NOTES ON SPECIFICATION FOR SEALING CHIP

These notes are for guidance only and are not intended to be included in contract documentation.

1. SAMPLING AND TESTING

Sampling and testing is to be done by a laboratory accredited to NZS/ISO/IEC 17025. This includes International Accreditation New Zealand (IANZ) accredited laboratories that hold accreditation to carry out the relevant tests, and personnel or field laboratories that carry out sampling and testing under the accreditation of such a laboratory.

2. SYNTHETIC AGGREGATES

The NZ Transport Agency may approve the use of chip produced from materials other than natural rock, provided it complies with all requirements of the NZTA M06 specification. Chip materials may include (but are not limited to) calcined bauxite and Glenbrook Melter Aggregate (GMA).

Approval may be considered for other materials, such as recycled materials, that do not necessarily comply with all requirements of the M06 specification. Written application to the NZ Transport Agency's Lead Advisor, Pavements should be made for assessment and approval of non-compliant alternative materials.

3. QUALITY ASSURANCE

All quarry operations that produce chip must have in place a Quality Assurance plan that at a minimum follows the Civil Contractors BPG 05- Best Practice Guideline - Quality Assurance of Aggregate for Roads.

It is the responsibility of the sealing contractor to demonstrate evidence of quality controls to the client or engineer, and for chip producers to provide proof of compliance to the contractor, especially in relation to high Polished Stone Value (PSV) chip.

The required source property testing frequencies have been prescribed in the specification to ensure that sufficient test data is available for analysis. The prescribed frequencies are the absolute minimum testing frequencies that are acceptable. It is the responsibility of the sealing chip producer to ensure that sampling and testing is carried out, and that the quality of each aggregate produced remains compliant. Variable test properties should attract higher testing frequencies.

4. WEAK PARTICLES TEST

The Weak Particles Test (AS 1141.32) has been included in the specification to provide extra testing information where chip compliance is in dispute. This test determines whether chip has been contaminated with any deleterious material. It is not expected that the test will be undertaken under normal circumstances.

5. SKID RESISTANCE

The skid resistance of a chip sealed pavement surfacing is primarily a function of a seals' macrotexture and an aggregate's resistance to polishing. The macrotexture of a chip seal surfacing is a function of the seal design and its interaction with the substrate.

Surface roughness, or microtexture, of individual aggregate particles in a chip seal is a significant contributor to skid resistance. As a result, retention of chip microtexture over the life of a chip seal surfacing is essential. Research has shown that stone polishing characteristics are a function of an aggregate's geological properties, as well as traffic and weather conditions. The action of traffic, and in particular heavy vehicles, will degrade microtexture by polishing aggregate particles, with a resultant loss of skid resistance, especially in fine weather. The action of water and fines on a wet road surface tends to restore some microtexture through abrasion. A road site generally achieves a balance between polishing and restoration over time, which lasts throughout a surface's life.

Determining the propensity of an aggregate to polish is a critical consideration in the selection of a chip source for use in chip sealing.

There are two methods for determining an aggregate's resistance to polishing:

- The Aggregate Performance method, which is preferred, or
- The Polished Stone Value method.

With the introduction of NZTA T10 Specification for State Highway Skid Resistance Management, the preferred method of aggregate selection is the Aggregate Performance Method. However, if sufficient information is not available then PSV may be approved for use by the NZ Transport Agency Regional Operations Manager or their nominee.

Refer to NZTA T10 specification section 12 for more information.

6. AGGREGATE PERFORMANCE METHOD

Where sufficient information is available, the preferred Aggregate Performance Method should be used to characterise an aggregate's skid resistance performance. Using data on the aggregate's polishing (i.e. SCRIM Coefficient, or Equilibrium SCRIM Coefficient achieved over the life of a surfacing), a matrix of aggregate performance for a variety of polishing stress situations (normalised by heavy traffic level) can be used to demonstrate satisfactory skid resistance.

Details on application of the Aggregate Performance Method can be found in the NZTA T10 Specification for State Highway Skid Resistance Management.

7. POLISHED STONE VALUE

The M06 specification continues to require the Polished Stone Value (PSV) test to be carried out for an aggregate. A PSV test should always be accompanied by the companion Weathering Quality Index and Crushing Resistance source property testing for the same composite sample.

The Polished Stone Value method uses a laboratory accelerated polishing test to rank aggregates according to their relative propensity to polish. While the test works well for ranking aggregates, experience has shown that the Polished Stone Value assigned to an aggregate by the test does not adequately predict its polishing performance in the field; hence the preference for the aggregate performance method for chip source selection.

The NZ Transport Agency has standardised aggregate source names (quarry and/or producer) in RAMM in order to improve the information collected about aggregate performance. It is the supplier's responsibility to ensure that test reports identify the quarry source for each aggregate using the correct pre-set NZTA quarry source name, as listed in the RAMM database. Follow the link below for an interactive map.

https://nzta.maps.arcgis.com/apps/webappviewer/index.html?id=c81a4699b12c43328cb6f505d9c5bc3b

When the Polished Stone Value method is used to select an aggregate for a surfacing, the prescription of the required PSV for a road site should follow the process outlined in NZTA T10 Specification for State Highway Skid Resistance Management. Where a high (typically 60 or greater) Polished Stone Value is specified but is unachievable locally, T10 Notes should be referred to.

The engineer may take samples at any time for random verification testing. Should the results of any verification testing fail to meet the requirements of the specification, it is the supplier's responsibility to demonstrate the quality of the material supplied through quality records and/or further tests, and at the supplier's expense. If a sample is taken for verification testing, it must be a composite sample blended from Grades 2 (if available), 3, 4, 5 and 6 chip as required in M06 section 4.1.

Accredited PSV testing agencies are listed on the IANZ website, and can be found by searching for 'Polished Stone Value' at http://www.ianz.govt.nz/directory/.

The PSV test uses a standard control stone to normalise test results. Traditionally, a control stone sourced from the United Kingdom has been used, but more recently a New Zealand control stone has been identified. Either control stone can be used by the testing agency.

8. PSV TEST SPECIMENS

The PSV result obtained for an aggregate can be affected by preparation of test specimens. To improve reliability of the test, the following photographs of correctly prepared test specimens are provided to guide testing agencies.

Figure 1: Correctly Prepared Test Specimen #1

Figure 2: Correctly Prepared Test Specimen #2.

These test specimens have the following attributes that improve the reliability of the PSV test result:

- Test particles (chips) of differing appearance are randomly distributed across the test specimen.
- Particles are placed shoulder to shoulder, minimising the open space between the particles.
- Particles are placed so that a flat, freshly broken surface is uppermost.

It is recommended that testing agencies undertaking a Polished Stone Value test should use these photographs as an aid to improve the quality of test specimens and consequently the representativeness of test results.

9. PRODUCTION PROPERTIES

Cleanness values for Grades 5 and 6 chip may be specified in contract requirements, although the values typically used to specify Grades 2, 3 and 4 will not be achievable for Grades 5 and 6 chip in most cases. Smaller chip grades of equivalent cleanness will return lower cleanness values due to the higher aggregate particle surface area in the test sample.

The Broken Faces Content test is not required for aggregate that is produced from a 'hard rock' (i.e. a non-alluvial) source, because, by definition, all the rock is freshly crushed.

The size and shape for Grade 5 chip is required to be determined, in addition to the particle size distribution required by section 5.3. The fraction retained on the 4.75mm sieve only is to be tested. At this stage, there is no requirement for size and shape testing for Grade 6 chip in the specification.

10. GLENBROOK MELTER AGGREGATE FROM NEW ZEALAND STEEL

Aggregates that meet the requirements of NZTA T10 Specification for State Highway Skid Resistance Management in high stress locations are in short supply. The New Zealand Steel (NZS) Glenbrook Melter aggregate (GMA), produced at Glenbrook, can be used in some high stress locations.

11. USE OF RECYCLED ASPHALT PRODUCT (RAP) CHIP FOR MEMBRANE SEALS

Bitumen-coated aggregate yielded from RAP production can be used in place of M06 specified aggregate in membrane seals constructed beneath asphalt surfacings that will not be open to public traffic. The RAP must be processed to provide a chip fraction from 100% RAP that consists of hard, durable aggregate free from any fines. The maximum RAP aggregate size used in a membrane seal beneath thin lift asphalt should be equivalent to Grade 4 chip. Grades 4, 5 and 6 sealing chip (or equivalent size) are also acceptable.

The maximum RAP aggregate size used in a membrane seal beneath deep lift asphalt should be equivalent to a Grade 2 sealing chip or smaller.