Tennessee Department of Transportation
Division of Materials and Tests

Aggregate Approval Process (SOP 2-1)

Purpose- The purpose of this document is to establish a formal process for evaluating, testing, and approving aggregate sources to be used for general Tennessee Department of Transportation (TDOT) construction, bituminous and concrete surface mixtures.

Background- Aggregates must exhibit certain physical and chemical properties that reflect their ultimate quality and durability. The TDOT Standard Specifications for Road and Bridge Construction dated January 1, 2015, have several aggregate properties specified, including abrasion resistance, freeze-thaw durability, gradation, particle shape, deleterious materials, and others. Aggregates used for bituminous or concrete riding surfaces must demonstrate additional properties that would indicate the aggregates ability to satisfactorily provide a skid-resistant pavement. These properties may include silica dioxide content, insoluble residue content, calcium carbonate content, and British Pendulum Numbers.

1. **ALL AGGREGATES:**

   An aggregate source shall complete and maintain the following procedures to be considered for use in TDOT projects. In addition, an aggregate facility must provide a Type A laboratory as specified in Section 106.06 of the Standard Specifications.

1.1 **Approval Procedures:**

1.1.1 **New Aggregate Sources**

   **Step 1-** The Producer must prepare a written Quality Control Plan (QCP). This plan must be site specific. TDOT has prepared and uploaded a generic aggregate quality control plan on the following link:


   The plan must indicate in detail how the Producer proposes to control the equipment, materials, and production methods to insure that the specified products are obtained. The plan must list the personnel responsible for production and quality control at the site and include information on how to contact each person (phone, email, etc.). The following specific information must also be included in the plan:

   - Identification of the physical location of the source, to include a description of the property site and reference to the nearest identifiable points such as highways and towns. The physical address and map shall be included.

   - A description of the signs used to identify each stockpile as intended for TDOT usage. Stockpile signs must be legible from the cab of a truck fifty feet from the identified pile. A photo of the signage shall be submitted with the plan.
A loading and shipping control plan which includes a description of the methods by which the products are to be loaded and shipped for use by TDOT, including safeguards against loading improper aggregate, contamination, degradation, and segregation of the aggregate. The plan must also include methods of insuring that all products are accurately identified and that all shipping units are clean. A diagram of the process, from mining/dredging through the loading and transporting offsite, shall be included.

A plan for dealing with quality control sample failures. This plan must include how the Producer plans to initiate an immediate investigation and how the Producer will implement corrective action to remedy the cause of the problem. The plan shall state how loading operators are trained to identify problems.

Two paper copies or an electronic copy of the Producer's written quality control plan must be submitted to Headquarters Materials and Tests with the original request for plant approval. If an electronic copy of the plan is submitted, the Producer will ensure that Headquarters Materials and Tests Division and the appropriate Regional Materials and Tests receives the submitted plan.

Step 2- The aggregate producer shall submit test results (within the previous six months) from an accredited independent laboratory or another state Department of Transportation laboratory indicating the material’s ability to meet TDOT’s current Standard Specifications (Section 903). These tests shall include, but may not be limited to, gradations, gravities (Bulk, Saturated Surface Dry (SSD), and Apparent), sodium sulfate soundness loss, percentage of wear, and the percentage of absorption. Lightweight aggregate shall have results for the durability factor submitted along with the above listed results. At no time will past departmental verification samples be accepted as a replacement to the above mentioned independent laboratory results.

Step 3- If the material tested by the accredited independent testing laboratory, or another state Department of Transportation laboratory, meets the TDOT current specifications for an approved aggregate, then a sample of the same material shall be obtained by Regional Materials and Tests personnel and submitted to the Headquarters Materials and Tests laboratory for a complete chemical (surface aggregates) and/or physical verification based on the type of aggregate requested for approval. If the verification test results from the initial sample meet the requirements for aggregate approval, then a second verification sample of the material shall be obtained and tested for consistency.

Step 4- If the material meets for consistency (at least two consecutive passing samples by Headquarters Materials and Tests laboratory), it will be added to the official TDOT Producer List maintained by Headquarters Materials and Tests. If a sample that has been submitted and tested fails to meet any of the approval criteria, then a second “referee” sample of the same material shall be obtained for testing. When two subsequent samples fail approval testing, a representative from the Producer, Regional Materials and Tests, and Headquarters Materials and Tests will hold a conference (at the request of the Producer) to discuss the acceptance of newly produced material. The Producer must wait a minimum of three months before re-
applying for approval status on the TDOT Producer List. Once it has been demonstrated that the material meets TDOT aggregate approval specifications as indicated by the results of two consecutive verification samples, Headquarters Materials and Tests shall notify both regional TDOT personnel and the producer. It will be the Producer’s decision to continue processing aggregate for final use.

**Step 5:** Acceptance of the aggregate for use on a TDOT project will be based on the chemical (surface aggregates) and/or physical properties of the processed material for its intended use (i.e. base stone, concrete coarse aggregate, riding surface, etc…). All sampling and testing will be in accordance with the TDOT Standard Specifications, TDOT Materials and Tests Standard Operating Procedures (SOP), and AASHTO/ASTM Testing procedures.

1.1.2 ACTIVE Aggregate Sources listed on the TDOT Producers List must review their QCP annually ensuring that all information is up-to-date. In the event any changes are made to the mining operation, the aggregate production facility, aggregate production process, any key personnel, or a change in ownership, an updated QCP must be resubmitted immediately to Headquarters Materials and Tests and the appropriate Regional Materials and Tests reflecting all changes or corrections.

1.1.3 INACTIVE Aggregate Sources must complete Steps 1-5 in order to become ACTIVE on the TDOT Producer List.

1.1.4 Approval of stockpiles at stockyards must have test results (within the previous six months) from an accredited independent laboratory or TDOT quality results. If the stockpile has been tested and approved from the source location and having the verified results above, the approval will be based upon consistency of other acceptance testing such as gradation. The stockpile may also be verified through submitting samples for normal quality testing as stated above.

1.2 Quality Monitoring:

1.2.1 An aggregate’s approval/status is contingent based on continuous, satisfactory field performance as well as periodic laboratory evaluation of sampled material. In addition to the quality monitoring outlined below, an aggregate’s approval/status may also be rescinded if there is any concern for safety that may be related to the approved material as determined by a visual inspection.

1.2.2 Aggregate sources will be continuously sampled and tested for quality (chemical and/or physical properties) by TDOT. At a minimum of once every six months (with a minimum of 90 days between samples), a sample of the approved material shall be obtained by Regional Materials and Tests personnel and submitted to the Headquarters Materials and Tests laboratory for a verification of the standard aggregate quality properties. Semiannual tests will represent January through June and July through December. If at any time TDOT feels the necessity to pull additional samples for testing, such sample will represent the most recent semiannual test. Aggregate that does not meet TDOT specifications will not be accepted for use on TDOT projects.

1.2.3 If a sample that has been submitted and tested fails to meet any of the approval criteria, then a second “referee” sample of the same material shall be obtained for testing. In the event that the referee sample passes, another sample shall be tested to provide consistency of two
consecutive passing results. When two subsequent samples fail quality testing, the aggregate source’s approval/status for use on TDOT projects shall be immediately rescinded and any production utilizing the failing material shall cease.

1.2.4 The Regional Materials and Tests shall notify the Producer of the failing test results as soon as possible; at which time a representative from the Producer, Regional Materials and Tests, and Headquarters Materials and Tests will hold a conference to identify the location/distribution of the failing material and to develop a plan for determining the use of any existing material and the acceptance of newly produced material for TDOT projects.

1.2.5 Once new material is produced, a sample of the material shall be tested for aggregate approval by an accredited independent laboratory or another state Department of Transportation laboratory at the Producer’s expense. At no time will past verification samples be used to determine the quality of new or existing stockpiles.

1.2.6 If the material tested by an independent laboratory meets current TDOT specifications for an approved aggregate, then a sample of the same material shall be obtained by Regional Materials and Tests personnel and submitted to the Headquarters Materials and Tests laboratory for a complete verification of aggregate properties. If the test results from the initial sample meet the requirements for aggregate approval, then a second sample of the material shall be obtained and tested for consistency.

1.2.7 Once it has been demonstrated that the material meets TDOT aggregate specifications as indicated by the results of two consecutive verification samples, Headquarters Materials and Tests shall notify both Regional TDOT personnel and the Producers. At this point, the approval/status of the Producer will be updated.

2. **SURFACE AGGREGATES:**

Coarse aggregate that is to be tested for use in a bituminous or concrete riding surface must not only meet the requirements of the TDOT Standard Specifications, but also demonstrate satisfactory field performance. To become an approved coarse aggregate source for bituminous or concrete riding surfaces the following steps must be met, in addition to steps 1-5 listed in Section 1.1 above:

**Step 6-** Based on the chemical and physical properties, the Producer must identify the TYPE of aggregate for which he requests approval. Initial approval of coarse aggregates such as crushed granite, crushed gravel, crushed gneiss, crushed quartzite, crushed sandstone, or crushed slag shall be tested for both physical and chemical properties. Physical testing results are required to meet the current TDOT specifications while the chemical testing is required to verify the composition of the material. Other crushed aggregate (limestone for example) may be used provided it meets the chemical, physical and performance characteristics shown below.
Current TYPE requirements and limitations are listed in Table 903.24-1 for other material (limestone for example).

Table 903.24-1. Quality Requirements for Type I, II, III, and IV Aggregate

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic use</td>
<td>All roads</td>
<td>All roads</td>
<td>15,000 ADT max.</td>
<td>5,000 ADT max.</td>
</tr>
<tr>
<td>Silica Dioxide (ASTM C-25)</td>
<td>40% min.</td>
<td>30% min.</td>
<td>20% min.</td>
<td>10% min.</td>
</tr>
<tr>
<td>Acid Insoluble Residue (ASTM D 3042)</td>
<td>50% min.</td>
<td>35% min.</td>
<td>25% min.</td>
<td></td>
</tr>
<tr>
<td>BPN 9 (AASHTO T-278, T-279)</td>
<td>30 min.</td>
<td>30 min.</td>
<td>25 min.</td>
<td>22 min.</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>32 % max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Section for Approval</td>
<td>20,000 ADT min. for 2 years, OR 7.3 million vehicle passes per test lane for min. 2 years (4-lane rural interstate, max. ADT 35,000 allowable)</td>
<td>20,000 ADT min. for 2 years, OR 7.3 million vehicle passes per test lane for min. 2 years (non-interstate)</td>
<td>10,000 ADT min. for 2 years, OR 3.65 million vehicle passes per test lane for min. 2 years (non-interstate)</td>
<td></td>
</tr>
</tbody>
</table>

Step 7- Other material (limestone for example) which has been laboratory tested and conforms to the chemical and physical properties of Table 903.24-1 (above) and Subsection 903.24 of the Standard and any Supplemental Specifications must then demonstrate satisfactory test strip performance. Material meeting TYPE I requirements are exempt from providing a test section for approval, but must maintain a satisfactory field performance to remain an approved source.

Step 8- The aggregate Producer, with TDOT assistance, will be responsible for identifying existing or proposed asphalt paving construction project for a test strip location. The test strip shall be within the traffic range identified in Table 903.24-1 (above) for the TYPE of aggregate which approval is being requested. Traffic ranges shown are for two lane roadways. Since it may be difficult to identify two lane roads with ADT volumes shown, the outside lanes of rural 4-lane roadways will be considered, provided the minimum number of vehicle passes are obtained in that lane. The number of vehicle passes will be calculated by assuming the outside lane will receive 30% of the ADT. The Producer shall provide project documentation such as the title sheet which will include the project description, location, and the Average Daily Traffic (ADT). Also, the Producer shall submit the calculations of traffic requirements for specified type of surface aggregate requested.

Step 9- The aggregate Producer will be responsible for coordinating the test section with the prime contractor. No additional payment will be made for the test section or other costs associated with the test section. Coordination will include the submittal of a
bituminous mixture design by a TDOT certified asphalt mix design technician, and appropriate contract Supplemental Agreements or change orders.

**Step 10-** Once the bituminous mixture design is approved the test strip may be constructed in accordance with TDOT Standard Specifications and Contract requirements. The test section shall be 0.5-0.6 mile in length in each direction. The contractor will be required to place, at the producer’s expense, a blue sign at the beginning and end of each test strip. The signs shall read: “Begin Test Strip” and “End Test Strip”.

After the test strip is completed, TDOT will conduct periodic friction tests to determine the actual in place performance. If the test section demonstrates a frictional value greater than 40* after a minimum two year test period, that source material will be considered acceptable. When the total number of vehicle passes must be met, a test strip may need to be in place for more than 2 years.

(* Tested in accordance with AASHTO T-242, a test will be performed each 0.1 mile (minimum 5 per direction) with no individual test below 40)

**EXAMPLE:** A Type III aggregate is to be tested on a 4 lane rural roadway with an ADT of 18,000.

- 7.3 Million Vehicle passes are required. (from TABLE 1)
- 18,000 ADT x 0.30 for outside lane = 5400 ADT in the outside lane
- 7,300,000 vehicle passes ÷ 5400 vehicles per day = 1352 days = 3.70 years = ~ 3 years and 8 months

2.1 **Quality Monitoring:**

In addition to meeting the quality monitoring of Section 1.2 of this SOP, the following shall be met:

2.1.1 **At a minimum of twice per year (with a minimum of 90 days between samples); one sample submitted January through June and another sample submitted July through December, a sample of approved limestone material shall be obtained from the source stockpile by Regional Materials and Tests personnel and submitted to the Headquarters Materials and Tests laboratory for both a complete chemical and physical verification of both the approved surface aggregate properties and the standard aggregate quality properties. All other crushed aggregate types will only require a chemical (excluding the BPN) and physical verification testing at the same frequency.**