New Global Model Introduction: The All-New 2016 Honda Civic

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Engineering Team
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New Global Model Introduction:
The All-New 2016 Honda Civic

CONCEPT
A History of Civic Personalities

An Epic Civic

The First Civic “Super Civic” “Wonder Civic” “Grand Civic” “Sports Civic” “ Miracle Civic”
Development goal

Create the best C-Segment vehicle in the world
Global Production Locations

Civic is produced at 10 assembly plants globally – 2D, 4D, 5D variations
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PACKAGE
Package Concept

LOW WIDE

- 40mm
- 20mm
+ 55mm
+ 75mm
+ 75mm (4630mm total)

- 30mm
+ 30mm
+ 75mm
Package concept: Coupe

- 0.8 inches (54.9)
- 5.4 inches

Rear headroom
VS current coupe
+0.2 inches

Cargo room
VS current coupe
+0.2 cu-ft.

- 1.2 inches
+ 1.2 inches

- 5.4 inches

-5.4 inches (176.9 inches total)
Package Concept

Best-in-Class Interior Volume

Previous Civic

New Civic

Elantra

Corolla

Mazda 3

Cargo Volume

Passenger Volume
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DESIGN
Exterior Design

Honda Signature Lighting
Mechanical Sculpted Extension
Advanced, Thin High Tech Extension

Honda Design

Steel Matters - Demand Nothing Less
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Coupe Exterior Design Concept
Interior Design

Dynamic & Wide

Tech Center Console

Premium Materials
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DYNAMIC PERFORMANCE
### Performance Target

<table>
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<tr>
<th>TARGET</th>
<th>GOAL</th>
<th>Previous NA Mass Market Targets</th>
<th>European Performance Targets</th>
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</thead>
<tbody>
<tr>
<td>Acceleration</td>
<td>G-feeling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Economy</td>
<td>Efficiency</td>
<td></td>
<td></td>
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<tr>
<td>Brakes</td>
<td>Confidence &amp; Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handling</td>
<td>Agility &amp; Directness</td>
<td></td>
<td></td>
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<tr>
<td>Safety</td>
<td>Maximum protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise, Vibration &amp; Harshness</td>
<td>Refined Crusing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior Quality</td>
<td>Premium Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stance</td>
<td>Low &amp; Wide Exterior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior &amp; Cargo Volume</td>
<td>Superior Packaging</td>
<td></td>
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</tbody>
</table>
Dynamic Performance | Chassis Optimization

- Independent Multilink Rear Suspension & Rigid Mount Subframe
- 10" Master Power with Large Diameter Master Cylinder
- Dual Pinion Variable Ratio Electric Power Steering
- Hydraulic Bushings
- MacPherson Strut Front Suspension
- Low Friction Bearing / Brake Calipers (Front & Rear)
Agile & Direct Handling

Agile

Best in class agility

New Civic

LX

Touring

Previous Civic

Fast Response

Direct

New Civic

Touring

LX

European Competitor

Precision

G Delay (Hz)

0.1

0.5

-30

3.5

-30

0

-10

Yaw Damping (dB)

0

-10

G Delay (Hz)

-30

0.1

0.5

-30

3.5
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POWERTRAIN
Two New Powertrains

Fun

Efficient

Previous Civic

SOHC 1.8L 5AT | CVT

Two All-New Engines

High Performance 1.5L Turbo

Best Balance 2.0L
Two New Powertrains

All new powertrains maximize acceleration and efficiency

Best Performance 1.5L: Horsepower / Torque / Fuel Efficiency
Best Combination 2.0L: Horsepower / Fuel Efficiency / Value

<table>
<thead>
<tr>
<th>Model</th>
<th>Engine</th>
<th>Mission</th>
<th>Power (hp)</th>
<th>Torque (lb-ft)</th>
<th>Fuel Economy (mpg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Civic EX-T / Touring</td>
<td>1.5L Turbo</td>
<td>CVT</td>
<td>174</td>
<td>162</td>
<td>City: 31, Hwy: 42, Comb: 35</td>
</tr>
<tr>
<td>2016 Civic LX / EX</td>
<td>2.0L</td>
<td>CVT</td>
<td>158</td>
<td>138</td>
<td>City: 31, Hwy: 41, Comb: 35</td>
</tr>
<tr>
<td>2016 Toyota Corolla LE</td>
<td>1.8L</td>
<td>CVT</td>
<td>132</td>
<td>128</td>
<td>City: 29, Hwy: 38, Comb: 32</td>
</tr>
<tr>
<td>2016 Hyundai Elantra SE</td>
<td>1.8L</td>
<td>6AT</td>
<td>145</td>
<td>130</td>
<td>City: 28, Hwy: 38, Comb: 32</td>
</tr>
<tr>
<td>2016 Mazda 3 i Touring</td>
<td>2.0L</td>
<td>6AT</td>
<td>155</td>
<td>150</td>
<td>City: 30, Hwy: 41, Comb: 34</td>
</tr>
</tbody>
</table>
Powertrain concept

Powerful Acceleration

Winning Technology

Lightweight Platform
Turbocharged Engine
CVT with Torque Converter

Mid-range Acceleration Performance (Vehicle Speed 50 Mph)

Continuously Acceleration

Honda internal data

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Powertrain | Fuel Economy

1.5-liter Turbo Powertrain

2.0-liter Powertrain

Label City Fuel Economy (MPG)

Label Hwy Fuel Economy (mpg)

New Civic
1.5-liter Turbo
Better
2.0-liter

Previous Civic

J-Competitor
K-Competitor
J-Competitor
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BODY CONSTRUCTION
Optimized body construction for platform commonality

- Increased Civic family commonality
- Increased future model commonality

2 Door / 4 Door Shared Stampings

Engine Room Strength:
Stronger front side frame can be used for heavier future models

Variable Wheelbase:
Front floor can be easily extended for longer wheelbase vehicles.

Variable Rear Overhang:
Rear floor can be shortened or extended for Civic family or future vehicles.
Body Structure Material Grades

16M Civic has a HSS Application Ratio of 58%

(Previous 13M only applied 55% HSS)

Use of hotstamp increase from 1% → 14%

Material Grades
- PHS : 1500
- UHSS : 980-1180
- AHSS : 590-780
- HSS : 340-440
- LSS : 270
- Aluminum : 6xx x Series
- Fiber Reinforced Plastics
- Others

Efficient material use enables excellent NV, Dynamics, and Safety Performance
Ride / Handling / NV Performance

16M Civic increases body TORSION by 25% allowing for TOP IN CLASS HANDLING.

**HANDLING**
- Key connection areas to reduce idle vibration & booming
- Dash board lower stiffener to improve handling
- Damper house stiffener to reduce crank noise

**RIDE COMFORT**
- Tactically placed gussets to reduce road noise
- Internal rear structural ring to improve handling
- Floor cross members to improve ride comfort

**BOOMING**
- Closed ring rear bulkhead
- Cross member structure for handling

**ROAD NOISE**
- Addition of cross car brace to improve handling

**ENGINE NOISE**

<table>
<thead>
<tr>
<th>Static Stiffness</th>
<th>Previous</th>
<th>16M</th>
<th>Increase Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bending (N/mm)</td>
<td>6750</td>
<td>8050</td>
<td>19%</td>
</tr>
<tr>
<td>Torsion (N/mm)</td>
<td>28800</td>
<td>35975</td>
<td>25%</td>
</tr>
</tbody>
</table>

* Measurements taken without Subframe.
Improved body construction and technology allows size and stiffness increase at reduced weight

- **Adaptive Resistance Welds** – short pitch spot welding on door ring area: -1.2kg
- **Aluminum front bumper beam & crush cans**: -2.4kg
- **Resin front bulkhead**: -1.5kg
- **Expansion of hot stamping**: 1% → 14%: -7.1kg
- **Lightweight acoustic under cover**: -1.3kg
- **HSS Front Floor Panel**: -2.3kg
- **Inner set welding construction**: -2.6kg
Weight Reduction Sources

Hot Stamping and 980MPa materials used in B-Pilr improve safety at reduced weight.

Material Grades
- PHS: 1500
- UHSS: 980-1180
- AHSS: 590-780
- LSS: 270

Previous Civic:
- 590MPa Construction
- +15 spot welds

Previous Civic:
- Two Piece Inner Panel
- +6 spot welds

16M Civic:
- PHS Laminated Blank
  -1.59kg
  Pressed with main stamping

16M Civic:
- Tailor Welded Inner
  -0.18kg

Weight Reduction
-20%
Body NVH Treatment

16M Civic achieves TOP IN CLASS NV PERFORMANCE at all grades levels.

Increased body sealing efforts to reduce WIND, ROAD, & ENGINE NOISE

NV Separator locations

Wind noise

Quietness

Leak performance

Hood insulator
Dashborad outer insulator
Engine under cover insulation
Acoustic fender partitions
Fender enclosure
Application of BAFFLE PLATE with NV MICRO PERFORATION
Front fender inner
Wheel house insulators
Application of FELT rear inner fender
Application of FR Floor under cover (HDPE: LX FELT: EX, TOURING)

WIND NOISE
ROAD NOISE
ENGINE NOISE
BODY SEALING
Dynamic Performance | Body Rigidity

- **Torsional Rigidity**: +25%
  - Quicker Handling Response

- **Body Sealing**: +58%
  - Remarkably Hushed Interior

- **Body-in-White Weight**: −68 lbs
  - More Nimble Performance

- **C_dA**: −12%
  - Better Fuel Economy
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CRASHWORTHINESS DEVELOPMENT
Presentation Outline

Complete Vehicle Safety Design

- Front Crash Protection (NCAP & ODB)
- Rear Crash Protection
- Side Impact Protection (SICE)
- Roof Crush Protection
- Pedestrian Protection
- Small Overlap Protection (SOT)
Vehicle Safety Features & Structure

Key Design features provide the highest level of crash performance, while maintaining styling, weight, and technology targets.

- Multi-Crush Can, High Load Front Bumper System
- High Load Capacity Sub Frame with Link Bracket
- Tailor Tempered Hotstamp Center Pillar
- Tailor Tempered Hotstamp One Piece Rear Frame
16M Civic utilizes Gestamp IN-DIE SOFTZONE technology to achieve tailor tempered area within a single part.
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VEHICLE PLATFORM DEVELOPMENT
FOR FRONTAL CRASHWORTHINESS
Maintaining the styling concept resulted in a reduction of 30mm of crash stroke. In order to achieve this, a new crash concept was developed.
US NCAP | Construction

Previous Civic

16M Civic

Increased Strength

Reduced Loading of Cabin

New High Strength Load Path
Previous Civic

Weld

16M Civic

Weld

High Strength Floor

New Platform Welding

Short Pitch Welding 45 → 20mm
Front Crash | Achievement

**US NCAP FRONT**

⭐⭐⭐⭐⭐

- Previous Civic
- 16M Civic

**IIHS SOT+MOT**

GOOD

**IIHS Small Overlap Safety Cage Evaluation**

- POOR
- MARGINAL
- ACCEPTABLE
- GOOD

Measured Intrusion (cm)

- Lower Hinge Pillar
- Footrest
- Left Toepan
- Brake Pedal
- Rocker Panel (lat)
- Steering Column (long)
- Upper Hinge Pillar
- Upper Dash
- Left IP

Lower occupant compartment

Upper occupant compartment

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VEHICLE DEVELOPMENT FOR SIDE CRASHWORTHINESS
Side crash concept is to maximize loading of large high strength cross car sections to minimize intrusion and occupant injury.

1. Minimize Intrusion
2. Passenger Protection
Side Crash | Construction

SOFTZONE: HT550 (TS 550~650MPa)

HOTSTAMP: (TS 1500MPa)

SOFTZONE placement allows for desired SIDE CRASH MODE while reducing weight compared to previous generation Civic (▲ 3.1kg/car)
Side Crash | Video
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VEHICLE PLATFORM DEVELOPMENT
FOR REAR CRASHWORTHINESS
Rear crash concept was developed to maximize efficiency of the rear frame and minimize intrusion towards the fuel system.
Rear Crash | Construction

**Detail B**

- **HOTSTAMP** (TS 1500MPa)
- **SMALL SOFTZONE**: HT550 (TS 700~800MPa)
- **SMALL SOFTZONE**: HT550 (TS 700~800MPa)
- **SMALL SOFTZONE**: placement allows for desired RR FRM MODE while reducing weight compared to previous generation Civic (▲ 4kg/car)
Rear Crash | Results

Component Test

Vehicle Test

Frame Load

Frame Crush
Rear Crash | Video
Honda Sensing™ | Advanced Safety & Driver Assist Technology

Honda Sensing™

- ACC with Low Speed Follow
- Lane Keeping Assist System
- Road Departure Mitigation
- CMBS (Vehicles & Pedestrians)
- Forward Collision Warning
- Lane Departure Warning

Monocular Camera

Camera
Detses size and shape

Radar
Detses speed and position

Millimeter Wave Radar

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www.autosteel.org
Create an “epic civic”

All New Chassis

All New Body

Two All New engines

How do we create the best C–Segment vehicle in the world?
2016 North American Car of the Year