

1601 - STEEL BARS FOR CONCRETE REINFORCEMENT

SECTION 1601

STEEL BARS FOR CONCRETE REINFORCEMENT

1601.1 DESCRIPTION

This specification governs the steel bars for concrete reinforcement that are produced from billet steel.

1601.2 REQUIREMENTS

a. General.

(1) Any plant producing steel bars for concrete reinforcement through this specification must be currently prequalified. A plant is any facility that rolls or otherwise produces the bars from the basis steel.

(2) All the bars produced through this specification are to be deformed unless specified otherwise on the in the Contract Documents.

(3) When it is required to bend and cut bars in order to produce components for a project, conduct these operations in a fabrication shop before shipment to the project. This requirement applies unless it is specified otherwise in the Contract Documents or documented approval is obtained from the Engineer's representative. Heating of the bars to facilitate the bending operation is not permitted.

b. Material Specifications.

- Carbon steel bars..... AASHTO M 31
- Rail-steel and Axle-steel bars AASHTO M 322

1601.3 TEST METHODS

Conduct all tests required by the applicable AASHTO material specification of **subsection 1601.2b**.

1601.4 PREQUALIFICATION

a. General. Contact the Bureau Chief, Materials and Research, to arrange for the required sampling, observation of testing procedures and review of the plant quality control program.

The plant is to absorb all the Engineer's representative expenses associated with the inspection. This includes travel, subsistence and lodging, and the expenses of shipping the selected specimen bars to the KDOT Materials and Research Center for comparison testing.

It is the option of the Bureau Chief, Materials and Research, to grant approval status to a plant based upon the qualification test and inspection results of the transportation agencies of other states.

A plant will be notified by written documentation in the event of any change in their approval status. The Bureau of Materials and Research will maintain a list of all plants that are prequalified and approved to provide bars to KDOT projects.

b. Plant Quality Control Requirements. The plant must have a quality control section identified within its organization that is adequately staffed to perform the required lot by lot testing. The plant laboratory must have proper equipment, calibrated according to AASHTO T 67 (ASTM E 4) annually as a minimum, with which to adequately perform all testing according to **subsection 1601.3**. Provide a copy of the plant quality control plan to the Engineer's representative during the plant inspection.

c. Sampling and Testing Procedure. The Engineer's representative will select the test samples, at random, at the plant. Provide access to all facilities necessary for the Engineer's representative to randomly select samples from all lots defined below. Provide plant personnel to cut and label the necessary specimens from the randomly selected bars.

(1) Lot size. The lot of reinforcing bars that is subject to sampling includes all sizes, grades, and heats in stock. Remove the samples from 3 different bars from each of 10 heats, i.e., 30 sample bars, unless exceptions are authorized by the Bureau Chief, Materials and Research, or their designated representative.

(2) The sample size is 12 feet for all bars selected.

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(3) Sample preparation. Assign each sample bar a unique identification number. Durably affix this number to each end of the bar. Cut each sample bar into 2 equal length specimen preparation sections. Each section provides 1 tensile and 1 bend test specimen. The specimens from one section are for testing by the plant and the specimens from the companion section are for the comparison testing by the KDOT. Leave the KDOT's specimen preparation section in 1 piece. Conduct all sample preparation operations in the presence of the Engineer's representative.

(4) Specimen testing. Test the specimens according to the procedures and requirements of the applicable AASHTO specification as referenced in **subsection 1601.2b**. For the purpose of comparing the plant and KDOT testing laboratories, one tensile and bend test specimen set from each sample is to be tested by each laboratory. Provide all the necessary facilities and test records required by the Engineer's representative to witness the tests.

The Engineer's representative will witness all relevant testing performed by the producer. Record the plant test results onto a KDOT form and sign the form. Provide these results to the Engineer's representative for submittal to the KDOT central laboratory.

Submit the remaining companion sections from each sample to the KDOT central laboratory. It is mandatory that these sections each have at least one occurrence of the plant's unique mill marking character set that identifies the bar.

(5) Comparison testing. The companion sections will each provide a tensile and bend test specimen set that will be tested by the KDOT central laboratory according to the procedures and requirements of **subsection 1601.2b**.

The KDOT results will be compared to the parallel plant data from each heat for variations and differences. These variations and differences may not exceed the following, based on the KDOT values as the reference where applicable:

Property	Individual Specimen	Average Specimen
Yield Strength	15%	6%
Tensile Strength	10%	4%
Δ Elongation, %	9	6

All variations and differences are absolute value based.

A heat that fails the comparison requirements may be resampled 1 time only, and on a 2 to 1 basis. It is preferred that the resample be removed from the same heat that failed. The initial test results will be replaced by those of the resample specimens.

d. Plant Status.

(1) Attainment of prequalified status. In order for a plant to be prequalified to provide bars to KDOT projects, the following requirements must be complied with:

(a) With the exceptions as noted in (b) and (c) to follow, no single heat of those tested is permitted to fail to comply with the applicable requirements referenced in **subsection 1601.2b**.

(b) No lot tested by the KDOT may have any of the individual test results for yield strength, tensile strength, or elongation below the AASHTO specified minimum values without the deficiency also being identified by the plant quality control section.

(c) It is permissible for one bend test specimen from one heat only to fail the bend test.

(d) The variations from the comparison testing are not to exceed the values stated in **subsection 1601.4c.(5)** for any heat.

(2) Renewal of prequalified status. The following schedule will apply to plants that have attained their initial prequalification status:

(a) One year after the initial prequalification, the plant will again be evaluated according to **subsection 1601.4**.

(b) For plants that retain prequalification after the second evaluation, the next evaluation will be required after a 2-year time interval.

(c) For plants that retain prequalification after the third evaluation, the required evaluation time interval will be extended to 3 years thereafter providing the plant is not disqualified.

(d) A prequalified plant that becomes disqualified must comply with all the requirements that apply to a plant that is attempting the initial prequalification, with the following exception. The

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disqualified plant may petition for an immediate reevaluation provided it can be demonstrated to the Bureau Chief, Materials and Research, that the disqualifying deficiencies have been corrected.

(3) Disqualification. All prequalified plants that are currently providing bars for KDOT projects will have their product quality monitored through the use of verification samples.

(a) Verification samples. The Regional Materials Laboratories will randomly select on average 1 verification sample per month from the bars being provided by each prequalified plant for use on KDOT projects. Special arrangements may be considered for plants providing small quantities during the course of a year. These samples are to include all bar grades and sizes that may be available for use on KDOT projects. These samples will be obtained from various shipments and at any fabrication, coating, or precast facility, or warehouse selected by the Regional Materials Engineer. On occasion, it will be necessary for the Regional Materials Engineer to notify the District to obtain verification samples at a project. Samples will be submitted to the MRC for testing according to the procedures and requirements of **subsection 1601.2b**. Reduction in sampling will follow the criteria established in Part V, Appendix A, Multi-level Sampling Frequency Chart, with the following exception: Reduced Frequency Approved by Regional Materials Engineer with Notification to Bureau of Materials and Research.

(b) Verification sample testing. The verification samples are to comply with the minimum requirements of the applicable AASHTO specification of **subsection 1601.2b** with the exceptions as noted in the following.

- It will be permissible for the test results from only one annual verification sample from each prequalified plant to be less than the following:

Property	Requirement
Unit Weight:	99% of the specified minimum
Yield Strength:	95% of the specified minimum
Tensile Strength:	95% of the specified minimum
Elongation, %:	Specified minimum minus 2

- Not more than 10% of the annual verification samples from each prequalified plant will be permitted to have test results less than the applicable specification minimums.
- Not more than one annual verification sample from each prequalified plant will be permitted to fail the bend test.
- In the event that the verification samples fail to comply with the proceeding, the Engineer's representative may resample the failing heat(s) one time only on a 2 to 1 basis or reject the failing heat(s). The Contractor is to replace the rejected heats at no additional cost to the KDOT. The initial test results will be replaced by those of the resample specimens.

Failure of the verification sample bars from a plant to comply with **subsection 1601.4d.(3)(b)** will result in disqualification of the plant and removal from the prequalified source list. In the event of disqualification, the plant is subject to **subsection 1601.4**. A plant that fails to comply with **subsection 1601.4d.(3)(b)** 2 times, consecutive or otherwise, will be permanently disqualified.

1601.5 BASIS OF ACCEPTANCE

- a. The plant must be currently prequalified.
- b. Submit for approval to the project Engineer and MRC, a copy of a Type A certification (certified mill test report), as specified in **DIVISION 2600**, that governs the analysis of all bar steel heats delivered to the project.
- c. The Engineer's representative of the project must be provided with shipping orders, an invoice, or cover letter that documents the project number, bar sizes and grades, heat, job, or mill order number(s), and the total weight of each heat of the represented bars delivered to the project.

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d. The Engineer's representative of the project must be provided with a document stating that the bars delivered to the project comply to this specification. This documentation must bear the signature and title of an official of the plant with Contract Document binding authority, and must be notarized. This requirement may be included on the certified mill test report referenced in **subsection 1601.5b.**

e. Single or bound groups of bars must be tagged or otherwise marked in a durable manner. At a minimum, this identification must list the bar manufacturers corporate identification and plant location, the heat, job, or mill order number, and display a copy of the plant's unique mill marking character set that identifies the bar.

f. The final disposition of the bars will be completed at the final destination as the result of inspection for the quality of workmanship and the delivery condition.