

## Efforts To Promote Infrastructure Through The Making Of A Light Steel Frame Bridge With Composite Floor In Nanggela Village

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### ABSTRACT

The Civil Engineering Department of Road and Bridge Design Engineering Study Program in order to support the government's efforts to advance disadvantaged villages in infrastructure, contribute to advancing infrastructure in the village of Nanggela. Contributions are given in the form of community service activities, namely: construction of a lightweight steel bridge with composite floors that connects the villages of Nanggela – Nanggerang funded by the Politeknik Negeri Jakarta's research and community service unit. The implementation method carried out includes the preliminary stage, Bridge structure design stage, proposal preparation stage to UP2M PNJ, and Stage of activity implementation. The results obtained are the installation of a lightweight steel bridge using a composite floor that is able to connect between the villages of Nanggela and Nanggerang in Kali Caringin, RT 04 RW 03, Nanggerang Village, Kec. Tajur Halang, Bogor Regency, West Java and suitable for use by residents around the lightweight steel bridge with composite floors is a technological innovation in the field of bridge structures that can be applied to community service programs based on this study program.

**Keywords:** Community service; Bridge; Light steel; Composite flooring.

### INTRODUCTION

In a road network, bridges serve to unite two points that are cut off by an obstacle such as roads, rivers, valleys and railroads (Rosyada & Indianto, 2021). Before 1989, Nanggela was in the same village as Nanggerang, only in that year it split into Sukmajaya village, Nanggela is the name of the village that is integrated with the people of Nanggerang, Tajurhalang, Kab. Bogor, West Java, Indonesia. Currently Nanggela is one of the underdeveloped villages in the Tajurhalang area in terms of infrastructure.

In order to support the government's efforts to advance disadvantaged villages in infrastructure, The Road and Bridge Design Engineering Study Program contributes to advancing infrastructure in the village of Nanggela. Contributions are given in the form of community service activities, namely: construction of a lightweight steel bridge with composite floors that connects the villages of Nanggela - Nanggerang. The bridge connects the village of Nanggela with the village of Nanggerang with a size of 6 x 3 m. The village is located in the Kali Caringin area, RT. 04, RW. 03, Nanggerang Village, Kec. Tajurhalang, Kab. Bogor, the location can be seen in Figure 1(appendix). Located about 22.5 km from the Politeknik Negeri Jakarta campus as seen on google maps Figure 2 (appendix).

Based on survey data and interviews with village secretaries, RT heads, and local RW heads on Saturday, March 27, 2021, it was found that people in carrying out their daily activities often cross bridges with bamboo as shown in Figure 3 in the appendix. Therefore, the community service team for Road and Bridge Design Engineering took the initiative to serve the area to build a pedestrian bridge that can be passed by 1 car and motorbike.

The purpose of the Community Service activity program for Road and Bridge Design Engineering Study Program, Department of Civil Engineering, Politeknik Negeri Jakarta, is the construction of a lightweight steel bridge with composite floors that connects the village of Nanggela – Nanggerang in Kali Caringin, RT 04 RW 03, Desa Nanggerang, Kec. Tajurhalang, Bogor Regency, West Java.

### METHOD

The type of community service that we do is community service based on a study program, namely the Road and Bridge Design Engineering study program. The location of our

service is Kali Caringin, RT 04 RW 03, Nanggerang Village, Kec. Tajur Halang, Bogor Regency, West Java. The lightweight steel bridge assembly is carried out at the bridge workshop, namely at Perum LIPI Pondok Rajek Indah, block H, no. 22, Pondok Rajek, Cibinong, West Java. The tools and materials needed in the manufacture of composite floor light steel bridges can be seen in table 1.1 in the appendix.

This PkM activity is carried out for a period of 9 months, namely March - November 2021. The stages carried out include:

1. Preliminary stage

The preliminary stage is the initial stage when conducting PkM, before carrying out the preliminary stage activities carried out include:

- a. The study program PkM team meeting was held with the aim of establishing a common perception between team members and determining what service was in accordance with the study program that had the value of innovation. And it was agreed by the team members and the head of study program to carry out PkM in Bogor Regency, namely the manufacture of composite floor light steel bridges
- b. Conducting a site survey and observation can be seen in Figure 3 in the attachment  
A site survey is carried out to determine the exact situation of the location to be built, so that the stretch of the bridge that will be built can be known and conduct a survey to the job site to see field conditions and take measurements (Rusyid & Indianto, 2019). Observation, that is making direct observations to the location, intense in dialogue and participating in daily habits activities (Haryono et al., 2021). Then to determine how important this location is a bridge is made.

2. Bridge structure design stage

Structural design aims to produce a structure that is stable, strong, durable, economical and easy to implement(Haryono et al., 2021). Design is the process of determining the parts of the bridge structure that are expected to be able to withstand the load on it. The purpose of this design is to obtain a bridge that is stable, strong, durable, inexpensive, and provides convenience during installation in the field. This lightweight steel bridge is an innovation in the field of bridge structures using composite floors. To unite the concrete with the frame (bondek) between the two, a shear connector is installed, resulting in a composite action (A Indianto & Supriyadi, 2013; Andi Indianto, 2011). The design of the light steel bridge structure can be seen in Figure 4.

The process that has a further important role is to include a budget plan (RAB) which consists of a plan for the purchase price of materials, worker wages, equipment rental, lunch, and so on.

3. Stage of preparation of proposals to UP2M PNJ

The cost to carry out this service is entirely dependent on the funding proposal submitted to the Unit Penelitian dan Pengabdian Masyarakat (UP2M) of Politeknik Negeri Jakarta (PNJ).

4. Activity implementation stage

The method of implementing the activities carried out in community service by the Road and Bridge Design Engineering study program, PNJ Civil Engineering Department, is

a. Preparation phase

After the proposed funds are approved in the amount of Rp. 25,000,000. The activity implementation team carried out the preparation stage, namely a coordination meeting with the implementation team and purchased the materials needed. The materials needed are listed in table 1.1 below.

b. Light Steel Bridge Circuit

The assembly of the light steel bridge starts from cutting the material, making the holder for the wiremesh, welding, assembling the bridge frame into a single unit.

c. Bridge truss structure testing

Testing of the bridge truss structure is carried out with a load of > 500 kg.

d. Bridge structure assembly in the field

Assembling the bridge structure in the field requires a lot of energy to lift the bridge to the service location. In addition, the head of the bridge also needs the right place for the bridge to be installed.

e. Bridge floor casting

Making composite floors on light steel bridges requires a lot of energy, therefore local residents, homebase lecturers at TPJJ, and students are needed to be present to help complete the activities.

f. Bridge load testing

The load test is planned to be tested with a full load of 1 public transportation, which is about 1600 kg of cargo to carry out tests on this bridge.

## RESULTS

The results achieved in this community service activity program include:

1. The lightweight steel composite floor bridge has succeeded in connecting the villages of Nanggela and Nanggerang so as to make it easier for local residents to carry out their activities, for example to land, selling, as shown in Figure 5.
2. The span obtained from the bridge is 2 x 6 meters as shown in Figure 6.
3. The lightweight steel composite floor bridge is able to withstand a load of approximately 1600 kg.

Photos of community service activities in order to advance infrastructure in Nanggerang Village can be seen in the appendix.

## DISCUSSION

Community service activities based on study programs, in this case carried out by the Road and Bridge Design Engineering study program, PNJ Civil Engineering Department, are the installation of a light steel bridge using a composite floor that is able to connect between the villages of Nanggela and Nanggerang in Kali Caringin, RT 04 RW 03, Desa Nanggerang, Kec. Tajur Halang, Bogor Regency, West Java and suitable for use by local residents. In implementation of course there are several obstacles faced by the team, namely:

1. When making the bridge head, there is a dimensional discrepancy so that the distance between the bridge heads does not produce a suitable bridge span
2. At the time of assembling the bridge, workers who usually do light steel truss work for roofs have difficulty because there are slight differences in making these lightweight steel truss bridges.
3. The location of the bridge which is at the end of the settlement and the road leading to the bridge has not been paved, making it difficult to mobilize tools and materials.

However, these obstacles can be anticipated and minimized by:

1. The head of the bridge that has been made and produces the span made is carried out by first making a reference for the weighting.
2. Provide direction and guidance to workers from cutting to installing this light steel frame bridge.
3. Manually transport tools and materials from the last point of the vehicle to the bridge construction site.

## CONCLUSIONS And RECOMMENDATIONS

The installation of a lightweight steel bridge using a composite floor that is able to connect between the villages of Nanggela and Nanggerang in Caringin River, RT 04 RW 03, Nanggerang Village, Kec. Tajur Halang, Bogor Regency, West Java and suitable for use by residents around the lightweight steel bridge with composite floors is a technological innovation in the field of bridge structures that can be applied to community service programs based on this study program.

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### **REFERENCES**

- Haryono, K., Wahyuni, E. G., & Fahreza, F. M. A. (2021). The Mapping of Mosque Community to Improve Mosque Engagement in Community Kholid. *Abdimas Umtas: Jurnal Pengabdian Kepada Masyarakat*, 4(2), 770–781.
- Indianto, A., & Supriyadi, I. (2013). Studi Kasus Kerusakan Jembatan Dan Pengaruhnya Terhadap Sisa Umur Jembatan. *Jurnal Poli-Teknologi*, 12(9). <http://jurnal.pnj.ac.id/index.php/politeknologi/article/view/589>
- Indianto, Andi. (2011). Pengaruh Lantai Komposit Terhadap Kinerja Rangka Baja Pratekan. *POLI TEKNOLOGI*, 10(1), 48–54.
- Rosyada, A. S., & Indianto, A. (2021). Evaluasi Kapasitas Tiang Pancang Miring pada Pilar Jembatan Tipe Pile Cap. *Journal of Applied Civil Engineering and Infrastructure Technology*, 2(2), 32–38. <https://doi.org/10.52158/jaceit.v2i2.245>
- Rusyd, I., & Indianto, A. (2019). Redesain struktur bawah jembatan dengan kepala jembatan tipe pile cap. *Seminar Nasional Teknik Sipil Politeknik Negeri Jakarta*, 575–580.

## APPENDIX

Table 1.1. Materials used for the manufacture of bridges Mild steel composite floors

No	Description	Quantity	Unit
1	Mild Steel CNP 1 MM	38	stem
2	Bondek 6m 0.75 mm	2	Sheet
3	couplers	2	Box
4	Iron 10 Full	2	stem
5	Ring M6 (100Ppcs)	2	Pack
6	Bolt 8.8 10X15	200	Fruit
7	Nachi Drill Bit No 6	3	Fruit
8	4" cutters	1	Box
9	Nikko Welding Wire 2mm	1	Box
10	Cast Plastic	1	kg
11	Sika Concrete Additive	3	Bottle
12	Aviation Snip Left Cutting	1	Unit
13	Wiremesh M6	2	Sheet
14	Bolt 8.8 10X15	150	fruit
15	Dianbolt 10*105	20	Fruit
16	Dianbolt 10*105	20	Fruit
17	couplers	1	Box
18	0.65 . Mild Steel	3	stem
19	reng	2	stem
20	L screw (Contents 100/pack)	2	Pack
21	10 . T lock	1	Fruit
22	Acrylic	2	Fruit
23	reng	5	stem
24	0.65 . Mild Steel	1	stem
25	M Coupler 10*19	200	Fruit
26	Nails 5 and 7	0.5	kg
27	Building Yarn	3	Roll
28	Ropering 7cm	200	fruit
29	Cimankok Sand	1	Cabbage
30	Cement	9	Zak
31	Split	1.5	Cabbage

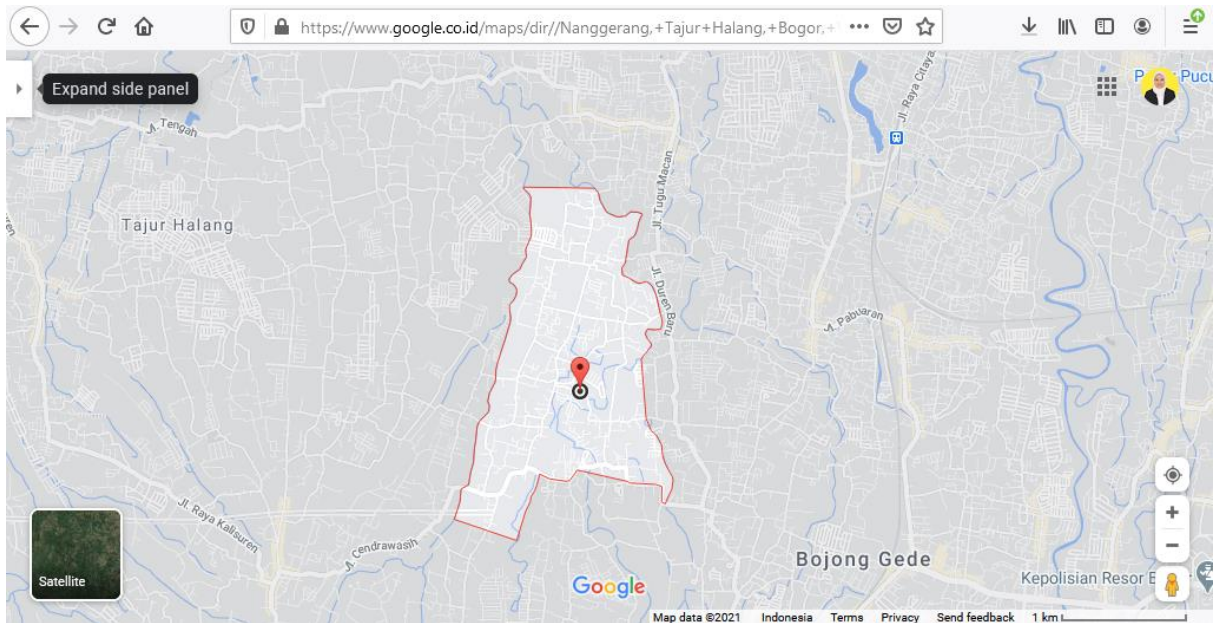


Figure 1: Location of Nangerang Village, Tajurhalang District, Bogor Regency

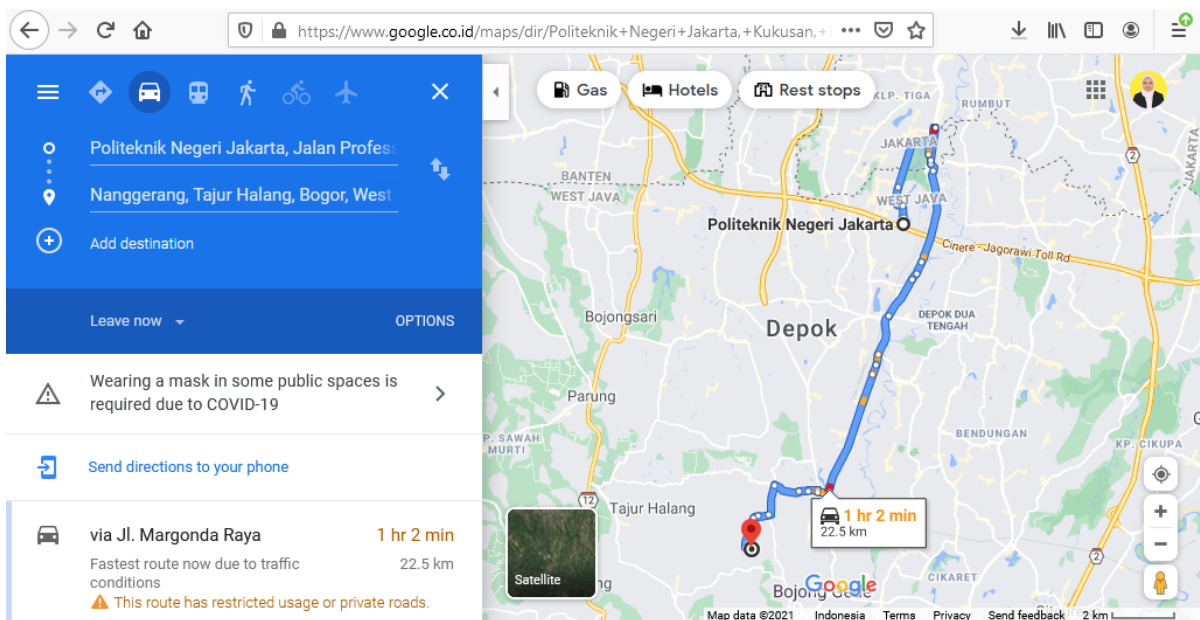


Figure 2: Distance from the Politeknik Negeri Jakarta to the location



Figure 3: Survey of the location of the pedestrian bridge with a bamboo base

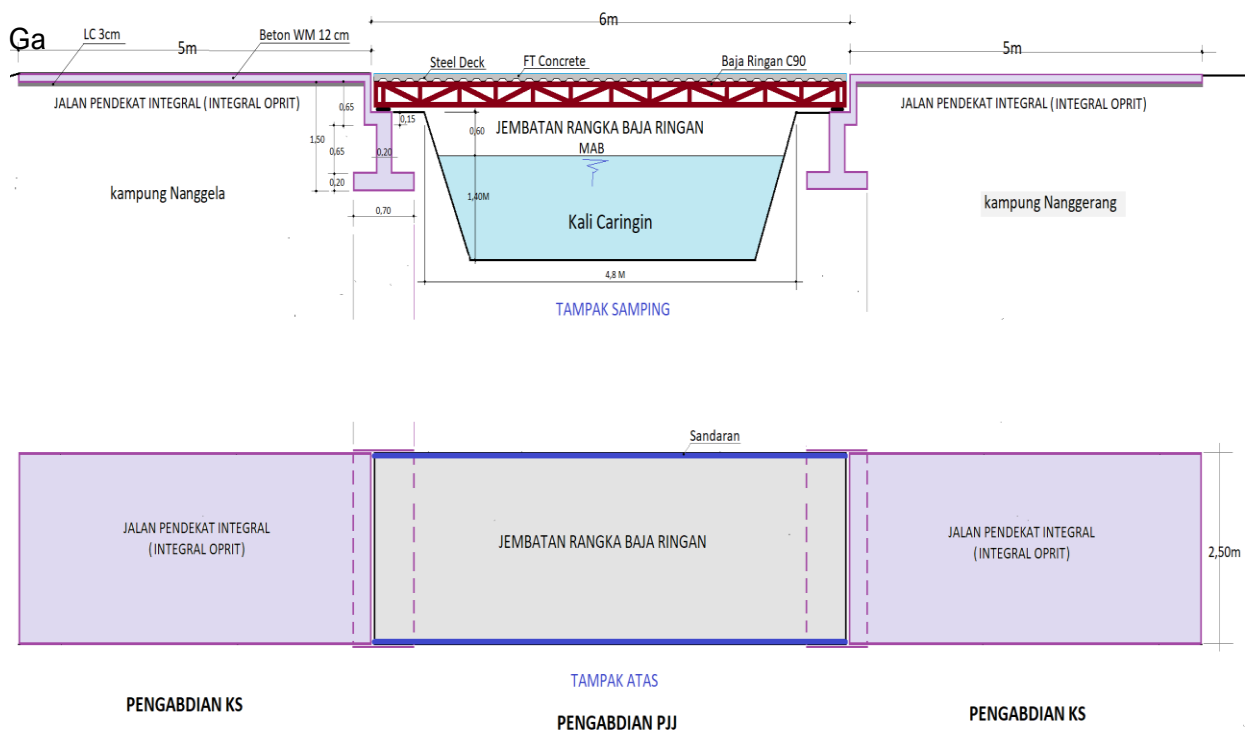


Figure 4: Community Service Design composite floor light steel bridge structure



**Figure 5:**The composite floor light steel bridge successfully connects the villages of Nanggela and Nanggerang



**Figure 6:**The span obtained from the bridge is 2 x 6 meters