



Durability Study of the City Post



Davidson Traffic Control Products

Pexco LLC

Tacoma, WA

September 2016

City Post

High Performance Channelizers



Durability Study - 2016



High Performance Delineation - History

Channelizer posts (also known as 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 application of these products has expanded into areas demanding greater durability and ease of use.

In 2013, Pexco introduced the first product designed to meet these new demands: the flush-mount, spin-in City Post with embedded anchor cup. Proven on test decks and in the field, the performance of the original City Post spawned demand for a bolt-down version: enter the new City Post SM Surface Mount.

In the United States, 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. The testing is consistent and repeatable for all products tested.

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

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



NTPEP reports findings from the tests they conduct, providing transportation agencies a baseline for fair and 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 1990s, 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.

Original Spin-in City Post – High-Speed Impact Testing

Texas A&M Transportation Institute, College Station, Texas

In an effort to test the upper limits of the City Post, they were subjected to a severe endurance test at Texas A&M 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 and 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° and 58° F



City Posts Prior to the Start of Impact Testing

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



**City Posts after 50
Impacts @ 60 mph**



City Posts after 100 High-Speed Impacts

Watch the testing on YouTube at:

<https://www.youtube.com/watch?v=zza1qMQ8XEc>

Test Results:

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

- Three posts were pulled and 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
- 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

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 – and 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

New City Post SM Surface Mount High-Speed Impact Testing

Texas A&M Transportation Institute, College Station, TX – March 23, 2014

The City Post SM was created to supply an ultra-high impact resistant post that simply bolts to the roadway, as traditionally done in North America. Pexco once again contracted with TTI to conduct high speed/ high durability testing on the City Post Surface Mount. Testing was conducted as follows:

Testing Protocol: a total of 12 City Posts 36" in length were installed

- Posts were affixed with Hilti Coil Anchors to the test deck
- Installation was quick and easy – no special tools were required
- Posts were arranged in the standard "NTPEP" test configuration:
 - 1 row of bumper impacts
 - 1 row of wheel-over impacts
- Planned vehicle impact speed was 60 mph
- Temperature ranged between 45° and 60° F



City Post Surface Mount – After 100 impacts

Watch the testing on YouTube <https://www.youtube.com/watch?v=oxCRuWLPx4Q>

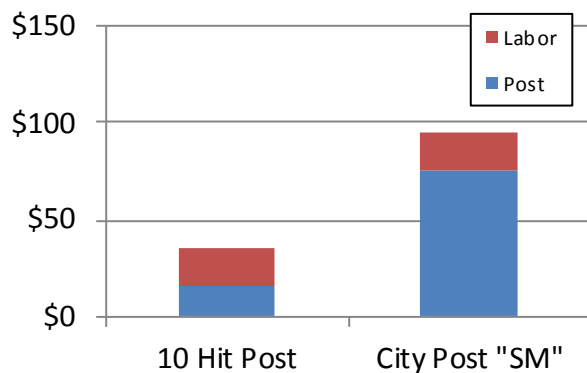
Testing continued well past the 100 impacts at 60 MPH (ask your sales representative about just how far). It is safe to say we set a new performance level with City Post Surface Mount!

Durability vs. Maintenance and Safety

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?"

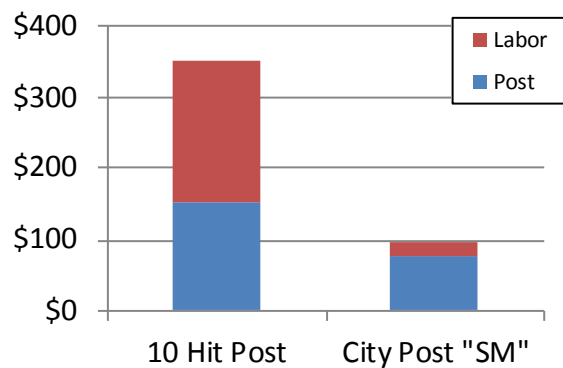
While agencies are encouraged to keep costs at a minimum and ultimately minimize the initial spend out of tight budgets, short sighted gains often lead to long term losses. Below is a table showing the relatively higher initial cost of the City Post. **Realize, however, that with life expectancy well 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, 9 times more lane closures will be required for 9 times more post replacements, with 9 times the risk to workers out on the roadway replacing a failed, inferior product.

Expense Analysis: Initial Investment vs. Life Cycle Replacement Costs



Initial Installation Cost Comparison

Single post, labor and materials



72 % reduction in life cycle costs!

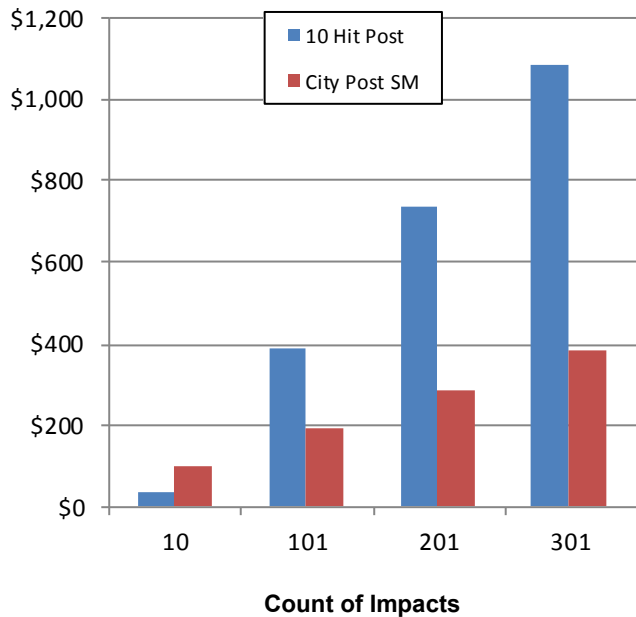
Comparison of costs after 100 impacts

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 far more durable City Post. What this chart doesn't indicate is the financial cost – read the human cost – of a vehicle accident due to premature post failure, or an accidental injury to a maintenance worker charged with replacing a failed "10 hit" post.

When extended out to 200 or 300 expected impacts, the life cycle cost differences grow dramatically, as can be seen in the next two charts.

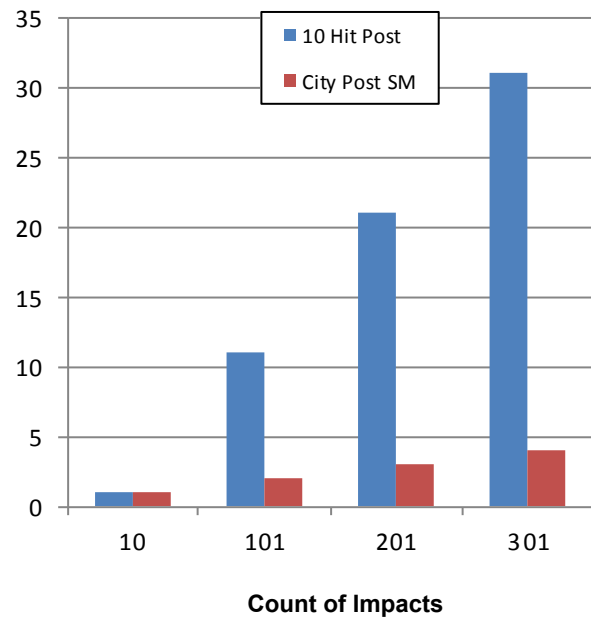


Cost and Risk Reduction Comparison



Significant Reduction in Costs

Material and Labor Cost Comparison



Significant Reduction in Risks

Count of incidents of worker exposure

As the chart above shows, there is no catching up once you go down the road of low performance “10 hit” posts; once you cross 3 replacements you are on a downhill slide. 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 3 times at most with the City Post ... versus 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, one size, every time, 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 and Results

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

Highway Applications



Interstate 35, Stillwater, Oklahoma 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. Since the City Posts were installed at this location, there have been *zero fatalities!*

BENEFIT:

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

Highway Applications

Denver, Colorado – E470 Toll Lanes

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. Since 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

Riverside County, California Interstate 10 to SR 60 Gore Point

The exit from westbound I-10 near Beaumont, California, to westbound California State Route 60 was the site of many sudden and illegal lane changes at the gore. The installation of the City Post effectively discouraged motorists from making dangerous, last minute lane changes. Cal Trans loves the performance of the City Post – “they’re awesome!”



BENEFIT:

- Reduced damage to impact attenuators in the gore
- Improved safety for the traveling motorist

Santa Ana, California

Merging Lane Delineation



Exit 105B off southbound I-5 puts motorists directly onto North Broadway, a four-lane undivided arterial highway which was formerly California State Route 51. The City installed low-grade channelizer posts to prevent drivers exiting from I-5 from veering across four lanes of traffic over to the local community college. The posts

they chose to use did not stand up to the beating and were a constant maintenance nightmare. In the summer of 2014, the City installed our newly developed City Post SM in the hopes of properly directing traffic and eliminating the ongoing maintenance headache – and it worked.

The City Posts in this location have taken a quite a beating, and are performing quite well, as designed, as promised!

BENEFIT:

- Reduced need for maintenance of channelizers
- Improved safety for the traveling motorists



St. Louis, Missouri

Emergency Vehicle Access

One of the first installations of the City Post SM in the country was used to mark/block an emergency vehicle cross over. With all local EMS services knowing they can drive right through the posts with no damage to their vehicles, more timely arrival at emergency sites has become a reality.

BENEFIT:

- Improved safety for traveling motorists
- Faster life-saving access for emergency vehicles who need to cross median quickly and safely

Specialty Applications

Interstate 85, Duluth, Georgia HOT/HOV Lane

Northeast of Metro Atlanta, the I-85 Peach Pass Express Lanes are used by well over half a million travelers monthly. At the southbound entrance to the toll lane, drivers seeking to avoid the transponders were jumping in and out of the HOT lane, creating a hazard and triggering accidents. To improve safety and ensure toll compliance, Georgia DOT officials installed 405 City Posts in the buffer area. Installation of the posts took only three nights (GDOT had projected seven nights).



BENEFIT:

- Minimal maintenance required despite 250,000 ADT volume and 70 mph speed
- Posts discourage drivers from crossing in and out of HOT lane
- Fewer accidents keep traffic moving at a steady pace on the heavily congested I-85 artery

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)



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, Louisiana. 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 and easy realignment by 1 person with no equipment
- Clear and precise channelization for hurricane evacuations



Notice the tire mark in the slush, crossing directly into the leading post.

Columbus, Ohio No Parking / Loading Zone

The traffic engineer decided to trial the City Post Surface Mount in a location where nothing lasted more than a week or two at best. Heavy trucks making deliveries to the bar would consistently pull up and park on top of the posts, imparting slow, crushing blows. The City Post Surface Mount was installed in early October of 2014. The photo above shows the same installation 6 months after installation. The customer is very happy with the performance of the post in this application.

BENEFITS:

- Limited to no maintenance on the post, in a previously labor intensive location
- Keeps an important loading zone clear for trucks
- Trucks are doing very little damage to the product

Bike Lane Applications

Chicago, Illinois Bike Lane

As Chicago's DOT broadens their bike lane initiatives along Clinton Street, they continue to turn to Pexco's City Post. For the latest installation, they chose a slightly shorter version of the post with tighter spacing near intersections to provide the safest bicycle pathways and transition areas possible for bikers and vehicles alike.

BENEFIT:

- Flexible yet sturdy posts provide clear bike lane delineation
- Tighter spacing at intersections draws heightened attention to potentially hazardous crossings
- Ten-foot spacing of posts discourages drivers from entering bike lanes before making left turns



Evanston, Illinois Bike Lane

Evanston's bike lane (shown at the right) provides clear evidence of the superiority of the City Post's sleek, narrow profile over a traditional post with an 8-inch wide base. Performance and durability were additional factors in Evanston's decision to choose the City Post.

BENEFIT:

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





Stockholm, Sweden Bike and Pedestrian Lane - Entryway Protection

Metal posts have traditionally been used to prevent cars from entering bike and pedestrian lanes, creating additional collision hazards for cyclists given their rigidity. City Posts provide a safer, more effective alternative, offering the desired level of separation but without the dangers of metal posts.

BENEFIT:

- Sturdy yet flexible City Posts provide biker-friendly lane protection
- Spin-in base mount provides narrow base profile and easy installation
- Ultra high durability provides all the benefits of traditional metal posts minus the collision hazards



St. Louis, Missouri Bike Lane

As part of the city's larger "Bike St. Louis" initiative, a new protected bike lane was recently installed between 20th Street East and 4th Street. Project planners chose the original spin-in City Post for the project and included the innovative addition of directional signage on the posts. Users report that the new bike lane has made a huge difference in the feeling of safety when riding downtown.

BENEFIT:

- Original spin-in City Post provides clear delineation of new bike lane
- Use of City Post for signage display provides heightened directional instruction for motorists and cyclists alike

For a product demonstration, field trial, 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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