

Styling Development for 2010 Acura ZDX

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ABSTRACT

In keeping with Acura's core value of being an innovator of vehicle segments, the ZDX team identified an opportunity to create a segment that would satisfy a trend-setting luxury customer and raise Acura's prestige.

The ZDX styling concept of "Suspenseful Emotion imagining an epicurean [luxurious] journey" provides a driving and living experience of emotion and style. The "Motion Surfacing" exterior concept gives the vehicle an immediate and strong visual impression. The "Two plus Freedom" packaging concept combines characteristics of sport sedans, coupes, and SUVs to provide spirited, coupe-like driving and strong all-road performance. The "Destination Hotel" interior design concept extends the living experience of a modern and luxurious getaway.

ZDX's coupe proportions featuring large wheels and tires and a small, tapered cabin allowed stylists to create very dramatic shapes, such as the deep shoulders over the rear tires. The all-glass panoramic roof maximizes the feeling of interior openness while minimizing exterior size. The interior features wrap-around leather surfaces, ambient lighting, and a center command area called the "Blended Technology Monolith," which blends the climate, entertainment, and navigation systems.

ZDX's purpose of inviting a couple to explore and drive in a spirited fashion led to a new mix of sport SUV driving and utility combined with the comfort and seating of a sport sedan or coupe.

1. Introduction

Acura has established itself in the US market as a luxury brand with balance between performance, comfort, and value by innovating new vehicles in luxury segments or by creating entirely new vehicle segments. Luxury vehicle brands have divided their lineups into the main categories of stylish coupes, versatile sedans, and flexible SUVs. For example, Acura TSX and TL impress as sport sedans while Acura RDX and MDX created and continue to define their niche as sport SUVs.

Acura set forth with the ZDX project to add to their lineup of sedans and SUVs; however, in keeping with the Acura's core value of being an innovator of vehicle segments, the ZDX team identified an opportunity to create a new segment that would satisfy a trend-setting luxury customer and raise Acura's prestige.

This paper examines the styling concept development process from initial market understanding to final vehicle creation, and describes the achievement of key components, including the deep one-piece rear quarter panel, all-glass panoramic roof, disappearing instrumentation, and stitched leather interior surfaces.



Fig. 1 2010 Acura ZDX



Fig. 2 Acura ZDX positioning concept

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2. Vehicle Concept

2.1. Target Customer

The design team targeted a customer of a certain mindset, versus age or gender. The ZDX target customers are active, adventurous individuals who appreciate cutting-edge design, innovative thinking, and fresh ideas. They are self-assured trendsetters and understand good design beyond preconceived categories. They value sleek, edgy, exotic or emotional design and find appeal in craftsmanship and high technology.

ZDX customers are in a life stage without children. They might be considered coupe category buyers since their key purchase reasons include styling and performance; however, due to their active lifestyle, they find great value in vehicles with utility and capability. They enjoy weekend getaway trips, traversing twisty mountain roads, and golfing with friends. Such activities require their vehicles to handle tough urban driving conditions year-round.

2.2. Styling Concept

The ZDX styling concept was “Suspenseful Emotion imagining an epicurean [luxurious] journey.” The designers imagined the emotion one feels when approaching this vehicle as suspenseful, that is, a mixture of anticipation, excitement, and not knowing what lies around the corner. They desired to capture the feeling of suspense and excitement a skier feels at the moment just before launching down a slope. ZDX targeted the idea of a vehicle that invites two people to join in a driving and living experience of emotion and style. The experience may be one of just two people enjoying an invigorated drive on different roads, a trip where spontaneous shopping may occur, or a planned trip with another couple to a special destination. Glancing at the ZDX, the target customer would dream of partaking in these types of positive experiences and activities, which the design team called the “Epicurean Journey.” This styling concept set the tone for the exterior, packaging, and interior design concepts.

2.3. Exterior Styling Concept

The exterior concept of “Motion Surfacing” required the vehicle to make an immediate and strong visual impression. Since the overall styling concept focuses on

the feeling of suspense when a person walks up to or sees the vehicle, the overall proportion needed to make a rapid impression. The secondary visual sensations of line, shape, and detail needed to enhance the overall proportion and draw on the customer’s experiences and emotions. The designers wanted all of the surfaces to be interactive with and generate from adjacent surfaces as the viewer moved around the vehicle and viewed it from new vantage points. The shapes and lines will in effect never end. They will just lead to new, dynamic surfaces.

The ZDX target customer is rich with experience in many types of vehicles; therefore, they are able in a glance to categorize a vehicle as SUV, sedan, or sport coupe. ZDX designers wanted to draw from the customer’s experiences with these different types of vehicles and combine the advantages offered by all three. For example, traditional SUV shapes and proportions seek to maximize passenger and cargo volume while providing all-road strength and security; sport coupes convey personal and dynamic character through a low and wide stance, small passenger compartment and windows, and smooth, flowing shapes; and sedans focus on passenger comfort with four equal seating areas and a separate cargo area.

2.4. Packaging Concept

The “Two plus Freedom” concept guided the packaging design. The packaging sought to combine some of the stand-out characteristics of sport sedans, coupes, and SUVs to provide the driver and passenger with spirited, coupe-like driving and strong all-road performance.

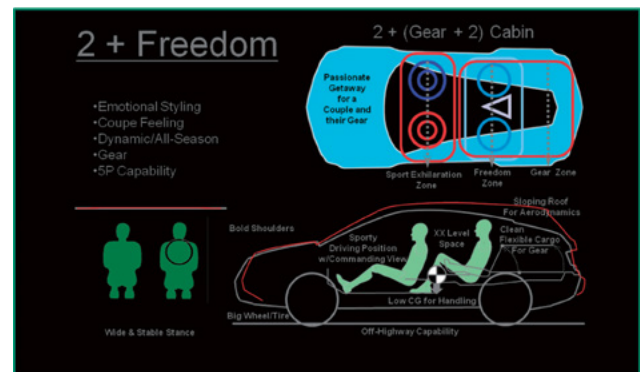


Fig. 4 Concept document describing styling shape and proportion of ZDX compared to existing vehicle

Image not displayed for copyright reasons.

Fig. 3 Key images of ZDX usage environments

The cockpit layout provides a coupe-like feel for the front passengers. The rear area provides sport sedan seating for three adults or converts into luggage and utility space. To access the seating areas with sedan ease, four doors were required, and a rear hatch chosen for access to the utility space. The vehicle's high, protective beltline and low roof create a secure feeling from inside the cockpit. However, the passengers do not feel confined due to the integration of an all-glass roof. This layout supports the concept of a personal, sport luxury vehicle that inspires spirited driving while adding an adventurous feeling. The designers imagined the confidence of sitting higher in traffic than a coupe when looking out and focusing on other vehicles, yet having the emotional experience of a coupe when looking forward over the front fender forms or when looking rearward and seeing the haunches of the rear shoulders lifting over the large wheels and tires.

2.5. Interior Styling Concept

The interior concept was “Destination Hotel,” which centers on the feelings of adventure and luxury for the high-end customer. The adventurous couple who enters the “destination hotel” is rewarded with a modern design combined with seductive textures and an exhilarating personal ambiance. The designers wanted the ZDX interior to be an extension of this hotel living experience.

The interior highlights the dominant front passenger area by surrounding the front passengers with rich leather,

advanced ambient lighting, and modern technology. The key to this is the center “Blended Technology Monolith” area where climate, entertainment, and navigation systems blend and then disappear into crafted fine metal and leather materials.

3. Design Achievement

Achieving ZDX's exterior, packaging, and interior concepts required close collaboration between Styling, Engineering, and Manufacturing. This section looks at the key design breakthroughs from Styling's perspective. Critical to achieving the ZDX's styling and engineering breakthroughs was the clear communication of the designers' styling and package concepts to the engineers. The designers felt that the key to communicating the concepts was having the engineering team personally see a styling mock-up of the ZDX while viewing the concepts. This made clear the ways in which ZDX was different than SUVs, sedans, and coupes, and helped them understand how vital uncompromised styling was to the character of ZDX.

3.1. Deep Dimension Body Shapes

ZDX's coupe proportions featuring large wheels and tires and a small, tapered cabin allowed the stylists to create very dramatic shapes, such as the deep shoulders over the rear tires. The idea was to express the “Suspenseful Emotion” concept in the overall mass and



Fig. 5 Initial ZDX interior concept



Fig. 7 Description of ZDX form

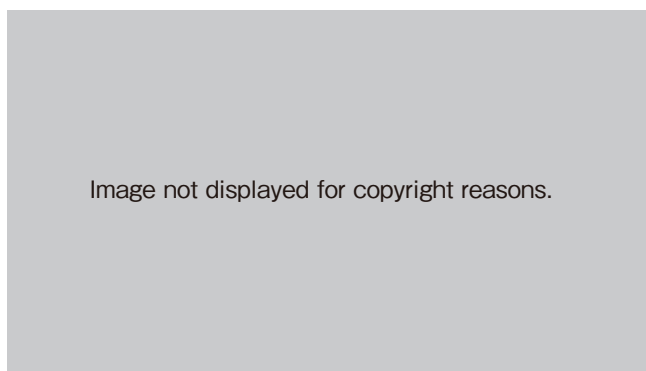


Fig. 6 Interior concept set tone for ZDX interior mood



Fig. 8 Description of ZDX stance

stance of ZDX. The designers imagined a sling shot pulled back in tension and in ready. They desired the overall appearance of the form to be uncompromised by the realities of passengers, door openings, and functioning parts. Yet they knew that ZDX needed to have comfortable seating and utility space for four.

For ZDX to accommodate four adults comfortably, four independent doors were necessary. The goal was to have the doors designed into the overall form so as not to compromise the deep, dramatic shoulders. In addition, the front rear door side pillar was positioned as far rearward as possible, similar to the position in a two door, to mimic the driving environment of a sport coupe. To allow comfortable passenger ingress, the cut lines for the doors needed to be as far fore and aft in the cabin area as possible and flow with the side window and body design lines. This design led to very deep stamping draw conditions in the rear cutline area of the rear door and wheel opening.

To achieve the crisp body line on the flowing rear wheel area and allow for a door cut line immediately forward of the wheel opening presented stamping challenges. The depth of stamping draw from the furthest out point on the rear wheel arch form into the door opening seal line was much greater than any previous construction. The team did not want to compromise the styling, so they did not request major shape changes to ease the stamping difficulty.

To achieve the design, engineers investigated two



Fig. 9 Rear wheel opening and shoulder area of ZDX has deep shapes with crisp edge



Fig. 10 Stamping achievement of deep draw ZDX rear quarter side panel

development plans concurrently. The primary plan, if successful, would result in a one-piece rear quarter panel. Styling and Engineering worked together to relieve some of the depth of draw and acute angle conditions that were making the stamping improbable. Using stamping simulation tools, engineers were able to achieve a panel design and stamping process plan that showed probability of producing the deep draw while maintaining reasonable scrap rates. To confirm the plan, dies were made to test the stamping before committing to the one-piece panel.

If the one-piece stamping could not be achieved, the backup plan was to use known technology to achieve the shape in two stamped pieces; however, this would add weight, cost, and complexity to manufacturing. In the end, the dramatic deep shoulder styling was achieved with a high-quality one-piece panel that helped meet weight and cost targets.

3.2. Panoramic Roof

ZDX's overall purpose of inviting a couple to explore and drive in a spirited fashion led to a new mix of sport SUV driving and utility combined with the comfort and seating of a sport sedan or coupe. This results in a more reclined seating position, but higher off the ground like an SUV and a small tapered cabin like a fast back coupe. While these characteristics satisfied many of the emotional and dynamic targets of the customer, they raised functional issues with visibility and passengers' perception of freedom versus confinement. The panoramic roof was pioneered to meet these seemingly contradicting needs and wants.

The goal of the panoramic roof was to maximize a feeling of interior openness while minimizing exterior size. It needed to provide maximum up, side, front, and rear visibility while maintaining the coupe cabin form. In keeping with the styling image of simple flowing forms, the roof could not be overflowing with visual detail and complexity.

The resulting roof is a smooth glass surface from base of the windshield to the rear license area that is disrupted only by a performing rear air spoiler and four minimal on-surface cut lines between panels. In plain view, the glass surface extends from left to right roof side rails without cuts. The visibility from within the cabin was maximized and tuned to create up-and-outward visibility.



Fig. 11 Long and wide expanse of glass of ZDX panoramic roof



Fig. 12 The ZDX panoramic roof allows unparalleled upward and outward visibility experience



Fig. 13 Sun shades roll out from center roof beam in fore and aft directions to provide protection to front and rear passengers

The mechanisms and structures of the sliding center section were minimized and moved outboard to create an amazing open roof experience. To protect passengers from excess sunlight, the roof glass provides 70% sun protection, and powered sun shades span out from the center transverse roof beam that block all but 3% of sunlight.

3.3. Disappearing instrumentation

Achieving the center control stack “Monolith” theme was an interesting blend of engineering creativity and styling dream. The styling team envisioned the front passengers in personal wraparound areas of fine leather, and in between them would be a center command area referred to as the “Blended Technology Monolith.” This area would allow passengers to interact with many

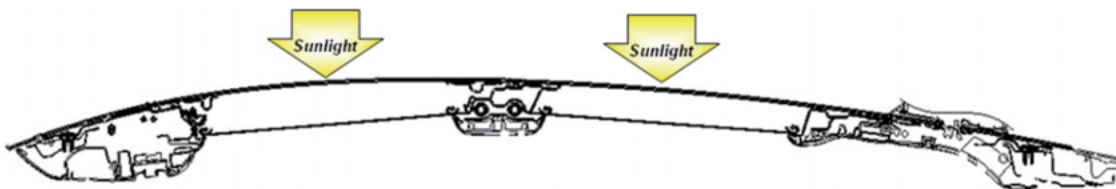


Fig. 14 Section of panoramic roof and sun shade mechanism



Fig. 15 Images of Blended Technology area in off and on conditions used to demonstrate idea during development of ZDX

functions of the vehicle, such as climate, sound, and navigation, but not be overly complicated or cluttered.

Engineers had already been working on a process to have a simple surface that could transform into an interactive display when lit. They had no specific product to apply this technology until they learned of the idea the ZDX designers had in mind for the Blended Technology Monolith area.

3.4. Stitched Leather Interior Surfaces

Creating the wraparound leather surfaces to achieve the interior design concept required new business and manufacturing processes. The design idea was to have leather wrapped and stitched around the interior parts and appear seamless. This required the door and part cuts to be minimized and the leather texture, color, and stitching to be perfectly consistent and flowing from one part to another. Three suppliers, each with excellent experience in providing stitched leather parts, were chosen to make the interior leather surfaces.

In the past, appropriate matching of different parts from different suppliers was achieved by creating a master sample and distributing it to each supplier. However, a new level of matching accuracy would be required since the ZDX would have naturally varying leather and actual stitching. Since the suppliers had slightly different techniques to select and trim leather and used different materials and thread, the design team had to establish new verification processes to guarantee consistency.



Fig. 16 ZDX interior design sketch expressing wraparound shapes and hand-stitched leather surfaces

4. Conclusion

The ZDX defines a new vehicle class for a new class of Acura owner. ZDX combines the emotional and dynamic character of a sport coupe with the utility and confidence of sport sedans and SUVs. The flavors of these luxury categories are blended in an incredible way to truly delight an active, discerning customer pursuing life.

Achieving the exterior, packaging, and interior concepts posed challenges that required innovation and close collaboration between Styling, Engineering, and Manufacturing. The key design achievements included the following:

- (1) The deep rear quarter panel required a depth of stamping draw greater than any previous construction. Using stamping simulation tools, engineers were able to achieve a one-piece panel design that met the deep draw requirement while maintaining reasonable scrap rates.
- (2) The reclined seating position and small tapered cabin raised functional issues with visibility and passengers' perception of freedom versus confinement. The all-glass panoramic roof allows unparalleled upward and outward visibility that maximizes the perception of interior openness while minimizing exterior size.
- (3) The Blended Technology Monolith allows passengers to interact with many functions of the vehicle, such as climate, sound, and navigation, but not be overly complicated or cluttered.
- (4) The wraparound interior leather surfaces required a new level of matching accuracy to accommodate naturally varying leather and hand-stitching. The design team established new processes to guarantee consistency across multiple suppliers.

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