

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 104 WINDSHIELD WIPING AND WASHING SYSTEMS

TOYOTA MOTOR CORPORATION
2020 TOYOTA COROLLA LE, PASSENGER CAR
NHTSA NO. C20205105

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January 6, 2020

FINAL REPORT

PREPARED FOR

**U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2020 TOYOTA COROLLA PASSENGER CAR was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 104 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-104-08 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-104-08A dated 4 April 1997.

1.1 The test vehicle was a 2020 Toyota Corolla Passenger car. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTDEPRAE1LJ060304

B. NHTSA No.: C20205105

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 07/19

E. Color: Black Sand Pearl

F. Body Style: LE

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 104 testing on November 19, 2019.

SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2020 TOYOTA COROLLA passenger car, NHTSA No. C20205105 was subjected to FMVSS No. 104 tests on November 19, 2019. The selected portions of FMVSS No. 104 tests used were as detailed in the following subparagraphs. The test vehicle was positioned in the test system with three water spray nozzles suspended in line with the center of the longitudinal axis of the windshield and horizontal left/right center of the windshield to provide an even distribution of spray to the entire windshield. The height of the nozzles was approximately 22 inches above the glazing surface. The washer fluid tank was filled with all season washer fluid as recommended by the manufacturer. A tachometer was installed which could be monitored from inside the vehicle.

2.1 WIPER FREQUENCY TEST

The wiper frequency test was performed with the ICE (internal combustion engine) or in the case of an EV (electric vehicle) the electric propulsion system activated and with a minimum of 50 cubic inches per minute of water from the spray nozzles. The wiper frequency was measured at the low and high wiper speed settings with the propulsion system activated in its idle condition. In the case of ICE vehicles, the wiper frequency was also measured at the low and high wiper speed settings with the engine at 2000 RPM.

2.2 WIPED AREA TEST

The test was conducted with the windshield wiper system operating at the high speed setting, engine (ICE or EV) at idle RPM and the spray nozzles spraying water at a minimum of 50 cubic inches per minute and a maximum of 100 cubic inches per minute. The wiper blade wipe pattern was outlined on the glazing surface and then transferred to a windshield pattern. The wiped area was determined for areas A, B and C from the windshield pattern.

2.3 WASHER CAPABILITY TEST

The windshield glazing surface was coated with a mixture of water and fine grade test dust. Within 15 seconds following application of the water-dust mixture, the windshield wiper and washing system was activated in the high speed mode for ten complete cycles. The vehicle's engine (ICE or EV) was operating at idle RPM. The cleared areas of the windshield were marked on the inside windshield surface. After ten complete cycles the system was deactivated and the wiped area transferred to a windshield pattern.

The glazing surface was cleaned and dried. The water dust mixture was re-applied and the test repeated.

The windshield patterns were used subsequently to determine the cleared area percentages.

SECTION 2 CONTINUED

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.4 SUMMARY OF RESULTS

Based on the test performed, the test vehicle's windshield wiping and washing system appears to meet the requirements of FMVSS 104.

Vellum patterns from capability Test #1 and Test #2 were identical.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2020 TOYOTA COROLLA Passenger Car.

SUMMARY OF DATA
FMVSS 104, WINDSHIELD WIPING AND WASHING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
 VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
 VEH. BUILD DATE: 07/19 TEST DATE: NOVEMBER 19, 2019
 CONTRACT NO./DELIVERY ORDER NO.: DTNH2216D00031/693JJ919F000169
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

WIPER TYPE: 2-SPEED ELECTRIC

WASHER TYPE: HIGH PRESSURE ELECTRIC PUMP

WINDSHIELD AREAS: A = 1153.3 in² B = 881.4 in² C = 338.5 in²

MANUFACTURER'S WINDSHIELD PATTERN USED: Yes X No

ACCESSIBILITY:

- | | | | |
|-----|-------------------------------------|--------------|------------------|
| (1) | Washer Control Accessible: | Yes <u>X</u> | No <u> </u> |
| (2) | Wiper Control Accessible: | Yes <u>X</u> | No <u> </u> |
| (3) | Washer Reservoir Filler Accessible: | Yes <u>X</u> | No <u> </u> |

DESCRIBE UNUSUAL FEATURES OF WIPING AND WASHING SYSTEMS:

PERFORMANCE:

TEST	PASS	FAIL
WIPER FREQUENCY	X	
WIPE AREA	X	
WASHER CAPABILITY	X	

RECORDED BY: G. FARRAND

DATE: 11/19/19

APPROVED BY: D. MESSICK

FREQUENCY TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
 VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
 VEH. BUILD DATE: 07/19 TEST DATE: NOVEMBER 19, 2019
 CONTRACT NO./DELIVERY ORDER NO.: DTNH2216D00031/693JJ919F000169
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

Water Hardness: 6 grains/gallon (12 max.); Date Certified: 11/19/19

Water Spray Flow Rate: 79 in³/min. (specified range = 50 to 100 in³/min.)

Ambient Air Temp.: 64 °F (50-100°F); Water Temp.: 56 °F (100°F max.)

Manufacturer's Recommended Engine Idle Speed: 750 rpm

RUN 1, MAXIMUM WIPER FREQUENCY TEST:

TIME	ENGINE SPEED	TOTAL CYCLES	AVG. CYCLES/MIN. (45 MINIMUM)
1 ST 3 minutes	<u>750</u> (idle ± 50 rpm)	185	61.6
2 ND 3 minutes	<u>2000</u> (2000 rpm ± 50 rpm)	187	62.3

Frequency at least 45 cycles/minute regardless of engine speed: Yes X No _____

RUN 2, LOWER WIPER FREQUENCY TEST:

TIME	ENGINE SPEED	TOTAL CYCLES	AVG. CYCLES/MIN. (20 MINIMUM)
1 ST 3 minutes	<u>750</u> (idle ± 50 rpm)	130	43.3
2 ND 3 minutes	<u>2000</u> (2000 rpm ± 50 rpm)	127	42.3

Highest and lower frequency differ by at least 15 cycles/minute, and lower frequency is at least 20 cycles/minute regardless of engine speed: Yes X No _____

REMARKS:

RECORDED BY: G. FARRAND

DATE: 11/19/19

APPROVED BY: D. MESSICK

WIPE AREA TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
 VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
 VEH. BUILD DATE: 07/19; TEST DATE: NOVEMBER 19, 2019
 CONTRACT NO./DELIVERY ORDER NO.: DTNH2216D00031/693JJ919F000169
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 64 °F (specified range of 50 to 100°F)

Air Velocity at windshield = 0.1 mph (specified range of 0 to 1 mph)

Engine speed = 750 rpm (manufacturer's recommended idle \pm 50 rpm)

Temperature of water spray = 56 °F (100° F maximum)

Water spray flow rate = 79 in³/min. (specified range of 50 to 100 in³/min.)

Windshield wiper frequency = 61 cycles/min. (45 cpm minimum)

TEST RESULTS:

PERCENT WIPED				
WINDSHIELD AREA	ACTUAL	REQUIRED	PASS	FAIL
A	92.5%	80%	X	
B	95.7%	94%	X	
C	100%	99%	X	

REMARKS:

RECORDED BY: G. FARRAND

DATE: 11/19/19

APPROVED BY: D. MESSICK

CAPABILITY TEST DATA
FMVSS 104 – WINDSHIELD WASHER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
 VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
 VEH. BUILD DATE: 07/19; TEST DATE: NOVEMBER 19, 2019
 CONTRACT NO./DELIVERY ORDER NO.: DTNH2216D00031/693JJ919F000169
 TEST LABORATORY: GENERAL TESTING LABORATORIES
 OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 64 °F (specified range of 50 to 80°F)

Washer reservoir fluid temperature = 73 °F (specified range of 70 to 80°F)

Air Velocity at windshield = 0.1 mph (specified range of 0 to 1 mph)

Engine speed = 750 rpm (manufacturer's recommended idle ± 50 rpm)

Number of windshield washer nozzles on the vehicle = 2 (3 Spray orifices on each)

Windshield washer system activation coordinated with components of the wiper system:
 Yes X No

TEST RESULTS:

CLEARED AREA PERCENTAGES						
WINDSHIELD AREA	TEST 1	TEST 2	AVG	REQ'D*	PASS	FAIL
A	93.0	93.0	93.0	75%	X	
B	95.8	95.8	95.8	75%	X	
C	100	100	100	75%	X	

*NOTE FOR REFERENCE ONLY: SAE 942b, revised Jul72, recommends capability to clear 80% of the total wash area and 90% of the wash area included in AREA C.

REMARKS:

RECORDED BY: G. FARRAND
 APPROVED BY: D. MESSICK

DATE: 11/19/19

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
TIMER	ACCU-SPLIT	ACT2	03/19	03/20
TEMPERATURE READOUT	OMEGA	43P136P	08/19	08/20
TACHOMETER	MONARCH	ACT 3 1444664	11/19	11/20
SPRAY SYSTEM	GTL	N/A	BEFORE USE	BEFORE USE
ANEMOMETER	OMEGA	HH-600	09/19	09/20
CYCLE COUNTER	GTL	GTL	BEFORE USE	BEFORE USE
SOFT WATER	N/A	N/A	BEFORE USE	BEFORE USE
TEST DUST	AC	GM FINE	CALIBRATED DUST	CALIBRATED BY VENDOR*

*AC Inspection #503, Batch #1943, Measured with particle size roller analyzer.

SECTION 5
PHOTOGRAPHS



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE VIEW OF VEHICLE



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.5
VEHICLE CERTIFICATION LABEL



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.6
VEHICLE TIRE INFORMATION LABEL



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.7
TEST SET-UP



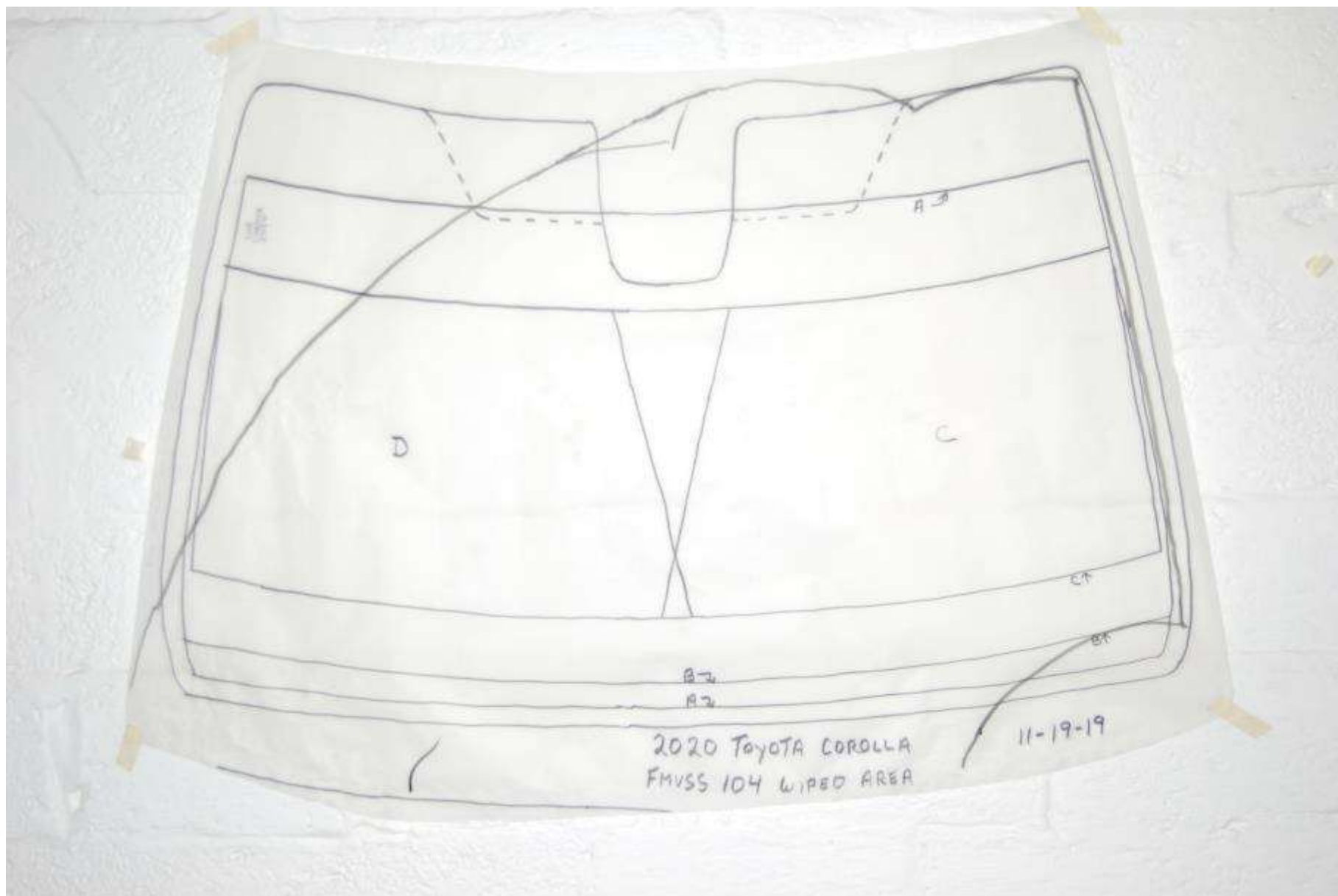
2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.8
WIPER AND WASHER CONTROL



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.9
WIPED AREA TEST IN PROGRESS



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.10
WIPED AREA TEST PATTERN



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.11
CAPABILITY TEST #1 PRE-COATED WINDSHIELD



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.12
CAPABILITY TEST #1 IN PROGRESS



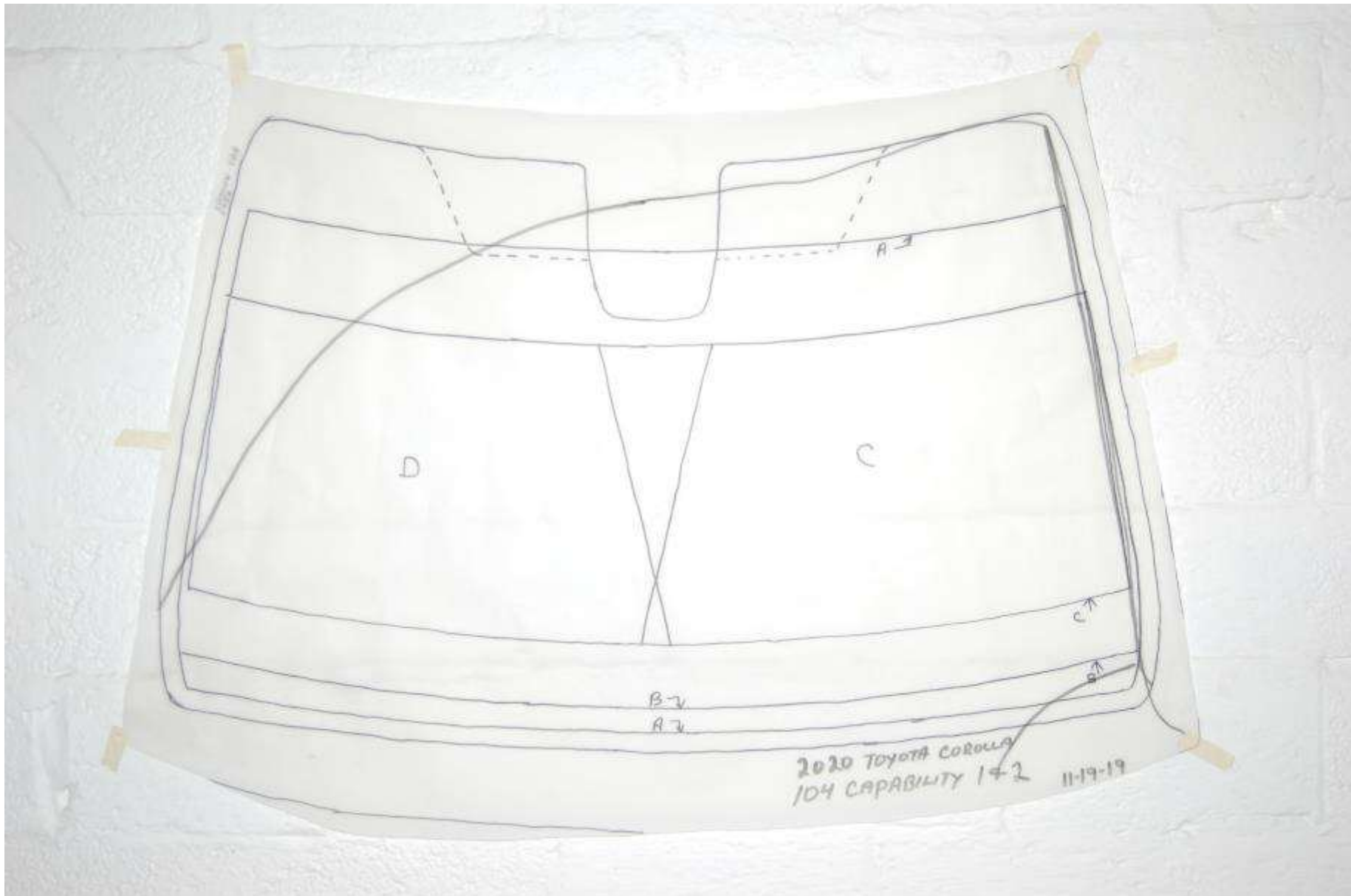
2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.13
CAPABILITY TEST #2 PRE-COATED WINDSHIELD



2020 TOYOTA COROLLA
NHTSA NO. C20205105
FMVSS NO. 104

FIGURE 5.14
CAPABILITY TEST #2 IN PROGRESS



2020 TOYOTA COROLLA
 NHTSA NO. C20205105
 FMVSS NO. 104

FIGURE 5.15
 CAPABILITY TEST #1 AND #2 PATTERN

SECTION 6

OWNER'S MANUAL INFORMATION

Windshield wipers and washer

Operating the lever can use the windshield wipers or the washer.

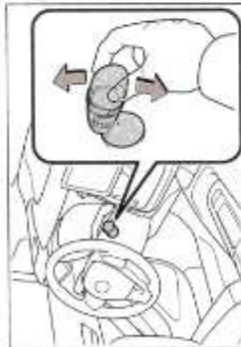


NOTICE

- When the windshield is dry Do not use the wipers, as they may damage the windshield.

Operating the wiper lever

Operating the lever operates the wipers or washer as follows.



- 1 INT (U.S.A.) or (Canada) Intermittent windshield wiper operation
- 2 LO (U.S.A.) or (Canada) Low speed windshield wiper

operation

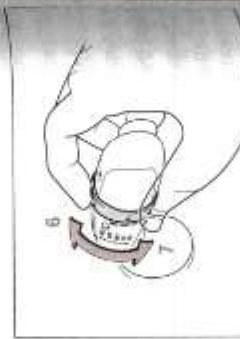
- 3 HI (U.S.A.) or (Canada) High speed windshield wiper operation
- 4 MIST (U.S.A.) or (Canada) Temporary operation



- 5 Washer/wiper dual operation

Pulling the lever operates the wipers and washer. Wipers will automatically operate a couple of times after the washer squirts.

Interval adjustment type only: Wiper intervals can be adjusted when intermittent operation is selected.



- 6 Increases the intermittent windshield wiper frequency
- 7 Decreases the intermittent windshield wiper frequency

- The windshield wiper and washer can be operated when the engine switch is in ON.

- If no windshield washer fluid sprays

Check that the washer nozzles are not blocked if there is washer fluid in the windshield washer fluid reservoir.

- When stopping the engine in an emergency while driving

If the windshield wipers are operating when the engine is stopped, the windshield wipers will operate in high speed operation. After the vehicle is stopped, operation will return to normal when the engine switch is turned to ON.

WARNING

- Caution regarding the use of washer fluid

When it is cold, do not use the washer fluid until the windshield becomes warm. The fluid may freeze on the windshield and cause low visibility. This may lead to an accident, resulting in death or serious injury.

NOTICE

- When the washer fluid tank is empty

Do not operate the switch continually as the washer fluid pump may overheat.

- When a nozzle becomes blocked

In this case, contact your Toyota dealer. Do not try to clear it with a pin or other object. The nozzle will be damaged.