The Barn Raiser

Mid-South Engineering Company

Issue No 26 Working Together Second Quarter, 2008

Considerations for Plant Entrances to Public Roads

By: Larry Carter

Entering and exiting public roadways at industrial plant locations is something just about all of us experience on a regular basis. At first glance, it may appear that little thought or planning needs to go into the layout and design of a plant entrance. But a careful observer quickly recognizes both a good entrance and a poorly planned access. A truly safe plant entrance requires careful consideration of many variables for the benefit of employees, suppliers and patrons as well as the public motorist who may never enter your facility.

The first consideration is the "**intersection**" of the plant entrance roadway to the public access road. The intersection is defined as the angle made between the centerline of the entrance and the edge of the pavement or the centerline of the public access road. If possible, it is preferred that the plant entrance roadway intersect the main road at right angles (90 degrees) but intersecting angles in the range of 60-90 degrees are typically acceptable. Intersections at angles of 45-60 degrees are allowed in special situations by most governing bodies, while intersections at angles less than 45 degrees are strongly discouraged by most and could be prohibited. State highway departments or local legislated roadway branches' guidelines and regulations need to be part of an access road's due diligence in the planning to see what rules apply.

Another consideration when planning an entrance is to consider issues related to visibility and having a clear line of sight. A safe entrance onto a public road is dependent on good visibility and the ability to detect on-coming traffic. The "**intersection**", previously discussed, goes a long way in establishing good visibility by promoting the proper angle and your ability to see both directions. Additionally and when possible, entrances should be located away from bends or rises in public roads that limit visibility. It may also be necessary to trim or cut bushes, trees or other vegetation both along the public road and the plant property to improve visibility. Adequate entrance lighting is another item that should be taken into account. Entrance lighting will not only assist with night time traffic, but will also improve visibility during inclement weather conditions

Since many of the public roads have fairly high speed limits, safety for slowing or accelerating vehicles is a major concern. Therefore, consideration should be given to the installation of "**ramps**" or "**sidings**" along the shoulder of the road where one may safely either pull off the public road to get to the plant entrance or gain speed and merge with motorist traveling at full speed without endangering yourself or passing motorists.

Many highway legislative bodies dictate the lengths of these ramps and that length must include calculations based upon vehicle types, number of anticipated vehicles, speed limits and the incline/decline or grade where the entrance is located on the public roadway.

The daily quantity and types of plant vehicle traffic is important. Not just the current daily quantity, but thoughts of future growth impact decisions. If all truck traffic and employee traffic share a common entrance, special attention to entrance roadway widths, surface material selection, paint striping and signage must be taken into account. You may also need to include a special lane for queuing of truck traffic for incoming or exiting shipments. Similarly, the number of employees and shift change times where traffic can congest with trucks or each other may mean a third lane is warranted and could be combined with security (*electronic gate keys or security guards*) checks. In addition, the patterns of how all these different incoming and exiting vehicles cross and flow to and from the plant are a measure of success in the design.

The entrance roadway "**turning radius**" or arc made as the entrance widens out and joins the public road should consider vehicle types. Large trucks and vehicles pulling trailers will require an adequate turning radius. Materials that may typically extend beyond the trailer such as structural steel, piping, logs, etc., add to the radius. Too tight of a turning radius coupled with heavy truck traffic not only creates unsafe conditions but also results in accelerated paving surface wear. If the public roadway is a divided highway, similar consideration must be given to the room needed in the median of the divide for vehicles to turn properly.

The final consideration in planning a plant entrance is the vertical alignment of the driving surfaces. Ideally, the plant entrance surface will be at the same elevation as the public road so that there is no distinct "bump" as one traverses between surfaces. When this is not possible, guidelines for maximum surface grades need to be followed.

In summary, a safe plant entrance requires thoughtful planning and pays dividends over the life of a facility. These few suggestions along with others and the requirements dictated by state, local and other regulatory agencies will assist in designing a safe plant entrance for a future facility. Similarly, in the case of existing operations, the entrance road may have not been designed properly or the circumstances could have changed and providing a safe entrance should be of paramount importance.

Establishing an Annual Electrical Systems Inspection and Cleaning Program

By: Wayne Beech

Periodic inspection and cleaning of a facility's electrical system is paramount to ensuring system safety and reliability. Time should be allocated to ensure the condition of new and existing equipment. The primary reason for conducting inspection and cleaning of electrical system components is to provide a proactive approach in identifying potential problems and reducing the risk of personal injury, lost production, and expensive electrical equipment damage. If the inspection and cleaning are conducted by qualified personnel on a defined time table, component deterioration and anomalies can be identified early on, and repair or replacement can be planned and expedited prior to equipment failure.

It seems like the largest obstacle of establishing an annual electrical system maintenance inspection and cleaning program is getting permission and a "down-time" commitment to provide the time needed to make the necessary inspections and cleanings. Most companies understand the need, but many see maintenance activity as being a burden with a cost that they will never recover or that increases the cost of product without just cause. In other words, the Return-on-Investment (ROI) on the maintenance dollar is always competing with the ROI of the production dollar. This competition for that dollar can be misleading if not presented correctly. However, if a conceptual plan with associated cost justifications and time tables can be presented in terms of production dollars and personnel safety, it becomes a much easier sell.

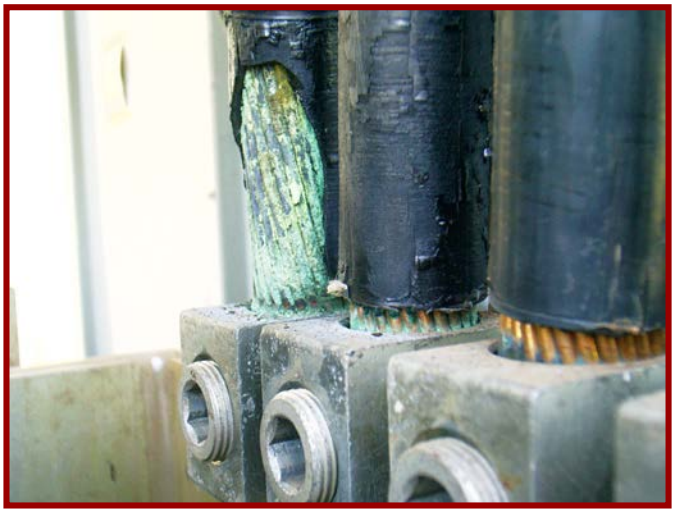
I have found a 10% to 17% ROI on production is typical for most manufacturing facilities. What does it cost to have an unplanned shutdown per hour or in some cases per minute? Production workers standing around during the outage, as well as after the outage discussing the details of the outage can cost more money than one realizes. The lost cost of space and machine time can add up, as well the overtime and emergency shipping costs involved in getting the plant back on line. These costs get even more inflated when the unexpected outage involves continuous production processes, (*although we recognize most continuous operations tend to be more geared toward preventive maintenance issues*). In addition, what costs are involved if an employee or contractor is injured or killed as a result of a failure in your electrical system (*i.e. insulation failure, incorrect trip settings, incorrect fusing, sticky contacts, loose or damaged equipment, dirt and grime, etc.*)? This could run into the millions, and can literally shut a company down. Where is the production ROI now? Well, some say that insurance will pick up the tab, but after a serious electrical incident will you be able to afford the insurance? You certainly can't go back in time to protect the injured people. It is much easier and much smarter to take the proactive approach, and put a comprehensive electrical maintenance program in place as soon as possible.

After the first cleaning, inspection, testing, and adjustments, the ROI for maintenance will become much more apparent and make it easier to convince upper management of the need. Make sure that you take pictures, document your findings, and conduct the associated risk analysis.

The benefits of establishing an annual preventive maintenance inspection and cleaning program is obvious to those of us who have been in the trenches and have witnessed personnel injuries, electrical equipment failures, lost production, and know the risks, personal stress, and dollar values associated with these. Unlike mechanical maintenance where the potential outage item is tangible to most operational people, the electrical maintenance item is many times hidden or not clearly understood.

For those that do not completely understand, I would like to explain it in terms of something that everyone can easily identify with. We change our oil, brakes, and antifreeze in our vehicles on a periodic basis to avoid vehicle wear, breakdown, depreciation, or a catastrophic event that may cause personal injury or even death. Why don't we look at our electrical systems in the same way? If one thinks about it, we rely on, and interface with, our electrical systems a lot more than we do our vehicles.

About the Author:
Wayne Beech is an electrical engineer with over 23 years experience, specializing in facility electrical systems maintenance, electrical systems design, and project management. He has conducted forensic investigations involving sub-standard electrical system maintenance practices. He has a BSEE from the University of Memphis in Memphis, Tenn. He is a member of Tau Beta Pi, and IEEE.



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