Major Changes in ASCE 7-10

There are several key changes made in ASCE 7-10, and this is a brief overview of those changes:

1) ASCE 7-10 is largely based upon Strength Design
2) Importance factors no longer used
3) Ultimate Wind Speeds

1. ASD versus Strength (LRFD)

The question comes up frequently, should I use ASD or LRFD (Stength) when calculating wind pressures? There is not a right answer to this question; both methods are acceptable if applied correctly. ASD has been the normal practice for years, and now the industry is moving toward an LRFD design basis. Right now we are in the transition, and it creates a lot of confusion. A more thorough explanation on the both methods can be found in AISC Steel Manual Design. In addition, there are resources on the web with good explanations, here is one: (http://www.bgstructuralengineering.com/BGDesign/BGDesign05.htm).

Since not everyone that calculates wind loads is a structural Engineer, here is the difference in a nutshell. With ASD you have lower loads and lower allowable stress. With LRFD (Strength) design you have higher loads and higher permissible stress. Both ASD and LRFD should result in similar designs, you wouldn't expect a drastically different structure with one method versus the other. You CAN'T take ASD loads and apply using LRFD, or Vis Versa. You must be consistent and apply the loads consistent with the design basis used.

If you still don't know which to use, most likely you have been using ASD and if you want your results to be comparable to past results, continue to use ASD.

Wind Load Combination Factors

These are the load combination factors applied to wind when performing a structural analysis. MecaWind now applies these factors directly, and the reported wind pressures are inclusive of the ASD or Strength factors, depending upon which option the user selected.

Code	ASD	Strength (LRFD)
ASCE 7-05 and Earlier	1.0*	1.6
ASCE 7-10	0.6	1.0*

*It is evident from the unity values that in ASCE 7-05 and earlier, the typical design basis was ASD; however, in ASCE 7-05 the typical design basis is assumed to be Strength (LRFD).

2. Importance Factor no longer used

There is no longer an importance factor used in ASCE 7-10. This used to be the way in which the designer accounted for different structural categories, but now that is handled in the wind speed. If we take the wind speed in Broken Arrow, OK, here is what we would find:

Design Wind Speed in Broken Arrow, OK

Wind Code	Structural Category	Wind Speed (mph)
ASCE 7-05	All Categories	90 mph
ASCE 7-10	Category I	105 mph
ASCE 7-10	Category II	115 mph
ASCE 7-10	Category III & IV	120 mph

The wind speeds are now different for each category. In addition, the wind speeds are also higher, because now they are based upon ultimate loading. More explanation of the Ultimate basis for wind speed is provided in Item 3 below.

3. Ultimate Wind Speeds

The wind pressures calculated in ASCE 7-05 were intended to be used for ASD design, and that's why the load combination factors were 1 for wind loads using ASD design. ASCE 7-10 now uses wind pressures which are intended for Strength (LRFD) design, and so the load combination factor is now 1 for wind loads when using Strength design. The wind speeds are now higher, but it can be shown that the resulting wind pressures are similar. Taking our example of a Category II structure in Broken Arrow, OK, here are the wind pressures in ASCE 7-05 and ASCE 7-10.

Broken Arrow, OK
Structural Category II

ASCE 7-05 – ASD Design
V = 90 mph, I = 1.0, Kz = Kzt = Kd = 1.0
qz = 0.00256*1*1*1*(90^2)*1.0 = 20.74 psf
Since load combination factor is 1.0, the wind pressure used for design is
Factored Wind Pressure = 20.74 psf * 1.0 = 20.74 psf

ASCE 7-10 - ASD Design
V = 115 mph, Kz = Kzt = Kd = 1.0
qz = 0.00256*1*1*1*(115^2) = 33.86 psf
Since load combination factor is 0.6, the wind pressure used for design is
Factored Wind Pressure = 33.86 psf * 0.6 = 20.31 psf

It can be seen that both codes lead to results that are very close to each other, with ASCE 7-10 giving about 1% lower for this particular example. Some larger differences might be found in other regions of the countries, especially coastal regions; however, this exercise is intended to illustrate that there is not the huge difference in wind loads that one my expect when first comparing wind speeds between ASCE 7-10 and previous versions.