



REPORT NUMBER: TWG-MGA-2011-018

**SIDE AIRBAG OUT-OF-POSITION INJURY
TECHNICAL WORKING GROUP**

**FORD MOTOR COMPANY
2011 FORD ESCAPE XLT FWD SUV
NHTSA NO.: MB0204TWG2**

TEST DATE: SEPTEMBER 8, 2011

FINAL REPORT DATE: SEPTEMBER 16, 2011

FINAL REPORT

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The results presented in this report relate only to the specified test items.

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side air bag deployment. These data constitute part of the general consumer information collected by Alpha Technology Associate, Inc.

SUMMARY

The effects of both a curtain and torso airbag deployment in a 2011 Ford Escape XLT FWD SUV with an out-of-position SID-IIs Build Level D were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on October 19, 2010. Pre and post test photographs of the vehicle and dummy can be found in Appendix A.

Three high-speed cameras (1000 fps) were used to document the side airbag deployment event. The following camera locations were used:

- Left Side Through Removed Driver Door
- Front Through Windshield
- Left Side $\frac{3}{4}$ View Through Windshield

One SID-IIs Build Level D dummy (Serial Number 304) was placed in the right front passenger seat situated in the inboard-facing position per Section 3.3.5.3 according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The dummy was instrumented with the following instrumentation:

- Head Accelerations
- Upper Neck Load Cell

The 9 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces.

The SID-IIs dummy's visible contact points were as follows:

- Curtain airbag to top and back of head
- Torso bag to left shoulder and left torso

The SID-II's dummy was placed in the right front passenger seat facing toward the center of the vehicle with its arm against the seatback. The arm was rotated horizontally in the forward direction with respect to the dummy. The seat track was adjusted forward. The dummy's pelvis was slid outboard until the dummy's back contacted the door trim panel or armrest and the CG of the head was centered in the deployment trajectory of the airbag. The vertical plane through the centerline of the dummy's rib-stiffener and shoulder bolt was parallel to the centerline of the vehicle. Masking tape was wrapped around the dummy's neck bracket to hold the dummy in place.

This orientation complies with Section 3.3.5.3 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group First Revision dated July, 2003.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
TEST SUMMARY

	Test Data	Description
Seating Position	P2	Right Front Seating Position
Test	3.3.5.3*	Side-facing SID-IIs dummy
Curtain Airbag	Roof-Rail Mounted	Side Airbag
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	SID-IIs Build Level D / 304	5 th Percentile Adult Female

* Procedure as defined by Lund, et al and the Technical Working Group dated July, 2003

Number of Data Channels	9
Number of Airbag Channels	4
Number of High-Speed Videos	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to top and back of head
Left Shoulder Contact	Torso bag
Left Torso Contact	Torso bag
Left Pelvis Contact	None

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an
NCAP Side MDB Impact on October 19, 2010.

TEST VEHICLE INFORMATION

Manufacturer	Ford
Model	Escape
Body Style	MPV
NHTSA No.	MB0204TWG2
VIN	1FMCU0D75BKA05139
Color	Sangria Red Metallic
Delivery Date	9/28/2010
Odometer Reading (mile)	41
Dealer	Griffin Ford
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	Yes
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seat (Driver Only)	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	8/2010

GVWR (kg)	2,014
GAWR Front (kg)	1,057
GAWR Rear (kg)	1,012

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				483
Cargo Wt. (RCLW) (kg)				143

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		Rearmost
Seat Height Position		Non-Adjustable
Placed in Position No. 2		---
Seat Back Angle (at headrest post)	SA (°)	7.5
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	258
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	110
Head CG to Door Window	HD (mm)	215
Head to Seat Back Centerline	HSC (mm)	139
Chest to Dash	CD (mm)	644
Chest to Seatback	CS (mm)	272
Right Arm to Seat Back Centerline	RACL (mm)	---
Left Arm to Seat Back Centerline	LACL (mm)	213
Right Arm to Door Panel	RA (mm)	---
Left Arm to B-Post	LA (mm)	95
Knee to Knee	KK (mm)	165
Toe to Toe	TT (mm)	245
Right Knee to Seat Cushion Centerline	KSCR (mm)	130
Left Knee to Seat Cushion Centerline	KSCL (mm)	132
Right Toe to Seat Cushion Centerline	TSCR (mm)	485
Left Toe to Seat Cushion Centerline	TSCL (mm)	500
Nose to Dash	ND (mm)	754
Nose to Headrest	NS (mm)	245
Top of Head to Headliner	HH (mm)	101

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. MB0204TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	38.5	9.7	-3.8	71.6
Head Y	g	19.9	12.8	-1.8	71.2
Head Z	g	19.4	9.6	-12.3	16.5
Head Resultant	g	44.3	9.6		
Upper Neck Fx	N	121.8	17.9	-156.2	33.2
Upper Neck Fy	N	94.7	27.6	-72.3	85.7
Upper Neck Fz	N	496.5	22.3	-743.1	15.2
Upper Neck F Resultant	N	744.6	15.2		
Upper Neck Mx	Nm	11.5	21.2	-8.4	13.7
Upper Neck My	Nm	13.5	20.2	-13.0	32.4
Upper Neck Mz	Nm	6.4	21.5	-6.5	72.0
Upper Neck M Resultant	Nm	17.9	20.5		

DATA SHEET NO. 4 (continued)
DUMMY INJURY CRITERIA VALUES

NHTSA No. MB0204TWG2

ATD position	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
	HIC	T ¹ (msec)	T ² (msec)	HIC	T ¹ (msec)	T ² (msec)
No. 2 Right Front	20.2	8.7	23.7	22.2	8.5	28.4

Position 2 Neck Injury Summary (SID-IIs Build Level D – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.17	22.2	493.30	55.66	8.89
Nte	0.20	32.7	193.63	-152.62	-12.97
Ncf	0.20	16.3	-695.72	21.20	4.00
Nce	0.18	14.1	-680.26	-53.56	-0.99
Peak Tension (CFC1000)		496.5 N	Peak Compression (CFC 1000)		-743.1 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	3880 N	Extension (mCVe)	61 N-m	Tension	2070 N
Compression (CVc)	3880 N	Flexion (mCVf)	155 N-m	Compression	2520 N
Condyle Offset	0.01778 m				

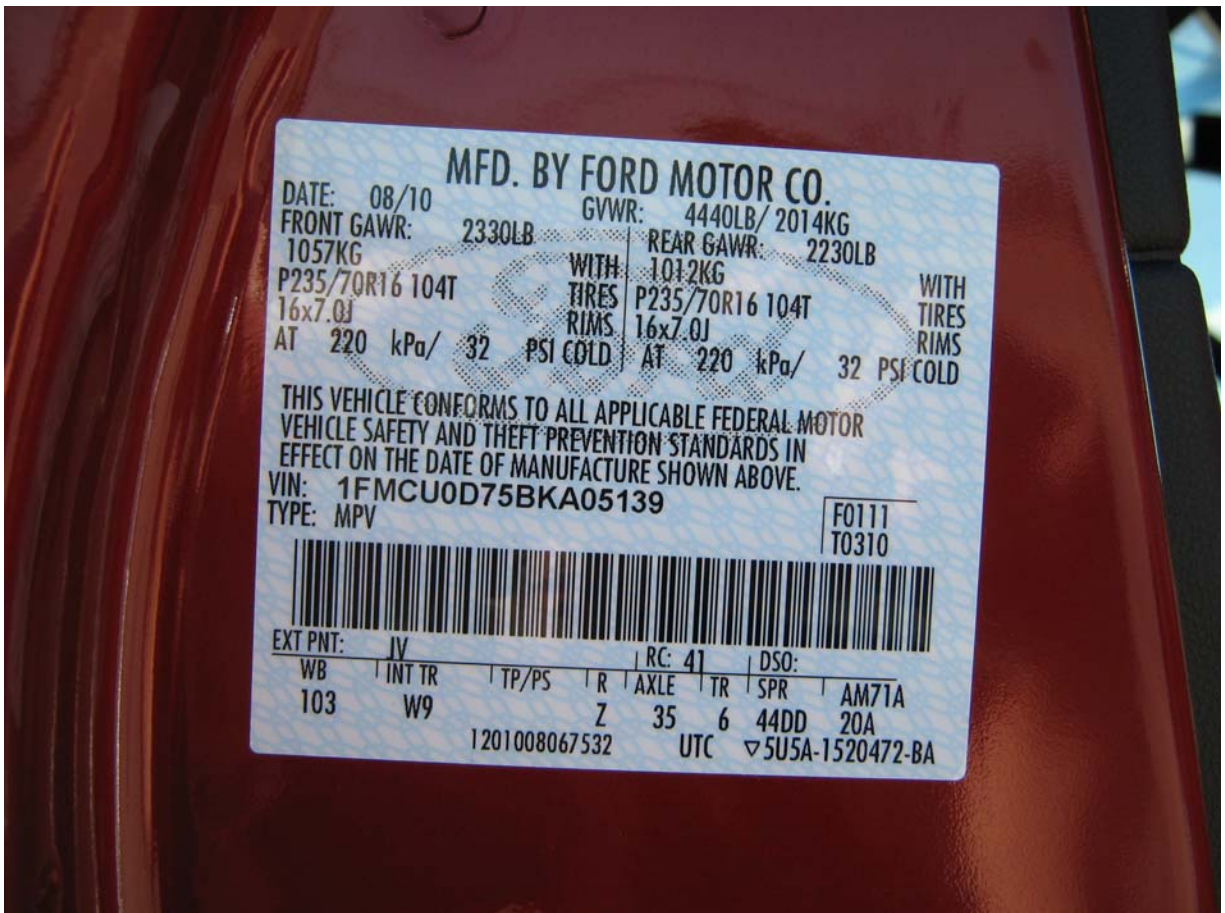
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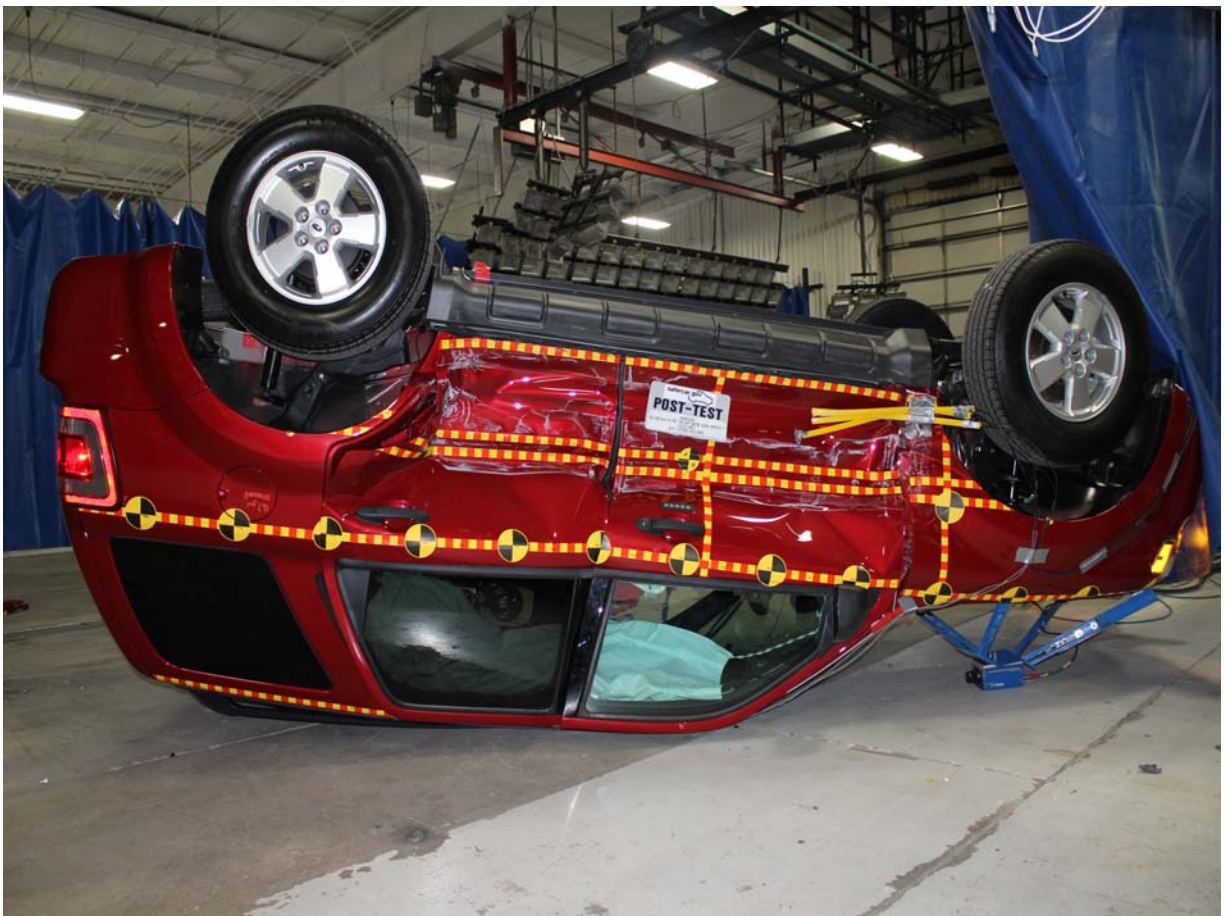
Right 3/4 Front View of Vehicle, As Received



Vehicle Certification Placard



Pre-Test Vehicle Left Side View



Post-Test Vehicle Left Side View



Pre-Test SID-IIs Dummy Left Side View



Post-Test SID-IIs Dummy Left Side View



Pre-Test SID-IIs Dummy Left Side Closeup View



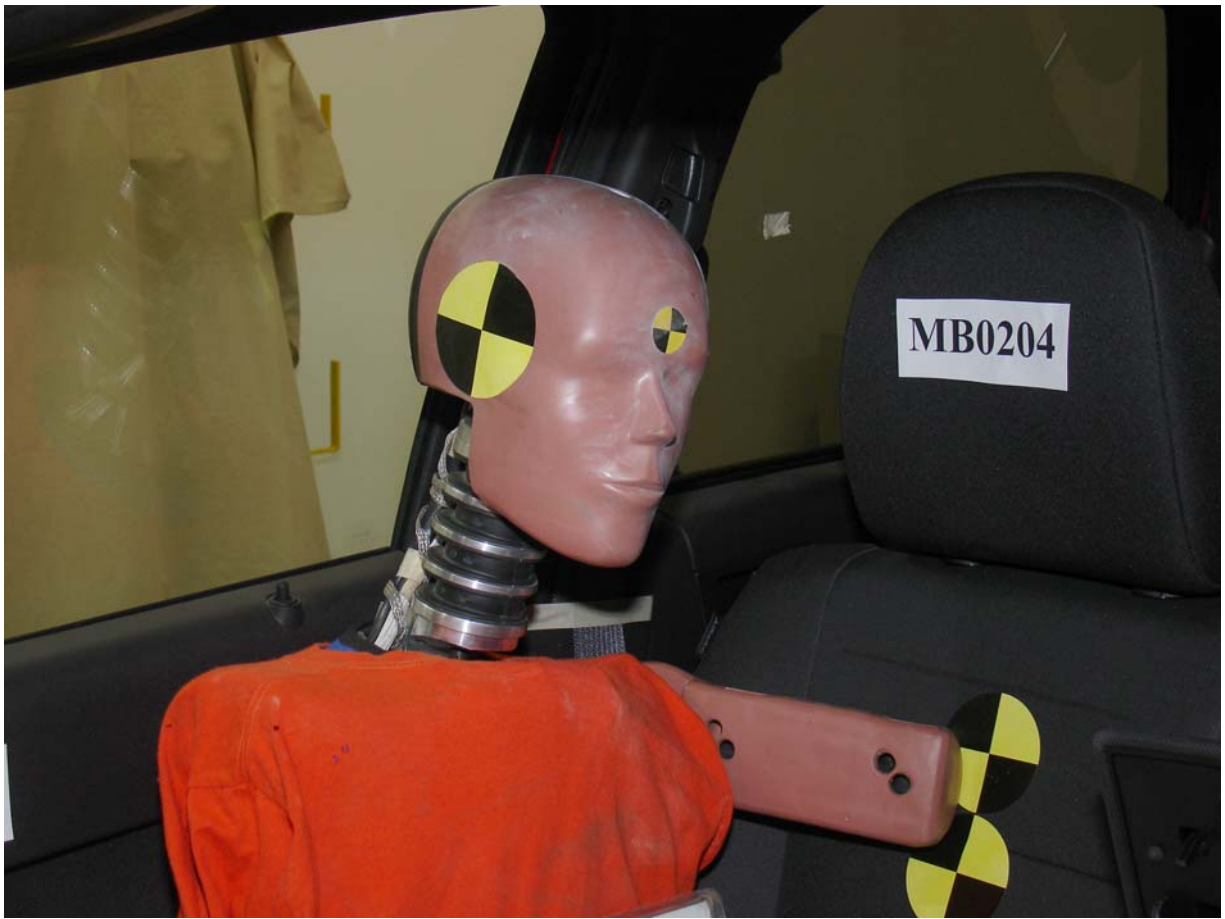
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Pre-Test SID-IIs Dummy Left ¾ Front View



Post-Test SID-IIs Dummy Left ¾ Front View



Pre-Test SID-IIs Dummy Left $\frac{3}{4}$ Front Closeup View



Post-Test SID-IIs Dummy Left $\frac{3}{4}$ Front Closeup View



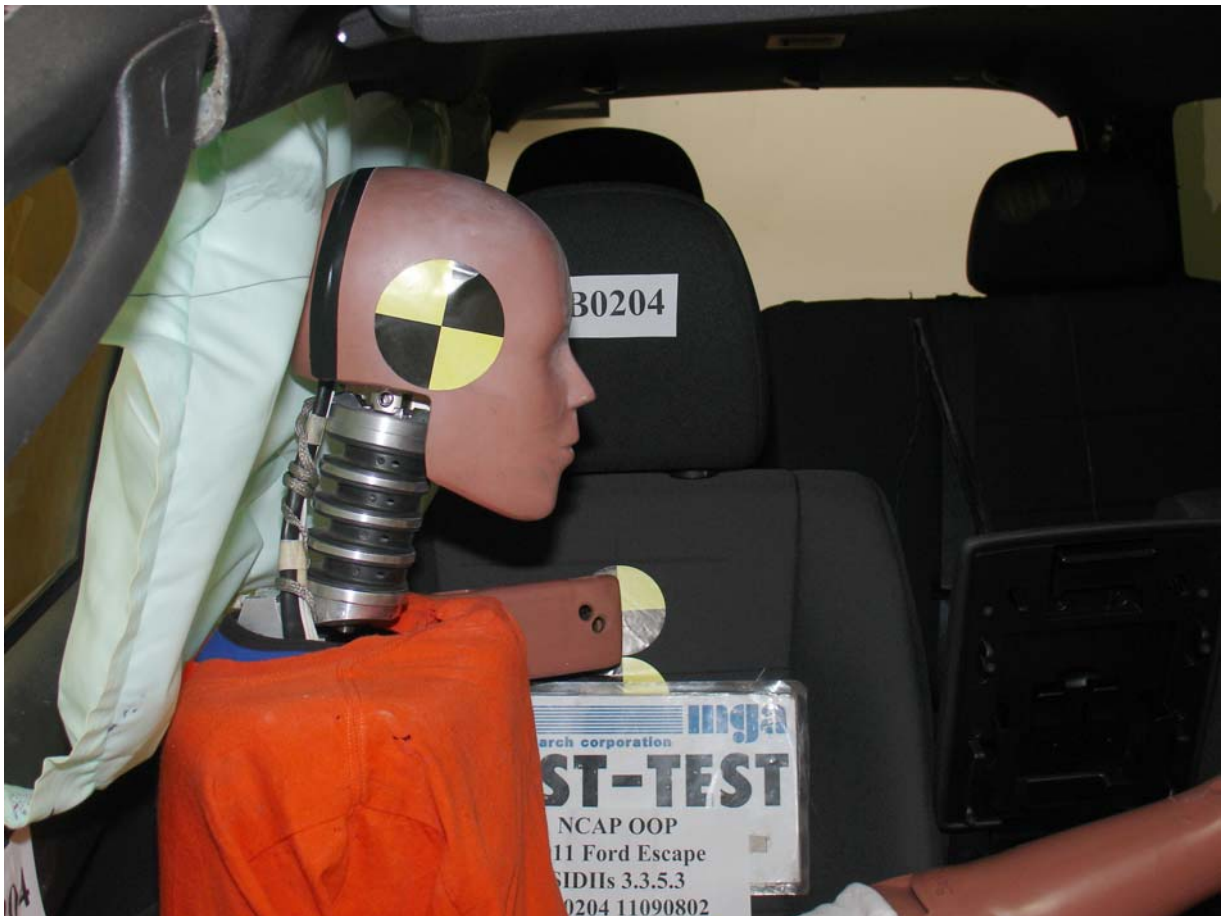
Pre-Test SID-IIs Dummy Front View



Post-Test SID-IIs Dummy Front View



Pre-Test SID-IIs Dummy Front Closeup View



Post-Test SID-IIs Dummy Front Closeup View



Pre-Test SID-IIs Dummy Right $\frac{3}{4}$ Front View



Post-Test SID-IIs Dummy Right $\frac{3}{4}$ Front View



Pre-Test SID-IIs Dummy Right Side View



Post-Test SID-IIs Dummy Right Side View



Post-Test SID-II's Dummy Right Side View (Door Open)



Post-Test Curtain Airbag Left View



Post-Test Curtain Airbag Left 3/4 Front View



Post-Test Curtain Airbag Front View

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