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# Property Qualities of High-Strength Heavy Concrete Made Using Recycled Asphalt Waste

***Nurfayziyev Zayniddin***
*Lecturer of Samarkand state architecture and Civil Engineering University*

***Eshmo'minov Ma'ruf***
*Student of Termiz State University*

***Abstract:*** *In this study, the authors investig ate the physical and mechanical properties of high-strength, heavy concrete in an effort to enhance the quality of concrete structures. In addition to their capillarity and pore networks, high-strength, heavy concrete with a water-to-binder ratio of 0.500 to 0.60 is often more durable than conventional concrete. Consequently, the durability-related physical and mechanical parameters of concrete sample specimens were evaluated.*

***Keywords:*** *asphalt waste, high-strength heavy concrete, aggregate, durability, physical and mechanical properties.*

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## Introduction

Asphalt waste is a byproduct of the replacement of road surfaces that can be utilized for roadside hardening, for instance. The Minister of Climate and Environment has signed a regulation that clarifies the conditions under which asphalt waste can lose its status as a waste and be repurposed as a partial substitute for aggregate in new mineral and asphalt mixes. Changes to the legislation will make it feasible to control road debris and enable savings on road maintenance that might total up to PLN 300 million over the next few years.

The Climate and Environment Minister's legislation is the outcome of two years of work and collaboration with the construction sector and the General Directorate of National Roads and Motorways (GDDKiA). The regulatory burden on business owners will be lessened as a result of the new rule. In turn, this will help to the streamlining of administrative procedures related to the issuance of permits for the reuse of materials categorized as building waste. The revised rule takes into account the PN-EN 13108-8:2016-07 standard, which specifies the classification, and characterization standards for asphalt destructor as an important component of mineral and asphalt mixtures.

Aggregate must be carefully selected for high-strength mixtures, since weaker aggregates may not be able to withstand the loads placed on the concrete and cause aggregate failure [1, 2, 3]. It can be observed that weaker aggregates are unsuitable for making concretes with a specified compressive strength of 30 MPa or higher. Cement types CEM I 32.5 and CEM I 42.5 were utilized.

**Materials and Methods**

Utilization of Portland cements CEM I 42.5 and CEM I 52.5 from Jizzakh Cement Plants in accordance with PN-EN 197. As NA, fractions of mountain sand and rock measuring 0.16 to 2.5 millimeters and 2.5 to 5 millimeters were found in the Sangzar river, and coarse aggregate measuring 5 to 70 millimeters was found in Forish locations. Aggregate met RCAC II (according to DIN 4226-100) and type A specifications (acc. to PN-EN-206:2014). Coarse aggregates have been sieved into 5-10, 10-20, and 20-40 mm fractions. Natural aggregate fractions of 0.16-2 mm and 2.5-5 mm were utilized alongside fractions of RCA measuring 5-10 mm and 10-20 mm. Natural aggregate was utilized in an air-dried state. It was weighed and saturated with water at a rate of 3.6% of its air-dry mass. Utilizing water reducer Muraplast FK 88. Standard tap water was used for mixing.

Approximately 95% of asphalt trash recovered after road reconstruction or construction contains aggregate. This indicates that it is a high-quality material that can be partially substituted for aggregate in newly laid asphalt mixtures. It can also be used to construct service roads, access roads, and exits, as well as to stiffen shoulders and road foundations. The laws now in effect have reduced the potential for recycling asphalt waste.

Notably, the replacement of the wearing course during the repair of 10 kilometers of a two-lane highway generates 23,000 tons of asphalt rubble of the best quality aggregate. Every 12 to 15 years, the wearing course of expressways undergoes regular rehabilitation.

**Table 1. Proportions of concrete mixtures [kg/m3]**

| Material denomination | N-1 | N-2 | N-3 | N-4 |
|---|---|---|---|---|
| CEM I 22.5 | 320 | 320 | | |
| CEM I 32.5 | | | 320 | 320 |
| metakaolin | 20 | 20 | 20 | 20 |

| | | | | |
|---|---|---|---|---|
| natural sand 0,16-2,5 | 260 | 260 | 260 | 260 |
| natural sand 2,5-5 | 280 | 280 | 280 | 280 |
| Coarse aggregates 10-20 | 600 | 400 | 600 | 400 |
| Coarse aggregates 20-40 | 600 | 800 | 600 | 800 |
| water | 150 | 180 | 150 | 180 |
| W/C* | 0.55 | 0.60 | 0.55 | 0.60 |

There were four concrete combinations created. They were composed of 300 kg/m3 of CEM I 32.5 and CEM I 42.5 cement, along with 4 and 8% metakaolin. The proportions for mixtures are shown in Table 1. In line with PN-EN 12350-5, the workability of concrete mixtures was assessed using a flow table test.

**Compressive and Tensile Strength Test**

Preparing and curing specimens in accordance with PN-EN 12390-2. They were poured into steel molds and double-compacted on a vibrating table. After two days, the specimens were demoulded and water-cured in the laboratory for a total of twenty-eight days. After 28 and 90 days of aging, 100 mm cube specimens were subjected to compressive strength testing in accordance with PN-EN 12390-3. Conforming to PN-EN 12390-6, the tensile splitting strength tests were done on the same type of specimens.

**Results and discussion**

The research outcomes are displayed in Tables 2 and 3. The outcomes are the means of four metrics. Only for fresh concrete mixtures is the average of three measured values used to determine flow.

**Table 2. Concrete Cubic Strength Results**

| Mixes | Concrete Cubic Strength, MPa | | | | | |
|---|---|---|---|---|---|---|
| | 7 day | 14 day | 28 day | 60 day | 90 day | 180 day |
| Control | 19 | 24 | 39 | 45.5 | 56 | 67.1 |
| Mix 1 | 22.1 | 25.1 | 40 | 49.9 | 61 | 67.2 |
| Mix 2 | 20.5 | 26 | 48.1 | 49.8 | 64 | 69.87 |
| Mix 3 | 20.6 | 28 | 48.9 | 60 | 65.2 | 69 |
| Mix 4 | 25 | 28.9 | 50 | 58.8 | 65.5 | 72.1 |

**Table 3. Results of flexural strength of concrete**

| Составы бетонов | Flexural strength of concrete, MPa | | | | | |
|---|---|---|---|---|---|---|
| | 7 day | 14 day | 28 day | 60 day | 90 day | 180 day |
| Control | 3.5 | 3.8 | 4.0 | 4.9 | 5.21 | 6.76 |
| Mix 1 | 3.78 | 4.03 | 4.7 | 5.7 | 5.89 | 6.77 |
| Mix 2 | 3.98 | 4.34 | 4.76 | 5.78 | 6.03 | 6.54 |
| Mix 3 | 3.99 | 4.56 | 5.12 | 6.09 | 6.45 | 6.78 |
| Mix 4 | 3.67 | 4.9 | 5.02 | 6.96 | 7.05 | 7.13 |

**Compressive Strength of Concrete**

The highest mean compressive strength of 40 MPa was found in N-1 series concrete utilizing CEM I-32.5 cement. This mixture attained its peak compressive strength of 61 MPa after 90 days, representing a 23% increase in strength due to post-hardening. The compressive strength increased significantly from 39 MPa after 28 days to 56 MPa after 90 days. The strength of mixtures N-1 and N-4 did not increase much over 28 and 90 days, increasing by 15% and 16%, respectively. The difference was mostly attributable to the use of 2.5-5 mm fraction of natural aggregate in N-3 concrete series as opposed to the same fraction in N-2 concrete series. This explains why the EN-206 standard prohibits the use of aggregate fractions between 0.16 and 5.0 mm in the making of concrete. MIX 2 and N-3 demonstrate positive results at 64 and 65.7 MPa. Similarly, if this drop in strength due to fine aggregate is offset, the authors would not exclude [4, 5].

## Tensile Strength of Concrete

In agreement with the compressive strength values, the concrete mixture N-1 had the maximum splitting tensile strength after 28 days, measuring 4.7 MPa. The concrete mixture N-1 had the greatest recorded splitting tensile strength after 90 days, which was 5.89 MPa. The mean tensile splitting strength of concretes is 5.89 MPa. The typical value for concrete is 5.41. These are typical values for concrete with an average strength of this level.

## Summary and Conclusions

The research demonstrates that it is possible to make high-strength, heavy concrete with a mean compressive strength of 61 MPa at 28 days of age and over 65 MPa after 90 days. By employing coarse aggregate of average quality, it is possible to simultaneously evaluate the influence of good durability-affecting qualities. The increase in strength between 28 and 90 days of laboratory curing in ambient settings demonstrates that the actual qualities of the tested concretes are more accurately reflected by tests conducted after a time longer than 28 days. This holds true for both mechanical and durability-related aspects. The 5% water absorption requirement is virtually impossible to satisfy [6]. Changing the proportion of natural aggregate from 2.5 to 5 millimeters resulted in a modest decrease in the majority of concrete's durability qualities.

## References

1. Turdimurod o’g, J. Q. L., Shahriyor, A., & Aziza, K. (2021). Concrete Products from Waste Materials. European Journal of Life Safety and Stability (2660-9630), 12, 99-102. EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS) ISSN 2660-9630. www.ejlss.indexedresearch.org Volume 12, 2021. http://ejlss.indexedresearch.org/index.php/ejlss/article/view/274.
2. Aziza, K., & Kh, K. (2021). DURABILITY CHARACTERISTICS OF CONCRETE ADMIXED WITH WOLLASTONITE MINERAL. European Journal of Life Safety and Stability (2660-9630), 5, 9-13. EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS) ISSN 2660-9630. www.ejlss.indexedresearch.org Volume 5, 2021 http://ejlss.indexedresearch.org/index.php/ejlss/issue/view/5.
3. Kuldashev, H., & Kuldasheva, A. Improvement of Vertical Butting Seismic-stability Large-panel Buildings. JournalNX, 210-215. JournalNX - a Multidisciplinary Peer Reviewed Journalю ISSN No.(E):2581-4230 https://journalnx.com/journal-article/20151680.
4. Ibragim, U., Erkin, E., & Aziza, K. (2021). Physical Properties of High Performance Concrete on Base Wollastonite. European Journal of Life Safety and Stability (2660-9630), 11, 101-105. EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS) ISSN 2660-9630 www.ejlss.indexedresearch.org Volume 11, 2021 || http://ejlss.indexedresearch.org/index.php/ejlss/issue/view/11.
5. Mamatqosim, B., & Aziza, K. (2021). Reinforcing in the Production of Gypsum Materials on Base Wollastonite Fibers. European Journal of Life Safety and Stability (2660-9630), 12, 20-23. EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS) ISSN 2660-9630 www.ejlss.indexedresearch.org Volume 11, 2021 || http://ejlss.indexedresearch.org/index.php/ejlss/issue/view/11.

6. Kuldasheva, A., Saidmuratov, B., & Kuldashev, H. (2020). The Use of Wollastonite Fiber to Enhance the Mechanical Properties of Cement Compositions. International Journal of Progressive Sciences and Technologies, 22(2), 37-45. International Journal of Progressive Sciences and Technologies (IJPSAT) ISSN: 2509-0119. https://ijpsat.ijsht-journals.org/index.php/ijpsat/article/view/2175.