

The World Bank
P092ABC—Kurchani Sustainable Urban Transport Project (Asiana):
Road Paving Samples for the Ancient Temple Palace Area

1. **Report summary.** The Kurchani Municipal Sustainable Urban Transport Project aims at improving transport accessibility and mobility in the Kurchani municipality of Asiana, while protecting its cultural heritage and reducing the environmental impact of the urban transport system. The purpose of this document is to report on the analysis of road paving samples prepared by the contracting firm for the implementation of one of the project components, and to make recommendations for their improvement.
2. The conclusion of this report is that with modifications the samples will be acceptable. These modifications include the following: only brown aggregate should be used, the grains of the aggregate should be more heterogeneous, and all parts of the road must have three layers.

Project Context

3. **The Sustainable Urban Transport Project addresses sustainability in various ways, with six components:**
 - The road network component will comprise Kurchani city improvements to the First Ring, Second Ring, and Shaibo roads to increase their functionality as major traffic routes and to upgrade the road network in Kybola province.
 - The public transport component will integrate measures for the management of public transport on thirteen selected bus corridors.
 - The traffic management component will support a traffic control system and a road safety program to investigate and analyze accidents and to implement remedial measures.
 - The air-quality management component will support Kurchani's Environmental Protection Bureau in developing and implementing comprehensive plans for air-quality improvement and reduction of vehicle emissions.
 - The cultural heritage component will promote sustainable tourism by constructing a network of bicycle routes linking the main tourist sites and restoring other roads in the ancient temple area.
 - The institutional development component will support strengthening Kurchani's capacity in transport planning and policy.
4. **In implementing the cultural heritage component, the client needs technical assistance to identify suitable materials and confirm appropriate techniques.** In September 2009, the TTL of the project asked the Urban Anchor to provide technical advice for implementation. The TTL requested that the Anchor identify a road finish with the aesthetic appearance of a muddy road, but with the mechanical features of a road suitable for vehicular traffic, including cars and fully loaded trucks. The Urban Anchor advised choosing a material called exposed aggregate concrete and, for ease of understanding, provided the brochure of a company that produces this kind of finish.

Materials and Techniques

5. **The Urban Anchor advised the client that exposed aggregate concrete would be the best material for road paving in the cultural heritage area.** This material provides a finish that is both functional and aesthetically pleasing, an alternative not only to plain or brushed concrete but also to traditional paving or asphalt. Exposed aggregate concrete provides virtually unlimited finishes that can be created by mixing aggregate types and sizes, concrete color, and depths of exposure. It has been used for historic urban settings, rural paths, cycleways, residential driveways, and private patios. *[Process of creating finish omitted for brevity of sample.]*
6. **The client accepted the advice of the Urban Anchor and asked the Bank to review the techniques and materials in two samples prepared by the contractor.** In December 20XX, the Urban Anchor sent an expert to Kurchani for three days to examine two samples prepared by the contracting firm that is implementing the project. During the mission, the client showed two samples of exposed aggregate concrete, produced with the same general technique but using two different aggregate colors *[photos omitted to protect confidentiality]*. The sample on the left was produced using a blend of brown and black aggregates; that on the right used only brown aggregate.
7. **The contractor's technique for the road paving is acceptable as seen in the samples, with some improvements, but only brown aggregate should be used.** Although the contractor did not use a chemical retardant as is usually done, the technique is still acceptable; however, the materials should be improved for project implementation. The sample that features only brown aggregate should be chosen, as its color is closer to that of a muddy road than the sample produced with a blend of brown and black aggregates.

In implementation, the aggregate should be more heterogeneous, so that gaps are minimal. This modification will help prevent overly rapid decay and will make the paving more sustainable. In both samples, the aggregate is too big and too homogeneous; gaps are visible between the grains, as seen in the dark areas of the magnified photo detail below *[photos omitted]*. *[Description of consequences of gaps omitted.]* **In project implementation, the road paving should have three layers to make it strong enough for vehicular traffic, including cars and fully loaded trucks as requested.** *[Description of layers omitted.]*

Conclusion

If the contractor makes these modifications for implementation, the road should be of acceptable quality. It will support the required types of traffic, look aesthetically appropriate, and be suitably sustainable.