

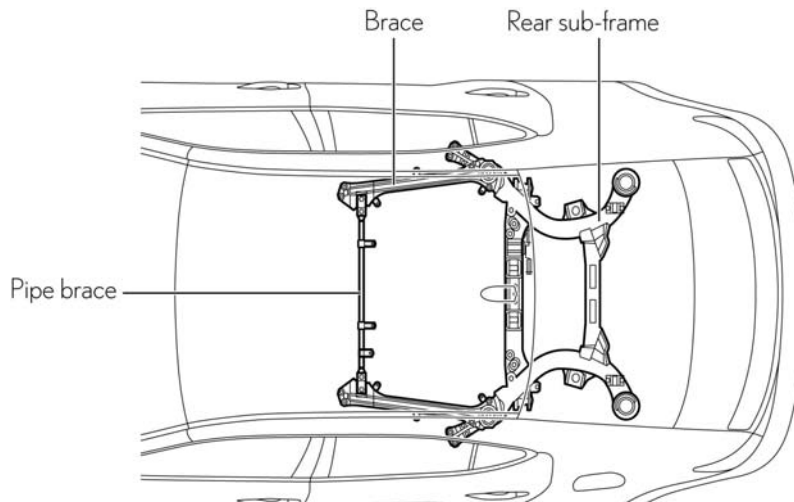
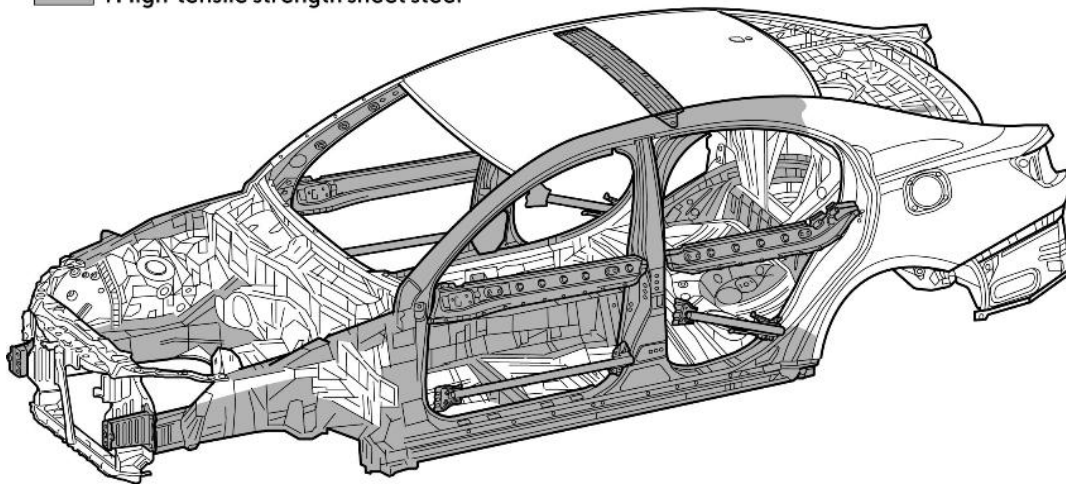
Lexus IS F Dynamics: Suspension and Steering

Power is nothing without control. With 416 horsepower and 371 lb.-ft. of torque, the Lexus IS F has no shortage of power. And for the IS F engineering team, nothing less than world-class control was acceptable. They also knew that a whole-vehicle approach was required to create a dynamic package worthy of their ambitions for the new “F” designation.

A Strong Foundation

Suspension engineers will tell you that a stiff body is a necessity for superior handling in any car, especially one with extremely high performance. So Lexus starting by endowing the IS F with a highly rigid body structure loaded with high-strength steel and strategic bracing. This provides the perfect platform for the carefully-tuned suspension and steering systems to work just as their designers intended.

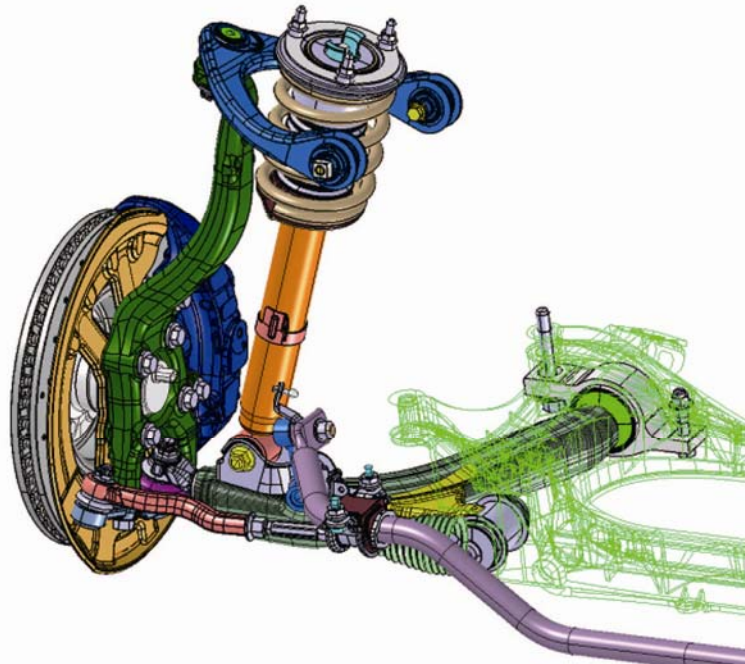
■ : High-tensile strength sheet steel



Front Suspension – Pointing the Way

The same engineers will also tell you that the classic double-wishbone suspension with upper and lower arms is *de rigueur* on a top-level performance car. The first clue? You will rarely see strut suspension on purpose-built race cars. Fortunately, Lexus already had the basis for a superior suspension system in hand from the current IS 350. No struts here.

At the front we find a modern variation on the double-wishbone design with wide-based A-arms made from high-strength steel and a stiff aluminum steering knuckle tying the two together. The system also employs a coil-over style shock absorber and spring assembly. And since the shock and spring have no suspension location duties, friction can be held very low, allowing engineers to fine tune both ride and handling with fewer compromises than strut systems.



Monotube gas-pressure shock absorbers are employed with stiffer springs and a larger stabilizer bar—all optimized to precisely control body, wheel and suspension motion. The stabilizer bar is hollow to reduce weight. The rubber “bound stoppers” that cushion the compression stroke are unusually long and are invoked early to help control body motions. Ride height has been reduced in both front and rear for a lower center of gravity to minimize body sway and lateral weight transfer.

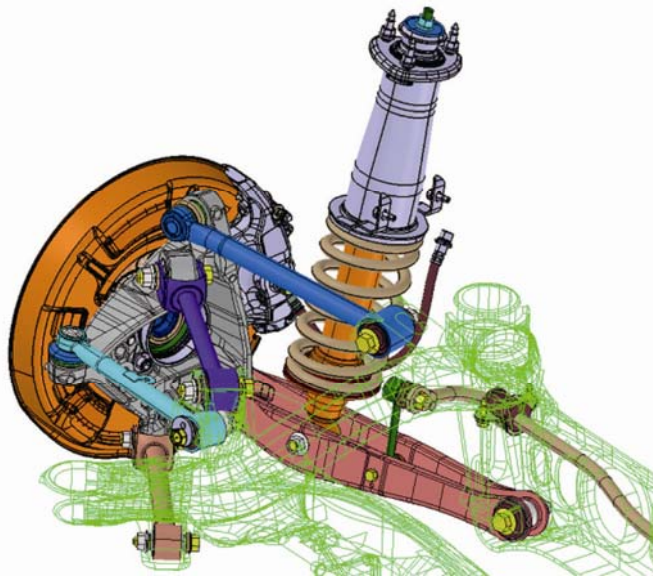
Aluminum steering knuckles and brake calipers minimize unsprung weight to help keep the tires in constant contact with less than perfect roads. Forged aluminum BBS road wheels also help in this regard.

Suspension bushings have been specially tuned for duty in the IS F. The rear lower arm bushing is liquid filled to minimize harshness and vibration. And new high-rigidity, high-precision wheel hubs and bearings have been adopted to cope with the notably higher cornering forces and other stresses that IS Fs are likely to see—say in turn 5 at Laguna Seca.

Rear Suspension – The Core of Stability

The rear suspension is also a contemporary twist on the classic double wishbone, this time in multi-link form. Rear suspension performance is crucial to any high-performance car and in the IS F it has received careful attention.

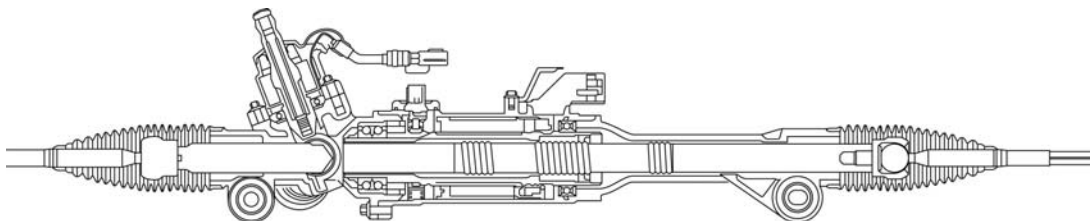
Suspension geometry has been modified to suit the lowered ride height while maintaining its anti-squat/anti-lift qualities. Like the front suspension, it has been extensively modified and tuned for high-performance duty, using higher rate springs and monotube shock absorbers with damping curves tailored to the IS F. It also uses long bound stoppers as auxiliary springs to help minimize body movement.



The suspension upright, which houses the wheel bearings and connects the wheel to the suspension arms, is made of aluminum—stiff, yet light to keep unsprung weight in check. The length of the upper arms has been changed and selected bushings have been revised in the name of control and feel.

Steering – The Great Communicator

It's interesting to note that steering systems usually get most of the credit (or blame) for steering feel and feedback. The fact is that there are so many more contributors such as body and bushing stiffness, suspension system geometry and rigidity, tire construction and stiffness and list goes on. But in the end, all the messages are ultimately fed to your hands through the steering and thus the IS F's system gets special attention.



A vehicle speed-sensing electronic rack & pinion power steering system is employed in the IS F. The compact unit uses a coaxial electric motor for assist that literally “wraps” around the rack.

There are several advantages of EPS. First, the system eliminates the parasitic power losses associated with a conventional hydraulic pump. This lets the engine keep more of its power for going fast while reducing fuel consumption at the same time. And since it uses no hydraulic oil, it cannot make any nasty hydraulic noises.

It also allows finer control of the assist curve. Controlled by vehicle speed, the system can provide the desired boost at any speed, allowing engineers to dial in plenty of feel when you want it at mid-to-high speeds while avoiding the need for Popeye arms when you don't (low speeds and parking). Unlike some competitors systems, the change in feel/effort is never abrupt and always feels natural.

Of course, the steering assist curve was tailored specifically for the IS F. In truth there are two curves etched in its computer memory. One is the "normal" setting, with a direct and linear yet comfortable feel. But when the vehicle is switched to "sport" mode, the steering assist is reduced overall for a more direct feel. This is much appreciated in those heart-in-your-throat fast sweepers.

Communication as it turns out, is valuable in many forms. The steering system on the new IS F speaks very clearly, in a language that anyone can understand.

