

# Expansion Anchorages

Expansion anchorage devices seldomly develop the full tensile strength of a stud or a bolt and are therefore less desirable than cast-in-place bolts and inserts. For this reason, expansion anchorage devices are generally used only for attaching fixtures such as signs, ladders, utilities, and temporary railings to hardened concrete.

Inspections by engineers from Structure Maintenance & Investigations have disclosed instances of loose anchorage devices for bridge-mounted signs. The lack of proper anchorage had gone undetected because a headed bolt was used instead of a threaded stud. When the bolt was tightened against the fixture mounting plate, it pulled the anchorage loose from the concrete. The anchorage then pressed against the other side of the plate, and further tightening gave the impression that the fixture was securely attached when actually it was loose. To minimize this problem, a threaded stud expansion anchor is specified instead of a headed bolt and shell-type mechanical expansion anchor (MEA) combination. This is especially the case when attaching bridge-mounted signs on concrete structures. The project plans will also specify the diameter of the anchor, while galvanizing requirements are given in the [Contract Specifications](#).

In the event that the aforementioned details are not shown in the project plans, the Structure Representative should consult with Bridge Design and issue a change order for threaded stud expansion anchors. Note that the stud diameter should be 5/8 inch if the plans call for a 5/8 inch anchorage device. The other aspects of the expansion anchorage must conform to the project plans and specifications.

When shell-type MEAs are used, an expander plug is driven against the shell to expand the shell against the concrete. A sufficient thickness of concrete must be provided behind the plug to resist the driving force. The drilled hole for the anchorage must also be true to size and shape to ensure the fullest bearing of the expanded anchor against the concrete. It is also important to verify that the length of the headed bolt is sufficient to grip the plies and engage the threads per the manufacturer's recommendations. Bolts that are too long may bottom out inside the anchor and not provide the correct grip on the plies. Verify that the installer understands and complies with the manufacturer's installation instructions. Manufacturers may specify the use of a special installation tool to seat the anchor in the concrete. Improperly seated anchors may pull out during fastener installation. Do not use these types of anchorages for bridge-mounted signs.

All concrete anchorage devices are subject to the authorization of the Engineer. Current authorized products can be found on the Department's [Authorized Materials List](#) (AML). On the page are links to the latest authorized products for concrete anchorage devices. If the proposed MEA does not appear on the working list, authorization must be contingent upon submittal to the Engineer of sample concrete anchorage devices,

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manufacturer's instructions, and certified results of tests indicating compliance with specification requirements. Consult the Materials Engineering and Testing Services Representative ([METS Rep](#)) and the Designer of Record for assistance.

In summary, the Structure Representative should verify that all expansion anchorage installations conform to the following:

1. Verify that the anchorage device is listed on the AML.
2. Verify that the proper size hole is drilled, and is properly cleaned out.
3. Verify the use of threaded studs and not headed bolts.
4. Verify the use of galvanized studs (not black steel studs).
5. Never accept a stud with a smaller diameter than the stud or anchorage device size specified on the project plans.