This data presented herein are the research summary of “mechanical behavior and durability performance of concrete containing recycled concrete aggregate” (Paul, 2011) [1]. The results reported in this article relate to an important parameter of optimum content of recycle concrete aggregate (RCA) in production of new concrete for both structural and non-structural applications. For the purpose of the research various types of physical, mechanical and durability tests are performed for concrete made with different percentages of RCA. Therefore, this data set can be a great help of the readers to understand the mechanism of RCA in relates to the concrete properties.

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Experimental factors
Four different percentages of volume fraction of recycle concrete aggregates are replaced with natural aggregate in production of new structural concrete.

Experimental features
Various volume of recycle concrete aggregates are blended with natural aggregate to investigate the physical, mechanical and durability properties

Data source location
Stellenbosch, South Africa

Data accessibility
The all data herein and relevant files are all available in this article

Related research article
SC, Paul. Mechanical behavior and durability performance of concrete containing recycled concrete aggregate. MSc Thesis, Stellenbosch University, Stellenbosch, South Africa, 2011.

1. Data

This dataset reported herein were obtained from the experimental studies conducted on the different percentages of recycle concrete aggregate (RCA) replacement in the concrete mix and relate them to the influence of physical, mechanical and durability properties. The detailed of the dataset can also be found in [1–3]. Additionally, the available data presented by other researchers [4–6] were used to check the applicability of RCA in new concrete. A large number of cubes and cylinders (about 300) were prepared to examine the aforementioned properties of RCA. Finally, the properties of concrete made from RCA were compared with a reference concrete made with 100% natural aggregates (NA).

2. Experimental design, materials, and methods

The materials compositions for different RCA mixes used in the research are shown in Table 1. The RCA was collected from the different sources of construction and demolition waste (C&DW) sites in the Western Cape region of South Africa. Concrete was then made by replacing different percentages (0%, 15%, 30%, 50% and 100%) of NA by RCA as they are assigned RCA0 to RCA100 in Table 1.

| Mix   | Cement | NA  | RCA  | Sand | Water |
|-------|--------|-----|------|------|-------|
| RCA 0 | 0.12   | 0.41| 0.00 | 0.39 | 0.07  |
| RCA 15| 0.12   | 0.35| 0.06 | 0.40 | 0.07  |
| RCA 30| 0.12   | 0.21| 0.20 | 0.40 | 0.07  |
| RCA 50| 0.12   | 0.29| 0.12 | 0.40 | 0.07  |
| RCA 100| 0.12 | 0.00| 0.41 | 0.40 | 0.07  |
Table 2
Physical properties of NA and RCA.

| Aggregate type | Relative density | Aggregates crushing value (%) | Flakiness index | Water absorption (%) |
|----------------|-----------------|-------------------------------|----------------|---------------------|
| NA             | 2.72            | 11                            | 25             | 0.60                |
| RCA            | 2.63–2.77       | 10.8–12.5                     | 19             | 3.2                 |

Fig. 1. Measured slump value of concrete with different RCA replacement.

Fig. 2. Percentages of air in fresh concrete mixes with different RCA replacement.

Fig. 3. Compressive strength of concrete mixes with different RCA replacement.
The physical properties of aggregates such as relative density of aggregates, aggregate crushing value, flakiness index, and water absorption capacity were also measured and presented in Table 2. All mixing was performed under laboratory conditions. Slump test to check the workability of the concretes was performed as per SANS 5862:2006 [7], and air content as per SANS 6252:2006 [8]. After pouring concrete into the moulds, a vibration table was also used to ensure the compatibility of the fresh concrete. The compressive and splitting tensile strength of hardened concrete was determined on 100 mm and 150 mm cube specimens according to SANS 5863:2006 [9] and SANS 6253:2006 [10], respectively. Cylindrical specimens, 300 mm height × 150 mm diameter were used for evaluating the

Fig. 4. Young’s modulus (E-modulus) of concrete mixes with different RCA replacement.

Fig. 5. Splitting strength of concrete mixes with different RCA replacement.

Fig. 6. Dry shrinkage (at 90 days) and total creep strain (at 14 days) of different concrete mixes.
static E-modulus of RCA concrete in compression as per ASTM C469 [11]. The durability of concrete was investigated by means of chloride conductivity, water sorptivity and oxygen permeability index test according to the guideline provided in [12,13]. Figs. 1–9 show the results when different percentages of RCAs were replaced with NA in production of new concrete. Furthermore, based on available data on RCA concrete the results were compared and details are discussed in [1,2].

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References

[1] S.C. Paul, Mechanical Behavior and Durability Performance of Concrete Containing Recycled Concrete Aggregate (MSc Thesis), Stellenbosch University, Stellenbosch, South Africa, 2011.
[2] S.C. Paul, G.P.A.G. van Zijl, Mechanical and durability properties of recycled concrete aggregate for normal strength structural concrete, Int. J. Sustain. Constr. Eng. Technol. 4 (1) (2013) 89–103.
[3] D.W. Immelman, The Influence of Percentage Replacement on the Aggregate and Concrete Properties from Commercially Produced Coarse Recycled Concrete Aggregate (MSc Thesis), Stellenbosch University, Stellenbosch, South Africa, 2013.
[4] C.S. Poon, Z.H. Shui, L. Lam, Effect of microstructure of ITZ on compressive strength of concrete prepared with recycled aggregates, Constr. Build. Mater. 18 (6) (2004) 461–468.
[5] J.Z. Xiao, J.B. Li, C. Zhang, On relationships between the mechanical properties of recycled aggregate concrete: an overview, Mater. Struct. 39 (6) (2006) 655–664.
[6] M. Malešev, V. Radonjanin, S. Marinković, Recycled concrete as aggregate for structural concrete production, Sustainability 2 (5) (2010) 1204–1225.
[7] South African National Standards SANS 5862:2006, Consistence of Freshly Mixed Concrete – Slump Test, SABS, Pretoria, 2006.
[8] South African National Standards SANS 6252:2006, Concrete Tests - Air Content of Freshly Mixed Concrete - Pressure Method, SABS, Pretoria, 2006.
[9] South African National Standards SANS 5863 2006, Concrete Tests - Compressive Strength of Hardened Concrete, SABS, Pretoria, 2006.
[10] South African National Standards SANS 6253:2006, Concrete Tests - Tensile Splitting Strength of Concrete, SABS, Pretoria, 2006.
[11] ASTM International Standard ASTM C469 / C469M - 10, Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression, ASTM International, Pennsylvania, USA, 2010.
[12] S.C. Paul, G.P.A.G. van Zijl, Durability index test performance of recycled concrete aggregate mixed with natural aggregate, Int. J. Adv. Civil. Eng. Arch. Res. 2 (1) (2013) 53–64.
[13] M.G. Alexander, J.R. Mackechnie, Y. Ballim, Guide to the Use of Durability Indexes for Achieving Durability in Concrete Structures, Research Monograph No. 2, 35, Department of Civil Engineering, University of Cape Town, 1999.