CHAPTER FIVE

B A R R I E R W A L L S

CONTENTS

BARRIER WALLS

Barrier walls are constructed after the deck is placed and, along with the deck, are the most visible elements of the bridge to motorists. Because of this, the surface finish and alignment of the walls are very important. There is usually no maximum time limit on the age of the deck before barrier walls are placed. However, there may be a minimum time or strength limit on the age of the deck. You will find these limits in the Standard Specifications or Special Provisions as well as detailed information about barrier walls in Specification 521. Be sure that no work is begun prior to the minimum allowable specified time shown in the specification or contract documents.

There are two barrier wall forming methods: stationary forming and slip forming. For the stationary forming method, metal or wooden forms that are the shape of the vertical barrier wall surfaces are firmly set in place on top of the deck. Concrete is placed in the forms and cured and then the forms are removed and reused for the next section of wall.

For the slip forming method, a machine guided by a string line, slowly moves along the deck while it covers the barrier wall rebars with a steel form in the shape of the barrier. Very stiff concrete is continuously fed into the machine, which automatically shapes and forms the barrier wall as it passes over the rebars. The concrete is stiff enough to stand up by itself once the machine moves forward thus leaving a correctly shaped wall that only requires final finishing and curing. Slip forming machines can routinely produce as much as 1500 feet of wall per day. On all but the smallest projects, barrier walls are usually slip formed because this method is much less expensive and far quicker than the stationary form method.

WHAT TO CHECK BEFORE CONCRETE PLACEMENT

As the inspector, you will need to check a number of items before the Contractor places any barrier wall concrete and the most important of these are as follows:

- Make sure the deck surface under where the barrier will be placed has a rough texture and that any loose concrete fragments or other debris have been removed before concrete is placed. This will ensure that there will be a good connection or bond between the barrier and the deck concrete.

- Check to see that rebars are the right grade, size, shape and length; that they are fastened with the right tie wire style and interval and that the tie wires do not protrude into the concrete cover zone; that the rebars are free of any coatings (concrete, curing compound, etc.) and significant corrosion; and that they are spaced and located properly and have the minimum concrete cover.

- Check on whether utility embedments such as conduits, pipes and junction boxes are located properly and that they are not in contact with rebars which would prevent concrete from flowing between the embedment and the rebars.

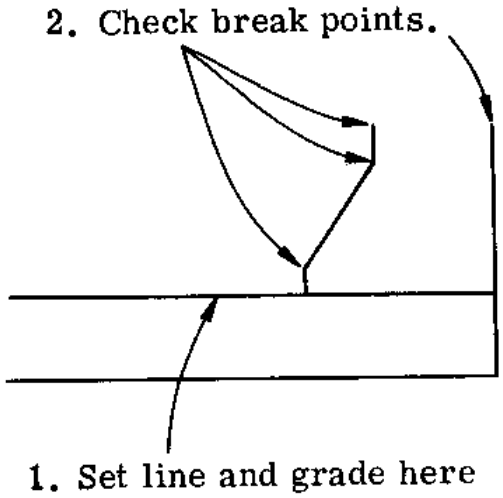
- For the slip form method, verify that the Project Administrator has approved the Contractor's slip forming machine and operations plan; that the slip forming machine is operating properly, particularly with regard to vibrators; and that the deck ahead of the machine is clean and level. Also, make sure that the shape and dimensions of the slip form are correct and that the string line used to guide the machine has been checked for correct line and grade.

- For the stationary form method, verify that forms are set on the correct line and grade and sight along the top of the forms to determine whether or not there is a smooth and true alignment. Forms must not have a deviation greater than 3/8 inch as measured from the midpoint of a 10 feet straightedge. Regardless of elevation variations in the deck surface, the barrier forms should be adjusted to produce a true, top of barrier, alignment. Also, make sure that shape and dimensions of the forms are correct and that form material is an approved metal or wood material. See diagram that follows.

    1. Check the alignment of the barrier wall on the deck slab as shown on the right.

    2. Check the break points in the forms also shown on the right.

    3. Check the alignment as the concrete is being poured and have the Contractor make any necessary adjustments.



- Be sure that expansion joints are located properly and according to the plans.

- Anchor bolts that extend from the top surface of the barrier wall for connecting bridge railings, may be required. Be sure that the Contractor sets them accurately and firmly secures them in place. They must be securely attached to the rebar cage to prevent the weight of the fresh concrete from moving them during placement.

WHAT TO CHECK DURING CONCRETE PLACEMENT

When the concrete is delivered to the site and is placed in the stationary forms or is poured into the slip forming machine, the items that follow must be checked to ensure that the wall will be sound and properly aligned:

- Before concrete is placed, interior surfaces of stationary forms and the surface of the deck must be wet. Consolidation of concrete must be thorough and this can be accomplished by a hand operated vibrator.

The edges or faces of the forms should be tapped or rodded to eliminate any entrapped air.

- When the forms for a barrier wall have been filled nearly to the top, all water and contaminated concrete should be removed, and the form should then be overfilled with fresh concrete. After the concrete has shrunk, the surface should be screeded off slightly above the desired final grade and should be given the final finish as soon as the concrete attains the proper set.

- For the slip form method, verify horizontal alignment behind the machine as the wall is placed by checking to see if there is a horizontal deviation greater that 3/8 inch as measured from the midpoint of a 10 feet straightedge. The Contractor must correct any deviations greater than 3/8 inch while the concrete is still moldable. Also, verify rebar clearances just in front of the machine as it progresses.

WHAT TO CHECK AFTER CONCRETE PLACEMENT

Once the concrete is placed, you must make sure that the proper form stripping, concrete curing and joint cutting procedures are followed by the Contractor. Here are some of the more important ones:

- For the stationary form method, forms can not be removed for at least 12 hours after placement and once they are removed the proper curing method must be used which can be found in Specification 400.

- Contraction joints must be sawed at intervals as specified in the plans and not later than 12 hours after concrete placement.

- For the slip form method: cure according to SS 400 and see that all pinholes, pockmarks and blemishes are patched with mortar. Curing compound must be applied to all concrete surfaces within 30 minutes after the slip form machine passes or when the surface dries to a damp condition, whichever comes first. The curing compound spread rate and procedure for measuring the spread rate is the same as it is for deck construction.

Q U I Z

1) The appearance of a barrier's surface and alignment are very important because they are the _____ _____elements to _____.

2) The deck surface below where the barrier will be placed must be free of _____ _____ and other _____.

3) Which of the following items should be checked about rebars before concrete is placed:
   a) Size, length, shape and grade
   b) Approval of the rebar manufacturer
   c) Location and spacing
   d) Qualifications of the ironworker setting rebars
   e) Correct style and interval of tie wires

4) The Project Administrator must approve the Contractor's _____ _____ machine and _____ plan.

5) Forms must not have a horizontal deviation greater than ____inch as measured from the midpoint of a ____ foot straightedge.

6) True or false: before concrete is placed, the interior surfaces of stationary forms and the surface of the deck must be thoroughly dry.

7) For the stationary form method, the forms cannot be removed for at least ___ hours after placement and once they are removed the proper curing method must be used which can be found in Specification ___.

8) True or false: contraction joints must be sawed not later then 12 hours after concrete placement.

ANSWERS TO QUESTIONS - PAGE 5 - 6

1) most visible, motorists

2) concrete fragments, debris

3) a, c, e

4) slip forming, operations

5) 2, 10

6) False: they must be wet

7) 12, 400

8) True