



# FCCIS – Future Circular Collider Innovation Study

(EU – Horizon 2020)

## Contest “MINING THE FUTURE”

Use of excavated material from tunnel constructions at CERN

Application for Phase 1



**CONTRACT NUMBER: 951754**

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## Table of Contents

<b>1</b>	<b>Overall information and style .....</b>	<b>1</b>
1.1	Timetable .....	1
1.2	Document Submission Procedure .....	1
1.3	Text colour .....	1
1.4	Size of Article and Layout .....	1
1.5	Fonts and Paragraph styles .....	1
1.6	Headings .....	1
1.6.1	Level-1 Headings .....	2
1.6.2	Level- 2 Headings .....	2
1.6.3	Level- 3 Headings .....	2
1.6.4	Equations, Formulas and Units .....	2
1.6.5	Abbreviations .....	2
1.6.6	Footnotes .....	2
<b>2</b>	<b>Cover- sheet .....</b>	<b>2</b>
<b>3</b>	<b>Summary - Abstract .....</b>	<b>2</b>
<b>4</b>	<b>Introduction .....</b>	<b>3</b>
<b>5</b>	<b>Main part of the application .....</b>	<b>3</b>
5.1	Technical description and feasibility .....	3
5.1.1	Innovation potential .....	3
5.1.2	Technology Readiness Level (TRL) of the overall proposal .....	3
5.2	Economic viability .....	3
	Can the economic visibility at this stage be demonstrated? YES/NO .....	3
5.3	Societal value .....	3
	Can the societal value at this stage be demonstrated? YES/NO .....	3
5.4	Relevance of the proposed use case for the FCC project .....	3
	Can the project relevance at this stage be demonstrated? YES/NO .....	4
5.5	Conclusion .....	4
<b>6</b>	<b>Pictures and Tables .....</b>	<b>4</b>
6.1	General .....	4
6.2	Figures .....	4
6.3	Tables .....	4
<b>7</b>	<b>Acknowledgements .....</b>	<b>5</b>
<b>8</b>	<b>References .....</b>	<b>5</b>
<b>9</b>	<b>Annex (if any) .....</b>	<b>5</b>

# **1 Overall information and style**

## **1.1 Timetable**

Deadline for report submission, first phase: 31<sup>st</sup> October 2021

Review and decision of the jury: from 1<sup>st</sup> November to 30<sup>th</sup> November 2021

Information regarding the jury decisions: 1<sup>st</sup> December 2021

Deadline for second phase: 30<sup>th</sup> June 2022

Final event of the contest at ZaB: 20<sup>th</sup> October 2022

## **1.2 Document Submission Procedure**

You are requested to submit the final application for phase 1 in MS Word or open document(s) format (i.e. .odt) file as well as pdf file(s) on the platform: <http://cern.ch/registration-mining-the-future>

The documents may include figures, equations, formulas, and tables which you must insert in the file.

The application may include supplemental material that can also be uploaded on the same platform.

## **1.3 Text colour**

All titles, author names, paragraph texts, equations and formulas shall appear in black. Only photographs, graphs and tables will appear in colour.

## **1.4 Size of Article and Layout**

Your report for phase 1 should not exceed a maximum of 8 pages (the preferred minimum being 6 pages).

The expected page format is A4 (210x297 mm), where the upper, lower, left, and right margins are respectively 2.5 cm, 2 cm, 2.5 cm and 2.5 cm, as in this template.

Diagrams, texts, and tables may not exceed 160x240 mm, as in this template.

Use the full length of the page. Do not start a new paragraph at the bottom of a page; instead, move the heading of the said paragraph to the top of the following page.

The text should be written in a single column.

Only the page number, header and footer formats shown in this template are accepted.

## **1.5 Fonts and Paragraph styles**

The title styles are those of the Word template file. Avoid creating or inserting others.

Use the "Paper Title" style in this template for your heading (Arial Bold, font size 10, exactly 12-point line spacing, and 6-point spacing after paragraph).

Use the "Normal" style in this template to enter the name(s) of the author(s). (Arial, font size 10, exactly 12-point line spacing, and 6-point spacing after paragraph). The authors' institution, city and country of origin should be listed in italics.

Use the "Normal" style for all paragraphs within the text (Arial, font size 10, exactly 12-point line spacing, and 6-point line spacing before paragraph).

Do not insert any blank lines.

## **1.6 Headings**

Headings shall be numbered in sequence. Use the "Heading 1", "Heading 2", "Heading 3", respectively for the first, second and third levels.

Use the same style as in this template.

### 1.6.1 Level-1 Headings

Level-1 headings will appear as shown above (Arial, capital, bold, font size 12, 18-space spacing before).

### 1.6.2 Level- 2 Headings

Level-2 headings will appear as shown above (Arial, bold, font size 11, 16-point spacing before).

### 1.6.3 Level- 3 Headings

The use of Level-3 headings is not recommended. Should you decide to use them regardless, they will appear as shown above (Arial, bold, font size 10, 12-point spacing before).

- Replace them as needed with bullet points in the same style.
- Do not use headings of Level 4 or above.

### 1.6.4 Equations, Formulas and Units

Use the “Equation” style in this template for equation or formula lines (Arial, 10-point font size). Equations and formulas shall be centred and numbered in sequence, as in the example below. Numbering will be shown in parentheses, at the end of each line.

$$v = p n \text{ (1)}$$

Where *p* and *n* respectively denote penetration and rotation speed.

All symbols within the body of the paragraphs will be in italics, as in the line above.

Do not enter equations or formulas in the body of the paragraphs.

Do not enter any hyperlinks to the equations, formulas, figures, or tables.

Use only IS (International System) units.

### 1.6.5 Abbreviations

All abbreviations must be explicitly defined at their first occurrence in the text. For instance, Tunnel Boring Machine (TBM).

### 1.6.6 Footnotes

Do not incorporate references using footnotes.

## 2 Cover- sheet

In the annex there is a template for a cover- sheet to be used.

This is to be completed as follows:

- Title or project name
- Firstname name Author1, institution, city, country
- Firstname name Author2, institution, city, country
- The institution of affiliation of an author may be: the company, the firm, the university department, the research institute, the service of an administration.
- Logos

The cover- sheet does not count as a page and should not contain a page number.

## 3 Summary - Abstract

Please add a brief description of the use case. The summary must be written in English. The summary is intended to be published at the “resource efficiency seminar” at Zentrum am Berg (ZaB) at the final event of this contest.

The maximum size of the summary must not exceed 3000 characters. The summary must not include figures, formulas, or tables. Do not place any acknowledgments or references in the abstract.

## 4 Introduction

The report must include an introduction to the subject. This will not serve as a second summary and it should not be a repetition of the summary text.

## 5 Main part of the application

The main part of the application should describe how the proposed use case meets the criteria - which you can find in the Competition Guidelines. Note that all criteria are equally included in the evaluation. Write a separate chapter for each criterion (level-1 heading). Each chapter should have the same scope. The length of each chapter is not prescribed. Please note, however, that the entire application should not be longer than 10 pages.

### 5.1 Technical description and feasibility

Provide a technical description of the use-case scenario explaining all technologies and processes that are involved on a construction site from the phase at which the excavated material is obtained to the phase at which the use case produces value for the end-user. This part should also discuss which of the required technologies already exist as well as those that still need to be developed? [5000 characters]

#### 5.1.1 Innovation potential

Discuss the innovative potential of your proposal and whether it creates a new product or technology or service with added value for other industries/sectors beyond particle physics. [2000 characters]

#### 5.1.2 Technology Readiness Level (TRL) of the overall proposal

Describe, for each technology and process involved in the proposed approach the TRL level and the needed steps to bring the required technology or process to the highest TRL level that would allow implementing the proposed use case in a construction project. [3000 characters].

### 5.2 Economic viability

Describe the economic viability of the proposed approach, i.e., the overall economic benefit vs. the costs and efforts required for the proposed approach. If needed, submit/attach a separate file with calculations, in depth explanations and figures. [5000 characters].

#### **Can the economic visibility at this stage be demonstrated? YES/NO**

If YES please explain why the proposed approach is economically viable by giving a quantitative analysis [max 3000 characters]. Upload a complete economic analysis including calculations and figures as supplemental material.

### 5.3 Societal value

Describe the societal value of the proposed use case. Explain how the proposed approach is valuable for the society by giving an analysis of the potential impacts on human capital, scientific products, industrial spillovers, policy making, and other relevant impact pathways of the proposed approach. [5000 characters].

#### **Can the societal value at this stage be demonstrated? YES/NO**

If YES please upload a separate document (supplemental material) demonstrating the societal impact of your proposal including impact on human capital formation, industrial spillovers, scientific output, cultural value, and any other relevant impact pathway. [max 3000 characters]

### 5.4 Relevance of the proposed use case for the FCC project

Describe if and how the proposed use case deals with the molasse materials that are expected to be found in the perimeter of the specific future circular collider project. Explain for which fraction of the expected excavated materials and in which areas you believe that the proposed use case is relevant for the FCC study. [5000 characters].

## Can the project relevance at this stage be demonstrated? YES/NO

If YES Describe, how it can be practically demonstrated that the proposed approach is relevant for the project, considering the expected types of Molasse and the percentage that is likely to be used under the proposed approach [max 3000 characters].

### 5.5 Conclusion

Your report must include a conclusion, but do not waste space in unnecessary repetitions.

## 6 Pictures and Tables

### 6.1 General

All diagrams, photos, etc. (except tables) should be referenced as Pictures. Pictures and tables shall be centred and kept separate from the text. Number the figures, from 1. Number the tables, from 1.

### 6.2 Figures

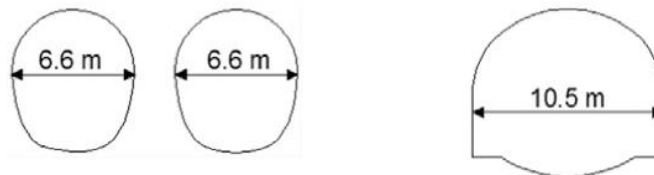
The electronic version of the booklet will be in colour.

Use figures of adequate quality. Make sure that the images are clear and presentable.

Captions, labels, and axis titles must be readable. Lines must be scanned to 900 dpi (for example, graphs or figures traced on computer, then printed and scanned to produce a .tif or .jpeg file). Colour lines must be scanned to 600 dpi (for instance, lines with shading or photos with lines added on or around the photos).

Use high-quality colour or black-and-white photos with clear contrast. Photos must be scanned to 300 dpi minimum. The contrast in colour photos must be adequate for black-and-white printing. Photos shall be considered figures and numbered as such.

When text is to be placed inside a figure (captions, axis labels, etc.), use the insertion style "text bubbles" in this template (Arial, font size 8 points).



**Figure 1. Example of figure**

Enter the title under the figure; use the style, "Figure Caption" in this template for the formatting of the title (Arial, font size 9 points, bold), as in the example.

### 6.3 Tables

Table titles should be placed above the tables, as in the example below (Table 1). Use the style "Table Caption" in this template (Arial, font size 9 points, bold, 6-point spacing before paragraph).

Use the style "Table Text" in this template for table content (Arial, font size 9 points, single-spaced, 2-point spacing before and after paragraph).

For the borders, use fine lines (1/4-point thick).

**Table 1. Example of Table**

Couche	E [GPa]	c [kPa]	d [m]
1	0.5	100	30
2	1.5	500	100
3	6.0	2000	> 200

## **7 Acknowledgements**

Place any acknowledgements immediately before the list of references under the heading "Acknowledgements", numbered as a Level-1 Heading.

## **8 References**

All sources must be referenced using the name of the author, followed by the year of publication. The following formats may be used: Schmidt (2007), Muller and Steiner (2010), Klein (2008a). In parentheses: (Schmidt 2007, Muller and Steiner 2010). If there are more than two authors, write "et al." after the first author's name. Example: Gianni et al. (1995).

Place the list of references at the end of the paper, under the Level 1 "References" heading. Use the "References" style in this template (Arial, 9-point font size, 6-point spacing before).

References may appear as shown below:

Abraham, K.H., et al. 1974. Vergleich von static, Spannungsoptik und Messungen beim Bau der Kaverne Waldeck II. Rock Mechanics, suppl. 3, pp 143-166

Duffaut, P. 2008. Pour être sûres, les centrales nucléaires doivent être souterraines. Tunnels & Outrages Souterrains, n°205, janv. 2008, pp 1-5

## **9 Annex (if any)**