



Durability Study of the City Post



Davidson Traffic Control Products

Pexco, LLC

Tacoma, WA

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Pexco City Post™

High Performance Delineation - History

Channelizer posts/delineators/pylons or bollards have long been used on the highways and roadways of North America and around the world for the safe channelization of traffic. In recent years the applications of these products have expanded into areas demanding greater durability and ease of use: enter the “City Post”.

In the USA, field testing of channelizer posts being considered for use on public roadways is conducted on the National Test Deck near Nashville, Tennessee by AASHTO’s National Transportation Product Evaluation Program (NTPEP). All 50 State Transportation Agencies subscribe to the NTPEP program and utilize this resource to evaluate all new products.

Overview of the NTPEP “*real world*” Impact Test Procedure:

- 8 posts randomly selected to be impacted at 55 MPH/ 88 KPH
 - 4 posts subjected to direct wheel-over impacts
 - 4 posts subjected to 18-inch bumper impacts
- 5 impacts in the summer (above 83° F) and 5 impacts in winter (below 34° F)
- Photos and measurements of lean taken after every impact
- Impact tests conducted twice a year



NTPEP reports findings from the tests they conduct, providing transportation agencies a baseline for fair & accurate comparison of products and manufacturers.

A full copy of the test procedure can be found by following the link below:

NTPEP Evaluation of Temporary Traffic Control Devices

http://www.ntpep.org/Documents/Technical_Committee/TTCD/Work%20Plans/TTCD%20Work%20Plan.pdf



Since the late 1990's, both public and private road authorities have expressed a need for greater durability in the channelizer posts they install: the ability to withstand 50 + real vehicle impacts at high speeds, easy to install, and easy to replace. Some examples are:

- The Florida DOT was the first state to put in place a “High Performance Delineator” specification, requiring a minimum of 50 impacts at 55 MPH.
- In 2013, the Texas DOT began exploring development of a 100 to 200 impact specification for high impact areas such as gores, merges and Managed Lanes.

City Post High-Speed Impact Testing

Texas Transportation Institute, College Station, TX

In an effort to test the upper limits of the City Post, they were subjected to a severe endurance test at Texas Transportation Institute (TTI), a fully certified independent testing facility*.

- **Testing Protocol: a total of 12 City Posts 36” in length were installed**
 - City Posts were deployed in anchor cups embedded in the pavement
 - Installation was quick & easy – no special tools were required
 - Posts were arranged in the “NTPEP” test configuration:
 - 1 row of bumper impacts, 1 row of wheel-over impacts
 - Planned vehicle impact speed was 55 mph
 - Actual vehicle speed was 60 mph with the 100th and final impact at 70 mph
 - Temperature ranged between 39 – 58° F



City Posts Prior to the Start of Impact Testing



City Posts after 50 Impacts @ 60 mph



City Posts after 100 High-Speed Impacts

Watch the testing on YouTube at: <http://www.youtube.com/watch?v=65-Ci8rZtXw>

* Texas Transportation Institute is an American Association for Laboratory Accreditation (A2LA) certified testing facility, and conforms with the requirements of ISO/IEC 17024:2003.



Test Results: All 12 City Posts were still standing after 100 high speed impacts!

- One wheel-over impacted post showed a crack along one edge, but was still standing
- Two of the twelve posts lost their top caps: one at impact # 2, one at impact # 82
- Three posts were pulled & replaced after 70 impacts to evaluate the durability of the reflective sheeting; otherwise there was no reason to remove any posts.
 - The 9 posts which received all 100 impacts showed a less than 3 degree list and lean at the conclusion of the testing
 - The 3 posts pulled at 70 impacts showed a less than 3 degree list and lean
 - The 3 replacement posts showed a less than 3 degree list and lean after testing

These results are very telling, as all posts are not created equal. Some perform very well with bumper hits, others do best with wheel-overs. This can be witnessed in many of the test reports published by NTPEP; often one row of the two rows of posts tested will have failed. In the real world you cannot predict how a vehicle will impact a post, so the post you choose should be able to survive both types of impact. Only a select few will do well with both types of impact – the City Post is one of those few!

One of the most telling statistics from the testing is shown in the table below, taken from the full TTI report. As the table shows not one delineator moved more than 3 degrees from its starting point. Delineator 3 did end up at 5 degrees off the vertical; however, it started at 87.5 degrees, and thus only moved 2.5 degrees through the course of 100 high-speed impacts!

Table 1. Measurement of Delineators after Impacts.

Delineator ¹ No.	Lean/List (degrees)									
	Start		Fifth Run		Tenth Run		70th ⁴		Final	
	Lean ²	List ³	Lean	List	Lean	List	Lean	List	Lean	List
1	89.8B	89.5L	88.8B	88.7L	88.7B	89.2L	87.7B	89.1L		
2	87.5B	89.7L	89.5B	89.5L	89.2B	89.7L			88.8B	89.0R
3	87.5B	88.7R	86.2B	89.2R	86.3B	89.5R			85.0B	87.6R
4	89.0B	89.4L	88.0B	89.8L	87.8B	90			86.7B	88.4R
5	89.5F	90	89.3B	89.9R	89.2B	89.8R	88.3B	90		
6	88.8F	88.0L	89.6F	89.0L	89.7F	89.0L			89.0B	89.8R
7	88.7B	89.5L	87.9B	89.5L	87.7B	89.3L			87.0B	89.4L
8	89.2B	89.7L	88.6B	89.8L	88.5B	90			88.0B	89.0R
9	88.2R	89.0L	87.2B	89.0L	86.8B	89.1L	86.5B	89.0L		
10	89.7B	89.58L	89.0B	90.0	88.7B	90			88.0B	89.3R
11	89.5F	89.2L	89.7B	89.4L	89.3B	89.4L			88.6B	90
12	89.7F	88.3L	89.5B	89.0L	89.0B	89.0L			89.0B	90

¹ Even numbered posts subjected to bumper impact; odd numbered posts subjected to tire impact

² Lean = forward (F) or backward (B) (facing impact face)

³ List = left (L) or right (R) (facing impact face)

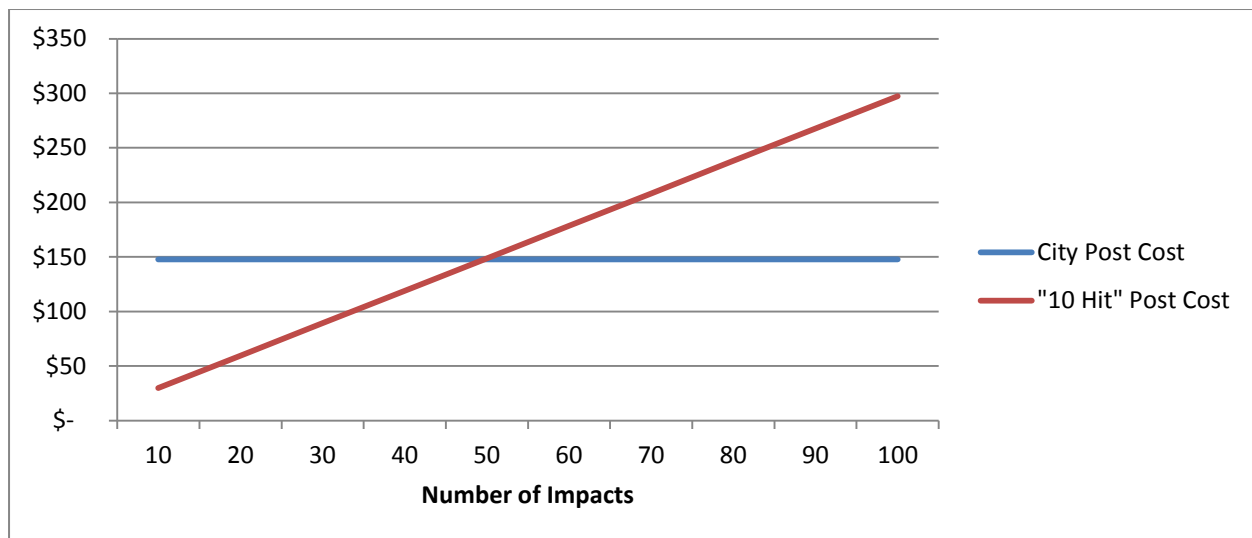
⁴ Posts 1, 5, and 9 exchanged



Durability vs. Maintenance

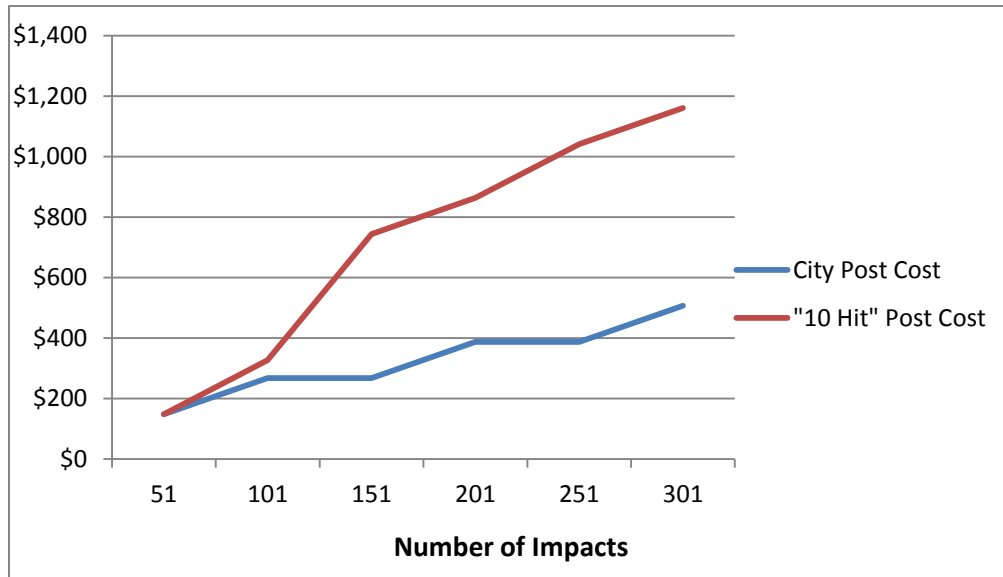
One question that must be asked when evaluating a channelizer post for any application is: “What is the maintenance cost over the lifetime of the product?”

While agencies are encouraged to keep costs at a minimum and ultimately minimize the initial spend out of tight budgets, short sighted gains often lead to long term losses. Below is a table showing the relatively higher initial cost of the City Post. Realize, however, that with life expectancy well beyond 100 impacts, there will be minimal need for replacement. If an inexpensive “10 hit” post is used instead of a high-performance City Post, there will be 9 more lane closures for 9 post replacements, with 9 times the risk to workers replacing a failed, inferior product.



As this chart indicates, as the number of impacts grows, the total cost of the inexpensive “10 Hit” posts continues to climb, eventually far outpacing the much more durable City Post. What this chart doesn't indicate is the financial cost – nor the human cost – of an accident due to premature post failure, or an accident to a maintenance worker charged with replacing a failed product.

If you extend this out to 200 or 300 expected impacts, the life cycle cost differences grow dramatically, as can be seen in the next chart.



As the chart above shows, there is no catching up once you go down the road of low performance “10 hit” posts; for all intents and purposes you’ve created a money pit. Even if at 101 impacts you replace all of the City Posts you are still money ahead. Once you reach the 300 impact mark, maintenance crews will have been on the road at most 3 times with the City Post vs. 30 times with a “10 hit” post. Which choice will you make?



City Posts in foreground; observe broken “10 Hit” posts in background



Why the City Post Works So Well

In the simplest terms, by the elimination or minimization of failure points found in traditional “10 hit” channelizer posts, ultra-high impact resistance has been virtually assured.

- 1. Polyurethane** – the entire City Post is built out of thermoplastic polyurethane (TPU):
 - TPU is the toughest, most tear-resistant flexible polymer made in the world today, with excellent performance over an extremely wide range of temperatures (-20°F to +160°F)**BENEFIT** – The strongest flexible plastic provides for the highest degree of impact resistance and the greatest durability for long life in the field.
- 2. Like Materials** – the entire construction is of the same super-strong polymer:
 - This creates a part that has the same structural strength, no more plastic vs. steel or rubber. No metal parts to rust or spring to fail. One common material throughout.**BENEFIT** – No variations in materials or components that can affect performance at varying temperatures or climates.
- 3. No Fasteners** – elimination of failure points and “notch sensitivity”:
 - The removal of pins, screws, bolts or other fasteners ensures a product that has a homogeneous structure.**BENEFIT** – Premature failures become a thing of the past; chances are cosmetic concerns will lead to replacement long before the post gives way.
- 4. Chemically Bonded** – the assembly is fused together in a way that creates one complete, unified assembly:
 - Incredible strength and durability
 - No bases, posts and pins, one unit, totally self-contained and ready for use.**BENEFIT** – Durability of a molded product with the flexibility of extrusion (lengths, colors, etc...) No mating of two dissimilar products to get to a completed assembly: one unit, on size, everytime, no “Frankenstein” assemblies.



High –Speed Impact Testing at TTI



City Posts withstand low-speed crushing forces



The City Post is a system that works as one unit with incredible performance. Designed and developed for the toughest of applications, let's take a look at a few recent installations:

Real World Installations & Results

Although it is a relatively new product, the City Post has developed quite a following built on its performance & ease of use. Applications for this new evolution in channelization are rapidly developing throughout North America. Here are just a few examples:

Interstate 35, Stillwater, OK – Gore Point

This 65 MPH gore point has in the past been the site of multiple fatalities due to difficult roadway geometry. City Posts provide critical guidance and withstand high speed impacts 10 – 15 times per day from both agricultural and heavy oil field vehicles. In the 18 months since the City Posts were installed at this location, there have been *no fatalities*.



BENEFIT:

- Outstanding visibility alerts motorists.
- Outstanding durability ensures safe & reliable channelization with very little need for maintenance.

Denver, Colorado – E470 Toll Lanes

While not a state highway, the E470 is a 47-mile-long (76 km) controlled-access private toll road traversing the eastern portion of the Denver-Aurora Metropolitan Area in the State of Colorado. The toll road is maintained by the E-470 Public Highway Authority, controlled by a governing board of ten elected officials, three from each county and one from Aurora. Construction and operation involves no state or federal funding or taxes, all products installed must “pay their own way”.





The E470 chose the City Post for several reasons: ease of use, ability to remove for plowing operations, durability and minimal maintenance.

BENEFIT:

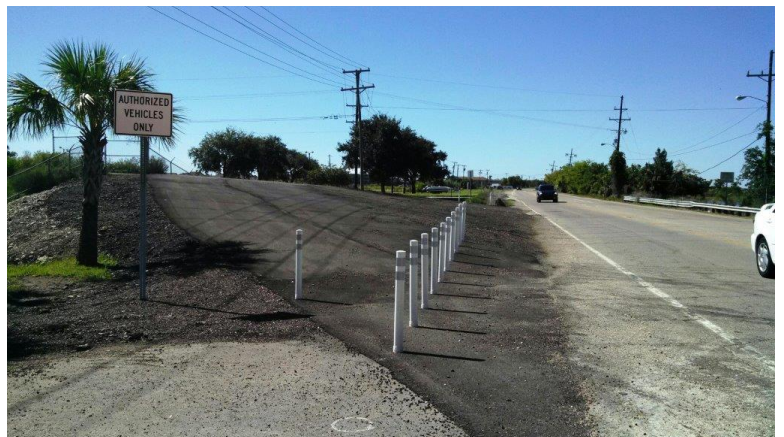
- Narrow footprint – retrofitting established HOT lane applications with no room for expansion
- High durability for high volume corridor
- Ability to remove and replace for plowing operations through the winter.



Slidell, Louisiana – Hurricane Evacuation Route

This installation of our new City Posts is north of the intersection of US 11 and Oak Harbor Boulevard in Slidell, LA. This area was devastated by Hurricane Katrina. The LA DOT&D constructed an emergency route to allow access to residents in Oak Harbor during high water events.

City Posts were installed to block off access to this single lane road on both ends during normal times. Law enforcement will unscrew the posts and then place them along either side of the run-around where extra anchor cups were installed to help delineate the edges of the roadway. Those anchor cups have a plug installed to keep dirt and debris out.



BENEFIT:

- Permanent installation of delineators, blocking everyday use
- Quick & easy realignment by 1 person with no equipment
- Clear and precise channelization for hurricane evacuations



Evanston, Indiana – Bike Lane

An application where the sleek, narrow profile of the City Post was preferable to a traditional post with an 8-inch wide base. Plus performance & durability were deciding factors in choosing the City Post.



BENEFIT:

- Bicycle-friendly posts with a sleek, narrow profile
- Forgiving, soft polyurethane presents low hazard
- Superior durability for reduced maintenance

Joliet, Illinois – Campus Entrance

Crossing of lanes when entering the campus was a problem. A raised curb was installed in an attempt to limit this activity. They used a black City Post to contrast with the white concrete; black posts are also effective when snow hides the raised curb.

BENEFIT:

- Lower traffic conflicts
- Improved delineation
- The anchor cups were “wet set” on this application, meaning installed when the concrete was being poured.





For detailed product information, material specifications or technical drawings, please contact your local sales representative or visit Pexco's website www.pexco.com/traffic:

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