PROJECT PROPOSAL

I. PROJECT PROFILE	
A. Title of the Project	Design, Development, Test and Market Validation of Marble Spool Insulator
C. Proponent	Romblon State University, College of Engineering and Technology
C. Project Cooperators	TIELCO (Tablas Island Electric Cooperative, Inc.); ROMELCO (Romblon Electric Cooperative, Inc.)
D. Project Duration	1 year project implementation 1 year monitoring of outcomes
E. Total Project Cost	**PhP 2,811,058.43** DOST MIMAROPA – PhP 2,542,695.43 RSU – PhP 268,363.00
II. PROJECT PROPOSAL	
A. Rationale	The Philippine Statistics Authority (PSA) published a report that the highest number of constructions every year in the Philippines are the residential constructions at 66.5%. And 89.7% from these constructions were single-type houses. Every new construction needs a connection to the local electric utility which requires all the necessary electrical devices, apparatus, and accessories for installation. Spool insulators are either made of polymer or porcelain, and spool insulators are exclusively imported from China and/or Thailand. On the other hand, marble as an insulating material appears to be more competitive than polymer and porcelain due to its abundance locally in the Province of Romblon. It has long been highly valued for its beauty, strength, and resistance to fire/corrosion. It is a metamorphic rock composed of recrystallized carbonate minerals most commonly calcite or dolomite. As a building material, marble is hard and features high compressive strength, strong wear resistance, high durability, and low water absorption capability. Therefore, marble has the potential as a viable alternative to polymer and porcelain as an insulating material in manufacturing spool insulators. Its abundance locally and inherent property to insulate make it an attractive material to consider. The proposed intervention of this research will be on the development of relatively cheap marble spool insulators from existing designs accepted in the market. It also includes quality tests of the developed product in accordance with ANSI standards and market tests for the product with the local electric service providers (TIELCO and ROMELCO).
B. Project Description	The research aims to fabricate a prototype of marble insulators at RSU Romblon Campus. The insulators will then be tested its physical and mechanical properties at RSU Main. Validation tests will also be conducted in accordance with ANSI standards. Tests will be made locally and will be validated in ANSI accredited laboratory in Singapore or Thailand.
C. Objectives	The main objective of the project is to develop and test the marble spool insulator. Specifically, it has the following objectives: 1. Design and development of marbles as spool insulators; 2. Test the marble for the following electrical properties of the marble spool insulator such as Low-Frequency Dry Flashover, Low-Frequency Wet Flashover, Vertical, and Low-

<table>
<tr><td></td><td>Frequency Wet Flashover, Horizontal;
3. Test the marbles to determine its physical and mechanical properties (Transverse Strength); and
4. Determine and then standardize the production cost of the marble spools after development and testing</td></tr>
<tr><td>D. Methodology</td><td>Class/Type-A (white) marble slabs with an appropriate dimension will be used as material for constructing the samples of marble spool insulators. The marble slabs must be dried and cleaned before storage and processing. The slabs will be cut into required lengths, to be formed and polished by hand to shape and size like ANSI C29.3 Class 53-2 spool insulator. Samples of the marble spool insulators as test specimens will be sent to an ISO/IEC 17025 accredited testing center. All tests will be conducted under the ANSI C29.1-1988 (Test methods for electrical power insulators) and ANSI C29.3-1986 (Wet-Process Porcelain Insulators Spool Type). Product and human safety during development, testing, and marketing stages would also be ensured through proper capability trainings for the researchers, and through tapping experts in the industry to oversee and assist during activities related to the project.</td></tr>
<tr><td>E. Business Plan</td><td>The existing porcelain spool insulator costs Php 50.00 while a piece of marble spool insulator costs Php 45.00 when produced in very small quantities. By economies of scale, the cost per piece of production of the marble spool insulator can be reduced significantly making it even more competitive in the local market. With mass production, the sale-purchase for each spool insulator could be between Php 30 to Php 40. Therefore, if the local electric distribution units (ROMELCO and TIELCO) purchase the product, their savings can be as high as Php 10 to Php 15 for each piece.
By expecting the production to be 100,000 pieces for the first two (2) years, translates to significant savings for ROMELCO/TIELCO equivalent to Php 1,000,000, and as high as Php 1,500,000. A domino effect should take place as these savings can be used for their development which includes new project works and job positions.
On the production side of this venture, the estimated cost of production for every piece is Php 30. Considering a 70% fixed cost (maintenance and cost labor in production) means that more jobs for the locals can be created as well as in the development of the production. Moreover, for each sale of the marble spool insulator (maximum of Php 40) expects a profit of Php 500,000 (Php 5.00 per piece) to Php 1,000,000 (Php 10.00 per piece) from the 100,000 items produced.
On the other hand, CNC machines can be considered in producing more quantities for a relatively shorter time at a lesser cost of production when an expansion is needed for export.</td></tr>
<tr><td>F. Activity Schedule</td><td>The following timetable will be followed:
<table><tr><td>Activity</td><td colspan="2">2020</td><td colspan="3">2021</td><td>2022</td></tr><tr><td></td><td>3Q</td><td>4Q</td><td>1Q</td><td>2Q</td><td>3Q</td><td>4Q</td><td></td></tr><tr><td>Consultation and meetings</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Project proposal preparation</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Project proposal review</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Revision, approval and MOA</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
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	signing							
	Fund release		x					
	Fabrication of marble insulator and procurement of equipment and supplies		x	x				
	Research proper		x	x	x			
	Completion & report preparation				x	x		
	Generation of 6 Ps					x		
	Liquidation						x	
	Report presentation						x	
	Monitoring			x	x	x	x	x

G. Budget Breakdown

The following line-item-budget would be followed for the project:

ITEM	DOST-GIA (P)	RSU (P)
MOOE		
Travelling Expenses – local	17,600.00	60,000.00
Training Expenses		
Supplies and Materials	19,000.00	10,000.00
Other Professional Services (@P1400/researcher x 2 researchers x 2 days / 2 weeks x 10 months)	112,000.00	76,363.00
Representation	6,000.00	
Other MOOE		
Fabrication Expenses	23,095.43	80,000.00
Transportation and Delivery		30,000.00
Communication		12,000.00
Equipment Outlay		
1 Unit 30KV Automatic Lighting Impulse Voltage Generator Tester for wet and dry flashover tests using ANSI 53-2 porcelain spool insulators	2,300,000.00	
1 Unit Data Analytics / Processor: 10th Gen. processor with 1.8 GHz based frequency, up to 4.10 GHz (atleast 8MB cache quad-core) / Storage: atleast 512GB SSD / RAM: atleast 8GB DDR4 / GPU: atleast 2GB dedicated display memory / Screen Size: 13.3 HD Resolution / Pre-loaded OS: Licensed Windows 10 64-bit / Inclusion: Laptop bags, wireless mouse	65,000.00	
Total	**2,542,695.43**	**268,363**

Romblon State University (RSU) counterpart would be the travel of faculty to present the paper and office supplies for preparation of manuscript, reports, and liquidation.

H. Project Management

The research would be implemented by the Romblon State University through the College of Engineering and Technology. The PSTC Romblon would coordinate with the regional office on the purchase of the equipment and in other aspects of project implementation.

I. Expected Output	After the research had been implemented, the following are expected: *Products.* Marble spool insulators that conform with ANSI standards for spool insulators; *People.* The project output and its development will open opportunities for local marble processing/shops to produce marble spool insulators consequently leading to the creation of new jobs. *Places and partnerships.* If successfully developed leading to its commercialization, the two local electric distribution utility: ROMELCO and TIELCO will be the first industry partners of the project. This will be followed by local marble shops as they start producing the marble spool insulators with inspection of the experts from the RSU College of Engineering and Technology. *Protection.* A published patent or utility model of the product. *Publication.* Published research paper of the marble spool insulator in a relevant scientific or professional journal. *Policy.* After the research was conducted, a policy draft on how to produce the marble insulators in accordance with ANSI standards and the same for local corporations.
J. Monitoring and Evaluation	Monitoring and evaluation will be made by the DOST PSTC Romblon. Monitoring and evaluation will be centered on project deliverables as listed in the expected output.

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