



DMD & Associates Ltd.

QUALIFICATIONS

Traffic Signal and Related Services Communications and Intelligent Transportation Systems

Prepared by DMD and Associates Ltd



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1 Introduction

Public pressure for improved traffic operation continues to be an issue for most jurisdictions. Other issues include public safety and reliability of traffic signal systems. In addition, commercial and residential development has contributed to significant growth and changes in traffic patterns, impacting the often dated traffic control systems. With ongoing changes and advances in the transportation related infrastructures it is difficult for many jurisdictions to stay current with technologies and systems which can improve traffic operations. Many jurisdictions do not have enough infrastructures to justify a full time technical specialist or where dedicated staff is justified, often find can't find or retain staff with such specialized knowledge.

How can we help? DMD offers a unique blend of technical expertise, support and services to jurisdictions, to supplement current staff knowledge.

Electronic traffic control systems require on-going refinement and adjustment to both maintain their safe operation and maximize efficiency. *How can our services benefit?* DMD's focus is transportation related electrical and electronic systems such as traffic signals, control systems and roadway lighting. Our firm has expertise in these technologies and can provide support.

For every transportation project, DMD & Associates strives to provide the owner with innovative, best value solutions. Our focus on transportation related projects means we bring knowledge of the nuances of these projects to the design team and owner. Our expertise allows us to assist owners in making sure that considerations that may have been missed are studied, ensuring the best value to the owner.

In transportation one of three things happens — either you get it right, spend extra monies applying fixes, or live with less than optimal results. As part of our services DMD assist your present staff to provide technical support to whatever level is required.

Specific areas of support are as follows:

1.1 Condition of Current Equipment

One of the first steps would be to assess the condition of the existing infrastructure. This would involve a site visit. We would also provide a consultation to understand any operational issues. A report would be prepared, including a cost estimate for any upgrades that may be necessary. This is the first step to a more efficient and safer signal system.

1.2 Optimization

Traffic continues to become a major issue for most jurisdictions. Public pressure for more efficient traffic flow and lack of budget or property to widen roads can be a constant source of aggravation. In the past traffic engineering firms offered traffic analysis aimed at refining traffic signal operation. These traffic engineering firms, though knowledgeable with respect to traffic studies and capacity analysis often lacked knowledge of the capabilities and features of today's modern traffic controllers and traffic systems. As a result, the operation of many signals can be optimized through simple timing changes and utilization of features within the traffic controllers. Our firm bridges this gap by offering traffic engineering services such as capacity

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analysis and signal timings coupled with our extensive knowledge of the traffic controller and related systems.

1.3 Signal Management

A traffic signal system provides exceptional value to the end user. Many jurisdictions do not have the staff or resources to deploy or manage a traffic signal system that will provide these benefits.

Today's traffic signal systems allow traffic signals to be optimized and monitored from a remote location. A growing trend in North America is to install a traffic signal system and retain a third party to both monitor and refine signal timings on an on-going basis. This is typically of most benefit to a smaller City with few signals and limited expertise to manage such as system. Outsourcing these services often provide better value over retaining in house staff to undertake a signal management role.

Typically we would assess a City for such as system, develop a plan for implementation and provide a fixed cost for ongoing monitoring and refinement of signal timings. We could also develop a corrective and preventative maintenance plan and standards to reduce liability. Remote monitoring of system controllers and equipment allows DMD to provide a higher level of service through system interrogation should a signal malfunction occur.

2 Firm Profile

DMD & Associates is an electrical and transportation engineering consulting firm providing a range of focused services for municipalities, government agencies, owners, developers and contractors. The firm was founded early in 2000 with a single office and a staff of three. Since then, DMD has grown to over 20 staff members with offices in Surrey, British Columbia, and Seattle, Washington.

Our abilities include the assessment and adaptation of new technologies and innovative approaches to typical or unique situations. We are a niche market firm focused on specialized transportation and electrical related assignments

The heart of our firm is our passion to deliver "best value" on every project. This means we only pursue assignments for which we are fully qualified and have adequate technical and staff resources. Once selected, we work closely with clients, owners and stakeholders to ensure that project goals, challenges and constraints are understood up front. We apply innovation born from insight and experience throughout the design and construction process. This ensures that each project proceeds smoothly and efficiently, resulting in constructed facilities that deliver anticipated performance and stands the test of time.

DMD & Associates understands the importance of applying quality control procedures to ensure that documents are accurate and complete. We have established an internal quality control program and checklist to guide the development of every project. Our exceptional service allows us to deliver outstanding results on every project.

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3 Firm and Individual Experience

3.1 Firm Capabilities

DMD specialize in transportation related projects. Our firm both undertakes electrical and traffic engineering components of these projects.

Typical services include:

- inventory of existing systems and condition assessments,
- planning and cost estimates,
- development and preparation of plans, specifications and estimates (PS&E),
- contract document preparation,
- construction services including commissioning and testing, and inventory assessment and

Our versatile staff also provides “soft engineering” elements such as focused studies in our areas of expertise, public involvement support and communications programs, development of graphics and photo-realistic simulations and public presentations.

The specialized services listed below are intended to show capabilities and can be tailored to meet client needs.

3.2 Specialized Services

Such specialized services include:

3.2.1 Condition Assessment and Upgrade Recommendations for Traffic Signals including Controllers and Cabinets

Specific elements can be accessed, or a complete assessment of the signal system can be undertaken. A plan and budget can then be developed for any upgrades that may be necessary. Examples are as follows:

3.2.1.1 Safety Related

- *Controller Operation* – Review and report on the controller operation and condition.
- *Grounding* – Grounding is often overlooked and can cause serious problems. We can review and test the existing grounding system, and make recommendations for any changes that may be required.
- *Phasing and Timings* – Review signal phasing and timings in accordance with recommended practice. This would include railway and emergency vehicle pre-emption.
- *Signal Displays* – New LED displays depreciate over time and as such much be checked for correct output (see attached Advisor).

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- *Roadway Lighting Levels and Standards* – Properly installed and maintained roadway lighting benefits the motoring public and pedestrians alike through increased safety . Lighting systems are often improperly specified and maintained.
- *System Hardware* – a review of system hardware such as poles, wiring, service equipment, signal heads, detection systems, controllers, pedestrian activation, signage, etc. can be undertaken with a view to making a safer environment for municipal staff and the public.

3.2.1.2 Efficiency Related

- *Phasing and Timings* – Review signal and timing and optimize if required.
- *Signal Coordination* – Review and report on performance of signal coordination with TS/PP in vehicle time space software. Many coordination systems are not updated after installation to adapt to changing traffic patterns and conditions. DMD has the expertise and software tools available allowing the signal coordination to be refined, thereby improving the roadway efficiency.
- *Vehicle Detection* – Vehicle detection is a critical element of any signal system. Correct placement and operation of detectors ensure an efficient signal operation. Existing vehicle detection operation, whether inductive loop, video or microwave can be accessed. New wireless radio systems are now very cost effective ways to transmit traffic data and video to the end user remotely.

3.2.1.3 Equipment Audit

- *Signal Equipment Condition* – review all signal equipment and make recommendations for upgrade or replacement.
- *Equipment Operating Systems* – review the software or firmware versions of traffic control equipment to determine if upgrades are available or necessary to improve the signal operation.

3.2.1.4 Plan and Budget for Upgrades

- *Prepare Plan and Budget for Upgrades.*

3.2.1.5 Maintenance

- *Review Maintenance Practices.*
- *Develop Maintenance Standards, Contract and Budgets.*
- *Monitor Performance*

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3.2.1 Commissioning of New Traffic Signals and Systems

For new signals we can provide the services required for commissioning and testing of:

- *Intersection controllers* – with over 30 years experience, DMD staff have worked with the municipalities across Canada with the start up and testing of new signal installations.
- *Video detection systems* – intersection detection, freeway and traffic data collection
- *Traffic management systems* – closed loop and hybrid traffic management systems
- *Custom systems*
- *Pre-emption systems* – including railway, emergency vehicle, transit and route preemption systems.
- *Communication Systems* - including fibre optic, twisted pair cable and radio.

3.2.2 Planning, Design, Commissioning, Testing, Troubleshooting of Traffic Management Systems

Provide design, commissioning and testing of:

- *System Design* – the staff at DMD have been involved in the design of over 25 traffic management systems, including Closed Loop and Hybrid Systems of all sizes.
- *System Integration* - robust communications is the key to the successful operation of any traffic management system. System integration services can be provided for all types of communications, including fibre, twisted pair copper or radio.

When required, we can provide network solutions and work with a jurisdiction's IT staff so the traffic management systems interface to the jurisdictions existing infrastructure.

3.2.3 Traffic Signal and Controller Training

To date most training is offered by suppliers and as such is specific to their products. As part of our services we offer in-house training custom tailored to suit our client's needs. Training elements can include:

- *Basic Traffic Concepts*
- *Troubleshooting* – NEMA TS1 & TS2 controller and cabinet assemblies
- *Controller and Cabinet Assemblies* - NEMA TS1 & TS2
- *System Communications* - FSK Communications and wireless systems
- *Vehicle Detection* - Inductive loop and video

3.2.4 Traffic Engineering

DMD can provide traffic engineering services including:

- *Observe Operations* – We will observe traffic operations and movement during peak and no-peak periods to better understand traffic flow.
- *Synchro Anyalsis* – We undertake capacity analysis using Synchro software

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- *Signal Timings*
- *Coordination Plans*
- *Railway Pre-emption Timings* – a reliable and failsafe system is required to ensure the safety of pedestrians and the motoring public. Both the wiring interface and signal timings often require adjustments due to a lack of understanding during initial design and installation.

3.2.5 Signal and Lighting Design

DMD can provide a full range of electrical engineering services including:

- *Signal Design Drawings*
- *Lighting Design Drawings*
- *Specifications*
- *Estimates*
- *Condition Assessments*

3.2.6 Construction Services

DMD can provide a full range of services during construction including:

- *Administration*
- *Technical Support*
- *Inspections*
- *Commissioning, Troubleshooting and Testing*
- *Record Drawings*

3.3 Personnel Experience

We offer a senior staff with extensive related experience. DMD senior staff can be involved to varying levels on any given project. Other DMD support staff are also available, including designers, project managers, Cad Tech and field support staff.. Key staff are as follows:

3.3.1 Daniel Wong, P Eng – Senior Engineer

Dan Wong has over 17 years of experience managing the design and construction of electrical engineering projects, including control systems, traffic signals, street and roadway lighting, closed circuit television (CCTV), communications systems, and medium- and low-voltage power distribution systems.

His expertise includes both electrical and traffic engineering, traffic signal design, development of signal phasing and timing plans using Synchro software, programmable logic controls (PLC), traffic signal systems and controllers, roadway and intersection lighting and various intelligent transportation systems.

He has participated in a wide range of projects for Cities, Provincial governments, developers, contractors, suppliers and various private organizations. Dan's attention to detail means that

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owners and clients receive construction documents that clearly communicate project goals and reduce risks.

3.3.2 Daryl Matthews - Technical Specialist/Project Manager

Daryl Matthews is a licensed electrician with 30 years of traffic signal experience. Daryl's past experience includes employment by a national supplier of traffic control products and the City of Kamloops. This unique background gives Daryl an understanding of City issues and requirements.

He has been instrumental in the design and development of NEMA TS2 test equipment and has also assisted with the research and development of other traffic control products. As National System Support for a leading traffic control manufacturer, Daryl was responsible for the deployment of over 25 Traffic Management Systems as well as providing technical support and training for the Canadian Traffic Community.

Daryl possesses a unique skill set of traffic control, electrical and networking training and experience. These tools will be beneficial in assisting DMD clients with any traffic control application, from Controller Troubleshooting to Traffic Management and Video System design and integration.

3.3.3 Don McLean, CET – Technical Specialist

Don McLean has over 27 years of experience in the design of transportation-related lighting systems, traffic signals and power distribution and control systems. Throughout his career he has focused on roadway lighting and has participated in well over 4000 thousand roadway lighting and signal projects and authored many of the related design, material and constructions used throughout the Province.

He is an active member of:

- Illuminating Engineering Society Roadway Lighting and Outdoor Lighting Committees
- International Dark Sky Association (IDA)
- Transportation Association of Canada and member of the Transportation Operations and Management Standing Committee (TOMSC)
- International Municipal Signal Association (IMSA)
- Intelligent Transportation Systems (ITS) Canada
- Canadian Standards Association (CSA)

Don has developed numerous lighting and signal design, construction and material standards in use today. These include the British Columbia Ministry of Transportation (MoT) electrical and signing construction, design and material standards as well as the roadway lighting and traffic signal standards for the BC Master Municipal Specifications. He is leading the current effort to develop performance-based maintenance standards for the MoT which will result in the privatized maintenance for all of the agency's outdoor lighting.

Don has undertaken lighting design for numerous streetscape lighting projects. He understands the architectural, aesthetic as well as functional elements of this type of lighting and signals. Having over 27 years experience gives Don the expertise and knowledge to provide accurate cost estimates for these specialized types of lighting systems.

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Don brings owners best value by following an aggressive, detail-oriented, and proactive approach that identifies project challenges up front and carefully integrates design tasks with schedule and budget constraints.

3.3.4 Specialty Sub-consultants

If necessary, our team calls on specialty sub-consultants to support the development of traffic signals. Sub-consultants may include geotechnical consultants, structural engineers, and others who understand the issues in traffic signals and can be quickly and economically be mobilized to provide insight and solutions to typical or unexpected situations.

Our philosophy in using sub-consultants is to engage only the necessary services needed to provide the owner with the best value for a quality installation. By carefully analyzing and responding to each project's requirements, DMD makes sure owners receives only the services they need.

4 Example Projects

Example projects are listed below:

4.1 Traffic Signal Projects

DMD undertake over 100 traffic design projects a year. These are spread throughout the Provinces of BC and Alberta. Specific projects are too many to list. As a sample of one of the many clients, we have included a project sheet of recent signal projects and services undertaken in Fort St John.

Many of the signal projects include Synchro analysis, signal and coordination timing plans. Many of our designs also include data systems communications, such as radio, twisted pair copper or fiber optics.

DMD can also provide designs of specialized elements such as CCTV and web cameras, video detection systems, railway pre-emption, uninterruptible power supplies, closed loop and hybrid traffic management systems, red light camera systems, pedestrian activation, emergency vehicle pre-emption systems, speed advisory signs, custom guide signs, support poles and foundations, pavement markings and signage.

Our senior staff have authored many of the standards and practices used throughout the Province which we apply to our designs.

Our services are provided directly to Cities or developers or as a sub-consultant to the civil design firm.

4.2 Roadway Lighting Projects

DMD undertake over 100 roadway lighting projects a year. These are spread throughout the Provinces of BC with some in Alberta. Specific projects are too many to list. Having authored

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the recently published Transportation Association of Canada Roadway Lighting Design Guide allows our staff to apply design techniques which can improve visibility and improve safety.

4.3 ITS Projects

4.3.1 WR Bennett Floating Bridge, Kelowna, BC

This \$148M project located in Kelowna, British Columbia involves the replacement of an existing 3 lane floating bridge with a new 5 lane - 1000m long floating bridge. DMD's work includes the design of construction specifications for the power distribution, roadway lighting, an automatic incident detection system, a CCTV system, a seismic monitoring system, a weather monitoring station, back-up power via a standby diesel generator and uninterruptable power supply (UPS), a vehicle counter and classification data collection system, a fibre optic network, navigational lighting, traffic signals and 3rd party utility conduit systems.

As the project is Design Build Finance Operate numerous life cycle cost analysis have been undertaken to define the best value over the 30 year concession period of the contract.

4.3.2 Advance Traveller Information System, North Vancouver, BC

Traffic congestion continues to plague motorists in all major Cities. The Advance Traveler Information System (ATIS) utilizes a series of cameras, vehicle detectors, and advanced traffic controllers located within the Lions Gate Causeway and adjacent areas to determine vehicle queues and post estimated delay times. This information is conveyed to the motoring public via large changeable message signs located at key corridor access points along the corridor.

The system included integration into an existing counter flow lane control system, and interfacing with an existing CCTV system and fibre-optic network. The project also included the design of remote controller cabinets and internal components, and interfacing with the ATIS software designer.

4.3.3 Nexus/Fast Lane Cross Border Project, Surrey, BC

Improved efficiency was required the Canada/US Pacific Border Crossing, requiring additional lanes for both autos and transport vehicles as well as Nexus/Fast lanes. The project involved electrical and lighting upgrades to the Canada Customs terminal and Highway 15 leading up the US Border.

DMD have also undertaken the design of guide signing on large overhead structures and well as an innovative truck queuing/priority to signal system which involved the use of programmable logic controller (PLC). The truck staging system allowed vehicles to assemble in designated areas and proceed to the border based on arrival.

Other project elements included parking lot lighting, roadway lighting, traffic signals and relocations to the Advance Traveler Information System (ATIS).

4.3.4 Traffic Controller Assessment/ Study, Ministry of Transportation

The Ministry of Transportation used outdated controllers and very expensive custom controller cabinets. A review was needed to investigate the availability of newer, more current products and move towards less customization.

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This assignment involved the review of current industry practice and a technical assessment of Caltran's Model 170 and 2070 and NEMA TS-1 and TS-2 controllers. DMD collected information on each of the products, interviewed numerous suppliers and users and documented product features and support. DMD prepared a final report summarizing various controller products and listed their advantages, disadvantages and features, including recommendations for retrofitting any new equipment into existing cabinets.

5 Insurance

DMD carry \$2M of errors and omission insurance and \$5M of comprehensive insurance.

6 References

We encourage those not familiar with DMD to call references from recent projects. DMD have a reputation of very satisfied client, providing repeat business. References from a cross section of those involved in transportation projects are as follows.

- *City of Kelowna*
 - Contact: Fred Wollin, Traffic Supervisor, Transportation Division
 - Phone: 250-469-8702
 - Email: fwollin@kelowna.ca
- *City of Burnaby*
 - Contact: Bob Baillie, Traffic Supervisor
 - Phone: 604-294-7456
 - Email: bob.baillie@city.burnaby.bc.ca
- *Township of Langley*
 - Contact: Theo Boersma, Operations
 - Phone: 604-532-7314
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Transportation-Related Engineering

DMD & Associates provides complete electrical engineering and lighting design for transportation projects, as well as signing and wayfinding design. Our experience includes highway and freeway lighting, traffic signals, intelligent transportation systems, power distribution and communications systems. Our specialists also have extensive experience providing electrical engineering services for tunnels, bridges, elevated and at-grade transit systems, ferry terminals, toll roads and roadways at ports and airports.

Our capabilities include

- **Power Distribution and Controls**
- **Highway and Roadway Lighting**
 - Computer-Aided Lighting Design and Modeling
 - Intersection Illumination
 - Obtrusive Light Mitigation
 - Environmental Analyses for Transportation Lighting (EIS and SEPA)
 - Highmast Lighting
 - Bridge and Tunnel Lighting
- **Traffic Signals**
 - Signal Timing Plans, Coordination and Optimization
 - Pole and Foundation Design
 - Traffic Control Systems
- **Intelligent Transportation Systems**
 - Toll Systems
 - Reversible Lanes and Counterflow Systems
 - Video Detection Systems and Closed Circuit Television (CCTV) Monitoring
 - Ramp Metering Systems
 - Red Light Cameras
- **Signal and Wayfinding Systems**
 - Sign Support Structures
 - Sign Layout



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Development of Standards and Specifications

DMD & Associates staff have considerable experience developing electrical engineering and related standards and specifications for local and regional governments, transportation agencies and private owners. These documents are used to guide future projects, minimizing design response time, reducing costs, controlling quality and normalizing maintenance intervals and procedures. Our experience includes standards for transportation-related lighting, traffic signals, signing and wayfinding and sports lighting.

Our capabilities include

- Construction Standards and Specifications
- Standard Drawing and Details
- Design Criteria/Performance Criteria
- Materials Specifications
- Drafting Standards
- Inspection Standards
- Maintenance Standards and Specifications
- Supplemental Specifications
- Development of Approved Products Lists
- Review and Updating of Existing Standards and Specifications



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Traffic Signals

DMD & Associates signal specialists perform feasibility studies and develop engineering designs and perform construction administration for local and regional transportation agencies, as well as private owners developing infrastructure for planned communities. Our expertise includes in-depth knowledge of traffic controllers, development and design of new signals and associated systems, intersection improvements, rechannelization, and signal renovation and retrofits. Our expertise includes single- and multiple-lane streets, roadways and arterials with complex traffic movements.

Our capabilities include

- Feasibility Studies
- Signal Timing Plans, Coordination and Optimization
- Troubleshooting Existing Systems
- Engineering Design and Construction Administration
- Low Energy Consumption Signal Design Using LEDs
- Video Detection Systems
- Signal Cabling and Wiring Methods
- Pole and Foundation Design
- Red Light Camera Systems
- Closed Circuit Television (CCTV) Monitoring
- UPS Systems for Signals
- Emergency Vehicle/Railway Preemption
- Fiber Optic, Copper and Wireless Interconnection Systems
- Development of Maintenance Procedures and Standards
- Inventory Assessments and Conditions Survey Studies





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Sports Lighting

DMD & Associates is an industry leader in the specialized design of sports lighting systems, with complete understanding of the needs of owners, users, maintenance personnel, neighbors and contractors. Our experts have extensive experience with both indoor and outdoor installations, ranging from recreational-level facilities to professional arenas, including projects in the United States and Canada. We have designed systems for very high light levels, with special consideration for large spectator crowds and TV. In addition, our engineers and designers are often asked to offer insights and perform troubleshooting to provide corrective measures for poorly performing existing systems, as well as designing economical upgrades.

Our capabilities include

- Engineering Design and Construction Administration
- Public Involvement Services
- Obtrusive Light Studies
- Cost and Feasibility Evaluations
- Energy Conservation Systems
- Lighting for TV Broadcasts
- Spill Light and Glare Mitigation
- Power Distribution
- Custom Lighting Controls
- Dimming and Switching Systems
- Development of Maintenance Standards
- Photographic Simulations of Proposed Installations (Daytime and Nighttime)
- SEPA and EIS Analyses
- Comparison Studies
- Consulting Services for Developing Lighting Ordinances
- Owner's Engineer or Representative
- Engineering Services for Design-Build
- Inventory Assessments and Conditions Survey Studies



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Electrical and Communications Engineering

DMD & Associates provides electrical and communications engineering for a wide variety of facilities, including municipal, industrial, institutional and commercial buildings, as well as transportation facilities, ports, airports, water and wastewater infrastructure. Our staff works closely with other disciplines such as architectural, mechanical and structural designers. We have excellent knowledge of codes and requirements of local service providers. By working closely with owners and operations staff we focus on innovative solutions that reduce both first costs and operating costs.

Our capabilities include

Electrical (Division 16)

- Low- and Medium-Voltage Power Distribution
- Site Servicing and Utility Coordination
- Backup and Emergency Power
- Interior and Exterior Lighting
- Gymnasium/Pool/Arena Lighting
- Outdoor Area lighting
- Fire alarm and Security Systems
- CCTV systems
- Building Controls, including PLCs
- Lighting Controls, including Daylight Harvesting and Dimming
- Systems Integration

Communications (Division 17)

- Service Planning
- Service entrances
- Planning and Design of Telecommunications Rooms
- Data Backbone Systems
- Horizontal Distribution Systems
- Systems integration



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Lighting Design

We collaborate with project stakeholders to identify performance, aesthetic, cost and operational issues related to lighting, and then develop well-detailed designs that meet stated requirements.

Our outdoor experience includes parks, pedestrian circulation, sign lighting, security lighting, parking lots and storage yards. Decorative lighting experience includes creating accent and ambience illumination for streetscapes, fountains, monuments, building exteriors, flag poles and other architectural elements.

Our indoor experience includes gymnasiums, office and industrial buildings, warehouses, tunnels and transit stations. We are also skilled in street lighting for projects ranging from suburban neighborhoods to major highways, as well as sports lighting.

Our expertise extends to assisting municipal governments and agencies in developing comprehensive lighting ordinances that help define and preserve community and neighborhood character while reducing energy consumption and obtrusive light impacts.

Our capabilities include

- Computer Aided Design and Modeling
- Energy Management/Conservation
- Sustainable Design, including LEED
- Determination of Appropriate Illumination Levels
- Lighting Controls and Daylighting
- Fixture and Equipment Selection
- Engineering Services for Design-Build
- Project Delivery
- Inventory Assessment and Conditions
- Surveys
- Measurement of Illumination Levels
- Power Distribution
- Coordination with Utilities
- Value Engineering





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PROJECT PROFILE

Signal and Lighting Upgrade Program

Fort St. John, British Columbia



Electrical Capital Cost
\$1.2 million

Engineering Fees
\$50,000

Project Duration
2000 to 2003

References

John Locher

City of Fort St. John
250/787-8150

Rob Close

Urban Systems
250/785-9697

Other DMD Experience in

Fort St. John

*New Traffic Signal at
Wal-Mart Shopping
Center*

Streetscape Lighting

*Various Street
Lighting Projects
(New and Upgrades)*

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DMD & Associates provides comprehensive engineering solutions for clients with complex traffic signal and lighting needs.

The City of Fort St. John inherited all Ministry of Transportation traffic signals located within the city limits as part of a Ministry cost-cutting program. Many of the signals had been installed in the 1970s and were aged, in poor repair and below current standards with respect to timing, displays and overall operation.

The City asked DMD to develop comprehensive signal standards, undertake the design for new signals, and provide recommendations and a program of improvements for the older infrastructure. Challenges included a limited program budget, a variety of equipment in disrepair, harsh winter temperatures (as low as -40 degrees C), a limited number of local contractors with signal installation experience and a lack of existing standards.

As the City's signal and lighting consultant, DMD provided an Inventory and Condition Assessment, a Preliminary Design Report, a cost estimate and a three-year budget-sensitive implementation program to upgrade the traffic signals, lighting and electrical systems. Construction packages included design drawings and Master Municipal Specification (MMS) documents for contractor bid that addressed the traffic signals and the following items as appropriate.

- Improved street and intersection lighting
- LED signal heads for reduced maintenance and power costs
- Larger signal displays and retroreflective tape for improved signal visibility
- New wiring
- Select new traffic controllers
- Refurbished and upgraded traffic controller cabinets
- Upgraded signal timings
- New high visibility street name signs
- Video detection and traffic counting

DMD provided inspection, preparation of record drawings, coordination and responded to issues through construction. DMD also provided multiple concepts for communications between signals and intersection monitoring using video detection cameras via fibre optic, radio, telephone and high-speed Internet.

DMD's traffic signal specialists prepared maintenance standards and specifications for street lighting and traffic signals. Throughout the project DMD senior staff has provided full electrical engineering support services responding to questions and issues related to signals and lighting at no additional cost to the City.

12th World Congress on Intelligent Transportation Systems (ITS) Review

Introduction

Staff of DMD & Associates Ltd attended the 12th World Congress on Intelligent Transportation Systems (ITS) held in San Francisco from November 6 – 10, 2005. This issue of the Advisor outlines a few of the interesting concepts and products showcased at the conference.

Automatic Incident Detection

In the past incident detection required a continuous human interface which involved viewing CCTV monitors and observing incidents. More often only the down stream effects of the incident were observed. New automatic incident detection technologies analyze real-time video images from CCTV cameras mounted on poles along the roadway. They detect various incidents on roadways, bridges, and tunnels and advise operators via preset alarms. The video image processing capabilities are now able to capable of detecting stopped vehicles, wrong way drivers, speed drop, queue, fallen objects, smoke, and pedestrians on a roadway.



An automatic incident detection system can be very effective for providing a fast response to an incident as well as a video log of past incidents. However, if the system is not properly configured, false alarms and nuisance alarms will be generated making the system less informative to the operator. A significant amount of effort must be given to the up front design, set-up and commissioning of the system to suit the dynamics of the particular roadway.

Video over IP Networks

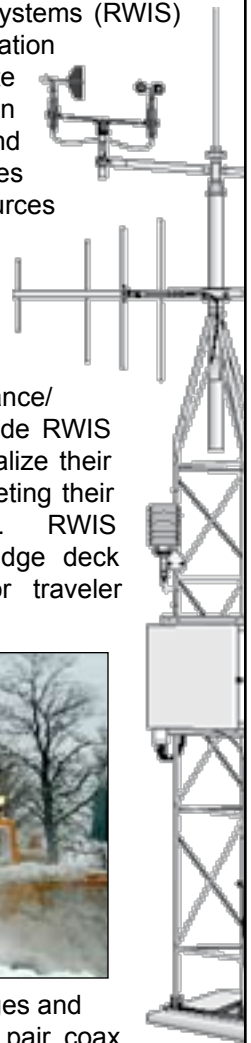
A significant part of any CCTV system is its transmission network which is used to deliver the video images and camera control data. There are different mediums for the transmission of these signals including twisted pair, coax, wireless, and fibre cable. Typically, each individual camera requires its own transmission medium. However, with the proliferation of digital video compression, the same transmission mediums can now carry multiple video/data channels. One particular approach is to package this compressed video/data into a standardized IP Packet which can then be transmitted over an Ethernet network.

The advantages of this technology is a reduction in the physical complexity of a CCTV transmission network, the ability to integrate with existing Ethernet networks, added troubleshooting capabilities, and increased scalability. However, the method of deployment of this type of technology will be unique to every CCTV system.

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Road Weather Information Systems (RWIS)

A full-scale Road Weather Information Systems (RWIS) incorporates collection and dissemination elements to sense and collect on-site and real-time weather and road condition information, and ultimately process and disseminate this information. RWIS provides a tool to better manage maintenance resources during winter weather conditions. The cost of road treatment may be lowered, while more effective treatment reduces the public's exposure to hazardous road conditions, which may bring with it accident reduction. Design/build/finance/operate (DBFO) project teams can include RWIS stations during the design phase and realize their benefits during operation to assist in meeting their performance and maintenance criteria. RWIS stations could include interfaces to bridge deck heaters, in-road chemical sprayers, or traveler advisory signs.





LED TRAFFIC SIGNAL DISPLAYS

Introduction

As of June 27th, 2005 new performance specifications for LED signals are available from the Institute of Traffic Engineers (ITE). The specifications titled "*Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Circular Signal Supplement*" define minimum luminous intensity, uniformity, distribution and chromaticity requirements for 200mm and 300mm diameter ball type red, yellow and green LED signal displays. New specifications for arrow and pedestrian displays will follow. The new ITE specification also defines a much wider range of candlepower intensity which is aimed at improving visibility from wider viewing angles.

LED Performance

Those who use LED signal displays should be aware that LED's operate quite differently than incandescent lamps. An incandescent lamp will maintain a fairly constant output throughout its rated life. The rated life is typically one year and the standard is to group re-lamp incandescent signals at the end of each year. Light output therefore was not typically an issue with incandescent signal displays. Unlike incandescent lamp, the luminous intensity of an LED will typically depreciate to well below its recommended luminous intensity, as defined in Section 4 of ITES document, before they fail. LED suppliers test their products when produced to ensure conformance to published specifications and these test results can be obtained from the suppliers.

The depreciation of an LED signal display varies depending on the manufacturer, its operating environment and the color of the display. It is therefore difficult for an owner to pin down when the LED will need to be replaced. Unfortunately, at present, there are no procedures for measuring the luminous intensity of any type of traffic signal display in the field with an acceptable level of accuracy.

Independent Testing

To verify minimum performance the signals should be tested by an independent testing agency. We recommend owners undertake random testing of their LED displays to verify minimum performance requirements are being met.

Many owners who have installed LED signal displays have continued to follow a cleaning cycle based on the yearly cleaning and re-lamping cycle for incandescent lamps. To determine the impacts of dirt on the display we recommend signals be removed and left dirty (maybe half a dozen displays) and sent to a testing lab. The signal would be tested as is (dirty) then wiped clean and retested. From the variation in light output a dirt depreciation percentage could be established. We suspect that when first installed (and intensity is highest) cleaning of an LED display may be undertaken less frequently than once a year and then more frequent over time as the light output depreciates. This will of course depend on the area and the accumulation of dirt on the display.



Conclusion

In summary we encourage owners who utilize LED signals to develop a program where signals are removed and tested on a regular basis to ensure ITE intensity and chromaticity specifications are maintained. We recommend testing be undertaken at 3 to 5 years from installation with ongoing testing on a regular basis. A list of laboratories who are equipped to test LED's can be obtained from LED suppliers.

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WEB CAMERAS - A COST EFFECTIVE SOLUTION

Introduction

Web cameras are a cost effective way to provide road users, managers and operators with up-to-date traffic and road condition information. They are relatively cheap (installed cost should be under \$10K), are quick and easy to install and should require minimal maintenance. Once installed, still images from the camera can be transmitted via the Internet to a web site where motorists, police and City staff can obtain road information. Images can be updated every couple of minutes or as desired.

Benefits

Just imagine the benefit to the motoring public who can easily view road conditions and adjust travel schedules or use alternate routes. Cameras may be used for roads under construction to both monitor the progress of construction as well review and monitor the contractor's traffic management. Web cameras can also be used to monitor facilities such as athletic ball fields where vandalism of synthetic turf fields may be of a concern.



Technology

Data is typically transmitted via a cellular 1X modem which is installed in the camera enclosure. Data can also be transmitted via high speed (ADSL) phone lines. Cameras are typically mounted on streetlight or traffic poles to reduce the cost of installing a separate pole for the camera. Cameras should be located near established electrical service panels to reduce installation costs. The camera requires a 120V circuit fed from a 15A breaker. The ideal and lowest cost installation is a web camera mounted directly onto an existing service pole with some modification to extend the height of the pole.

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Design

It is preferred, but not mandatory, that a camera be located in an area where roadway lighting is present so that the lighting enhances the image in hours of darkness.

Key considerations when considering web camera include:

- Mount on light pole structures at a minimum height of 8.0 meters above the road grade to reduce the potential for vandalism;
- Locate for easy access;
- Mount on a pole structure that is unlikely to be damaged from vehicle impacts. Cameras should not be located on structures with frangible or breakaway bases;
- Preferably oriented north, northeast or northwest. A camera facing south or east will be adversely affected by sun glare, resulting in the camera becoming ineffective for several hours of the day;
- New camera technologies offer improved images during hours of darkness.

Information from the camera can be displayed on a City or Municipal web site and refreshed automatically. Those interested in roadway conditions can simply access the site via the Internet. An example web site may be found at:

<http://www.th.gov.bc.ca/bchighwaycam/index.aspx>

The main operating cost is for data transmission. Data transmission costs are approximately \$90.00 a month for cellular and may be slightly less for transmission via phone lines depending on provider. No specific maintenance is required.

Conclusion

DMD have been involved in the design and deployment of many roadway web cameras. We are familiar with new and emerging camera technologies and as such can offer the best value. DMD can prepare installation drawings and specify camera equipment. If required DMD can purchase and assemble camera components as they have done on numerous projects.



Introduction

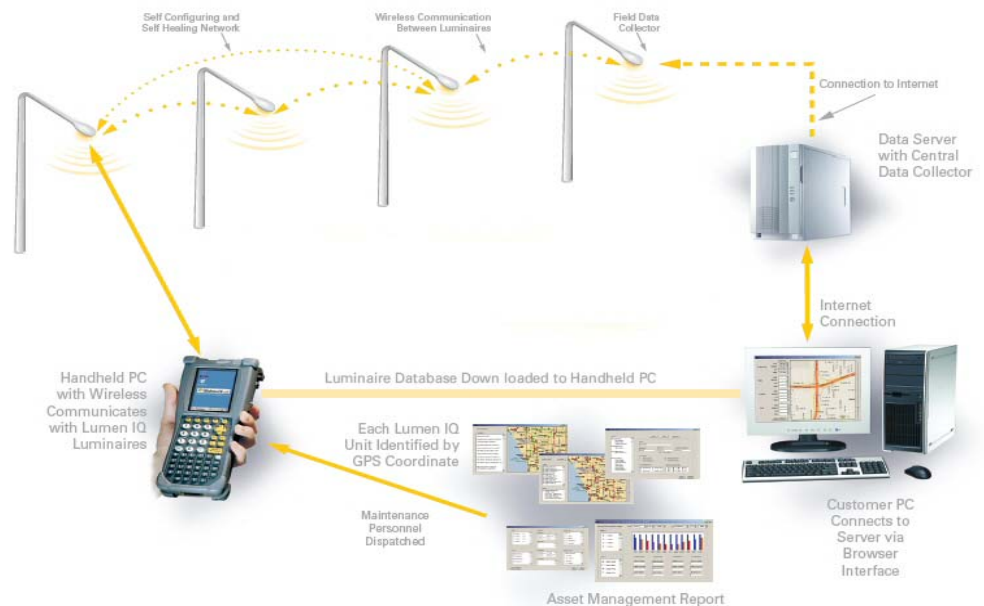
Recent blackouts in eastern North America as well as an increasing demand for power has opened all our eyes to what we often take for granted – reliable electricity. Unfortunately we can't continue using electricity at will without considering ways to conserve power. We must seek out new and innovative ways to reduce our power demands to ensure future generation can benefit from what we have enjoyed – uninterrupted delivery of reliable electrical power. In fact all communities should be strongly encouraged to find innovative ways to save power. Street lighting being a major consumer of power is a good place to start.

Benefits

DMD have analyzed and tested new wireless technology which retrofits into a standard street light and has the potential to save 40% power each year through dimming street light lamps during non-peak periods. Operational savings can also be realized through the systems asset management feature which assigns GPS coordinates to each street light allowing for outages to be automatically reported and tracked. The web based reporting system also offers accurate mapping and service routing to problem street lights.

A common concern with dimming street lighting is whether it creates the potential for liability. However, this concern is unfounded as the IESNA recommended practice for roadway lighting allows for various light levels based on defined levels of pedestrian activity. So as pedestrian activity is reduced over the course of the evening, light levels can be reduced by up to 50%

while still achieving recommended light levels. Moreover, Canadian legal experts have stated that Canadian law is clear that when a municipal government makes a legitimate policy decision, such as dimming street lights, that they are exempt from liability. Indeed, some experts foresee the potential for liability in the case where a city that does not adopt technology that allows malfunctioning street lights to be identified and fixed in a timely fashion. They argue the city may be liable for failing to adopt the best practice maintenance technology.



Conclusion

This technology has been installed on the street lights in-front of the DMD office in Surrey, BC. We would be pleased to demonstrate this technology to those who are interested. The street lighting can be viewed on full intensity or dimmed in 1% increments to a maximum of 50% of full brightness. DMD are committed to working with industry and assisting in research and applying new technologies. Contact Don McLean at DMD and Associates if you wish to view the Adaptive Lighting system.

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ROADWAY LIGHTING DESIGN

Introduction

The Transportation Association of Canada Roadway Lighting Design Guide, originally published in 1983, was deemed in early 2000 to be outdated and in need of replacement. Through a Canada wide competitive selection process DMD was selected to prepare the new Roadway Lighting Design Guide.

TAC Design Guide

Now complete and available for sale (www.tac-atc.ca) the nearly 500-page roadway lighting design guide covers all aspects of roadway lighting design including vision fundamentals and concepts, obtrusive lighting, planning and design process, system components and common elements, standards and codes, computer applications, maintenance, roadways and interchanges, intersections, roundabouts, crosswalks, tunnels, toll plazas, off roadway facilities (parking lots, pathways, etc), signs, streetscapes and work zone/temporary lighting.

In preparing the document, design standards and design practices from North America, Australia, New Zealand and Europe were researched. The majority of the Guide is, therefore, based on existing recommended practices of the Illuminating Engineering Society of North America (IESNA) and the Commission Internationale De l'Eclairage (CIE).

Improving Your Knowledge

DMD undertook this project of producing a Roadway Lighting Design Guide to both improve knowledge and quality of roadway lighting designs. Over the years improved computer lighting software has allowed anyone who can operate a computer to produce a roadway lighting calculations and lighting designs with little or no experience or background. In many cases suppliers offer lighting calculations at no cost. This has led to "cookie cutter" designs with good lighting design taking a back seat.

Many designers of roadway lighting feel more lighting is better and fail to consider contrast, glare, adaptation

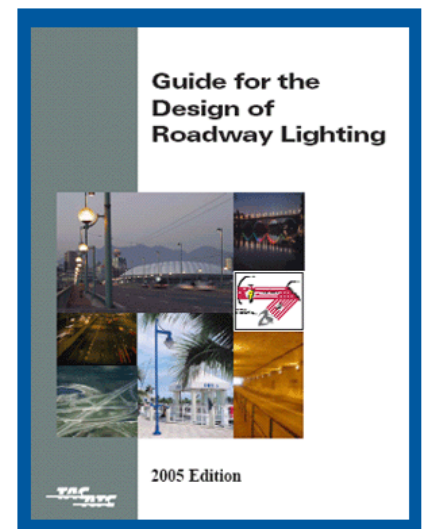
issues and other factors important to improving visibility and comfort for driver and pedestrians.

We encourage Cities, Municipalities and Government agencies to adopt the new TAC Roadway Lighting Design Guide. The document is an excellent educational source, very extensive in detail and as well defines many good lighting design practices which if adhered to will benefit and improve safety.

Looking to the Future

In the upcoming years many new lighting products and lighting design methods will be available to roadway lighting designers. DMD and Associates are committed to providing quality designs and staying current with new technology. Our key staff members are active members of the Illuminating Engineering Society and Canadian Standards Associations committees and attend lighting conferences throughout North America on a regular basis. This allows DMD to stay on the cutting edge of knowledge and through contacts gained on these committee's are networking and partnering with other design professionals from other parts of North America. One such new design method is that for lighting roundabouts.

Upcoming additions of the Advisor will deal with new technologies and design methods in order to offer our clients the best value.



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