ROAD DESIGN NOTE

The use of High Profile Barrier Kerb (HPBK)

1. Purpose

This Road Design Note provides advice on the use of high profile barrier kerbs (HPBK) to allow more scope in the landscaping of medians and outer separators on low speed urban roads (operating speed < 60 km/h).

2. Background

This Road Design Note has been issued in response to an identified need on some projects to provide landscaping treatments of high aesthetic value within the clear zone without the use of conventional safety barriers.

Conventional safety barriers are generally designed to provide protection from roadside hazards in high-speed environments. The projects in question are in low to intermediate speed environments where the use of conventional safety barriers is incompatible with aesthetic objectives, but an acceptable level of protection from roadside hazards is still required.

The performance capabilities of safety barriers are established by detailed crash testing, where some testing of barriers/high kerbs for lower speed environments has been carried out. The guidance provided in this note is based on the test information available and theoretical calculations of the resistance to vehicle overturning provided by a high profile kerb.

3. Accepted HPBK profiles

There are currently two alternative HPBK profiles that could be used to provide greater protection from roadside hazards than the conventional barrier kerb shown on SD 2001 (latest version). These profiles are shown below in Figure 1 and Figure 2:

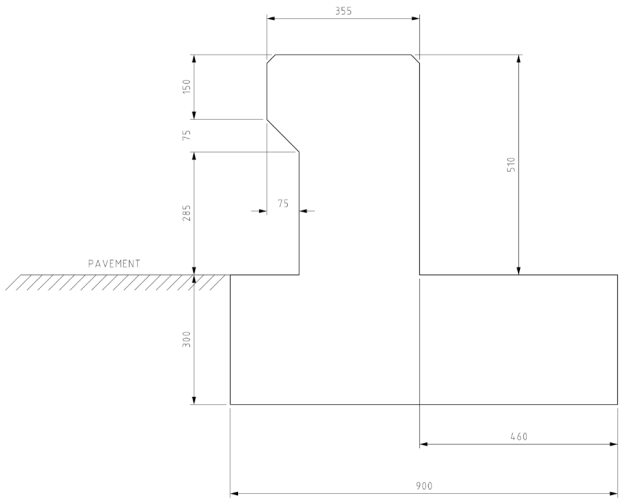

FIGURE 1: "MIDWEST" HIGH PROFILE BARRIER KERB

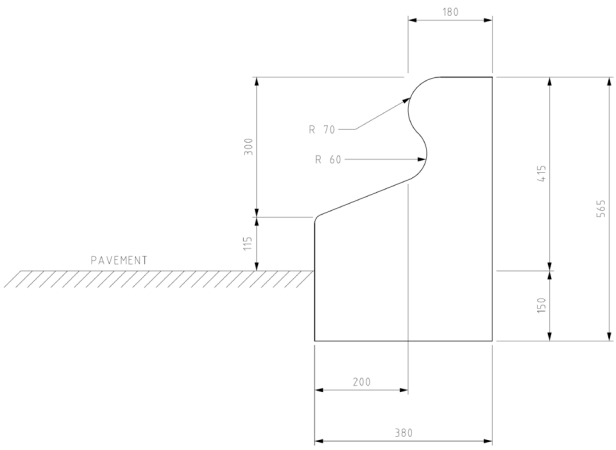

FIGURE 2: "TRIEF" HIGH PROFILE BARRIER KERB

3.1 "Midwest" HPBK

"Midwest" HPBK is a public domain low profile bridge barrier developed by Midwest Roadside Safety Facility, suitable for HPBK applications.

This system has been successfully crash tested to NCHRP 350 Test Level 2, vehicle speed 70km/h, impact angle of 25 degrees and vehicle mass of 2000kg. It is a rigidly anchored system that redirects vehicles by absorbing energy from the vehicle interaction rather than the barrier deflecting. A footing has been developed to suit Australian soil/pavement conditions and as the system utilises continuous reinforcement to develop its strength the product would be constructed using cast in situ techniques rather than precast.

3.2 "Trief" HPBK

"Trief" HPBK is a proprietary kerb profile owned by Precast Concrete Solutions Pty Ltd. (precast concrete.com.au)

"Trief" has been subjected to crash testing to the European requirements (EN1713) rather than the American requirements (NCHRP350) which Australia usually adopts.

This product has not passed NCHRP 350 TL 2 but has passed a similar test which is 64% of the impact severity compared to the American standard. "Trief" can only be expected to provide a limited level of protection from roadside hazards.

3.1 Choosing a HPBK Profile

The "Midwest" is the preferred profile as it has been subject to higher levels of crash testing. However, selection should be based on how closely the road will reflect the crash tested conditions.

4. Issues for consideration in use of HPBK

There are number of issues that should be considered before adopting HPBK at any particular site. These issues include the following:

4.1 Operating speed

As HPBK does not provide the same level of protection from roadside hazards as conventional safety barriers its use should be limited to low speed environments. The HPBK profiles shown in Section 3.0 should only be considered on urban roads where the operating speed is 60 km/h or less.

The installation of HPBK is not to be used to influence reductions in speed limit alone when proposed. The preference is to consider the road environment entirely.

4.2 Cross section requirements

Offsets from traffic lanes to safety barriers are required to ensure motorists can comfortably drive in the centre of the adjacent lane.

Given the height of HPBK and the low speed environment in which it would be utilised, a minimum offset of 0.3m should be provided to the nearest adjacent traffic lane. This offset would also apply to an adjacent bicycle lane.

Consideration should be given to the use of an audible edge line where warranted to discourage errant vehicles from impacting the kerb. VicRoads Traffic Engineering Manual Volume 2 provides guidelines for the use of a profiled edge line taking into considerations such as noise. Other treatments such as improved delineation or street lighting should also be considered prior to profiled edge lines.

4.3 Offsets to unyielding roadside hazards

A minimum offset of 1.5m from back of kerb to unyielding hazards such as trees is required to provide a clearance to vehicles that may tilt toward the hazard when impacting the kerb.

4.4 Drainage requirements

HPBK may require the installation of drainage facilities on both sides of the barrier when both the roadway and roadside fall towards the kerb. Breaks in the kerb to allow water to drain from the roadside to the roadway drainage system would not be acceptable unless the breaks can be designed so as not to create potential snag points for impacting vehicles. In this instance, consideration should also be given to providing adequate run out areas outlined below in 4.5.

4.5 Pedestrians

HPBK will provide a significant obstacle for pedestrians trying to cross the kerb given its height. Unless pedestrian movements can be controlled and directed to intersections or designated crossings, HPBK should not be used unless the demand for pedestrian movements across the kerb is expected to be minimal.

A run out area (area clear of hazards) should be provided at locations where formalised and transitioned crossing points are proposed to encourage pedestrian movements, as such areas represent a break in the barrier kerb where a vehicle can easily mount and travel through.

Pedestrian footpaths directly behind HPBK are strongly discouraged to protect pedestrians from vehicles that may strike the barrier and also prevent the likelihood of falls and other pedestrian injuries.

4.6 Parking adjacent to kerb

Given the pedestrian issue discussed above in 4.5, parking is not permitted adjacent to HPBK.

4.7 End treatments

A blunt end of a HPBK facing approaching traffic would be a significant roadside hazard. To address this issue, the HPBK should either be safely ramped down to a standard kerb height in accordance with the products specifications, or an appropriate crash cushion should be fitted to the end of the kerb.

5. Conditions for use of HPBK

Given the issues discussed in Section 4 above, the following conditions for the use of HPBK are required until further information on the performance of these kerbs is available.

- HPBK can only be considered for projects where:

(a) trees with trunks greater than 100mm diameter located within the clear zone are considered an essential element of the project or by the community.

(b) conventional safety barriers have an unacceptable impact on the aesthetic objectives of the project.

(c) the limited protection from roadside hazards provided by HPBK meets the road safety objectives for the road in question.

- HPBK shall only be used in urban areas where the operating speed limit is 60 km/h or lower. If HPBK is proposed for higher speed roads, a risk assessment shall be completed and submitted for review by the Manager Road Standards and Traffic before use of the HPBK is considered.
- a minimum offset of 1.5m from back of kerb to unyielding hazards shall be provided.
- a minimum offset of 0.3m shall be provided to the nearest adjacent traffic or bicycle lane.
- audible edge line shall be used in conjunction with HPBK unless shown to be a noise sensitive area.
- HPBK shall only be considered for use in medians and outer separators where:

(a) parking is not permitted; and

(b) pedestrian movements are controlled to designating crossing points or demand for uncontrolled pedestrian movements across the kerb is expected to be minimal.

References

Supersedes 03-30b

Approved by

Daniel Cassar

MANAGER ROAD STANDARDS AND TRAFFIC

VicRoads

Contact

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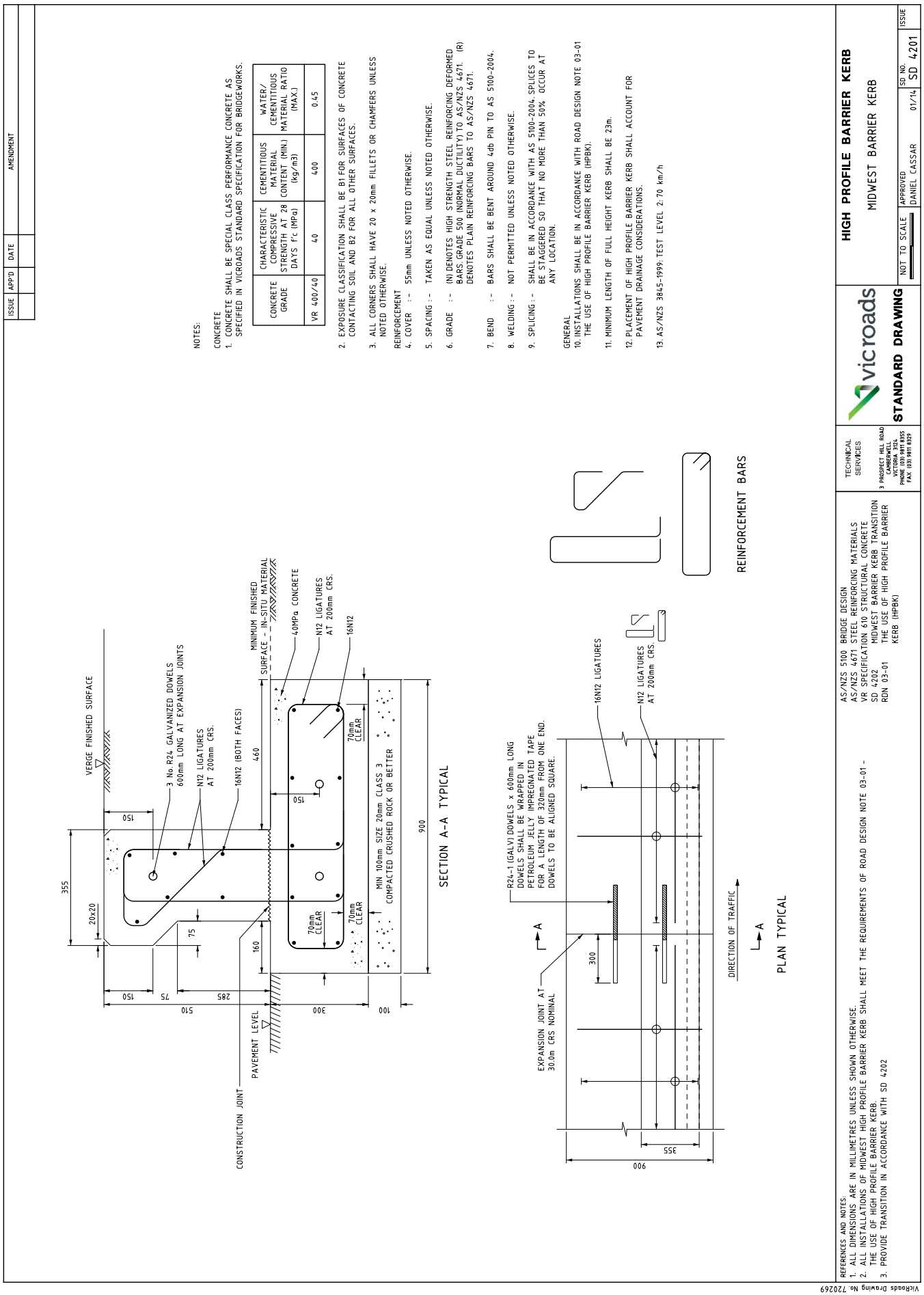
Road Design Notes are subject to periodic review and may be superseded

Appendix A

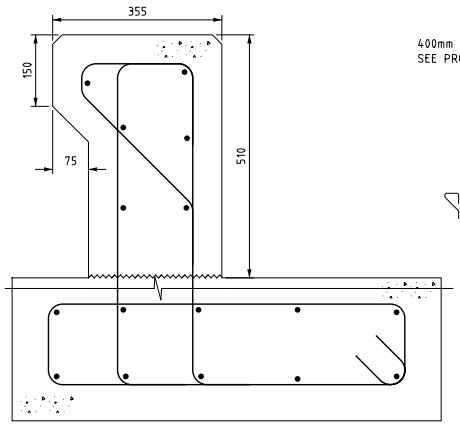
Standard Drawing SD 4201 – High Profile Barrier Kerb – Midwest Barrier Kerb

Standard Drawing SD 4202 - High Profile Barrier Kerb - Midwest Barrier Kerb Transition.

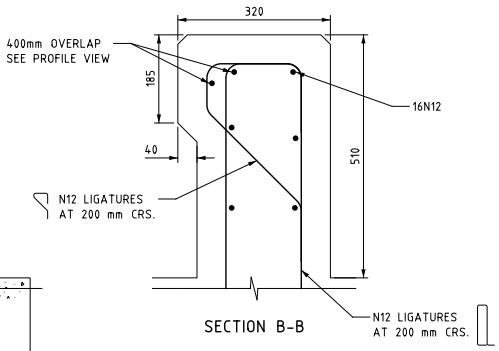
Appendix A: SD 4201



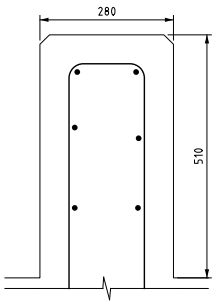
ISSUE	APP'D	DATE	AMENDMENT



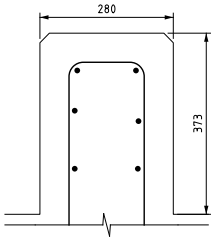
SECTION A-A
(REFER SD 4201)



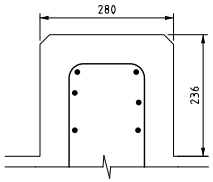
SECTION B-B



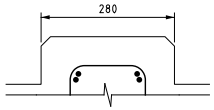
SECTION C-C



SECTION D-D



SECTION E-E



SECTION F-F

NOTES:

CONCRETE

1. CONCRETE SHALL BE SPECIAL CLASS PERFORMANCE CONCRETE AS SPECIFIED IN VICROADS STANDARD SPECIFICATION FOR BRIDGEWORKS.

CONCRETE GRADE	CHARACTERISTIC COMPRESSIVE STRENGTH AT 28 DAYS f'c (MPa)	CEMENTITIOUS MATERIAL CONTENT (MIN.) (kg/m3)	WATER/ CEMENTITIOUS MATERIAL RATIO (MAX.)
VR 400/40	40	400	0.45

2. EXPOSURE CLASSIFICATION SHALL BE B1 FOR SURFACES OF CONCRETE CONTACTING SOIL AND B2 FOR ALL OTHER SURFACES.

3. ALL CORNERS SHALL HAVE 20 x 20mm FILLETS OR CHAMFERS UNLESS NOTED OTHERWISE.

REINFORCEMENT

4. COVER : - 55mm UNLESS NOTED OTHERWISE.

5. SPACING : - TAKEN AS EQUAL UNLESS NOTED OTHERWISE.

6. GRADE : - (N) DENOTES HIGH STRENGTH STEEL REINFORCING DEFORMED BARS. GRADE 500 (NORMAL DUCTILITY) TO AS/NZS 4671. (R) DENOTES PLAIN REINFORCING BARS TO AS/NZS 4671.

7. BEND : - BARS SHALL BE BENT AROUND 4db PIN TO AS 5100-2004.

8. WELDING : - NOT PERMITTED UNLESS NOTED OTHERWISE.

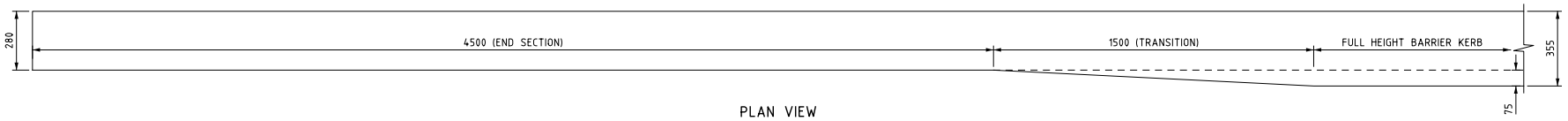
9. SPLICING : - SHALL BE IN ACCORDANCE WITH AS 5100-2004. SPLICES TO BE STAGGERED SO THAT NO MORE THAN 50% OCCUR AT ANY LOCATION.

GENERAL

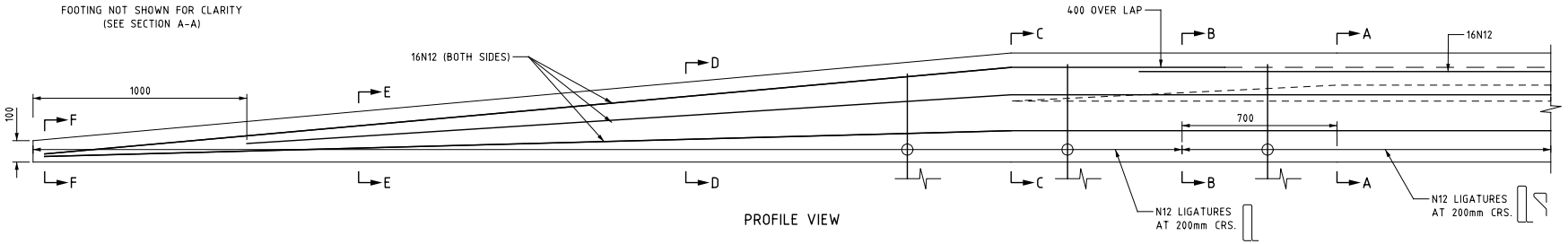
10. INSTALLATIONS SHALL BE IN ACCORDANCE WITH ROAD DESIGN NOTE 03-01 THE USE OF HIGH PROFILE BARRIER KERB (HPBK).

11. MINIMUM LENGTH OF FULL HEIGHT KERB SHALL BE 23m.

12. PLACEMENT OF HIGH PROFILE BARRIER KERB SHALL ACCOUNT FOR PAVEMENT DRAINAGE CONSIDERATIONS.



PLAN VIEW



PROFILE VIEW

REFERENCES AND NOTES:
i. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
ii. ALL INSTALLATIONS OF MIDWEST HIGH PROFILE BARRIER KERB SHALL MEET THE REQUIREMENTS OF ROAD DESIGN NOTE 03-01 - THE USE OF HIGH PROFILE BARRIER KERB.
iii. MIDWEST LONGITUDINAL LENGTH IN ACCORDANCE WITH SD 4201

AS/NZS 5100 BRIDGE DESIGN
AS/NZS 4671 STEEL REINFORCING MATERIALS
VR SPECIFICATION 610 STRUCTURAL CONCRETE
SD 4202 MIDWEST BARRIER KERB
RDN 03-01 THE USE OF HIGH PROFILE BARRIER KERB (HPBK)

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STANDARD DRAWING

HIGH PROFILE BARRIER KERB

MIDWEST BARRIER KERB TRANSITION

NOT TO SCALE	APPROVED	SD NO.	ISSUE
	DANIEL CASSAR 01/14	SD 4202	

VicRoads Drawing No. 720270