

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIAL PROCEDURE

---

METHOD OF TENSIONING AND REPORTING TORQUE OF BOLTS  
FOR NEW AND REPLACEMENT BREAKAWAY SIGN SUPPORTS

---

1.0 PURPOSE

To set forth the material requirements, define the method of testing and outline a method of recording the torque results so obtained.

2.0 SCOPE

The procedures set forth herein are intended to provide basic guidance for project field personnel, district materials personnel, Contractor personnel, as well as all maintenance personnel.

3.0 EQUIPMENT

The equipment required for this tensioning consists of one (1) 305 mm adjustable wrench (Crescent Type), one (1) accurately adjusted torque wrench, capable of being applied to 12.7 mm, 16 mm and 19 mm ASTM A325 nuts and one (1) set of small center punches.

4.0 DESCRIPTION

4.1 The operation of breakaway sign supports is entirely dependent upon the tension applied to the A325 bolts used in the assembly. The design is such that the hinge plate bolts must be tightened to approximately their full "Proof Load" rating to serve their intended purpose. A check of Standard Sheet TE1-3A will show the two types of hinge plates used while a check of Standard Sheet TE1-3B will show that the hinge plate is mounted 100mm below the bottom edge of the sign. This sheet also shows that only one (1) hinge plate is used on the "S" shapes, which are cut nearly all the way through while two (2) plates are used on "W" shapes, which are cut completely into two (2) pieces.

- 
- 4.1.1 The purpose of the hinge plate is twofold. First to stiffen the sign support so that high winds will not blow it over, hence the extreme tightening of the bolts; and second to slip from under the two bolts of the notched hinge plate or break the hinge plate for "W" shapes, upon the impact of an automobile.
- 4.1.2 The most particular of all bolts, with regard to tightening, are the bolts fastening the upright onto the stub which is embedded into the concrete base. These bolts are tightened to approximately one fifth (1/5) of their proof load which, from testing and experience, has been found to be the proper tension for the support to breakaway from the impact of an automobile, without serious injury to the car or occupants. In fact, it often happens that the support itself is not seriously damaged from being knocked down.
- 5.0 PROCEDURE
- 5.1 In all cases when installing or replacing breakaway sign supports, a representative from the District Materials Section is to be present to check and document the required torque.
- 5.2 The first operation before the support is erected is to check the tightening of the hinge plate bolts. This should be accomplished by the method shown on Standard Sheet TE1-3B.
- 5.2.1 Tighten bolts in systematic order to the prescribed torque.
- 5.2.2 Loosen each bolt and retighten to prescribed torque in the same order as initial tightening. (The above operations shall be accomplished with a 305 mm adjustable wrench, tightening as tight as possible).
- 5.2.3 Burr threads at junction with nut, using a center punch.
- 5.3 The procedure for bolting the upright to the stub is found on Standard Sheet TE1-3A.
- 5.3.1 Assemble post to stub with bolts and with one flat washer on each bolt between plates.
- 5.3.2 Shim as required to plumb post.

5.3.3 Tighten all bolts the maximum possible with the 305 mm adjustable wrench, to bed washer and shims and to clean bolt threads, then loosen each bolt in sequence and retighten in the same sequence to the prescribed torque. (See Table).

5.3.4 Burr threads at junction with nut, using a center punch, to prevent loosening.

5.3.5 Base Bolt Torque Table

Bolt Size	Newton - Meters Torque
12.7 mm x 64 mm	10.85 to 14.91
16 mm x 70 mm	25.76 to 37.96
19 mm x 89 mm	42.03 to 62.37

Because of the importance of proper torque on these base bolts, the above table is repeated here as given on Standard Sheet TE1-3A.


5.3.6 The size bolt to be used with the various post sizes should always be rechecked from Standard Sheet TE1-3A before the bolt is torqued.

5.3.7 The torque wrench used to determine the torque on these base bolts must be calibrated before use each day and for each succeeding days use.

5.4 It shall be the responsibility of the representative of the District Materials Section to keep a log of the torque reading of each base bolt on breakaways installed in the District and also to record a brief description of any accident involving a breakaway sign support, including damage due to wind storms.

5.4.1 One copy of the appropriate data from the above record shall be submitted to the Materials Control, Soils and Testing Division, Charleston, West Virginia, in computer format. (See attached sample).

- 
- 5.4.2 These data shall consist of the following:
- 5.4.3 Number of project.
- 5.4.4 Date installation completed.
- 5.4.5 Sign number.
- 5.4.6 Torque of each base bolt.
- 5.4.7 Report on hinge plate bolts.
- 5.4.8 Date of report.
- 5.4.9 Report of all accidents.
- 

  
Gary L. Robson, Director  
Materials Control, Soils  
and Testing Division

GLR:c

Attachments

FORMAT FOR REPORTING TORQUE OF  
BOLTS ON BREAKAWAY SIGN AND DAMAGE  
TO BREAKAWAY SIGNS

This format supersedes the one issued on May 21, 1980, for reporting information as per MP 657.00.50, Section 5.4.1.

Attached is a sample T-702 and HS-30 mark sensing form (See Attachment two). Your reports should be filled out in the same manner as this sample. A T-7 printout is also attached (See Attachment three). The printout comes from the T-702 and HS-30 enclosed.

A. T-702

1. The Code block should be marked "add".
2. The project is not to be filled in. It may be noted on the blue shaded area at the bottom right, if it is known.
3. The type of sample will always be 1865.
4. The source will be M320I for initial reporting of torque and M320A for accident reports.
5. The date torque was witnessed should be filled in the "date sampled" block. If the T-702 represents a damage report, the date of the damage or the date it was reported should be filled in in the "date sampled" block.
6. The inspectors name and District should be filled in on the "Sampled By" block.

B. HS-30 Page 1 (Torque of Bolts)

1. The Code Block should be marked "add".
2. The inspector should fill in his employee number and sign his name in the technician signature block.
3. Fill in a one (1) and an eighteen (18) as shown in the unmarked blocks.
4. If this report represents only part of the bolts to be torqued on the project, fill in the date completed block with zeros. When the bolts on the last supports on the project are torqued and reported, fill in the date completed with the date the last bolts were torqued.

5. The test data is filled in as follows:

- a. Block one - Fill in the sign number from the plans if known. If not, fill in a one (1) in the last block. When reporting the torque of a repaired sign, write in the word repair in the last six boxes (Note: None of the test blocks should ever show a number or letter in the first column).
- b. Blocks two through nine - Fill in the measured torque for the bolts as required from the special provisions. If there are only four bolts for a sign, just fill in blocks two through five. If there are eight bolts, use all eight blocks.
- c. Block ten - Fill in a five (5) to show that the hinge plate bolts have been checked as per section 5.2 of the MP.
- d. Block eleven - Fill in the two digit number of the county in columns 2 and 3. Skip column 4. In the last three blocks, fill in the route number; for instance, I70 or 250. If only two numbers are needed, use the last two columns.
- e. Block twelve - fill in the mile point. There are two decimal points so that the mileage can be written 5.55. There must always be two decimal points filled in even for exact mileage, i.e., a sign right at milepost ten should be filled in as 1000. The computer assigns the decimal. The mileage increase from South to North and from West to East, regardless of the lane direction (See Attachment 4)
- f. Block thirteen - In the last column, put the lane direction (N, S, E,W).

C. HS-30 Page 2 (Accident Report)

This report should be filed when the sign is repaired and an HS-30, Page 1, should accompany this to show that the bolts were properly torqued during repair or replacement. The accident report and the repair should be filed together when the repair work is done.

This HS-30 should be filled out as follows:

1. The code block should be marked "add".
2. The inspector should fill in his employee number and sign his name in the technician signature block.
3. Fill in a two (2) and an eighteen (18) as shown in the unmarked blocks.
4. Fill in the date of the accident or the date it was reported.
5. Fill in the data as follows.
  - a. Block one - Fill in a one (1) in the last column.
  - b. Block two - Fill in a one (1) in the last column.
  - c. Block three - Enter a one (1) in the last column if the damage was wind related. If not, leave this block blank.
  - d. Block four - Enter a one (1) in the last column only if the hinge bolts were damaged. If they were not, leave this column blank.
  - e. Block five - Enter a one (1) in the last column if the damage was vehicle related. If not, leave this block blank.
  - f. Block six - Enter a "G" in the last column if the sign post performed properly after the damage. If it did not, enter a "B".
  - g. Block seven - Enter county and route as explained earlier in HS-30, page one.
  - h. Block eight - Enter mile point as explained earlier in HS-30, page one.
  - i. Block nine - Enter lane direction as explained earlier in HS-30, page one.

Blocks ten through thirteen are not to be used.

All entries on HS-30 forms are to be right hand justified.

Attached is a table which summarizes what each block contains. The accuracy column shows the number of places after a decimal point that will be printed. Only the milepoint block has a decimal (See Attachment 5).



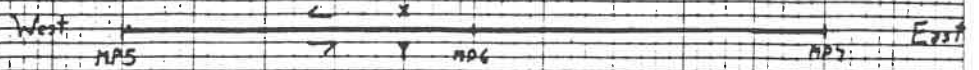




1004400 1805 10-27-80	LABORATORY NUMBER TELETYPE OPERATOR DATE REPORTED	TESTING LABORATORIES REPORT ON SAMPLE OF	
ROAD INA	COUNTY INA	ROUTE INA	DISTRICT INA 6
PROJECT INA	STATION INA	CONTRACT INA	OFFSET 000.0FT. FROM CENTER LINE
+ TO + TYPE OF SAMPLE BKY SIGN BOLT TORQUE	FIELD SAMPLE NUMBER M658E36 - (This may be used if District feels it would be helpful. It is not necessary.)	BRIDGE NUMBER	
ITEM NUMBER	QUANTITY REPRESENTED BY THIS SAMPLE 00000.0	QUANTITY TO DATE	
TEST REQUIRED (IDENTITY GOVERNING SPECIFICATIONS)			
DATE SAMPLED 05-12-80	DATE SHIPPED		
SAMPLED BY MARTIN M06	NAME OF CONTRACTOR		
ELEVATION 000.0 TO 000.0	HOLE NUMBER		
SPURCEA	OTHER IDENTIFICATION		
10000			

SIGN	REPAIR
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
TORQUE	20
H BLTS CKD	5
CNTY & RTE	35 170
MILEPOINT	005.55
LANE	W
DAMAGE RPT	1
AUTOMOBILE	1
PERFORMANCE	G
CNTY & RTE	35 170
MILEPOINT	005.55
LANE	W

MEETS SPECIFICATION REQUIREMENTS



If sign is at X on Westbound Lane the mile point would be 5.80. If the sign is on Eastbound Lane, it would still be 5.80 (Y)

North



South

If sign is at X on Northbound Lane, the mile point would be 5.60. If the sign is on the Southbound Lane at the same point, it would still be 5.60 (Y)

MATERIALS CODE 0865 TEST CODE 1  
 TYPE OF SAMPLE: BKY SIGN BOLT TORQUE

PAGE NO.	Block NO.	IDENTIFICATION	ACCURACY
1	01	SIGN	0
1	02	TORQUE	0
1	03	TORQUE	0
1	04	TORQUE	0
1	05	TORQUE	0
1	06	TORQUE	0
1	07	TORQUE	0
1	08	TORQUE	0
1	09	TORQUE	0
1	10	H BLTS CKD	0
1	11	CNTY & RTE	0

(Empty table area)

THE FIELD NUMBER IS THE TEST BLOCK NUMBER WHERE THE TEST IS TO BE REPORTED. IF THE PAGE NUMBER IS GREATER THAN 1, THEN THE PAGE NUMBER MUST BE REPORTED ON THE HS-30 FORMS WHEN CODED.  
 ACCURACY GIVES THE NUMBER OF POSITIONS TO THE RIGHT OF THE DECIMAL.

1	12	MILEPOINT	2
1	13	LANE	0
2	01	SIGN	0
2	02	DAMAGE RPT	0
2	03	WIND	0
2	04	HBLTS ONLY	0
2	05	AUTOMOBILE	0
2	06	PERFORMNCE	0
2	07	CNTY & RTE	0

MATERIALS CODE 0865 TEST CODE 2  
 TYPE OF SAMPLE: BKY SIGN BOLT TORQUE

PAGE NO.	FIELD NO.	IDENTIFICATION	ACCURACY
2	08	MILEPOINT	2