

**Geotechnical/
Structures****MAY 2026****Project Title:** Evaluation of #9 and Smaller Splices and Headed Bars for Use with Grade 80 Reinforcement**Task Number:** 4031**Start Date:** March 21, 2024**Completion Date:** December 31, 2026**Task Manager:**Seung Han Kim
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Evaluation of #9 and Smaller Splices and Headed Bars for Use with Grade 80 Reinforcement

Prequalifying #9 and smaller mechanical splices and head devices for use in bridge construction with higher-strength Grade 80 bars.

WHAT IS THE NEED?

The California Department of Transportation (Caltrans) is preparing to release a Structure Design Alert mandating that designers use American Society for Testing and Materials (ASTM) A706 Grade 80 reinforcement instead of ASTM A706 Grade 60 in Capacity Protected and non-critical members in Caltrans structures. Benefits of use of Grade 80 reinforcement in Caltrans structures may include reduced congestion, construction time, materials, cost, and environmental impact.

The existing Authorized Material Lists (AMLs) for couplers and headed bars has been compiled only for Grade 60 reinforcing bars. Research, testing, and development of proper Quality Control and Quality Assurance (QC/QA) procedures to evaluate couplers and headed bars used with Grade 80 reinforcement have not been performed to this date. To assure that these elements consistently meet the performance requirements of the department, test methods and acceptance activities must be developed that specifically address the risks of products currently available on the market for Grade 80 bars sized at or below #9.

WHAT ARE WE DOING?

This research will primarily be experimental. The work will start with a literature review of relevant research and common practices. Then a variety of Grade 80 reinforcement products will be collected from various manufacturers representing the different methods of creating high strength steel. These products will be tested with methods determined from the literature review to find variability of the products and suitability of tests for various types of Grade 80 products. Finally, the results will be used for recommendations on testing



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and acceptance activities of Grade 80 bars sized at or below #9 products for use in Caltrans structures.

Caltrans AMLs for couplers and headed bars are divided into sections based on the coupler design and headed bar connection type respectively. Research testing should include each of the coupler types, and each of the headed bar connection types. Specimens to be tested should be random samples. Yield strength, tensile to yield ratio, and elongation should be measured. The parameter of strain at peak stress should be measured.

The location of failure in relation to the coupler/headed connection should be noted. High strength rebar from different suppliers should be used, and the results for each supplier should be reported separately. Fatigue and cyclic loading will also be performed on each splice type as well using the parameters of the cyclic loading modified from California Test (CT) 670, section F.

WHAT IS OUR GOAL?

The goal of this research is to develop quality control and quality assurance (QC/QA) testing requirements for ASTM A706 Grade 80 couplers and headed bars. The research team will test commercially available couplers designed for Grade 80 reinforcing steel. The study will also review the current California Test (CT) 670 testing method to determine what changes may be needed for Grade 80 reinforcing bars that are #9 size or smaller, with emphasis in fatigue and cyclical testing.

WHAT IS THE BENEFIT?

This research will provide new or improved QC/QA testing criteria for ASTM A706 Grade 80 couplers and headed bars, enabling the evaluation of CT 670 that includes new criteria for testing Grade 80 splices. This research will lead to the development the basis for the Approved Materials List for Grade 80 bars sized at or below #9.

WHAT IS THE PROGRESS TO DATE?

The main goal this quarter was to finish testing couplers using slip and cyclic loading tests. These tests included pulling the couplers until they broke. Fatigue testing of the coupler samples also began.

During this period, 35 samples were tested:

- 12 cyclic loading tests
- 12 slip tests
- 11 fatigue tests

Manufacturers who did not respond to messages during this quarter are no longer considered to be waiting to send their samples.

For the headed bar testing program, the equipment needed for testing arrived during the third week of February. Headed bar samples will be tested using two methods: pulling them until they fail and applying repeated loading. These tests will begin after all coupler fatigue tests are completed"