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CONSTRUCTION OF SLOOF FOR THE RW 021 OFFICE IN BAKTIJAYA, SUKMAJAYA, DEPOK TO SUPPORT COMMUNITY ACTIVITIES

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Abstract

RW 021 is located in Baktijaya, Sukmajaya, Depok, about 5 km from Politeknik Negeri Jakarta (PNJ). The area includes 10 RTs, each with around 120 households. A key issue in RW 021 is the lack of a meeting hall for community activities such as posyandu, PKK programs, and counseling, which are currently held in residents' homes. In 2024, the foundation of a proposed RW office building was constructed using community service funding from the PNJ Civil Engineering Department's Materials and Structures Expertise Group, applying research on Self-Compacting Concrete (SCC) with blended cement. To continue construction in 2025, another research result was implemented, utilising steel waste fibre for casting the building's reinforced concrete slab beams. This project aimed to apply flexural performance research of fibre-reinforced concrete beams for sloof casting. As a result, the sloof casting was completed according to the planned drawings for the RW 021 office building.

Keywords : Self-compacting Concrete; Blended Cement; Footing Foundation

Abstrak

RW 021 terletak di Baktijaya, Sukmajaya, Depok, sekitar 5 km dari Politeknik Negeri Jakarta (PNJ). Wilayah ini mencakup 10 RT, yang masing-masing terdiri dari sekitar 120 kepala keluarga. Masalah utama di RW 021 adalah ketiadaan balai pertemuan untuk kegiatan masyarakat seperti posyandu, program PKK, dan penyuluhan, yang saat ini masih dilaksanakan di rumah-rumah warga. Pada tahun 2024, fondasi bangunan kantor RW yang direncanakan telah dibangun menggunakan dana pengabdian masyarakat dari Kelompok Keahlian Material dan Struktur Jurusan Teknik Sipil PNJ, dengan menerapkan hasil penelitian tentang Self-Compacting Concrete (SCC) menggunakan semen campuran (blended cement). Untuk melanjutkan pembangunan pada tahun 2025, hasil penelitian lainnya diimplementasikan dengan memanfaatkan limbah serat kawat baja untuk pengecoran balok sloof beton bertulang pada bangunan tersebut. Kegiatan pengabdian ini bertujuan untuk mengaplikasikan penelitian kinerja lentur balok beton bertulang serat pada pengecoran sloof. Hasilnya, pengecoran sloof berhasil diselesaikan sesuai dengan gambar rencana bangunan kantor RW 02.

Kata Kunci : *Self-compacting Concrete; Semen Campuran; Fondasi Telapak*

INTRODUCTION

Fibre-reinforced concrete is a type of concrete incorporating additional fibres to enhance its tensile and flexural properties. Steel wire waste, in the form of straight, ductile fibres (Amalia & Muhtarom, 2021), has been proven effective in improving the tensile and flexural strength of Self-Compacting Concrete (SCC). According to Amalia et al. (2023), the use of straight steel wire waste fibres can effectively delay the formation of initial cracks and enhance the flexural performance of reinforced concrete beams.

RW 021 is a community located in the Baktijaya sub-district, Sukmajaya, Depok, approximately 5 kilometres from the Jakarta State Polytechnic (PNJ) campus. It consists of 10 neighborhood units (RT), with an average of 120 households (KK) per RT, each comprising 4 to 8 family members. Most residents are tenants without permanent housing. The majority work as online motorcycle taxi drivers (ojek online), street vendors, labourers, construction workers, with a small percentage as civil servants. The average education level in this area includes junior high school graduates (±40%), elementary school graduates (±15%), high school graduates (33%), and university graduates (12%).

The results of the preliminary survey show land data for the planned location of the building and Posyandu activities, as well as other activities of RW 021, which are held at residents homes because they do not have a building or meeting room. One of the pressing issues faced by the residents of RW 021 is the absence of a community hall or dedicated space for holding neighbourhood activities. To date, activities such as integrated health services (posyandu), Family Welfare and Empowerment (PKK) programs, public outreach, and other meetings have been conducted in residents' homes. This lack of proper facilities has significantly limited the effectiveness of community initiatives. A site for the construction of the RW office building has been secured in RT 06. In 2024, the footing foundation was completed through community self-funding and support from a Community Service Program carried out by the Materials and Structures Expertise Group of the Civil Engineering Department, PNJ. The program utilised SCC with blended cement, based on previous research.

The result of this study on the use of steel wire fibres in SCC concrete mixture can increase tensile strength, flexural strength, and inhibit micro-cracking due to shrinkage in reinforced concrete beams (Amalia et al., 2023). The innovation in reinforced concrete beams and columns for the RW 021 office building addresses a critical need of the residents. This innovation enhances the serviceability of sloof beams and reinforced concrete columns (Masoud et al., 2018), extends the building's overall lifespan, and reduces maintenance and repair costs. The urgency of applying this research-based innovation is directly linked to the community's need: without a dedicated meeting hall, RW 021 residents are unable to conduct public health programs (posyandu), PKK activities, and community counseling in a proper, permanent space. The application of SCC with steel wire waste fibres thus serves as a targeted technological solution to an identified structural and social problem, bridging academic research output with grassroots infrastructure demand.

To assist residents in continuing the construction of the building, this activity aims to apply research findings on the flexural performance of reinforced concrete using steel wire waste fibre (Ahmed, 2020; Wael et al., 2018). This innovation involves producing self-compacting concrete (SCC) with added steel-wire fibres to improve concrete performance and prevent early cracking due to shrinkage or applied loads (Doo-Yeol Yo, 2022). In addition to supporting infrastructure development, this activity also serves as a means to educate the community on the correct and environmentally friendly practices for producing and casting SCC on-site. Several previous community service programs (PkM) have addressed similar infrastructure challenges in underserved urban communities. For instance, Wahyudi et al. (2022) conducted a PkM program involving the construction of a community health post (posyandu) facility in Bekasi using conventional reinforced concrete, successfully improving local health service access. Similarly, Suhartono et al. (2021) reported a PkM initiative in Bogor focused on building a multipurpose community hall using standard concrete, demonstrating the social benefits of infrastructure-based community service. Compared to these prior programs, the present initiative introduces a distinctive technological innovation—the use of SCC with steel wire waste fibres—which not only addresses the construction need but also contributes to sustainability by repurposing industrial waste materials. This positions the current program as both socially impactful and technically advanced relative to comparable community service activities.

METHOD

The community service location is RT 06, RW 021, Baktijaya sub-district, Sukmajaya, Depok. The partners involved include all heads and administrators, as well as representatives of residents from RT 01 to RT 10, RW 021, Baktijaya sub-district, Sukmajaya, Depok. This community empowerment activity involved the continued construction of a meeting hall for RW 021 by fabricating the sloof beams and structural columns using Self-Compacting Concrete (SCC) mixed with steel wire waste fibres. The method applied is based on previous research on the flexural performance of reinforced concrete beams using this type of fibre (Juan et al., 2019), which has been shown to enhance concrete strength and inhibit microcracks, leading to better structural performance. This activity was conducted for 6 months, from February to July 2025.

To evaluate the impact and effectiveness of the program, several quantitative and qualitative evaluation methods were employed. Structurally, the compressive strength of the SCC mixture was tested using standard cylindrical specimens (diameter 150 mm, height 300 mm) cured for 28 days, in accordance with SNI 1974:2011. The target compressive strength was 25 MPa (f'c = 25 MPa), consistent with the mix design based on prior research. In addition, the sloof beam dimensions were checked after formwork removal to verify conformance with the working drawings (200 mm x 300 mm for sloofs; 250 mm x 250 mm for columns). Socially, the program's impact was assessed through a structured questionnaire distributed to 24 community members from RW 021 (representing all RT 01–10), covering seven key evaluation indicators: (1) responsiveness and professionalism of the PkM team; (2) speed of program implementation; (3) conformity of activities with community expectations; (4) usefulness of program outcomes; (5) implementation according to agreed plan; (6) communication of final program report; and (7) willingness for future collaboration. Responses were recorded on a four-point Likert scale: Sangat Setuju (Strongly Agree), Setuju (Agree), Tidak Setuju (Disagree), and Sangat Tidak Setuju (Strongly Disagree).

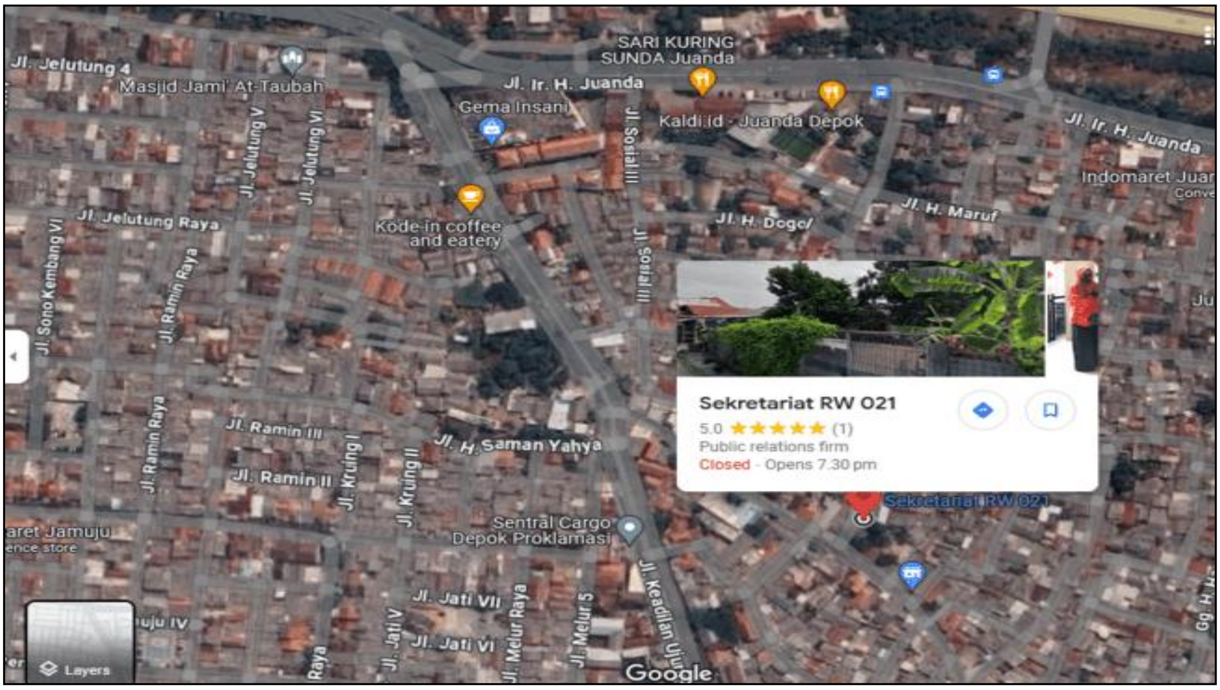
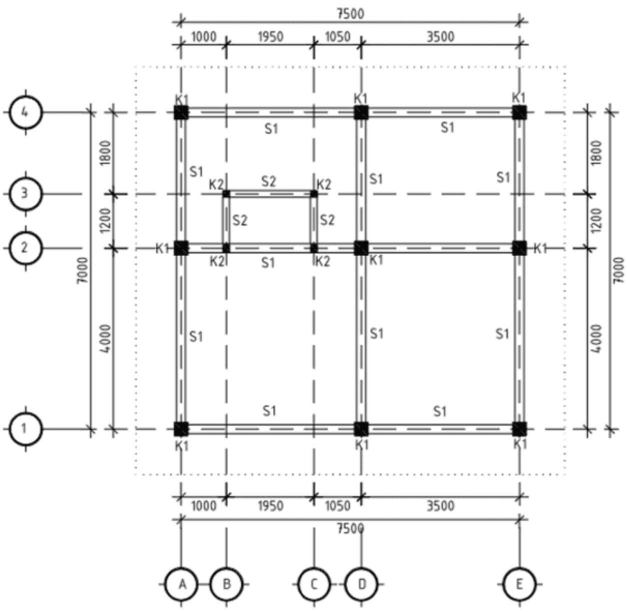


Figure 1. Community Service Location: RW 021 Secretariat Building, Kelurahan Bakti Jaya, Kecamatan Sukmajaya (Sumber: Google Maps)



S1	SLOOF	200x300mm
S2	SLOOF	150x200mm

Figure 2. Floor Plan for Sloof Beam and Column

The stages of activities to achieve the objectives of the service are as follows: location survey to identify the problems faced by residents, inventory of data on the geographic and sociological conditions of residents, making working drawings of sloof beams and reinforced concrete columns, making SCC concrete mix designs with the addition of waste wire fiber, calculating material requirements, making formwork and reinforcement of sloof beams and columns, carrying out casting of sloof beams and columns, concrete maintenance/curing, dismantling of formwork.

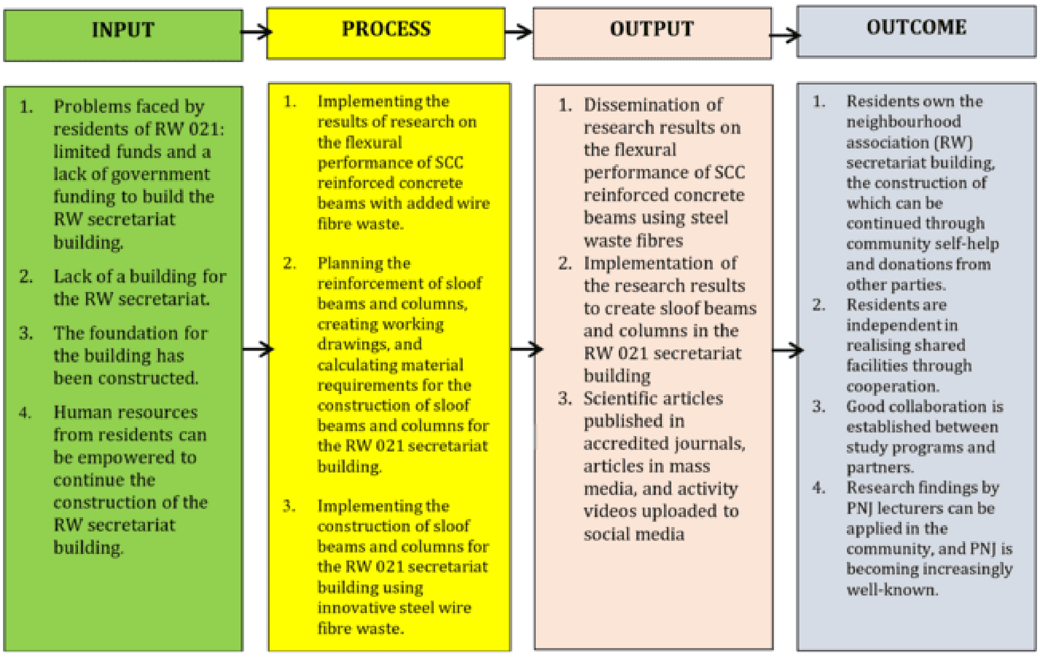


Figure 3. Program Implementation Process Diagram

The dimensions of the sloof beams constructed are 200 mm × 300 mm, and the columns are 250 mm × 250 mm with a clear height of 3.6 meters, totaling nine columns. The reinforcement details for both sloof beams and columns are shown in Figure 2. The implementation stages included:

1. Site Preparation: Community members carried out land clearing and levelling in a spirit of cooperation (gotong royong), supervised by the implementation team.
2. Fabrication of Sloof Beams: Formwork was built, and reinforcement was assembled for the sloof beams.
3. Fabrication of Columns: Column reinforcements were tied and placed along with the formwork.
4. Concrete Mixing: SCC was mixed with added steel wire fibres as per the specified proportions derived from research.
5. Casting: Concrete was poured into the prepared formwork for both sloof beams and columns.
6. Curing: The concrete was cured for 28 days by community members through regular watering at least once per day.

The main community partner for this program was the RW 021 leadership and residents, representing RT 01 through RT 10 in Baktijaya, Sukmajaya, Depok. Their contributions included:

1. Providing the construction site for the RW 021 secretariat building.

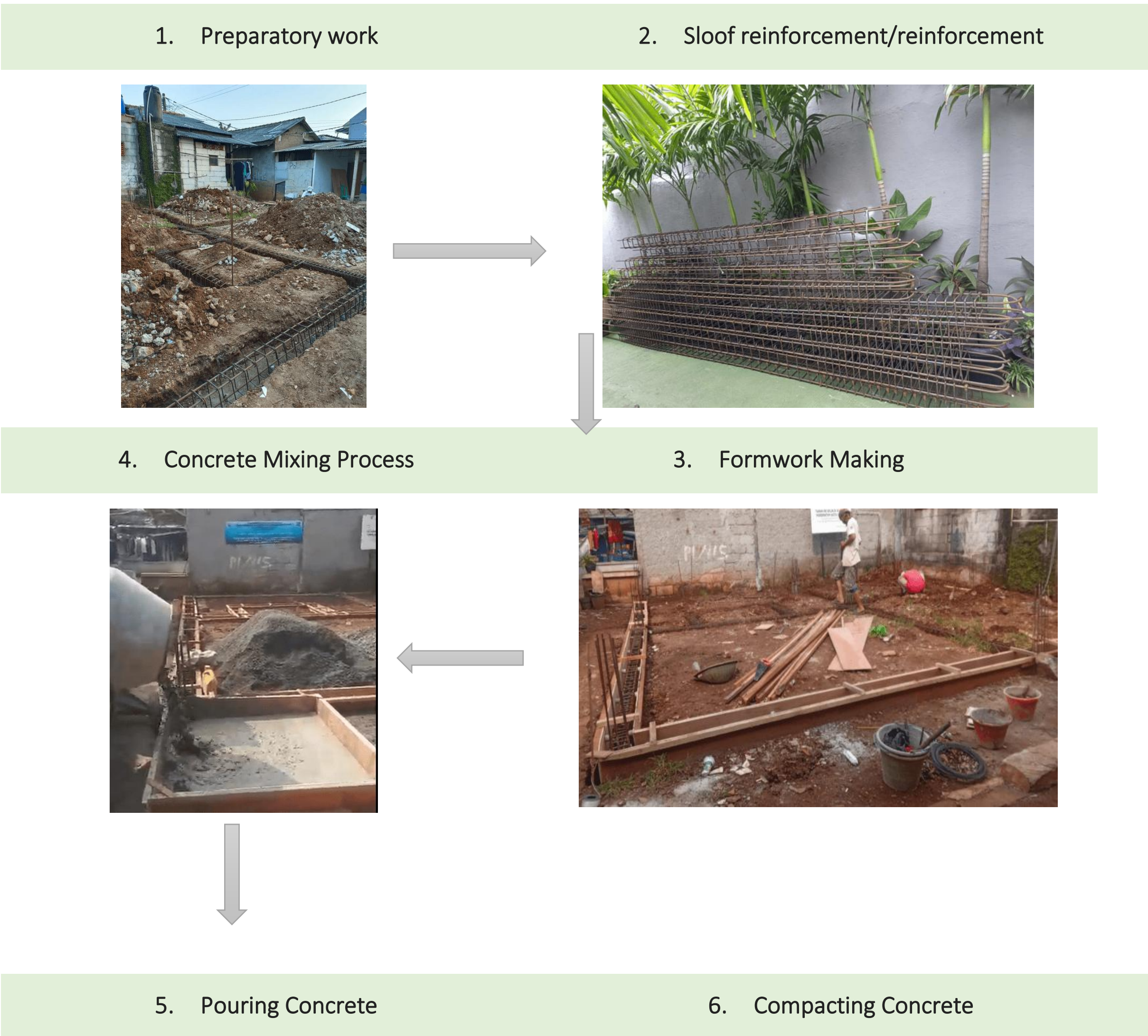
2. Supplying electricity and water during the construction process.
3. Participating in site preparation, formwork and reinforcement assembly, material transport, and concrete casting-all conducted collaboratively.
4. Providing necessary tools and equipment, as well as preparing meals during implementation.

Program Sustainability: Upon completion of the sloof beams and columns, the residents of RW 021 plan to continue the building's construction incrementally using community self-funding or donations. This ongoing effort supports the long-term goal of establishing a functional and permanent secretariat building for community activities.

RESULT

Preparatory work includes land clearing and digging holes where the sloof will be installed. After land clearing is completed, the work continues with reinforcement. The sloof reinforcement is made according to the working drawings, namely a sloof with dimensions of 200 mm × 300 mm, with a concrete cover thickness of 40 mm. The sloof is installed according to the building plan drawings. Before casting, formwork is made and concrete decking is installed. The assembled reinforcement is set at the building site, and then the formwork is installed before casting. The prepared formwork is placed together with the reinforcement, and preparation for casting. Casting work consists of mixing, pouring the concrete mixture into the sloof formwork, and finishing work. Quality control of the SCC mixture was carried out by testing three cylindrical specimens (150 mm × 300 mm) for each casting batch. After 28 days of curing, compressive strength tests were conducted in accordance with SNI 1974:2011. The test results showed an average compressive strength of 27.3 MPa, which exceeded the target design strength of 25 MPa (f'c = 25 MPa). This result demonstrates that the SCC mix with steel wire waste fibres performed satisfactorily under field conditions. Furthermore, post-construction visual inspection confirmed that no visible cracks were observed on the surface of the sloof beams or columns, indicating effective crack control by the steel fibre reinforcement. Dimensional verification also confirmed that the sloof beams and columns conformed to the working drawings: sloof cross-section measured 200 mm × 300 mm and column cross-section measured 250 mm × 250 mm, with a clear column height of 3.6 m.

The obstacles encountered during the community service process were that the location was in a narrow alley, where cars couldn't enter, making it difficult to load materials and concrete mixers. The solution was to rent a cart and have residents work together to transport the materials to the location. The final stage was the preparation of a report and scientific article. The next page shows the process of making SCC-sloof from land preparation to completion (Figure 4). Regarding community participation and social impact, a structured questionnaire was administered to 24 community members from RW 021 (representing all RT 01–10) upon completion of the program. The results demonstrate a high level of community satisfaction across all seven evaluation indicators. As shown in Figures 5–11, 79.2% of respondents Strongly Agreed that the PkM team responded to community needs professionally and appropriately, with the remaining 20.8% Agreeing. Regarding the speed of program implementation, 66.7% Strongly Agreed and 33.3% Agreed that the activities proceeded responsively. On the question of whether the program met community expectations, 75% Strongly Agreed and 25% Agreed. Similarly, 75% Strongly Agreed and 25% Agreed that the program delivered useful outcomes. Concerning adherence to the agreed plan, 62.5% Strongly Agreed and 37.5% Agreed. For the communication of the final report, 54.2% Strongly Agreed, 41.7% Agreed, and only 4.1% responded Disagreed, indicating a minor gap in reporting communication that can be addressed in future programs. Finally, 62.5% Strongly Agreed and 37.5% Agreed that they would seek future collaboration with the Civil Engineering Department (KBK Structures and Materials). Notably, no respondents selected Strongly Disagree for any indicator. These results confirm that the program generated meaningful social benefits, with near-unanimous positive reception across all measured dimensions of community satisfaction, program utility, and partnership continuity.



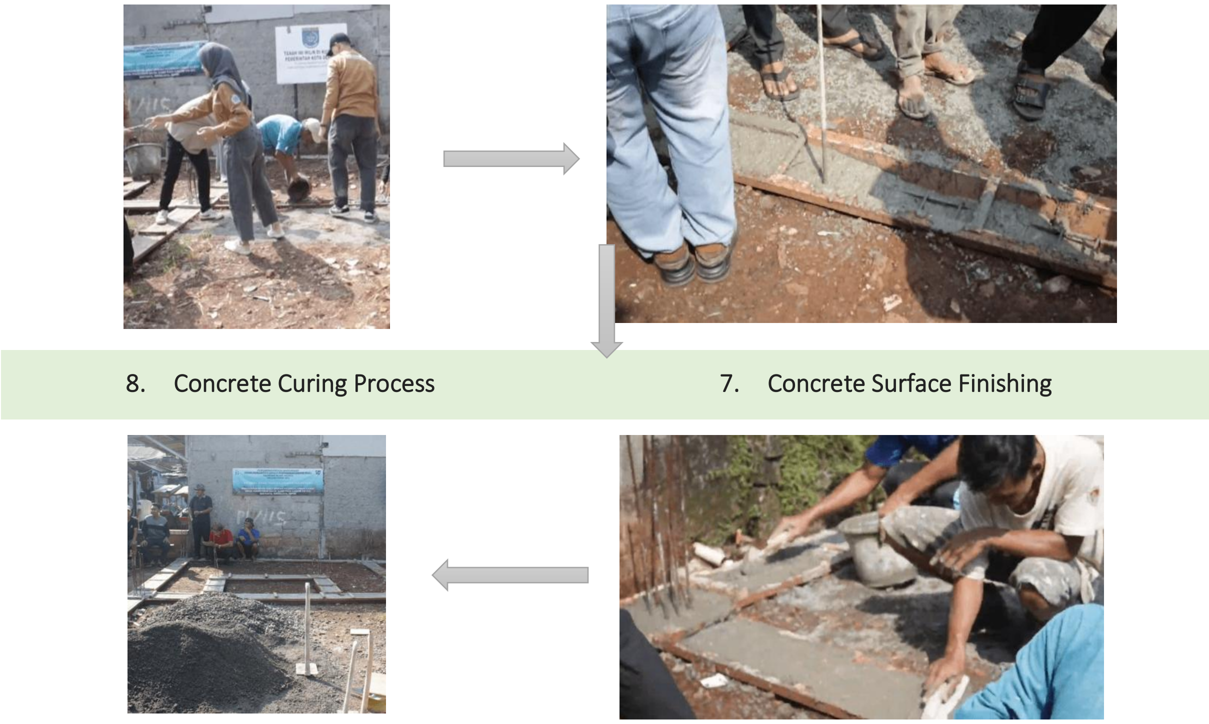


Figure 4. Stages of community service work in making SCC concrete blocks

DISCUSSION

In the modern construction industry, the use of Self-Compacting Concrete (SCC) is increasingly widespread due to its ability to flow and compact on its own without the need for mechanical vibration. SCC offers advantages in work efficiency, reduces the need for labor, and improves the quality and homogeneity of concrete structures. However, SCC also has weaknesses, particularly its tendency to crack due to shrinkage, tension, and flexural stress. These weaknesses can reduce the durability and service life of concrete in the long term. This issue also arises when SCC is applied to the construction of beams and columns. Reinforced concrete beams and columns remain vulnerable to cracking caused by flexural loads, shear, and deformation during use. These cracks can develop into serious structural damage, reducing the service life of the building and increasing maintenance and repair costs.

To address these problems in the community service location, the use of steel fibres (cut steel wire) as an additive in reinforced concrete has become an effective innovation. Steel fibres act as micro-reinforcements distributed evenly throughout the concrete matrix, helping to resist crack propagation and enhancing the tensile strength, shear resistance, and ductility of reinforced concrete beams and columns (Amalia & Muhtarom, 2021). The research findings on the use of cut steel wire fibres in SCC mixtures show improvements in tensile strength, flexural strength, and inhibition of micro-cracks due to shrinkage in reinforced concrete beams (Amalia et al., 2023; Constantin et al., 2019). This innovation was successfully applied in the construction of sloof beams and reinforced concrete columns for the RW 021 community office building. In practical implementation, the SCC mixture with steel wire waste fibres demonstrated workability suitable for field conditions, flowing adequately into the formwork without the need for mechanical vibration, thereby reducing construction time and labour requirements. The compressive strength achieved (27.3 MPa) exceeded the design target (25 MPa), confirming the structural adequacy of the mixture. Post-construction inspection showed no surface cracking, validating the effectiveness of the steel fibres in controlling shrinkage-related cracking under real-world conditions. With this innovation, sloof beams and reinforced columns will have improved service performance, extended building lifespan, and reduced maintenance and repair costs. Beyond the technical outcomes, the social benefits of this program were also significant. The completion of the sloof structure and columns marks a critical milestone in the construction of the RW 021 community hall, a facility that will directly enable health programs (posyandu), PKK activities, and community meetings—all of which had previously been conducted in residents' homes due to the absence of a proper venue. Community participation throughout the construction process also helped build local capacity in SCC production and casting, creating a foundation for residents to independently manage subsequent construction phases. A post-program questionnaire (n=24) confirmed near-unanimous positive reception: all seven satisfaction indicators received 100% positive responses (Strongly Agree or Agree), except for the communication of the final report, where 4.1% of respondents noted a shortfall—a finding that will inform improvements in future program reporting practices.

The application of science and technology, resulting from this research/innovation, aligns with the development programs of RW 021 community groups in Baktijaya, Sukmajaya, Depok, and and follows the revised PNJ Community Service Strategic Plan (2020–2024), under the program aimed at enhancing the capacity of PNJ community service implementers in producing outputs or products that are used or adopted by the community.

CONCLUSION

The application of steel wire waste fibres in Self-Compacting Concrete (SCC) represents a valuable innovation in enhancing the structural performance of reinforced concrete elements, particularly sloof beams and columns. This community service initiative successfully demonstrated the practical benefits of integrating research-based technology into real construction practices. The addition of steel fibres effectively improved the tensile and flexural strength of SCC, minimized the formation of micro-cracks, and extended the service life of the resulting structures. Quantitatively, the SCC mixture achieved an average compressive strength of 27.3 MPa after 28 days of curing, surpassing the design target of 25 MPa, and no surface cracking was observed on the completed structural elements. In terms of dimensional conformance, sloof beams and columns were verified to match the working drawings (200 mm x 300 mm and 250 mm x 250 mm, respectively).

Through collaborative efforts with the residents of RW 021 in Baktijaya, Sukmajaya, Depok, the project not only addressed the urgent need for a functional community hall but also empowered the local population by transferring knowledge and skills in sustainable and efficient construction techniques.

Community satisfaction was measured through a structured questionnaire completed by 24 community members (n=24), covering seven program evaluation indicators. Results show that across all indicators, the proportion of respondents selecting Strongly Agree or Agree reached 100%, with the exception of one indicator (communication of final report) where 4.1% selected Disagree. Notably, 62.5% Strongly Agreed that they would seek future collaboration with the Civil Engineering team, and 75% or more Strongly Agreed on program utility and conformity with expectations. The project aligns with the goals of the PNJ Community Service Strategic Plan (2020–2024), emphasising community empowerment through research application. Moreover, this initiative serves as a replicable model for similar community-based infrastructure development projects, promoting the use of environmentally friendly materials and techniques for long-term resilience and cost-effectiveness.

RECOMMENDATIONS

Based on the outcomes of this community service activity, several recommendations can be proposed to support the further development and sustainability of the program. First, further studies are recommended to investigate variations in the percentage and types of steel wire waste fibres incorporated into Self-Compacting Concrete (SCC) in order to determine the optimum mix composition that provides the best mechanical performance and durability for simple building structures in community environments. Second, the application of steel fibre-reinforced SCC should be expanded beyond sloof beams and columns to include other structural elements such as beams, floor slabs, and precast concrete wall panels. This broader application would allow the benefits of the technology to be more widely realized in community-based infrastructure development. Third, continuous mentoring and training programs should be enhanced for local communities, particularly construction workers and project managers, to ensure that knowledge related to the mixing, casting, and curing processes of fibre-reinforced SCC can be independently and consistently implemented in accordance with established technical standards.

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