MMM GROUP

Value Engineering and Innovation in the Design and Construction of the Southeast Anthony Henday Drive

Implications of P3 Projects for Geometric Design

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COMMUNITIES

TRANSPORTATION

BUILDINGS

INFRASTRUCTURE

PRESENTATION

Project Geometric Design Standards

Value Engineering Project Applications

Safety Oversight Process

Project Design Innovations

Project Process Innovations

PROJECT GEOMETRIC DESIGN STANDARDS

Geometric Design Standards were defined by the Province in the Technical Documents of the DBFO Agreement. Standards included:

- Design Speeds defined by Roadway Class
- Vertical curves minimums are 20% above TAC
- SSD required 25% in excess of TAC
- Cross section parameters are defined
- Profile constraints include LVC criteria, spacing of VPI and combination of minimums not permitted

PROJECT GEOMETRIC DESIGN STANDARDS

- Rigid Geometric Standards applied to P3
  - Limits flexibility and innovation in delivery
  - Cannot explicitly address safety with respect to the geometric standards
  - Profiles are inefficient for mass haul
- Innovation is forced from Geometric Design to other areas such as processes and construction delivery
- Rigid standards my not consider latest safety research

VE PROJECT APPLICATIONS
Project VE Workshop

VE undertaken in the pursuit phase

- Alternative interchange layouts
- Mass haul optimization
- Development of standardized structures
- Girder design optimization (concrete/steel)
- Traffic accommodation and staging
- Material substitutions
- Operations and maintenance LCC (Pavements)

VE PROJECT APPLICATIONS
Ongoing Design/Construction

VE Practised in project delivery

Minimal time for formal VE – Project Deadlines

VE applied as a Necessity = Mother of Invention

- Address project problems
  - Grade challenges
  - Traffic accommodation
- Resolve inefficient design
  - MSE Wall vs structure
- Introduced alternative methods - out of Province

SAFETY OVERSIGHT PROCESS
Conspicuity of Exit Bullnoses

Review of poorly constructed exit layouts

Ensure visibility and conspicuity

SAFETY OVERSIGHT PROCESS
Culvert Safety Grates

Safety grates requires according to AASHTO standard

Typical installation

SAFETY OVERSIGHT PROCESS
Grading and Median Light Poles

Berm median light poles not on breakaway base

SAFETY OVERSIGHT PROCESS
Inspection of Barrier End Treatments

Review installation as per manufacturer's requirements

SAFETY OVERSIGHT PROCESS
Shielding of Overbuilt Bridges

Barrier to shield extra wide lanes on bridges

PROJECT DESIGN INNOVATIONS
91 Street Interchange

Modification to interchange layout and avoidance of utilities

PROJECT DESIGN INNOVATIONS
Parsons Utility Cluster

Use of lightweight fill in large embankment over sanitary sewer and other services

PROJECT DESIGN INNOVATIONS
Pavement Field Issues

Control of groundwater flow in highly erodible soils

PROJECT DESIGN INNOVATIONS
Structure 1.1

Kinked steel
girder bridge

PROJECT DESIGN INNOVATIONS
Structure 1.6 Cast in Place Bridge

Reduced foundation & materials in structure

Traffic accommodation to accommodate cast in place construction

PROJECT DESIGN INNOVATIONS
Structures 9.1/9.2

Haunched girders over railway for vertical clearance

Reconsideration of mid span MSE wall

PROJECT DESIGN INNOVATIONS
Bretona Wetlands
Mill Creek Realignment

Mill Creek relocation
Naturalized wetland

PROJECT DESIGN INNOVATIONS
Electrical Wiring

Three phase wiring

Four conductor cable

Consecutive phases repeated in a repeating “daisy chain”

Reduced voltage drop, number of power supplies & provided optimum loading

PROJECT DESIGN INNOVATIONS
Low Level Illumination

Overhead power line constraints

Low level lighting

Avoidance of glare

PROJECT PROCESS INNOVATIONS

- Communications
  - Meetings and project planning
  - Electronic data management
  - Formal/informal communications
- Incremental Project Delivery
  - Staged roadworks
  - Staged bridge designs
- Project Design Oversight

SUMMARY

- Rigidity of project requirements limited innovation
- Nature of innovation limited to:
  - Processes
  - Design configurations
  - Construction processes
  - Project scheduling
- Missed opportunities
  - Explicit safety rationalization of design
  - Control on deviation from specifications