de prueba usa un criterio de criba de apertura cuadrada para determinar la gradación del suelo entre 3" (75-mm) y No. 200 (75-µm) tamices.

1.2 Los términos, suelos y material, se utilizan indistintamente durante la norma.

1.3 En los casos donde la gradación de partículas sea mayor a 3"(75mm) se necesitará de un tamiz, se podría usar el método de prueba D.5519.

1.4 En los casos donde la gradación de partículas sea menor a No.200 (75-µm) se necesitará un tamiz, se podría usar el método de prueba D.7928.

1.5 Usualmente, si el máximo del tamaño de partícula es igual o menor que 4.75mm (tamiz no.4), es aplicable el tamizado de un solo juego. Es más, si el tamaño de partícula máximo es mayor que 4.75 mm (tamiz no.4) e igual o menor a 9.5 mm (tamiz de ⅜"), entonces el tamizado de un solo juego o el tamizado compuesto se puede llegar a utilizar. Finalmente, si el tamaño de partícula máximo es igual o mayor a 19.0 mm (tamiz de $^{3}/_{4}$"), se puede aplicar el tamizaje compuesto. Para condiciones especiales, ver 10.3.

Este método de prueba está bajo la jurisdicción de ASTM, comité D18, en suelos y rocas, y es el principal responsable del subcomité D.18.03, en características de textura, plasticidad y densidad de suelos.

Edición actual aprobada el 15 de abril, 2017. Publicada en mayo, 2017. Originalmente aprobada en 2004. Última edición previa aprobada en 2009 como D6913-04)2009). DOI: 10.1520/D6913-17.

1.6 Se proveen dos métodos de prueba en esta norma. Los métodos difieren en los dígitos significativos registrados y el tamaño del espécimen (masa) requerido. El método a usar puede ser especificado por la autoridad solicitante; de otra forma deberá realizarse el método A.

1.6.1 Método A— El porcentaje (por masa) pasando cada tamaño de tamiz es registrado al 1% más cercano. Este método se debe usar cuando se está realizando tamizado compuesto. Para casos de disputas, el método A es el método de referencia.

1.6.2 Método B—El porcentaje (de masa) que pasa por cada tamiz es registrado al 1% más cercano. Este método es solo aplicable para tamizajes de una pieza y cuando el tamaño máximo por partícula es igual o menor al tamiz No.4 (4.75 mm).

1.7 Este método de prueba no cubre, en ningún detalle, la obtención de la muestra. Se asume que la muestra se obtiene usando los métodos apropiados y es solo representativa

1.8 Procesamiento de la muestra. Se proporcionan tres procedimientos (húmedo, seco al aire y seco al horno) para procesar dicha muestra con los cuáles se puede obtener un espécimen. El procedimiento seleccionado va a depender del tipo de muestra, el máximo tamaño de la partícula en la muestra, el rango de tamaños de partículas, las condiciones iniciales del material, la plasticidad del material, la eficiencia, y la necesidad de realizar otras pruebas en la muestra. El procedimiento podría ser especificado por la autoridad solicitante; de otra forma, se deberá seguir la guía suministrada en la sección 10.

1.9 Este método de prueba requiere típicamente de dos a tres días para completarse, dependiendo del tipo, tamaño de la muestra y tipo del suelo.

1.10 Este método de prueba **no** es aplicable para los siguientes suelos:

1.10.1 Suelos que contienen turba fibrosa, la cual cambiará el tamaño de la partícula durante el proceso de secado, lavado, o tamizaje.

1.10.2 Suelos que contienen materia extraña, como solventes orgánicos, asfalto, fragmentos de madera, u objetos similares. Tales materias extrañas pueden afectar los procesos de lavado y tamizaje.

1.10.3 Materiales que contienen componentes cementosos, como el cemento, ceniza volante, u otros aditivos estabilizadores.

1.11 Este método de prueba podría no producir resultados consistentes dentro y entre laboratorios, en los siguientes suelos, por lo que la declaración de precisión no se aplica a ellos.

1.11.1 Suelos friables en los que los procesos de tamizaje cambian la gradación del suelo. Típicos ejemplos de estos suelos son algunos suelos residuales, la mayoría de las lutitas erosionadas y algunos suelos cementados debilitados como elduro, caliche o la coquina.

1.11.2 Suelos que no se dispersan fácilmente como la arcilla glauconítica o arcillas plásticas secas.

1.11.3 Para probar estos suelos, el método de prueba debe ser adaptado, o alterado, y estas alteraciones deberán ser documentadas. Dependiendo de las consideraciones del diseño, se podría realizar un programa especial de gradación-prueba. Dichas alteraciones podrían requerir que los procedimientos de lavado y tamizaje se estandarizaran para que cada espécimen se procese de manera similar.

1.12 Algunos materiales que no son suelos, pero están hechos de partículas, podrían ser probados usando este método. Sin embargo, las secciones aplicables antes mencionadas deberán ser probadas o medidas con este estándar.

1.13 Todos los valores observados y calculados deberán conformar las pautas para los dígitos significantes y redondeo establecido en Práctica D6026, a no ser que sea reemplazada por este método.

1.13.1 Los procedimientos utilizados para especificar cómo la información es recopilada/registrada y luego calculada en este estándar son considerados como el estándar de la industria. Además, son representativos de los dígitos significativos que usualmente deberían ser retenidos. Los procedimientos utilizados no toman en consideración la variación de materiales, objetivo de la obtención de información, objetivos de estudio especiales, o alguna otra consideración por los objetivos del usuario; y es práctica común el incrementar o reducir dígitos significativos de información reportada para conmensurar con estas consideraciones. Está más allá de la visión de estos métodos de prueba el considerar dígitos significantes utilizados en métodos de análisis para el diseño de ingeniería.

1.14 Unidades—Los valores dimensionales indicados ya sea en unidades SI o unidades de pulgada-libra, deberán considerarse como el estándar, tal como 8" o 200 mm de diámetro del tamiz. Excepto, las designaciones del tamiz son identificadas típicamente utilizando el sistema "alternativo" de acuerdo con la práctica E11, tal como 3" y No. 200, en vez del sistema "estándar" de 75-mm y 75- µm, respectivamente. Solo las unidades SI son utilizadas para las determinaciones, cálculos, y resultados indicados de masa. Sin embargo, el uso de balanzas o escalas de libras no será considerado una no conformidad con este estándar.

1.15 Un resumen de los símbolos utilizados en este método de prueba es dado en Anexo A1.

1.16 Este estándar no pretende abarcar todas las medidas de seguridad, si existieran, asociadas con su uso. Es la responsabilidad del usuario de este estándar el establecer prácticas apropiadas de seguridad y salud, y determinar la aplicabilidad de limitaciones regulatorias previo a su uso.

1.17 Tabla de contenidos—Todas las tablas y figuras aparecen al final de este estándar.

(Hidrómetro) Análisis.

E11 Especificación para la tela de tamiz de prueba de alambre tejido y tamices de prueba.

E177 Práctica para el uso de los términos de precisión y sesgo en los métodos de prueba ASTM.

E691 Práctica para la realización de un estudio entre laboratorios para determinar la precisión de un método de prueba.

3. Terminología

3.1 General:

3.1.1 Una descripción general de términos usado en los procesos de tamizado está presente en fig.1(a) utilizando un formato tabular, y en fig. 1(b) usando un formato de diagrama de flujo. Además, fig. 1(a) incluye símbolos utilizados en los procesos de tamizado.

3.1.2 Hay dos tipos de definiciones en las siguientes secciones. Hay definiciones que son generales (ver 3.3). y otras que son específicas a este estándar (ver 3.3). Para encontrar una definición, puede ser necesario revisar ambas secciones. Las definiciones están en orden alfabético.

3.2 Definiciones:

3.2.1 Para definiciones de términos generales utilizados en este método de prueba, referirse a terminología D653.

3.2.2 Tamizado compuesto, v—en el tamizado, el proceso de separar un espécimen largo en un tamiz de separación designado para obtener porciones de partículas más gruesas y finas. La porción gruesa es tamizada usando el set de tamizado grueso. La porción más fina es sub muestreada para obtener un sub espécimen de tamaño manejable (masa) y este sub espécimen es tamizado utilizando el set de tamizado fino. El resultado de ambos sets de tamizado (grueso y fino) son combinados matemáticamente para determinar la gradación del espécimen grande.

3.2.2.1 Discusión—En algunos casos el sub espécimen podría requerir de otra separación; eso es, utilizando un segundo tamiz de separación designado, lo que resulta-en una segunda porción gruesa y un segundo sub espécimen obtenido de la segunda porción fina.

3.2.3 Material acumulativo retenido (material acumulativo retenido o masa acumulativa retenida), n—en el tamizado, la masa del material retenida en un tamiz individual más las masas del material retenido en todos los tamizados más gruesos/grandes.

3.2.4 Porcentaje acumulado retenido, n—en el tamizado, la proporción de material acumulativo retenido en un tamiz específico de acuerdo ~~a~~ con la masa del espécimen, es expresado en porcentaje.

3.2.5 Tamiz designado para separación, n—en tamizaje, el tamiz seleccionado para separar el espécimen en porciones más gruesas y finas.

3.2.5.1 Discusión—El tamaño de un tamiz designado para separar es de un ~~tamaño~~ promedio, típicamente rondando $^{3}/_{4}$" (19.0 mm). Puede haber dos tamices designados para separar, por ejemplo, el primer sub espécimen puede ser separado en un segundo tamiz para obtener una segunda porción más gruesa y también obtener un segundo sub espécimen de la segunda porción más fina.

3.2.6 Material acumulativo fraccionado retenido, n—en tamizaje, cuando se tamiza un sub espécimen, la masa retenida del material en un tamiz individual, más las masas de material retenidas en todos los tamices más gruesos.

Términos [A]	Modificando adjetivos y símbolos

A–Set de tamizaje de una pieza

espécimen	húmedo (S,M_m), seco o secado en horno (S, M_d), secado al aire (S,M_{ad}), lavado (S_w , M_d)
set de tamizaje.	
material acumulativo o masa retenida en el	CMR_N
noveno tamiz.	CPR_N
porcentaje que atraviesa el noveno tamiz[B].	PP_N
porcentaje retenido en el noveno tamiz[C].	PR_N

B – Tamizaje: separación única, sólo se utiliza un tamiz designado para separar

espécimen	Lo mismo que arriba
tamiz designado para separar	
porción más gruesa	Húmedo (CP, M_m), seco o secado en horno (CP, M_d), secado al aire (CP, M_{ad}), lavado (CP_wM_d)
set de tamiz más grueso.	
material acumulativo o masa retenida en el	CP, CMR_N
noveno tamiz.	CP, CPR_N
porcentaje acumulativo retenido en el noveno	CP, PP_N
tamiz.	$CSCF_N$
porcentaje atravesando el noveno tamiz[B].	Húmedo (FP, M_m), seco (FP, M_m), secado al aire
factor de corrección al tamizar.	(FP, M_{ad})
porción más fina	Húmedo (SubS, M_m) seco o secado a horno
sub espécimen	(SubS, M_d), secado al aire (SubS, M_{ad}), lavado ($SubS_w$, M_d)
set de tamiz más delgado.	SubS, $FCMR_N$
masa acumulativa fraccionada retenida en el	SubS, $FCPR_N$
noveno tamiz.	SubS, FPP_N
porcentaje acumulativo fraccionado retenido en el	SubS, FPR_{first}
noveno tamiz.	FP, PP_N
porcentaje fraccionado atravesando el noveno	SubS, PP_N
tamiz.	
porcentaje fraccionado retenido en el primer	
tamiz.	
porcentaje de porción más delgada atravesando el	
noveno tamiz.	
porcentaje atravesando el noveno tamiz[D].	

C– Tamizaje: separación doble, se usan el primer y segundo tamiz designado para separar

Espécimen	Lo mismo que arriba
1er tamiz designado para separar	
1er porción más gruesa	Lo mismo que arriba
Lo mismo que arriba, excepto que el prefijo 1er	1erCP, CMRN, 1erCP, CPRN, 1erCP, PPN,
se agrega a todos los términos	1erCP, PP_N, 1erCSCF
1er porción más fina	Lo mismo que arriba
1er sub espécimen (utilizado para producir el 2do	Húmedo (1erSubS, Mm), seco (1erSubS, Md),
sub espécimen y la 2da porción más gruesa para	secado al aire (1erSubS, Mad)
tamizar)	Seco o secado en horno (2doCP, Md), lavado
2do tamiz designado para separar	($2doCP_w$, Md)
2da porción más gruesa	

2da porción más fina
2do set de tamizaje grueso
1era masa acumulativa fraccionaria retenida en el noveno tamiz.
1er porcentaje acumulativo fraccionario retenido en el noveno tamiz
1er porcentaje fraccionario que atraviesa el noveno tamiz
1er porcentaje fraccionario retenido en el 1er tamiz
Porcentaje que atraviesa el noveno tamiz[C]
Porcentaje de porción más fina que atraviesa el noveno tamiz
2do factor de corrección al tamizar.
Factor de corrección de tamizado de la 1era porción más fina
2do sub espécimen (seleccionado de la 2da porción más fina)

Set de tamizado más pequeño
2da masa acumulativa fraccionaria retenida en el noveno tamiz
2do porcentaje acumulativo fraccionaria retenido en el noveno tamiz
2do porcentaje fraccionario que atraviesa el noveno tamiz
2do porcentaje fraccionario retenido en el 1er tamiz
Porcentaje de la primera porción más fina que atraviesa el noveno tamiz
Porcentaje que pasa el noveno tamiz[D]

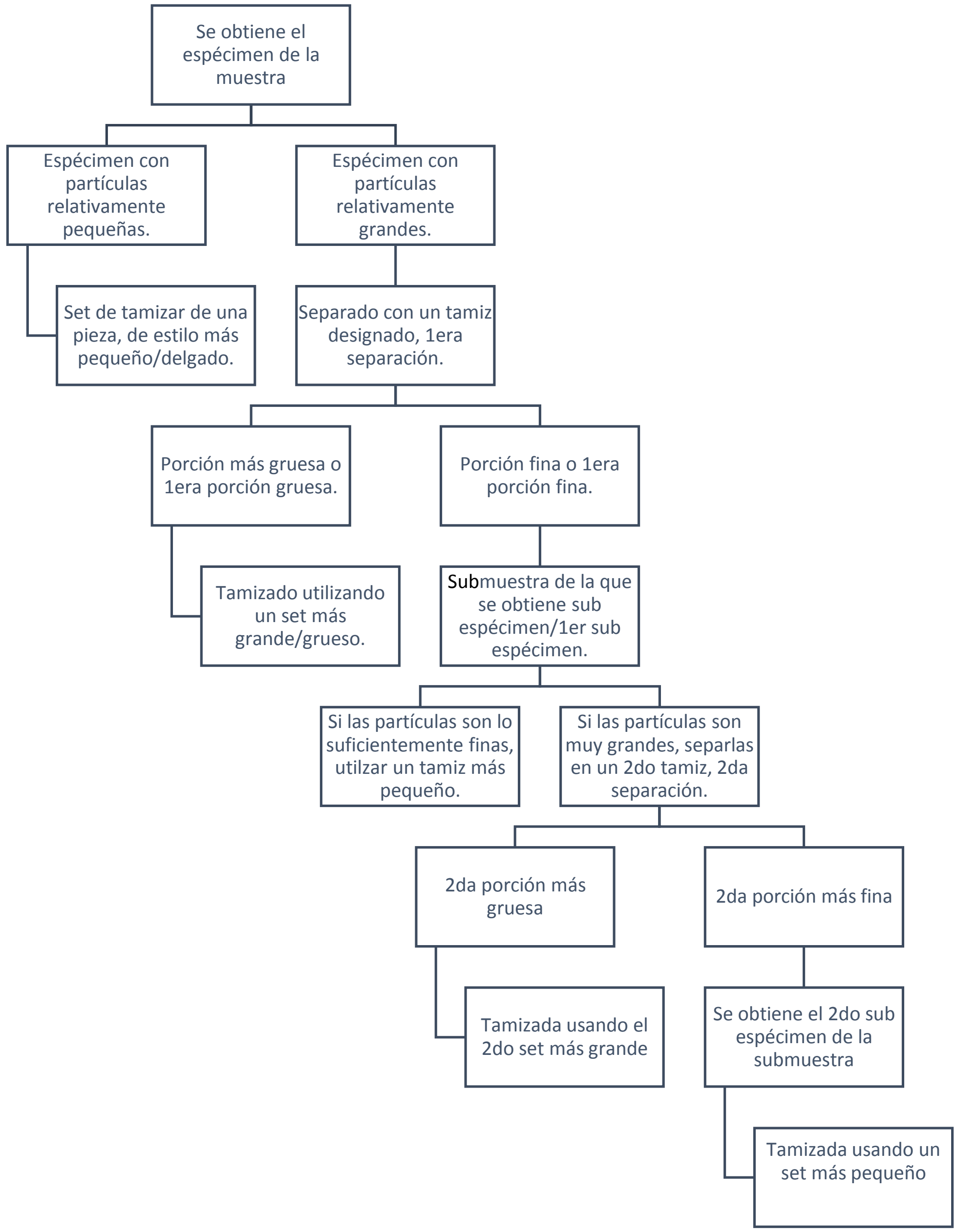
Seco o secado al horno (2doFP, Md)

2doCP, FCMRN
2doCP, FCPRN
2doCP, FPPN
2doCP, FPR primero
2doCP, PPN
FP, PPN
2doCSCF
1erFP, CSCF
Húmedo (2doSubS, Mm), seco (2doSubS, Md), secado al aire (2doSubS, Mad)

2doSubS, FCMRN
2doSubS, FCPRN
2doSubS, FPPN
2doSubS, FPR_{1er}
1erFP, PPN
2doSubS, PPN

Notas: [A] el término masa es omitido, ya que todos los términos no porcentuales están en masa (g). Algunos términos, tal como material retenido, porcentaje retenido (excepto cuando requerido) y material fraccionario son omitidos ya que solo la metodología "acumulativa" está presente.
[B] Es igual a 100 menos el porcentaje acumulativo retenido. [C] Sólo es requerida en determinación de precisión.
[D] Función del porcentaje fraccional apropiado que pasa y CSCF.

FIG. 1 (a) Terminología y símbolos típicamente usados en los procesos de tamizado



3.2.7 Porcentaje acumulativo fraccionario retenido, n—en tamizaje, la proporción del material acumulativo fraccionario retenido en un determinado tamiz en proporción a la masa del sub espécimen, se expresa en ~~porciento~~ porcentaje.

3.2.8 Material fraccionado retenido, n—en tamizaje, cuando se tamiza un sub espécimen, la masa del material retenido en un tamiz individual.

3.2.9 Porcentaje fraccionario que atraviesa, n—en tamizaje, la porción del material en masa del sub espécimen/es que atraviesa/n un tamiz expresado en porcentaje.

3.2.9.1 Discusión—cuando se utilizan dos sub especímenes, habrá un 1er y un 2do porcentaje fraccionario.

3.2.10 Porcentaje fraccionario retenido, n—en tamizaje, la proporción del material fraccionado retenido en un tamiz específico en proporción a la masa del sub espécimen, expresado en porcentaje.

3.2.11 Gradación, n—en suelos, la proporción de masa en distintos tamaños de partícula.

3.2.11 Discusión—Esta proporción se presenta usualmente en un formato tabular (tamaño del tamiz y el porcentaje que pasa) o en un formato gráfico (porcentaje que pasa versus el logaritmo del tamaño del tamiz en mm). El formato gráfico es referido como distribución tamaño-partícula o curva de gradación.

3.2.12 Tamaño máximo de partícula, n—en tamizaje, el tamaño de tamiz más pequeño en comparación al promedio en el cual se retendrá menos del uno por ciento de la muestra.

3.2.12.1 Discusión—con fines prácticos, estime el tamaño máximo de la partícula como igual al tamiz más pequeño en tamaño al promedio, en el cual pareciera que todo el material probado fuera a pasar por ese tamiz. Se necesita el tamaño máximo de la partícula para determinar la masa requerida, tanto del espécimen y sub espécimen.

3.2.13 Tamaño máximo del tamiz, n—en tamizaje, el tamiz más pequeño en tamaño, que es más grande que cualquier partícula en el espécimen o sub espécimen.

3.2.14 Tamaño mínimo del tamiz, n—en tamizaje, el tamiz más pequeño en tamaño se usa para tamizar el espécimen o sub espécimen.

3.2.14.1 Discusión—este tamaño es ya sea el de un tamiz designado para separar (1ero o 2do) o el número 200 (75-µm).

3.2.15 Porcentaje que atraviesa, n—en tamizaje, la porción del material en masa en la muestra que pasa por un tamiz expresado en porcentaje.

3.2.15.1 Discusión—este valor equivale al material retenido y acumulado en un determinado tamiz, dividido por la masa del espécimen, substrayendo la proporción de uno, y luego multiplicarlo por 100. Para tamizar, sería el porcentaje fraccional que atraviesa, multiplicado por el factor de corrección del tamiz (CSCF).

3.2.16 Distribución del tamaño de partícula, n—ver gradación.

3.2.17 Porcentaje retenido, n— en tamizaje, la porción del material retenido en un determinado tamiz a la masa del espécimen, expresado en porcentaje.

3.2.18 Condición saturada de superficie seca, n— en suelos de grano grueso, es un estado en el cual las partículas del suelo básicamente están saturadas de agua, pero no hay muestras visibles de esta.

3.2.19 Set de tamizaje, n—en tamizaje, un set de tamices estándar. Para tamizado de un solo set de tamices, el tamaño va a variar del ~~tamaño~~ máximo hasta el número 200 (75-µm). Para tamizaje con varios tamices, habrá uno para partículas finas y uno para gruesas. Juntos, estos tamices van a variar desde el tamaño máximo hasta el número 200 (75-µm).

3.2.20 Tamaño de tamiz, n—en tamizaje, el tamaño de la abertura en la tela metálica del tamiz en mm o µm.

3.2.21 Set de tamizado de una pieza, v— en tamizaje, el proceso en el cual solo se necesita un set de tamices para determinar la gradación del espécimen en comparación al tamaño máximo de la partícula del tamiz número 200 (75-µm).

3.2.21.1 Discusión—típicamente, esto se aplica a los especímenes que poseen un tamaño máximo de partícula de unos 9.5 mm (⅜") o menos, cuando se utiliza el método A ~~o~~ el tamaño máximo de una partícula es de 4.75 mm (tamiz número 4) o menos, y cuando se utiliza el método B y la distribución de las partículas menor al tamiz número 200 (75-µm), no es necesario.

3.2.22 Separación, v— en la muestra o sub muestra, el proceso de reserva de muestras, el acuartelamiento de material, o pasar materiales a través de un divisor o caja de fusibles para obtener una porción representativa del material para pruebas; eso es, el espécimen o sub espécimen.

3.2.22.1 Discusión—se provee una descripción de la reserva de muestras, acuartelamiento o división de materiales en Anexo A2, desde A.2.1.1 a A.2.1.3.

3.2.23 Período de agitación estándar, n—en tamizaje, el período de tiempo que opera un agitador de tamiz mecánico va de 10 a 20 minutos, el cual se ha verificado, satisface los requerimientos para tamizar a fondo.

3.2.24 Set de tamiz estándar, n—al tamizar suelos, el grupo de los 14 tamaños específicos de tamiz requeridos para determinar la gradación de suelos entre (e incluyen) los tamices de 3"

(75mm) y el número 200 (75-µm), como se indica en la tabla 1.

3.2.24.1 Discusión—La mayoría de estos tamices son diferentes de los que se usan en los ensayos de agregados para hormigón (método de prueba C136), especialmente para los tamices menores al número 4 (4.75mm).

3.2.25 Sub espécimen, n—en tamizaje, es la porción representativa del material que atraviesa el tamiz seleccionado, es decir, la porción más fina.

3.2.25.1 Discusión— cuando el tamizaje requiere de múltiples tamices, deberá haber más de un sub espécimen. El 1er sub espécimen (es decir, el de la porción más fina) deberá ser separado en una 2da porción más gruesa y una 2da más fina, que se sub muestran para obtener el 2do sub espécimen.

3.3 Definiciones de términos específicos en esta norma:

3.3.1 Porción más gruesa, n—en tamizaje, la porción del espécimen retenido en el tamiz.

3.3.1.1 Discusión— cuando se utilizan dos tamices distintos, habrá una 1era y 2da porción más gruesa.

3.3.2 Set de tamizaje más grueso, n—en tamizaje, el set de tamizaje que va desde el tamaño máximo hasta el tamaño designado.

3.3.2.1 Discusión— Cuando se utilizan dos tamices diferentes, el 1er set de tamices más gruesos que iría desde el tamaño máximo hasta el primer tamiz designado. El tamaño del 2do set grueso iría desde el 1er tamiz designado hasta el 2do tamiz designado.

3.3.3 Factor de corrección de tamizado (CSCF), n— en tamizaje, un factor que se utiliza para convertir el porcentaje fraccional de paso determinado a partir del tamizado de la subespecie, al porcentaje de paso de la muestra. El CSCF es igual al porcentaje que atraviesa el tamiz designado en el set de tamices más grueso (es decir, el último tamiz en dicho set). Este valor se calculará a un dígito más del requerido (0.1%) para recudir errores de redondeo.

3.3.3.1 Discusión— cuándo se utilizan dos tamices designados, habrá un 1er y 2do CSCF.

3.3.4 Porción más fina, n— en tamizaje, la porción del espécimen que atraviesa el tamiz designado.

3.3.4.1 Discusión— cuando se utilizan dos tamices designados, la 1er sub espécimen obtenido de la 1era porción más fina, será separada en una 2da porción más gruesa y una 2da más fina, de la cual se obtiene el 2do sub espécimen.

Tabla 1 Norma de set de tamices[A]

Designación de tamices de acuerdo con E11			
Alter.	Prom.	Alter.	Prom.
Lid.		Núm. 10	2.00 mm
3 in.	75 mm	Núm. 20	850 µm
2 in.	50mm	Núm. 40	425 µm
1-½ in.	37.5 mm	Núm. 60	250 µm
1 in.	25.0 mm	Núm 100	150 µm
¾ in.	19.0 mm.	Núm. 140	106 µm
⅜ in.	9.5 mm	Núm. 200	75 µm
Núm. 4	4.75 mm	Pan	

[A]Una tapa típicamente no se usa o es necesitada cuando se usa un tamiz grueso rectangular que posea dimensiones superiores a los 200mm u 8 in.

3.3.5 Set de tamiz fino, n— en tamizaje, el tamaño de este set va desde el último tamiz designado, hasta el núm. 200 (75 µm).
3.3.5.1 Discusión—Cuando el tamizado ocupa un 2do sub espécimen, el set más fino va desde el 2do tamiz hasta el núm. 200 (75 µm).
3.3.6 Tamiz insignificante—en la precisión de los resultados de prueba, cualquier tamiz que posea un 1% o menos de material acumulativo retenido durante el análisis.
3.3.7 Separando, v—en tamizado, el proceso de dividir un espécimen o sub espécimen en dos porciones, las porciones gruesas (retenidas) y finas (que pasan), utilizan un tamiz designado.
3.3.7.1 Discusión—cuando el tamizado requiere de dos tamices designados, habrá una 1er y 2da porción más gruesa, porción fina y sub espécimen.
3.3.8 Tamiz significante, n—en la precisión de los resultados de prueba, cualquier tamiz que posea más de un 1% de material acumulativo retenido durante el análisis.

4. Resumen del método de prueba

4.1 Este método de prueba se usa para determinar la distribución tamaño-partícula (gradación) de la muestra de suelo. Se debe obtener un espécimen representativo de la muestra en uno de tres procedimientos distintos (humedad, secado al aire, o secado en horno). Para especímenes que contengan partículas relativamente pequeñas, se tamizará el espécimen en su totalidad, utilizando tamices de una pieza. Sin embargo, el espécimen puede contener una variedad de tamaños de partícula y podría requerir separar el suelo en 2 o 3 rangos para un tamizado más eficiente, utilizando uno o dos tamices designados. Este proceso es denominado tamizado compuesto. Para una sola separación (dos porciones), se tamiza la porción más gruesa en su totalidad, mientras que la porción más fina se divide en sub especímenes más pequeños para tamizarlos. Estos resultados se combinan matemáticamente. Para especímenes que contengan partículas muy grandes, este podría requerir dos separaciones; es decir, tres porciones (1era y 2da porción gruesa y 2da porción más fina), ver Fig. 1(a) y Fig. 1 (b) Previo al tamizado, según corresponda, el material será lavado para remover cualquier partícula fina y secadas en horno. El material a ser tamizado se colocará en el tamiz más grueso de cada uno de los sets de tamices y se batirá mecánicamente. La masa de las partículas retenidas en cada tamiz será determinada. Los resultados producirán una tabulación de los tamaños de los tamices versus el porcentaje atravesado que puede ser presentado gráficamente como una curva de gradación (una gráfica del porcentaje que pasa versus el logaritmo del tamaño de la partícula en mm).

4.2 Los diagramas de flujo que describen los requerimientos de los diferentes procesos de tamizado que se mencionaron antes, están presentados abajo en cuatro figuras, Fig. 2 hasta Fig. 4(b).

5. Significado y uso

5.1 La gradación del suelo se usa para la clasificación de acuerdo con Práctica D2487.
5.2 La curva de gradación (distribución tamaño-partícula) se usa para calcular el coeficiente de uniformidad y coeficiente de curvatura.
5.3 La selección y aceptación de los materiales de relleno se basan, usualmente, en la gradación. Por ejemplo, los terraplenes de carreteras, rellenos y las presas de tierra podrían requerir de gradación.
5.4 La gradación de los suelos usualmente controla tanto el diseño como ~~el control de~~ la calidad de los filtros de drenaje, y el drenaje de aguas subterráneas.
5.5 La selección de opciones para la compactación dinámica y lechada está relacionada con la gradación del suelo.
5.6 La gradación del suelo es un indicador de las propiedades de ingeniería. La conductividad hidráulica, compresibilidad y la resistencia a la cizalladura están relacionadas con la gradación del suelo. Sin embargo, el comportamiento de la ingeniería depende de muchos factores (tales como estrés efectivo, historia del estrés, tipo de mineral, estructura, plasticidad y orígenes geológicos) y no se puede basar únicamente en la gradación.

Nota 1—La calidad del resultado producido por estos métodos de prueba dependen de la competencia del personal que lo realiza, y la capacidad tanto del equipo como de las instalaciones usadas. Las agencias que cumplen los criterios de Práctica D3740 son generalmente consideradas capaces de realizar competentes pruebas objetivas/muestreo/inspección/etc. A los usuarios de estos métodos de prueba se les advierte, aunque cumplan con la Práctica D3740 esto no asegura resultados confiables. Unos resultados confiables dependen de muchos factores; la Práctica D3740 provee un medio para evaluar algunos de esos factores.

6. Equipo

6.1 Tamices—cada tamiz deberá cumplir con los requerimientos de Especificación E11. Generalmente, los marcos de estos tamices son circulares y con un diámetro de 8 in o 200 mm, y ya sea de largo completo (50 mm o 2 in) o medio (25 mm o 1 in). La altura del tamiz depende, generalmente, del número de tamices que se requieran típicamente en el set de tamices, el tamaño de las partículas tamizadas, y el tipo y tamaño del agitador del tamiz. Las partículas que posean dimensiones que estén relativamente cerca o excedan de la altura del tamiz, no se podrán tamizar en la pila de tamices, solo individualmente. Por ende, en una pila de tamices, la relación entre la altura del tamiz o espacio entre los tamices rectangulares y la apertura de la tela del tamiz debe exceder 2. marcos más grandes que se ajustan a la Especificación 11, son aceptables, pero requieren consideraciones especiales por refuerzo.

6.1.1 Set estándar de tamiz—este set consiste en todos los tamices listados en Tabla 1. Algunos tamaños adicionales se pueden añadir si son requeridos o necesitados para reducir una sobrecarga al tamiz. Además, se deberían omitir algunos tamaños más grandes, durante el análisis de tamices, dependiendo del tamaño máximo de la partícula; sin embargo, por lo menos un tamiz en el proceso de tamizado debe tener un 100% de paso.

6.1.2 Colador de lavado, núm. 200 (75 µm) —Un tamiz núm. 200 (µm) con una altura mínima sobre la pantalla de 50 mm o 2 in para prevenir la pérdida de material retenido durante el lavado. Se prefiere una malla de tamiz de acero inoxidable porque es más duradera y menos propensa a daños o desgaste. Se puede reforzar el tamiz con una malla más grande debajo de la tela de 75 µm. El refuerzo de tela metálica (respaldo) no debe tener una malla de tela de alambre más gruesa que el núm. 20 (850 µm). El refuerzo de tela metálica debe estar unido al marco del tamiz junto con una tela metálica número 200 (75 µm), no al marco del tamiz inferior donde la malla de metal núm. 200 (75 µm) fue unida. Además, es de buena práctica utilizar una malla de respaldo aplanada (enrollada o calandrada), para que sea menos abrasiva con la malla de metal núm. 200 (75 µm).

Estimar visualmente el tamaño máximo de la partícula (99% o más atravesará el tamiz dado) para determinar si se debe utilizar el tamiz de una o de varias piezas, ver 10.3. Referirse a fig. 1a y 1b para los términos usados en estos procesos de tamizado.

Si el tamaño estimado máximo de la partícula es igual o menor que 9.5 mm (tamiz de 3/8 in.) requiere el método A o el tamaño estimado máximo estimado es igual o menor que 4.75 mm (tamiz núm. 4) requiere el método B.

En caso de si

En caso de no

Se usa un tamiz de una pieza.

Se requiere un tamizado compuesto si solo se usa el método A.

Utilizando la tabla 2, determine la masa del espécimen requerida, basado en el método requerido (A o B) y el estimado tamaño máximo de la partícula.

Seleccionar el procedimiento para obtener el espécimen basado en:

- En muchos casos, toda la muestra se puede usar como espécimen; por ende, se determina el método de procesamiento por la condición deseada del espécimen cuando se selecciona el sub espécimen.
- Típicamente, el procedimiento húmedo es el más fácil y preferido, ver 10.4.1 y 10.5.2. Sin embargo, es requerido si:
  a) Se requieren otras pruebas y esos resultados fueron alterados debido al secado o
  b) Más de dos procesos divisores serían requeridos durante el uso de un divisor o una caja de rifles.
- Se puede usar el procedimiento de secado al aire, pero se aconseja precaución cuando se lidia con muchos tipos de suelos, ver 10.4.1, 10.4.4 y 10.5.3.
- El procedimiento de secado al horno no es muy práctico cuando se lidia con muestras grandes o que contengan grava gruesa, arcilla plástica o limos, ver 10.4.1 y 10.5.6.

Seleccionar el procedimiento húmedo, secado al aire o secado en horno:

- Si la muestra es húmeda, el proceso húmedo es el más fácil: combinar la muestra y seleccionar el espécimen con una cuchara, ver 10.4.1 y 10,5,1.
- Si la muestra es seca, utilizar secado en horno o al viento y un divisor para obtener el espécimen, notando que el divisor no se puede usar más de dos veces, ver de 10.4.2 hasta 10.4.4.
- Si la muestra recibida es relativamente pequeña en masa, pero cumple los requerimientos de la Tabla 2, entonces toda la muestra se puede usar de espécimen.

Seleccionar el tamiz de separación designado basado en:

- Otras pruebas requeridas, tales como D698 o D 1557.
- La dificultad de procesamiento incrementa rápidamente a medida que la malla del tamiz disminuye. El uso del tamiz núm. 4 (4.75 mm) puede ser tedioso, mientras que el de 3/8 in. (9.5 mm) es más fácil, ver Nota 8.
- La porción retenida (porción más gruesa) no puede contener demasiadas partículas que pertenezcan a una porción más fina, ver 10.5.2.3.
- Si se usa el tamiz de ¾ in. (19 mm), usualmente se requiere de un segundo tamiz.

Si es necesario, secar en horno al espécimen.

Proceder al diagrama de flujo para tamizado de una sola pieza, fig. 3.

Procesar el material en el tamiz de separación designado, que resultará en una porción fina y una gruesa. Proceder al diagrama de flujo para tamizado, fig. 4a. Si se requiere del 2do tamiz designado para separar, también se requerirá de la fig. 4b.

6.1.3 Tamiz de separación designado—un tamiz utilizado para separar el espécimen en dos porciones (fina y delgada) en tamizado compuesto. El tamiz de separación designado deberá cumplir con la especificación E11. Puede ser necesario tener tamices de distintos tamaños para poder usar como el tamiz de separación. Normalmente, estos no son los mismos tamices que se usan en la pila de tamices (set de tamizaje) que se coloca en el agitador de tamiz. Típicamente, el 1er tamiz designado es rectangular y bastante largo, mientras que el 2do tamiz designado posee 200 mm u 8 in. de diámetro.

6.2 Fregadero de lavado con boquilla rociadora—un lavado que tiene adherida una boquilla rociadora a una línea flexible para facilitar que los procesos de lavado y transferencia de materiales no sufran derrames. Además, la boquilla rociadora será tal, que la cantidad de agua podrá ser contralada fácilmente. La temperatura del agua deberá ser relativamente similar a la temperatura ambiente, para prevenir cambiar las dimensiones de la malla del tamiz, junto con preocupaciones de seguridad y salud.

Desde Fig. 2, el espécimen para el set de tamiz de una pieza ha sido seleccionado y secado en horno, referirse a fig. 1a y 1b para los términos utilizados en el proceso de tamizado.

Para determinaciones de masa, ver 11.2.

Determinar masa del secado en horno, S, M_d.

Dispersar este material, ver 11.4.2 y remover el material que sea más fino que el tamiz núm. 200 (75 µm) lavándolo, ver 11.4.3 o método de prueba D 1140, también se puede usar el método B.

Secar al horno el material retenido y determinar su masa, S_W, M_d.

Tamiz seco (ver 11.4.4) este material lavado en seco utiliza el juego de tamiz más fino que cumpla los requisitos 6.1 y 6.1.1, y determinar lo siguiente para cada noveno tamiz:

- La masa acumulada retenida para cada tamiz, CMD_N;
- El porcentaje acumulado retenido, CPR_N; y,
- El porcentaje que pasa, PP_N, al porcentaje más cercano del método A o 0.1% del método B. Ver 11.4.4.

Nótese que el porcentaje acumulado retenido no tiene que ser registrado, especialmente si se hicieron los cálculos en una computadora o una calculadora apropiada.

Fig. 3 Diagrama de flujo para tamizado de una sola pieza.

6.3 Criba vibratoria mecánica de tamiz—un dispositivo que sostiene un grupo de tamices, mientras que al mismo tiempo les imparte suficiente movimiento como para cumplir los requisitos de rigurosidad que se explican en 8.2. El "período de agitación estándar" debe ser entre 10 a 20 min. La criba vibratoria deberá tener un dispositivo de cronometraje, o se debe usar un dispositivo de cronometraje en conjunto con la criba.

Nota 2—las cribas vibratorias imparten un movimiento que causa que las partículas en los tamices reboten y giren, así todas ellas tienen una oportunidad amplia en varias orientaciones en las aberturas del tamiz, y típicamente cumplirán este requisito de rigurosidad de tamizado. Una criba vibratoria que posee un movimiento horizontal y/o vertical giratorio/orbital fluido típicamente **no** cumple con este requisito de tamizado, ya que las partículas no estarán rebotando ni girando.

Balances—para el tamizado de una sola pieza, se usa un balance. Para el tamizado que ocupe más piezas, será necesario más de un balance. Los balances deben cumplir con los requerimientos de Especificación D4753; es decir, tener una legibilidad (sin estimación) para determinar la masa tanto del espécimen como sub espécimen con un mínimo de tres dígitos significativos para el método A, o un mínimo de cuatro dígitos significativos para el método B. La masa del espécimen se puede identificar en partes (determinaciones múltiples de masa). El balance utilizado para determinar el material acumulativo retenido o el material acumulativo fraccionado en cualquier tamiz, debe tener una legibilidad igual o mejor a aquella que se usó para determinar la masa del espécimen/sub espécimen.

Nota 3—preferiblemente, el balance debe tener una capacidad de tara para que la masa del material pueda ser determinada directamente, sin restar la masa del contenedor. Esta característica es inmensamente útil durante el proceso de tamizado para determinar la masa del material acumulativo retenido o cuando se hacen múltiples determinaciones de masa para determinar la masa del espécimen.

6.5 Secado en horno—un horno termostáticamente controlado, capaz de mantener una temperatura uniforme de 110 + 5°C en toda la cámara de secado. Esto, usualmente, requiere del uso de un horno de tiro forzado.

6.6 Contenedores de tamizado—estos contenedores se usan para: (a) contener la muestra de tamizado o el material que se va a tamizar, como una porción gruesa; (b) remover el material retenido en el tamiz(ces); (c) recoger y transferir ese material; y, (d) contener el material acumulativo retenido.

6.6.1 Contenedores de muestras—contenedores de paredes lisas, sin esquinas estrechas para atrapar marial, hechas de material resistente a la corrosión y al cambio en la masa al calentar, enfriar, remojar y limpiar repetitivamente. Los contenedores deben ser lo suficientemente grandes para permitir humedecer la muestra. El contenedor debe facilitar la transferencia de la muestra del contenedor hasta el colador de lavado (núm. 200 (75 µm) o colador de separación designado) y viceversa, mediante una operación de aclarado/lavado, y permitir decantar el agua de lavado clara del recipiente.

6.6.2 Contenedor de colección/transferencia—este contenedor se usa para recoger el material retenido en un determinado tamiz y para transferirlo al contenedor sosteniendo el material acumulativo retenido durante el proceso de tamizado. El contenedor debe tener un diámetro más grande que el tamiz. Se puede usar un molde para pastel de superficie lisa de 230 mm (9 in) junto con un cepillo de pintura de 25 mm (1 in) para ayudar en transferir todo el material. El color de este contenedor debe aumentar la observación de que se ha logrado transferir todo el material exitosamente.

6.6.3 Contenedor de masa acumulativa—este contenedor debe ser lo suficientemente grande como para recibir el material retenido que está contenido en el dispositivo de colección/transferencia sin sufrir alguna pérdida. La masa debe ser menos que la capacidad de tara del balance para que así se pueda determinar directamente la masa acumulativa retenida (ver nota 3). En la mayoría de los casos, se puede usar el contenedor de muestra/s. Este método de prueba asume que la masa del material acumulativo retenido se determina directamente. Este enfoque es más fácil que determinar la masa del material retenido en cada tamiz.

Desde la fig. 2, la muestra se ha procesado sobre el primer tamiz de separación designado. Este diagrama de flujo usa el adjetivo 1er para todos los términos aplicables, aun cuando un 2do tamiz de separación designado, 2da muestra, etc. puedan no ser requeridos. Referirse a la fig. 1a y 1b para los términos utilizados en el proceso de tamizado. Para determinaciones de masa, ver 11.2.

Material retenido en el 1er tamiz designado de separación (porción gruesa), CP.

Secar en horno y determinar la masa seca, CP, M_d.

Si se requiere, ver 11.5.1. dispersar y eliminar el material más fino que el tamiz de división designado mediante lavado, ver 11.5.1.1.

Secar en horno y determinar masa, CP_w M_d.

Tamizar la porción gruesa, determinar el material acumulativo retenido, el porcentaje que pasa versus cada tamiz, ver 11.5.1. Determinar el factor de corrección del tamizado compuesto, 1er CSCR, ver 12.5.1.2.

Calcular la pérdida de material durante el lavado o tamizado. La pérdida total debe ser menor al 0.5% de la masa seca de la muestra, S,MD_d, ver 11.5.2.2 & 11.5.1.2.

Material que pasa el 1er tamiz de separación designado (1er porción fina), FP.

Determinar humedad de la masa, FP, M_m.

Obtener la 1era muestra para tamizarla y determinar el contenido de agua (D 2216) que cumpla con los requisitos de masa indicados en la tabla 2.

- Para procesamiento húmedo, mezclar bien y obtener la 1era submuestra, ver 10.5.3.
- Para el procesamiento de secado al aire, utilizar un divisor (no más de dos divisores) para obtener la 1era submuestra, ver 10.5.3.

Calcular el contenido de agua, W_{fp} y la masa seca de la porción más fina, FP, M_d.

Determinar la masa seca de la 1era submuestra, 1er SubS, M_d.

Determinar la masa seca de la muestra de prueba, S,M_d.

¿Es el tamaño del 1er tamiz designado para separar igual o mayor al de ¾ in. (19.0 mm)? Ver 11.5.2.

No

Sí

Se requiere de un 2do tamiz designado para separar, ver fig. 4b.

Dispersar y remover material que sea más fino que el tamiz núm. 200 (75 µm) lavándolo, ver 11.5.2.1.

Secar en horno y determinar masa, 1er $SubS_wM_d$.

Tamizar la 1era muestra lavada, determine el material acumulativo, la 1era porción fina/porcentaje fraccional que pasa (opcional) y el porcentaje que pasa versus cada noveno tamiz, ver 11.5.2.2.

Fig. 4 (a) diagrama de flujo para tamizado compuesto—separación única

De la fig. 4a, se ha obtenido la 1era submuestra y se ha secado en horno; se ha determinado su contenido de agua; se ha determinado la masa seca de la muestra; y, se ha tamizado la 1era porción gruesa. Referirse a la fig. 1a y 1b para los términos utilizados en estos procesos de tamizado. Para determinaciones de masa, ver 11.2.

Seleccionar el tamaño del segundo tamiz designado para separar con base en:

- La dificultad para obtener una porción retenida limpia (partículas limitadas pertenecientes a la porción fina) incrementa rápidamente, a medida que disminuye el tamaño de la tela del tamiz.
- La masa de la porción que pasa no puede ser mucho más grande que cuatro veces la masa requerida de la 2da submuestra, ya que se requiere un divisor para obtener la 2da submuestra y no puede haber más de dos procesos de división.
- Un tamiz de 3/8 in (9.5 mm), o el núm. 10 (2.00 mm) es el que normalmente se usa.

Ver 11.6.1.

Tamizar la 1era submuestra sobre el 2do tamiz de separación designado, ver 11.6.1. En la porción retenida, romper cualquier conglomeración usando la presión de los dedos, un mortero, o un mortero cubierto de goma. Se reprocesa el material en un 2do tamiz designado para separar. Tener cuidado de no romper ninguna partícula individual y asegurarse que la porción retenida está relativamente limpia, para que se cumpla el criterio de 0.5%, ver 11.6.1.1 y 11.6.1.2.

Porción retenida de la 1era submuestra o la 2da porción gruesa:

Determinar su masa seca, 2do CP,M_d.

Si se requiere, ver 11.6.2, dispersar y remover el material que sea más fino que el 2do tamiz designado para separar, lavándolo.

Secar en horno el material lavado y determinar su masa, 2do CP_w, M_d.

Tamizar este material lavado en seco, determine el 1er material fraccional acumulativo retenido, 1er porcentaje fraccional que pasa (opcional) y el porcentaje que pasa versus cada noveno tamiz, ver 11.6.3. Determine el factor de corrección del 2do tamizado compuesto, 2do CSCF, ver 12.6.2.2.

Calcular la pérdida de material durante el lavado, tamizado, o ambos. La pérdida total debe ser menor al 0.5% de la masa seca de la 1era submuestra, 1er SubS, M_d.

Ver 12.6.2.3.

Porción que pasa de la 1era submuestra o 2da porción fina:

De esta porción, y usando un divisor, seleccionar la 2da submuestra que cumpla los requisitos de masa dados en Tabla 2 y determine su masa seca, 2do $SubS_w$, M_d, ver 11.6.4.

Dispersar y remover el material más fino que el tamiz núm. 200 (75 µm) lavándolo, ver 11.6.4.1. y material lavado en horno seco, 2do $SubS_w$, M_d.

Tamizar el material lavado en seco y determinar el 2do material acumulativo fraccionado retenido, el porcentaje que pasa de la 1ra porción más fina (opcional) y el porcentaje que pasa versus cada noveno tamiz, ver 11.6.4.2.

Fig. 4 (b) diagrama de flujo para tamizado compuesto—doble separación (continuación)

6.7 Cepillos de tamiz—cepillos para ayudar en la eliminación del material retenido en los tamices con diámetros pequeños (≤200 mm) y con mallas más finas (≤3/4 in, (19 mm)). Los cepillos deben tener las siguientes características:
6.7.1 Las cerdas deben estar unidas firmemente al mango del cepillo, para evitar que las cerdas se conviertan en parte del material retenido.
6.7.2 Las cerdas deben ser lo suficientemente firmes y pequeñas para remover eficazmente las partículas enredadas en los orificios del colador, pero también deben estar hechas de un material que no dañe la malla ni se deteriore muy rápido. Cerdas de alambre, incluso latón, **no** se deben usar con una tela de alambre cuyo tamaño es menor al núm. 20 (850 µm).
6.7.3 Las cerdas deben ser capaces de entrar en contacto con el límite de la malla de alambre y el marco del tamiz.
6.7.4 El mango del cepillo debe ser tal que la mano de uno controle fácilmente el movimiento y la presión del cepillado. Un ejemplo, el mango está encima de las cerdas (como una brocha) o inclinado (un ángulo de 30 a 45 grados) a la cabeza de las cerdas (como un cepillo limpiador de verduras o un cepillo de dientes doblado).
6.7.5 Las cerdas deben tener un diámetro pequeño y ser suaves a la hora de que se cepille tela de alambre de un tamaño igual o menor a una malla núm. 100 (150 µm). Unas cerdas suaves, que tengan un diámetro pequeño removerán las partículas sin que haya que realinear la tela de alambre.
6.7.6 Los cepillos que cumplen estos requisitos son pinceles rígidos rectangulares redondos y relativamente pequeños con cerdas acortadas, cepillos de dientes suaves a duros con mangos doblados, y cepillos de verduras con cerdas acortadas.
6.8 Artículos diversos—artículos diversos tales como una botella de lavado, una espátula y una varilla para mezclar/revolver podrían ser útiles.
6.9 Divisor o caja de fusibles (opcional, pero podría necesitarse durante el tamizado compuesto) —un dispositivo para obtener una porción más pequeña representativa (espécimen) de una porción más grande (muestra). Este dispositivo tiene un número par de rampas de igual ancho, pero no menos de ocho, que se descargan alternativamente a cada lado del divisor. Para un material seco que posea partículas más gruesas que un tamiz de 3/8 in. (9.5 mm), el ancho mínimo de las rampas debe ser aproximadamente 1- ½ veces el de la partícula más grande del material que se está dividiendo, pero no menos de 12.5 mm o ½ in. Para el material seco que sea igual o más fino que el tamiz de $^{3}/_{8}$ in. (9.5 mm), el ancho mínimo de las rampas debe ser de aproximadamente 1- ½ veces la partícula más grande en el material, pero no menos de aproximadamente 3 mm o $^{1}/_{8}$ in. El divisor debe estar equipado con dos o más receptáculos para sujetar las dos mitades del material, después de la división. También debe estar equipado con una tolva/tolva de alimentación (preferiblemente activada por una palanca o con una puerta de corte) y un sartén o recogedor de bordes rectos que tenga un ancho igual o un poco menor al ancho total del montaje de las rampas, por el cual el material seco se puede alimentar a una velocidad controlada a los conductos. El divisor y el equipo accesorio deben estar diseñados, de tal manera, que el material fluya suavemente sin restricción o pérdida de material.

Nota 4— algunos divisores están diseñados de manera que se pueda ajustar el ancho de los conductos.

6.10 Accesorios de despiece (opcional) —una superficie dura, limpia y nivelada, o una tela duradera, no porosa o lámina de plástico de aproximadamente 2 a 2.5 m o 6 a 8 ft; una cuchara de borde recto, una pala, o paleta; y una escoba o un cepillo.
6.11 Mortero y una mano de mortero cubierta de caucho (opcional) —Aparato para romper agregaciones de partículas de suelo secas al aire o en horno, pero sin romper ninguna partícula individual.
6.12 Horno de secado a baja temperatura (opcional) —Un horno controlado termostáticamente, capaz de mantener de manera uniforme una temperatura de 60 °C en toda la cámara de secado, para uso en procesos de secado al aire.
6.13 Baño de agua ultrasónica (opcional) —el baño de agua ultrasónico debe ser lo suficientemente grande como para contener un vaso de precipitados o un matraz que contenga el material a dispersar, antes del lavado. El nivel de

agua en el baño debe ser igual o mayor al de la muestra en el contenedor.
6.14 Agitador de dispersión (opcional) —un agitador de plataforma, acción de muñeca o tipo similar que tenga un movimiento giratorio, orbital, alternativo o similar que ayude en el proceso de dispersión, al agitar continuamente la tierra empapada.

7. Reactivos

7.1 Hexametafosfato de sodio —también conocido como metafosfato de sodio, es un agente de dispersión utilizado para dispersar algunos suelos de grano fino después de secarlos en horno, pero previo a lavarlos. Los suelos de grano fino que requieren de uso de un dispersante son aquellos que no se mojan fácilmente en agua, como algunas arcillas grasas y la mayoría de los suelos tropicales.
7.1.1 Para los materiales que necesiten de un dispersante químico, se puede añadir, ya sea directamente al material de remojo (adición seca) o agregando una solución dispersante al material, más según sea necesario.
7.1.1.1 Adición seca —añadir aproximadamente 4 gramos de hexametafosfato de sodio por cada 100 ml de agua que se haya añadido al material de remojo, y batir para distribuir el dispersante en todo el material.
7.1.1.2 Solución —hacer una solución utilizando 40 g de hexametafosfato de sodio y 1,000 g de agua destilada, desionizada, o desmineralizada. Añadir la solución al material, y más agua si fuera necesario, y luego batir para distribuir el dispersante por todo el material. La solución debe tener menos de una semana y estar bien agitada o mezclada antes de usarse. La fecha de preparación debe estar indicada en la botella o en un registro.

Nota 5— Las soluciones de esta sal, si son ácidas, se revierten lentamente o se hidrolizan de nuevo a la forma de ortofosfato, con una resultante disminución en la acción dispersiva.

8. Preparación de aparatos

8.1 Verificación de tamices —Previo a su **uso inicial**, evaluar cada tamiz para ver el estado general de la tela metálica, según lo especificado en método de prueba 1 de la especificación E11. Ese método provee las siguientes instrucciones de evaluación, “ver la tela contra un fondo iluminado uniformemente. Si se ven aparentes desviaciones, por ejemplo, defectos de tejido, pliegues, arrugas o materias extrañas en la tela, la tela metálica (tamiz) es inaceptable.” Esta evaluación debe ser documentada. Los tamices que no sean aceptables deberán ser remplazados y descartados o devueltos al fabricante para su reparación (telas de alambre).
8.1.1 Intervalo de verificación —Se deberá realizar y registrar la misma evaluación en intervalos de 6 meses a todos los tamices que estén en servicio continuo. Sin embargo, para los tamices que tengan un límite de uso de menos de 1,000 análisis de tamices por cada intervalo, entonces dicho intervalo se puede incrementar a 12 meses. Tamices que contengan partículas de suelo excesivas (cerca del 10% de los orificios del tamiz contienen partículas) deberán ser limpiados a fondo. Se puede hacer un baño con agua ultrasónica para limpiar los tamices más finos, mientras que se puede utilizar un cepillo más rígido o una herramienta puntiaguda para limpiar los tamices gruesos.
8.1.2 Durante cada proceso de tamizado, los tamices que sean más finos que, e incluyendo, al núm. 100 (150 µm) deberán ser revisados por algún daño en la tela, tal como un desgarro en el marco de contacto. Esta revisión se puede hacer mientras se remueve el material retenido en el tamiz durante el tamizado. No es necesario que se documente esta revisión.
8.2 Verificación de la criba vibratoria y el período de agitación estándar —Previo a su uso inicial, se debe revisar la criba vibratoria para un cribado minucioso, utilizando sets de tamices aplicables (típicamente se usan unos finos y otros gruesos) y material representativo. Además, se debe determinar el período de agitación estándar a cada set de tamices aplicable. Para cada set de tamaño diferente, se debe seguir la guía dada para tamizado con un set de una pieza (ver 11.4). Utilice suficiente material (muestra) de masa conocida (g o kg) para que, en cada tamiz en el set, excepto uno o dos, tenga~~n~~ algo de material retenido, pero que no se sobrecargue~~n~~. Agite el set de tamiz alrededor de diez minutos con la criba vibratoria. Al finalizar, inicie con el tamiz más grande y coloque una tapa ajustada encima del tamiz y el sartén debajo de él. Agite cada

tamiz manualmente, por aproximadamente un minuto usando el procedimiento de agitación manual (ver 8.2.3). Por cada tamiz, determine la masa del material retenido en él y en el sartén, el más cercano al 0.01g o una parte de 1,000, la que sea más grande. La proporción de la masa del material en el sartén en comparación con la masa de la muestra, multiplicado por 100 por cada tamiz debe ser menos del 0.5% (ver nota 6). Si todas las proporciones son menores al 0.5%, es adecuada la criba vibratoria, con un período de agitación de 10 minutos, y ese período se debe usar como el estándar para ese set de tamiz. Si alguna proporción es igual o excede el 0.5%, repita el proceso, pero con un período de agitación de 15 minutos. Si este período cumple con el requisito anterior, entonces este deberá ser el período promedio para ese set, a no ser que un período de agitación menor, como 12 minutos, sea verificado como adecuado. Sí el período de 15 minutos falla, entonces utilice el período máximo permitido, 20 minutos. Si el período de 20 minutos falla, entonces se debe considerar la criba vibratoria como inadecuada para tamizar. Deberá ser reparada o descartada. Luego de la reparación, repita las instrucciones dadas anteriormente para determinar el período de agitación estándar.

8.2.1 Criba vibratoria grande —Si se usa una criba vibratoria más grande para agitar sets de tamices con diámetros grandes (mayores a 200 mm o 8 in.) sets de tamices rectangulares, y la agitación a mano no es aplicable, entonces transfiera el material retenido en incrementos apropiados a un tamiz con un diámetro de 200 mm o 8 in. con una designación igual, junto con tapa y sartén, y agitar por un minuto. Siga las instrucciones dadas anteriormente para determinar el período de agitación estándar para cada set de tamices.

8.2.2 Intervalo de verificación —Se debe realizar y documentar la misma verificación en intervalos de 12 meses por cada criba que esté en uso continuo. Sin embargo, para cribas que tengan un uso limitado a menos de 1,000 análisis de tamices por un intervalo de 12 meses, entonces este intervalo se puede incrementar a 24 meses. No todos los tamaños de sets de tamices (finos o gruesos) necesitan ser nuevamente verificados a no ser que el tiempo de agitación estándar cambie al set que se está verificando. El set más fino, o el set que tenga el período de agitación más largo debe ser utilizado para una nueva verificación.

Nota 6 —por ejemplo, después de agitar manualmente el tamiz núm. 4 (4.75 mm) la cantidad de material retenido en el sartén es de 0.20 g. Si la masa de la muestra es 100.00 g, entonces la proporción es de 0.2% = ((0.20/100.00) *100). En este ejemplo, si la cantidad en el sartén hubiera sido mayor que 0.50 g, la proporción hubiera excedido 0.5% y entonces se debe repetir el proceso de verificación, pero con un intervalo de tiempo mayor.

8.2.3 Procedimiento de agitación manual —para tamices con un diámetro de 200 mm u 8 in sostenga el tamiz individual, con tapa y sartén, en una posición levemente inclinada en una mano (alrededor de 15°). Golpee fuertemente el costado del tamiz con la palma de la otra mano, con un movimiento hacia arriba y a una velocidad de 150 veces por minuto, gire el tamiz aproximadamente una sexta parte de una revolución a intervalos de aproximadamente 25 golpes. Continúe así por aproximadamente un minuto.

8.2.3.1 Para tamices con diámetros más grandes o rectangulares, transfiera el material retenido a un tamiz con un diámetro de 200 mm u 8 in, en porciones adecuadas para evitar una sobrecarga (ver 11.3), y siga las instrucciones anteriores para cada porción.

9. Muestreo

9.1 General —este método de prueba no cubre, en ningún detalle, la obtención de la muestra. Se asume que la muestra se obtiene utilizando los métodos apropiados y es representativa. Sin embargo, la agencia de pruebas deberá preservar todas las muestras de acuerdo con Práctica D4220/D4220M, grupo B; excepto si la muestra recibida no cumple con esos requisitos. En ese caso, no es necesario mantener el contenido de agua del material. La masa de la muestra debe cumplir o excede los requisitos de masa del espécimen, tal como dice Tabla 2 (ver 10.2).

9.2 Fuentes de muestras —la muestra para el análisis de tamiz puede provenir de una variedad de fuentes y puede contener una amplia gama de tamaños de partículas. Típicamente, las muestras para el análisis de tamiz se obtienen de las siguientes formas: muestras a granel (muestras de bolsas grandes o cubos), muestras en bolsas pequeñas o jarras, muestras en tubo, o muestras de otras pruebas (tales como resistencia, consolidación o conductividad hidráulica). En algunos casos, (por ejemplo, prueba de compactación) las pruebas previas pueden causar una reducción del tamaño de las partículas. Para estos casos, el análisis de tamiz puede ser necesario en la muestra inicial, en la muestra degradada, o en ambas. A continuación, se ofrece una descripción general de cómo se pueden seleccionar los especímenes para varios tipos de muestras; mientras que los detalles para obtener especímenes de las muestras están en la sección 10.

9.2.1 Muestras a granel—generalmente, se obtienen muestras a granel debido a que se necesitan múltiples pruebas, o hay presentes partículas grandes, o ambas. Además, la muestra a granel generalmente se convertirá en el espécimen y se va a requerir de tamizado compuesto. Si se necesitan más pruebas, estas se deben coordinar con el análisis de tamiz para que las muestras se obtengan de una manera eficiente y representativamente, usando el procedimiento húmedo (preferiblemente) o el de secado al aire. Por ejemplo, los métodos de prueba D698 o D1557 son los que se requieren frecuentemente en las muestras a granel, junto con el análisis de tamiz. Para esta prueba, probablemente sea más eficiente procesar la muestra recibida, ahora un espécimen, en el tamiz designado para separar, utilizando ya sea el tamiz de $^{3}/_{4}$ in (19 mm), $^{3}/_{8}$ in (9.5 mm) o el núm. 4 (4.75 mm) y obtener las muestras del tamiz (porción fina y porción gruesa) durante este proceso. Aunque partículas de gran tamaño (porción gruesa) no se usan en las pruebas con D698 o D1557, se debe calcular el análisis de tamizado compuesto para representar tanto la muestra a granel como la compactación del material (dos gradaciones). Los diagramas de flujo que presentan una descripción de este procedimiento se presentan en fig. 2 hasta fig. 4(b).

9.2.2 Muestras de jarra y bolsas pequeñas —dependiendo de la gradación de la muestra, puede que sea necesario utilizar toda la muestra o espécimen. Observe y estime el tamaño máximo de la partícula. Si la cantidad de material de la muestra es menor que el monto mínimo de masa requerido (como se muestra en tabla 2), tenga en cuenta que la muestra es de tamaño insuficiente. Si la cantidad (de masa) de la muestra es mucho mayor (aproximadamente 50%) de lo necesario, esta se puede reducir utilizando el proceso de humedad (preferiblemente) o el de secado al horno. Si hay otras pruebas que se pueden obtener de la muestra, puede ser mejor realizar las otras pruebas, tales como el contenido de agua y la gravedad específica, y luego tamizar el material que se usó. Anote en la hoja de datos si se han realizado pruebas previas en la muestra. No se puede usar este enfoque para pruebas que puedan alterar la gradación del suelo, tales como los límites de Atterberg.

9.2.3 Muestras de tubo intactas —para obtener una muestra de análisis de tamiz a partir de una muestra de tubo intacta, extruya, ya sea toda la muestra, o solo una porción. Observe y estime el tamaño máximo de la partícula. Utilice el procedimiento de humedad (ver 10.4.1) para obtener la muestra necesaria.

9.2.4 Muestras de pruebas previas —frecuentemente, después de que se hayan completado las pruebas de fuerza, conductividad hidráulica, consolidación, entre otras, la muestra o una porción de ella (del contenido de agua) se usa en el análisis del tamiz. La muestra entera se puede usar o dividir utilizando el procedimiento más apropiado para la selección de la muestra (húmeda o secada en horno). Si la masa de la muestra es menor de la requerida de acuerdo con la tabla 2, tenga en cuenta que la muestra tiene un tamaño inferior al indicado en la hoja de datos. Puede haber condiciones en las que no sea deseable analizar toda la muestra, debido a la faltad de homogeneidad de esta. Si en la muestra hay distintas capas, puede que sea necesario y útil el determinar la gradación de las capas individuales.

10. Muestra

10.1 General —esta sección está separada en cuatro partes. En la primera parte se proveen los “requerimientos de masa de la muestra” (requisito de masa mínimo). En la segunda parte, “la selección del procedimiento de tamizado”, es donde se explica la determinación de cuál procedimiento de tamizado se debe aplicar, tamizado de un solo set de tamices o tamizado compuesto. En la tercera parte, llamado “obtención de muestras”, se da una descripción general de los tres procedimientos aplicables (húmedo, secado al aire y secado en horno) para obtener una muestra del espécimen y su procedimiento de tamizado. Después de esta descripción general, existe una discusión con respecto a consideraciones especiales con respecto a suelos que se segregan fácilmente. En la cuarta parte, "requisitos de obtención y procesamiento de muestras", se dan detalles de cómo se aplican los procedimientos de humedad, secado al aire, y secado en horno para obtener la(s) muestra(s) y prepararlas para el tamizado ya sea del set de una pieza o el de tamizado compuesto.

Tabla 2 requisito de masa mínima para la muestra

Tamaño máximo de la partícula del material (99% o más pasa)		Masa seca mínima de la muestra, g o kg[A]	
Designación de tamiz alternativa	Tamaño máximo de la partícula	Método A – resultados reportados al 1% más cercano	Método B – resultados reportados al 0.1% más cercano
núm. 40	0.425	50 g	75 g
núm. 10	2.00	50g	100 g
núm. 4	4.75	75g	200g[B]
3/8 in.	9.5	165 g[C]	D
¾ in.	19.0	1.3 kg[C]	D
1 in.	25.4	3 kg[C]	D
1-1/2 in.	38.1	10 kg[C]	D
2 in.	50.8	25 kg[C]	D
3 in.	76.2	70 kg[E]	D

[A] Las masas de muestras no deberían exceder significativamente (más del 50%) los valores presentados, ya que sin son excesivamente grandes, podrían terminar sobrecargando el tamiz, (ver 11.3) e incrementando la dificultad del procesamiento de la muestra.
[B] La misma que "C", excepto que se multiplica por 10.
[C] Estos valores se basan en la masa de una partícula individual de forma esférica, en el tamiz dado, primero multiplicado por 100 y luego por 1.2 (factor para tener en cuenta la incertidumbre), y finalmente se redondea al número que sea conveniente.
[D] Las muestras de este tamaño requieren de un tamizado compuesto. Los tamaños de muestra requeridos para informar los resultados al 0.1% no son prácticos y los posibles errores asociados con el tamizado compuesto hacen que esta sensibilidad no sea realista para las muestras que posean estas partículas de mayor tamaño.
[E] La misma que "C", excepto que se omite el factor 1.2.

Chapter V

Data Analysis

The purpose of this chapter is to analyze the different aspects related to the process of translation, alongside the literary theories that were explained in Chapter II. In addition, it includes a small explanation of the approaches employed in the investigation. The analysis of the translations is supported by the literary theories, as previously mentioned, as well as the results obtained from the instruments. Additionally, this is reinforced with the interpretation of the investigator. In the final phase, the different aspects that revolve around the process of translation will be analyzed.

5.1 Approaches to the investigation

"The research approach is a plan and procedure that consists of the steps of broad assumptions to detailed methods of data collection, analysis, and interpretation. It is, therefore, based on the nature of the research problem being addressed" (Chetty, 2016). As it was stated, an approach serves as a guideline that leads to a conclusion. An approach allows the investigator to have a whole new perspective regarding certain aspects when translating. Each document that must be translated has underlying elements that hint at the message and intention of the writer, which still remains the main objective of the process. For this investigation project, the investigator deemed the qualitative approach the most well-suited for this analysis. *"Qualitative research is the process of collecting, analyzing, and interpreting non-numerical data, such as language. Qualitative research can be used to understand how an individual subjectively perceives and gives meaning to their social reality"* (SimplyPsychology, 2019). In other words, by analyzing the language employed

by the writer in the document, it will be understood the reality in which they live and that they were trying to convey.

5.2 Analysis and Interpretation of the Results

In this section, the information of the results obtained from the different instruments will be analyzed with the intention of distinguishing the multiple factors that compose a written work, how it needs to be analyzed to fully infer the intention of the text, and also to identify the multiple changes that occur even in just one paragraph of a written work. In addition, it will be highlighted with examples how a glossary must be created, mentioning the condition the terms need to be included. Moreover, this analysis will be backed with the theoretical work presented in Chapter II.

5.2.1 Text Analysis

Throughout the investigation, the researcher has selected different paragraphs from the documents translated in order to dissect and analyze the different aspects that compose a text. These extracts from the documents will be presented in a table in order to differentiate their components. These tables will be filled according to the criteria of the researcher and his knowledge on the translation field.

Text Analysis

Text Summary	The stratigraphic profile of the subsoil in the area of the future dike, detected from the exploratory trenches, consists mainly of two types of material, namely: basement rock corresponding to ignimbrite and an

	area of ancient debris corresponding to a cell of the PTA. Ideally, the material on which the dike should be supported is the basement rock of the site, since it is the one with the greatest resistance and least compressibility. But, given the presence of a cell and some clay areas, this will not be possible along the entire length of the dike, so the possibility of settlements in the foundation must be accepted, which will be reflected in the dike in the future.
Text Style	Descriptive
Text Function	Informative
Formality	Formal
Generality or Difficulty	Technical

Text Summary	At this point we wish to emphasize that both for the case of global fault, in static and dynamic conditions, with and without leaching in the mass of waste, values are obtained that meet the minimum values require by both national and international codes. Namely a safety factor greater than

	1.50 for the static condition and greater than 1.10 for the dynamic condition. In the case of local faults without earthquake, acceptable safety factors are obtained (FS=2.58 and 1.52), but for the earthquake and leachate condition, the safety factor drops to a value of 1.08, which does not imply the fault but also does not comply with what the codes request.
Text Style	Descriptive
Text Function	Informative
Formality	Formal
Generality or Difficulty	Technical

Text Summary	6.1.2 Colador de lavado, núm. 200 (75 µm) —Un tamiz núm. 200 (µm) con una altura mínima sobre la pantalla de 50 mm o 2 in para prevenir la pérdida de material retenido durante el lavado. Se prefiere una malla de tamiz de acero inoxidable porque es más duradera y menos propensa a daños o desgaste. Se puede reforzar el tamiz con una malla más grande debajo de la tela de

	75 µm. El refuerzo de tela metálica (respaldo) no debe tener una malla de tela de alambre más gruesa que el núm. 20 (850 µm). El refuerzo de tela metálica debe estar unido al marco del tamiz junto con una tela metálica número 200 (75 µm), no al marco del tamiz inferior donde la malla de metal núm. 200 (75 µm) fue unida. Además, es de buena práctica utilizar una malla de respaldo aplanada (enrollada o calandrada), para que sea menos abrasiva con la malla de metal núm. 200 (75 µm).
Text Style	Descriptive
Text Function	Informative
Formality	Formal
Generality or Difficulty	Technical

Text Summary	Balances—para el tamizado de una sola pieza, se usa un balance. Para el tamizado que ocupe más piezas, será necesario más de un balance. Los balances deben cumplir con los requerimientos de Especificación D4753; es decir, tener una legibilidad (sin

	estimación) para determinar la masa tanto del espécimen como sub espécimen con un mínimo de tres dígitos significativos para el método A, o un mínimo de cuatro dígitos significativos para el método B. La masa del espécimen se puede identificar en partes (determinaciones múltiples de masa). El balance utilizado para determinar el material acumulativo retenido o el material acumulativo fraccionado en cualquier tamiz, debe tener una legibilidad igual o mejor a aquella que se usó para determinar la masa del espécimen/sub espécimen.
Text Style	Descriptive
Text Function	Informative
Formality	Formal
Generality or Difficulty	Technical

5.2.2 Color Coding

In this section, the researcher chose two fragments from two different documents translated by him, and employed a color coding in order to discern and show the various changes even just a paragraph goes through when adapted to the target language and its different grammar rules.

Transposition
Modulation
Reduction and expansion
Explicitation
Literal Translation
False Cognates

5.1.2.1 Spanish to English

Original Text	Translated Text
Presentamos el informe del Diseño Geotécnico realizado en el sector Este de la PTA La Uruka, ubicado en la localidad de La Uruca, cantón de San José, Provincia de San José, donde se proyecta la construcción de un dique de Cierre, para la ampliación del área de operaciones	We present the report of the Geotechnical Design carried out in the eastern sector of La Uruka PTA, located in the town of La Uruca, canton of San José, Province of San José, where the construction of a closure dike is projected, for the expansion of the area of operations.

Original Text	Translated Text

En este informe se presenta entre otras cosas, la información de campo recopilada que permitió conocer los suelos presentes en el sitio, complementada con investigaciones anteriores de INSUMA en la zona, que brindaron las características de los materiales y sus propiedades físico – mecánicas. Con base en toda la información disponible se realizó el análisis ingenieril y se plantean las recomendaciones geotécnicas pertinentes.	This report presents, among other things, the collected field information that allowed knowing the soils present in the site, complemented with previous INSUMA investigations of the area, which provided characteristics of the materials and their physical-mechanical properties. Based on all the available information, the engineering analysis was carried out and the pertinent geotechnical recommendations are proposed.

Original Text	Translated Text
El PTA La Uruka, se ubica en las Hojas Topográficas San Antonio y Real de Pereira, Escala 1:10.000, del Instituto Geográfico Nacional, aproximadamente entre las coordenadas de la cuadrícula Lambert Costa Rica Norte 518.81 a 519.35 Este y 216.5 a 216.67 Norte (ver figura N° 1).	PTA La Uruka is located on the topographic sheets of San Antonio and Real de Pereira, on the scale 1:10.000, of Instituto Geográfico Nacional (National Geographic Institute), approximately between grid coordinates Lambert Costa Rica Norte (North) 518.81 to 519.35 Este (East) and 216.67 Norte (North) (see figure N° 1)

Original Text	Translated Text
Los materiales a utilizar para conformar el dique de cierre, corresponden con grandes bloques de roca, provenientes de excavaciones que realiza EBI como parte de sus labores en otra PTA denominado el Huazo. En las Fotografías N° 7 y 8 se ilustra el material que se pretende utilizar.	The materials to be used for the closure dike correspond to large blocks of rock, coming from diggings that EBI realizes as part of their work on another PTA named ‘el Huazo’. On photographs N° 7 and 8, the material to be used is shown.

Original Text	Translated Text
Para tal fin se ha planeado construir una zona de relleno nueva ubicada al costado Este del PTA, entre un talud de roca en esta colindancia y los taludes actuales de las celdas existentes. Para tal fin debe construirse un dique de cierre en la zona, que es el objeto de este estudio.	For that end, it is planned to build a new landfill area located on the East side of the PTA, between a rock slope in this abutment and the current slopes of the existing cells. For that end, a closure dike must be built on this zone, as it is the objective of this study.

Original Text	Translated Text
La investigación geotécnica realizada en el terreno consistió en dos etapas: 1) Trabajo de campo y 2) Análisis de Gabinete. A	The geotechnical investigation realized on the terrain consisted on two phases: 1) Fieldwork and 2) Cabinet analysis. A detailed description of each of these phases

continuación se presenta una descripción detallada de cada una de estas fases.	is presented below. The area of interest corresponds to forms of volcanic origin, as indicated on the geomorphologic map of GAM, Scale 1:200.000 (Madrigal and Salazar, 1993), as it is shown in fig. N° 3.

Original Text	Translated Text
Los puntos específicos de investigación fueron señalados por el Ing. López de INSUMA, para que posteriormente se realizarán las excavaciones. En la Figura N° 2 se presenta una ubicación en la topografía de la zona de los puntos explorados con Pala mecánica.	The specific points of the investigation were pointed out by engineer López of INSUMA, so that the excavations will be carried out later. In figure N°2, a location in the topography of the area of the points explored with a power shovel excavator is presented.

Original Text	Translated Text
La ubicación de los sismos históricos indicados en el párrafo anterior se presenta en la Figura Nº 5 que se muestra a continuación, en la misma se ha ubicado el área de proyecto en un cuadrado en color azul, con el fin de que sea más fácil referenciar el área de interés en el mapa.	The location of these historical earthquakes indicated in the previous paragraph is presented in figure Nº 5 shown below, in which it has been located the area of the project in a blue square, in order to make it easier to reference the area of interest on the map.

Original Text	Translated Text
Como ya se mencionó anteriormente en la zona destinada a la construcción el dique de cierre, se realizaron 4 trincheras exploratorias excavadas con pala mecánica. En las fotografías de la N° 9 a la 12 se presentan fotografías de las mismas, así como la descripción de los materiales encontrados.	As previously mentioned, in the area destined for the construction of the closure dike, 4 exploratory trenches were dug with a power shovel excavator. In the photographs from No. 9 to 12, photos of these shovels are presented, as well as the description of the materials found.

Original Text	Translated Text
En el pasado se han detectado aceleraciones en el orden de 0.45 g con intensidades en la escala Mercalli de VIII, con tres sismos históricos registrados en zonas cercanas. Los primeros dos sismos ocurrieron el 30 de Diciembre de 1888 y el 28 de Marzo de 1851, ubicados ambos en la zona de Dulce Nombre.	In the past, accelerations in the order of 0.45 g with intensities on the modified Mercalli intensity scale (MM or MMI) have been detected, with three historical earthquakes recorded in nearby areas. The first two earthquakes occurred on December 30, 1888 and March 28, 1851, both located in the Dulce Nombre area.

5.1.2.2 English to Spanish

Original Text	Translated Text

The mass of the specimen can be determined in parts (multiple mass determinations). The balance used to determine the cumulative material retained or the fractional cumulative material retained on any given sieve has to have a readability equal to or better than that used to determine the mass of the specimen/subspecimen.	La masa del espécimen se puede identificar en partes (determinaciones múltiples de masa). La balanza utilizada para determinar el material acumulativo retenido o el material acumulativo fraccionado retenido en cualquier tamiz, debe tener una legibilidad igual o mejor que aquella que se usó para determinar la masa del espécimen/sub espécimen.

Original Text	Translated Text
3.2.12.1 Discussion—For practical purposes, estimate the maximum particle size as equal to the smallest sieve size from the standard sieve set in which it appears that all the material being tested would pass through that sieve. The maximum particle size is needed to determine the required mass of the specimen and subspecimen	3.2.12.1 Discusión—para fines prácticos, estime el tamaño máximo de la partícula como igual al tamiz más pequeño en tamaño al promedio, en el cual pareciera que todo el material probado fuera a pasar por ese tamiz. Se necesita el tamaño máximo de la partícula para determinar la masa requerida, tanto del espécimen y sub espécimen.

Original Text	Translated Text

3.2.22 splitting, v—in sampling or subsampling, the process of stockpile sampling, quartering material, or passing material through a splitter or riffle box to obtain a representative portion of that material for testing; that is, a specimen or subspecimen.	3.2.22 Separación, v— en la muestra o sub muestra, el proceso de reserva de muestras, el acuartelamiento de material, o pasar materiales a través de un divisor o caja de fusibles para obtener una porción representativa del material para pruebas; eso es, el espécimen o sub espécimen.

Original Text	Translated Text
3.2.25.1 Discussion—When composite sieving requires multiple designated separating sieves, there will be more than one subspecimen. The 1st subspecimen (that is, the subspecimen from the finer portion) would be separated into a 2nd coarser portion and a 2nd finer portion that would be sub-sampled to obtain the 2nd subspecimen	3.2.25.1 Discusión— cuando el tamizaje requiere de múltiples tamices, deberá haber más de un sub espécimen. El 1er sub espécimen (es decir, el de la porción más fina) deberá ser separado en una 2da porción más gruesa y una 2da más fina, que se sub muestran para obtener el 2do sub espécimen.

Original Text	Translated Text
6.6.3 The mass should be less than the taring capacity of the balance so that the cumulative mass retained can be	6.6.3 La masa debe ser menos que la capacidad de tara del balance para que así se pueda determinar directamente la masa

determined directly (see Note 3). In most cases, the specimen/subspecimen container can be used. This test method assumes that the mass of the cumulative retained material is determined directly.	acumulativa retenida (ver nota 3). En la mayoría de los casos, se puede usar el contenedor de muestra/s. Este método de prueba asume que la masa del material acumulativo retenido se determina directamente.

Original Text	Translated Text
6.7.5 The bristles have to be small in diameter and soft when brushing wire cloth size equal to or less than the No. 100 (150 µm) mesh. Small diameter, soft bristles will remove the particles without any re-alingment of the wire cloth.	6.7.5 Las cerdas deben tener un diámetro pequeño y ser suaves a la hora de que se cepille tela de alambre de un tamaño igual o menor a una malla núm. 100 (150 µm). Unas cerdas suaves, que tengan un diámetro pequeño removerán las partículas sin que haya que realinear la tela de alambre.

Original Text	Translated Text
8.1.1 Verification Interval—The same evaluation shall be performed and documented at 6-month intervals on all sieves that are placed in continuous service. However, for sieves that have a	8.1.1 Intervalo de verificación —Se deberá realizar y registrar la misma evaluación en intervalos de 6 meses a todos los tamices que estén en servicio continuo. Sin embargo, para los tamices que tengan un

limited usage of less than about 1,000 sieve analyses per 6-month interval, then this interval may be increased to 12 months.	límite de uso de menos de 1,000 análisis de tamices por cada intervalo (6 meses), entonces dicho intervalo se puede incrementar a 12 meses.

Original Text	Translated Text
9.1 General—This test method does not cover, in any detail, procurement of the simple. It is assumed that the simple is obtained using appropiated methods and is representative. However, the testing agency shall preserve all samples in accordance with Practice D4220/D4220M, Group B; except if the as-received sample does not meet those requirements.	9.1 General —este método de prueba no cubre, en ningún detalle, la obtención de la muestra. Se asume que la muestra se obtiene utilizando los métodos apropiados y es representativa. Sin embargo, la agencia de pruebas deberá preservar todas las muestras de acuerdo con Práctica D4220/D4220M, grupo B; excepto si la muestra recibida no cumple con esos requisitos.

Original Text	Translated Text
[D]Specimens of this size require composite sieving. The sample sizes required for reporting results to 0.1 % are not practical and the possible errors associated with composite sieving causes this sensitivity to	[D] Las muestras de este tamaño requieren de un tamizado compuesto. Los tamaños de muestra requeridos para informar los resultados al 0.1% no son prácticos y los posibles errores asociados con el tamizado

be unrealistic for specimens with these larger size particles.	compuesto hacen que esta sensibilidad no sea realista para las muestras que posean estas partículas de mayor tamaño.

Original Text	Translated Text
6.13 Ultrasonic Water Bath (Optional)—The ultrasonic water bath must be large enough to hold a beaker or flask containing the material to be dispersed prior to washing. The water level in the bath should be equal or higher than the water level in the specimen container.	6.13 Baño de agua ultrasónica (opcional) —el baño de agua ultrasónico debe ser lo suficientemente grande como para contener un vaso de precipitados o un matraz que contenga el material a dispersar, antes del lavado. El nivel de agua en el baño debe ser igual o mayor al de la muestra en el contenedor.

5.2.3 Glossary

As it has already been mentioned, a glossary is the main way a translator is going to defend himself when faced with a word or expression whose meaning is not in the knowledge of the aforementioned translator. Here, the researcher includes a list of all the terminology that had to be investigated in order to ensure the meaning of the documents remained in the same way for the target language's audience.

Sieve: A utensil consisting of a wire or plastic mesh held in a frame. Used for straining solids from liquids, for separating coarser from finer particles, or for reducing soft solids to a pulp.

Decanting: Gradually pour (liquid, typically wine or a solution) from one container into another, especially without disturbing the sediment.

Gradation: The process of arranging aggregates based on their size (aggregates are an important part of the construction industry as they constitute a significant portion of concrete mixes).

Aggregates: Raw materials that are produced from natural sources and are extracted from pits and quarries, including gravel, crushed stone, and sand. When used with a binding medium, like water, cement, and asphalt, they are used to form compound materials, such as asphalt concrete.

Mechanical Sieve Shaker: Test sieve shakers are used to analyze the samples collected in test sieves. The testing involves the shaking or manipulation of the sample, resulting in data analysis.

Riffle Box: A device designed to reduce a sample of coal or ore to half its original size. The box contains 12 chutes discharging alternately to opposite sides. The width varies according to the largest particle size. The volume reduction is rapid for dry material o suitable fineness.

Receptacle: An object or space sued to contain something.

Ultrasonic Bath: A piece of industrial or laboratory equipment that consists of a container, or bath, used for cleansing, mixing, or homogenization of objects or substances by sending ultrasonic vibrations through the liquid contained in it.

Dique: Muro grueso construido para contener la fuerza del agua, embalsarla o reducirla.

Rocas ignimbritas: roca ígnea y depósito volcánico que consiste en toba dura compuesta de fragmentos de roca y fenocristales en una matriz de fragmentos vítreos.

Chapter VI
Conclusions and Recommendations

In this chapter, the conclusions that were obtained through the research are going to be presented. The research questions that were set back in Chapter I will be analyzed in order to explain how the researcher obtained the aforementioned results. Furthermore, the researcher will provide the reader of this document with a description on how the goal of this investigation was achieved. Moreover, the research will offer some recommendations for future researchers or students who might find useable or relevant.

6.1 Purpose of the Conclusion

The objective of this conclusion is to analyze, after obtaining important knowledge, how the different procedures and methods used during a translation affect or modify the translated documents. This research was conducted under a descriptive approach, which gives the researcher the necessary guidelines to obtain the objectives of the investigation, as for example the researcher aimed to experience and differentiate the many changes a single document goes through when adapting it from one language to another. Moreover, this research aims to serve as an example or point of reference when analyzing the process of translation, the different aspects it compels when trying to convey a message from one language to another, and how to tell which the most suitable process is to render your translation.

6.2 Conclusions

In order to give this research a structure, one general objective and three specific objectives were proposed. These objectives represent the aspects the researcher wanted to understand from the beginning. They describe and represent the processes the researcher intended to accomplish. In the following paragraphs, a complete analysis on how these objectives were completed, will be presented.

6.2.1 To analyze the effect of procedures and methods used to translate documents from Spanish to English and vice versa.

As it has been stated multiple times throughout the research, there are many translation techniques that can be employed by translators. However, this depends on the type of documents/texts that are being translated. Furthermore, the audience of the document and its formality cannot be neglected by a translator. Furthermore~~,~~ the researcher carried out the translation~~s~~ of the original documents into their target language. From this action, the researcher was able to conclude that having a vast vocabulary is crucial for understanding the topic under study in the documents. However, such vocabulary has to be different from the one considered "terminology," as it helps to reveal the capacity the translator has to convey different types of text if required. Moreover, the translator must have the needed skills to investigate and create their own glossary if needed. In addition, even if it is an obvious statement, an almost perfect usage of grammar in both languages, as grammar mistakes from the author are not uncommon, is necessary to convey in a clear way the message, which is the core of any translation.

6.2.2 To apply various translation techniques to the documents in order to achieve natural, cohesive, and accurate texts.

As it has been previously stated multiple times throughout the investigation, a document goes through a number of modifications in order to provide a 'natural' feeling to the readership, as well as perfect grammar, so that the text can that does make sense to the target language audience. According to Beaugrande and Dressler, a text is a "communicative occurrence which meets seven standards of textuality," these are:

cohesion, coherence, intentionality, acceptability, informativity, situationality, and intertextuality. The researcher, based on this and on the information gathered beforehand, came to the conclusion that rendering a ‘communicative’ text is a crucial responsibility on part of the translator, as it was experienced by the researcher when carrying out the translations. However, it has to be said that this is not a simple task, but it cannot be overlooked, either.

6.2.3 To evaluate the effect of the translation techniques applied on the documents.

In order to render a successful translation, the original document’s message must be the core of the translation, as this was the main objective of the researcher of this investigation. It has to be stated that a loyal or ‘literal’ translation is going to be ‘efficient’ or even ‘correct,’ as this can be entirely subjective to the translator. In addition, after researching the many different methods and procedures that exist, the translator concluded that the semantic translation method was more appropriate, as it allows a ‘faithful’ translation of the document, and at the same time, it gives room for a more flexible and ‘pleasing’ reading experience to the readership in the TL. On the other hand, the appliance of the different procedures, such as transposition, expansion (amplification) and reduction (omission), punctuation changes, among others, prove crucial when aspiring a natural and fluent translation, as grammar between two languages differ drastically, and modifications will be necessary.

6.2.4 To create a glossary with the most relevant terminology found in both texts.

It has been previously stated that when translating, the glossary is one of the best friends a translator can have, as it will assist them whenever an expression or terminology escapes their knowledge. During the translation process, the researcher had a tough time identifying some words that were used constantly in ~~on~~ the document, as they could be considered terminology on the civil engineering; therefore, the elaboration of a glossary helped him turn the tables around, as the glossary allowed him to experience a faster and easier translation process, and thus, to increase greatly the efficiency of the translator. As the researcher experienced firsthand the benefits of a glossary, he came to the conclusion that it is necessary to read the document first, and create their glossary before even thinking on starting the translation.

6.3 Restatement of the Research Question

As stated in Chapter I, the research question that was set at the beginning of the investigation was "What are the different effects of the procedures and methods used to translate the documents *Propuesta dique de cierre sector este* from Spanish into English and *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis* from English into Spanish for Insuma?" During this investigation, the researcher was able to analyze the different changes a document goes through when translating from the original language to the target language, and experience firsthand what goes behind the mind of a translator when he decides to make a modification to the text for the sake of the naturalness and fluency of the text, or just because of the lack of equivalent expressions in the target language. From this analysis, the researcher could conclude that, even though, small modifications are sometimes perceived 'negatively' by a portion of the readership, these ones are necessary to keep the text loyal to the original document and to message of the author. Moreover, the translator needs to remind the purpose of translation, so he does not too far with these modifications, as 'faithfulness' is part of the integrity as a translator.

6.4 Recommendations

After concluding this investigation, it is important to provide some recommendations for future researchers and/or translators. This is done in order to facilitate their investigation project or to help them clarify ~~a~~ doubts they may have by providing helpful information. In the following paragraphs, future researchers and/or translators can find these recommendations.

First, it is recommendable to pick a document that does not contain very technical or difficult terminology, as it would greatly hinder your work. Even though, it is nice challenge to try and overcome, it could make the process of translation unnecessarily difficult. In addition, be sure that the document deals with a topic of your interest, as it will help to keep attention and passion, while also maintaining high productivity levels. Moreover, this will allow to keep more information and create more interpretations or points of view for the researcher to work with.

Second, researchers must know really well the field they want to delve deeper. In other words, they must be familiar with the topic they will work with. This way the investigation will be about something that they know, making it easier to develop. However, at the same time, it has to be something interesting, so that it also a topic the researcher has the desire to learn about. Future researchers will have to gather and read a lot of information, as being a familiar and interesting topic shall help smooth things out.

Finally, your investigation will not only prove useful for you, but for many future researchers and/or translators. This project needs the researcher to dedicate many hours to collect, arrange, polish, and correct a lot of information. Therefore, researchers must keep in mind their project will assist many others in their future investigation projects.

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