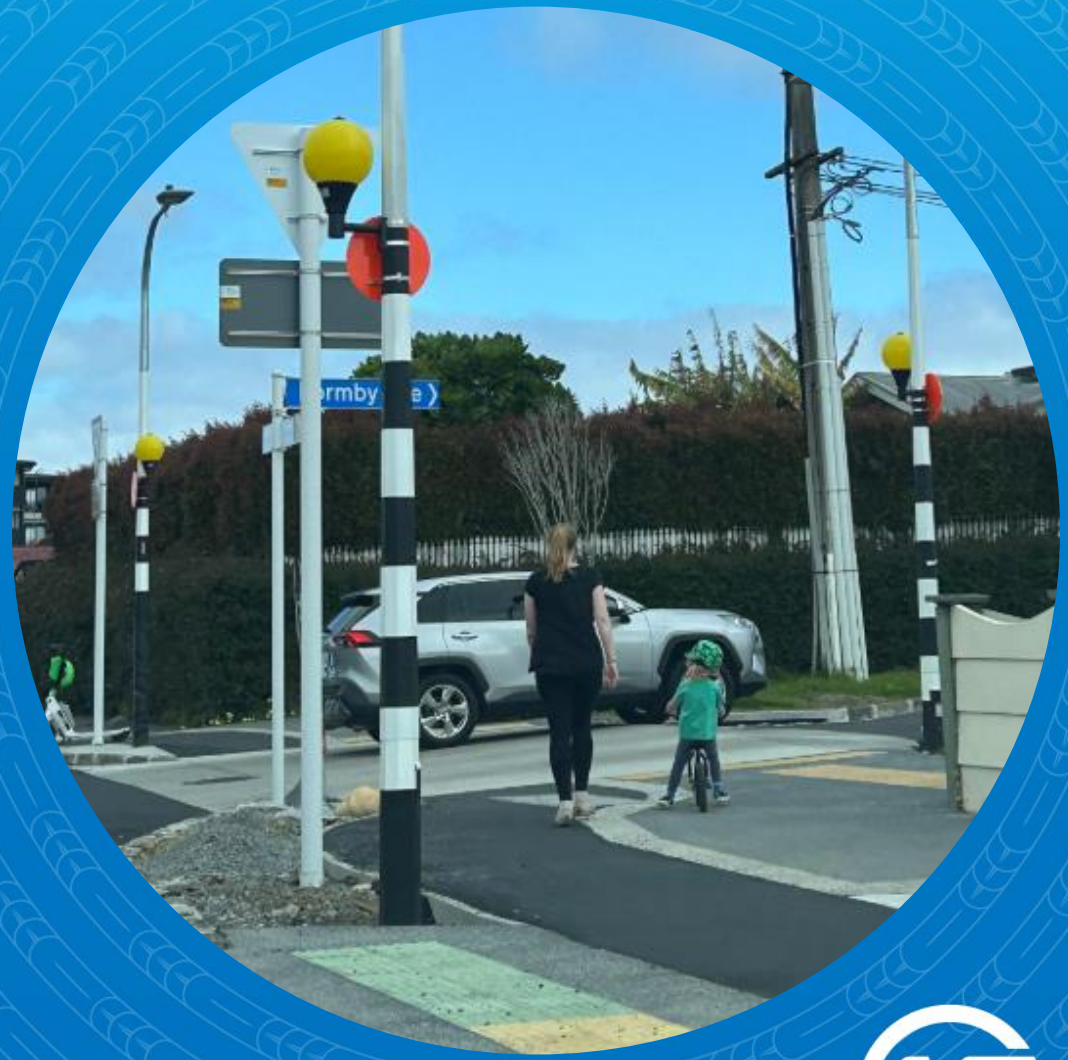
Refining Raised Safety Platform Design for Auckland



Presented by:

Andy Irwin, Principal Specialist – Transport Design

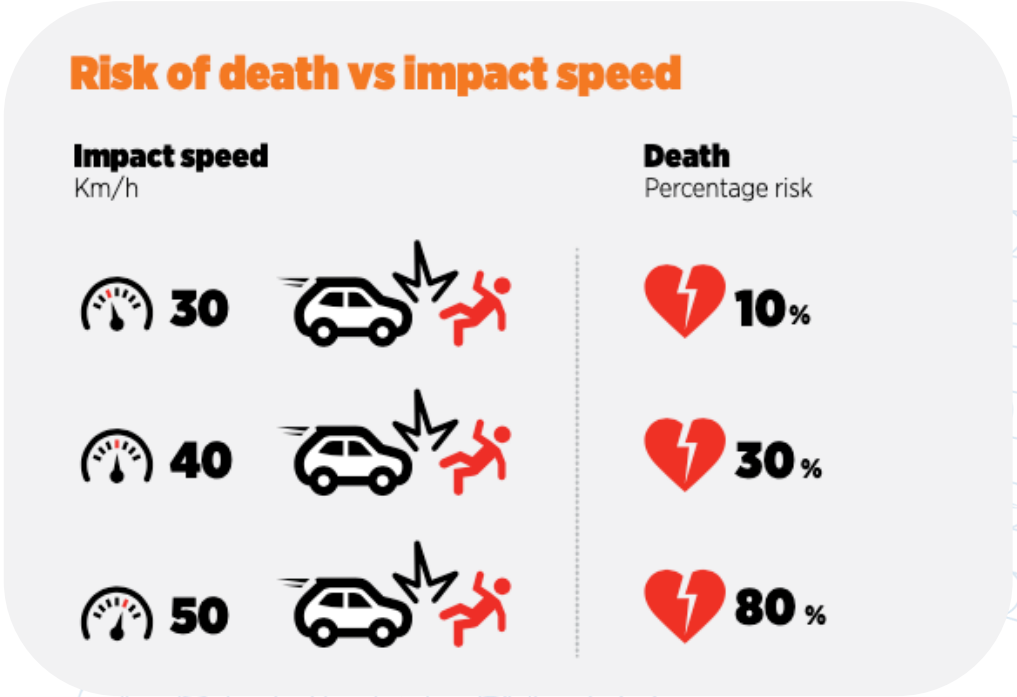
Benefits and issues arising from Raised Safety Platforms

Benefits

- 37 zebra crossings had 21 crashes in 5 years, of these 8 were Death or Serious Injuries (DSIs)
- Since installing raised safety platforms (RSP) at theses crossings, only 7 injuries have been reported, all minor
- Most of these were small-wheel users, not expected by drivers
- The benefit is real, but the problem is all vehicle user are affected by RSP and may cause nuisance to nearby residents

Issues

- Public complaints when RSPs don't meet design expectations
- Political push-back
- Refusal of funding for safety improvements
- Need to rebuild trust



Design and construction problems

Noise and vibration issues

Design not well detailed

Construction misunderstood or not checked for tolerance

Difficult road shape hard to fit

Result: too high or low, too steep or shallow

Application of standards in design and construction

What works in area traffic calming doesn't always work mid-block on faster roads

Late or early hours trucks
Some vehicles don't slow as much as intended

NZ Earthquake standards + soft soils in places = wobbly houses on wobbly ground, interrupted sleep, possible cosmetic building damage

Emergency vehicle response effects

Concern about emergency response delays

Possible damage to FENZ equipment from vertical impact forces

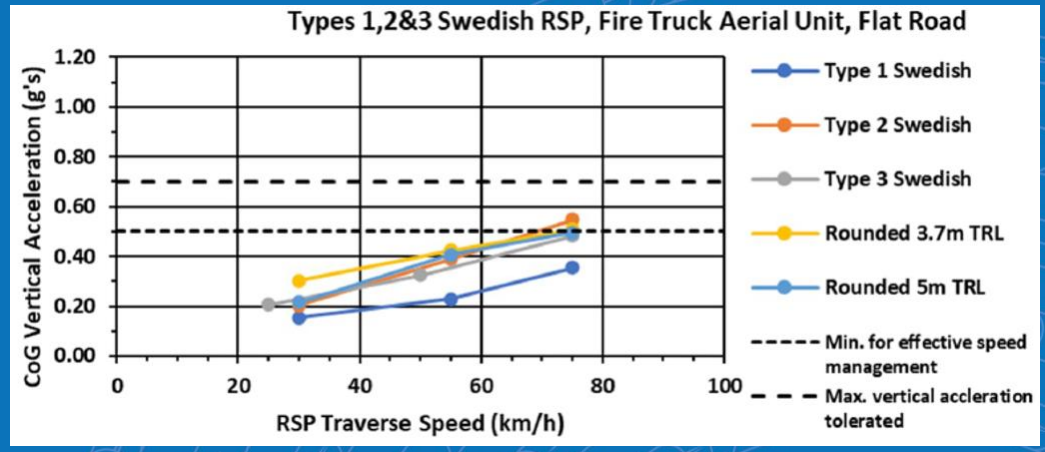
Research into the issues

Track test: Phone accelerometer app

- Different profile RSP constructed and measured in contractor's yard
- Phone app accelerometers placed at several positions in buses
- Supported choice of Swedish profile as Preferred Type

Dynamic modelling WSP study using PC-Crash™

- A range of vehicle types at various speeds
- A range of RSP profiles tested
- Vertical accelerations & impact load factors calculated and reported
- Field vibration tests carried out at two sites
- 3 buses driven at 30 and 40 km/h tested, compared with PC-Crash™
- Track test results were validated
- Predictions for bus and truck performance extended
- Predictions of acceptable performance for emergency services



Drone Speed Survey

Eliga Drone survey with AI processing

Method:

- Drone Speed Survey Video were recorded at 11 representative sites
- Length of recordings covered a good variety of vehicles and driver behaviours
- RSPs at each site were surveyed for detailed as-built profiles
- AI was used to analyse recordings over 50 m approaching and departing from RSPs
- Speed profiles were produced to show approach, crossing and departure speeds
- These were compared with passage at constant approach speed to obtain delay

Site 2. Carrington Road

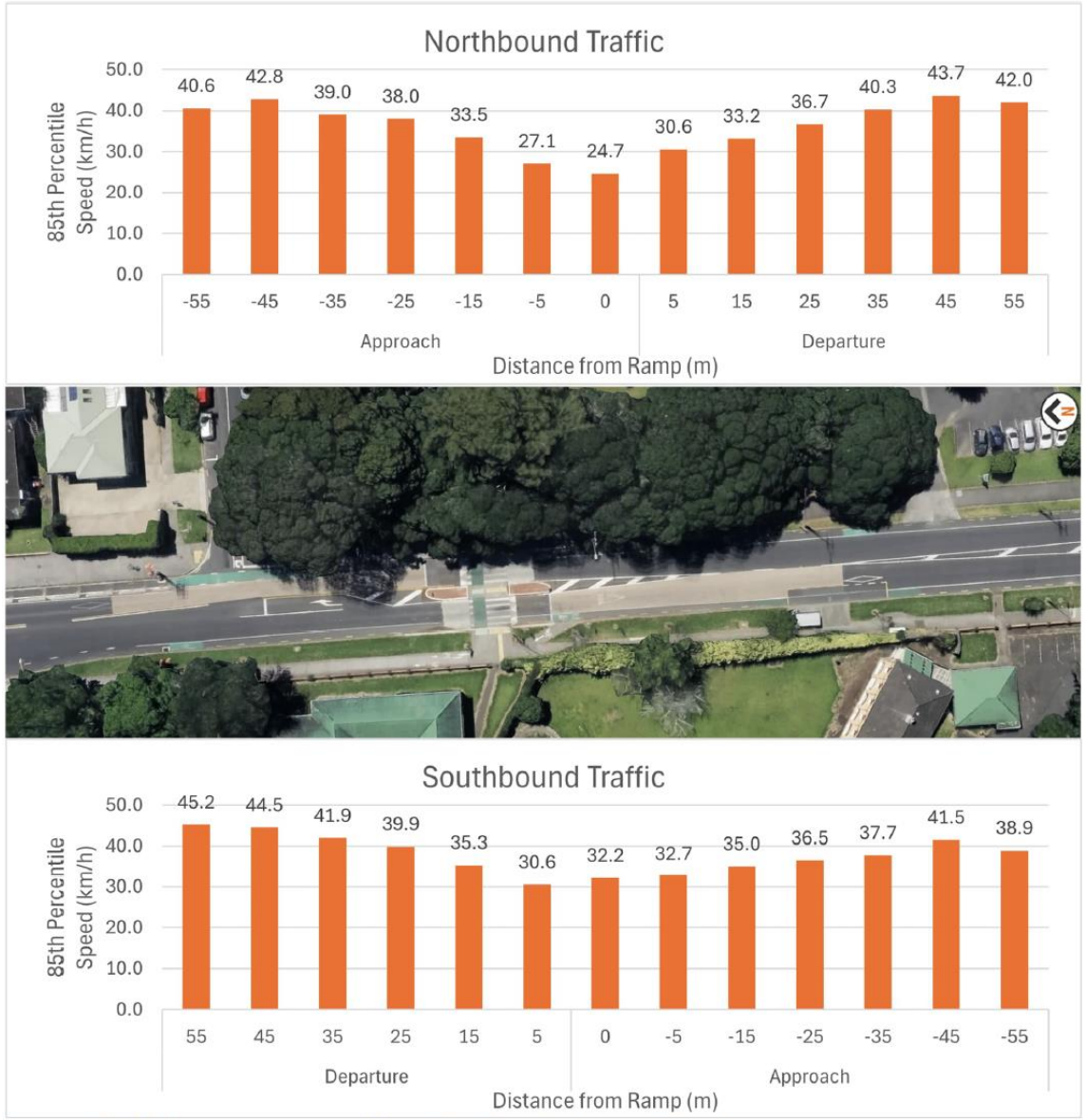


Figure 2: Site layout and speed profiles for Carrington Road

Drone Speed Survey

Eliga Drone survey with AI processing

RESULT:

- AI analysis enabled a simple and effective processing method for the drone surveys
- Variation of as-built profile and site context enabled performance to be compared with expected crossing speeds
- Delays could be calculated:
  - **2.7 sec for standard RSP**
  - **2.1 sec for Swedish RSP**

Evolution of Raised Safety Platform design

Practice Note 02 Edition 2

Conditions for use – policy development

- Type of RSP permitted for each road network category
- Profiles – Swedish table preferred

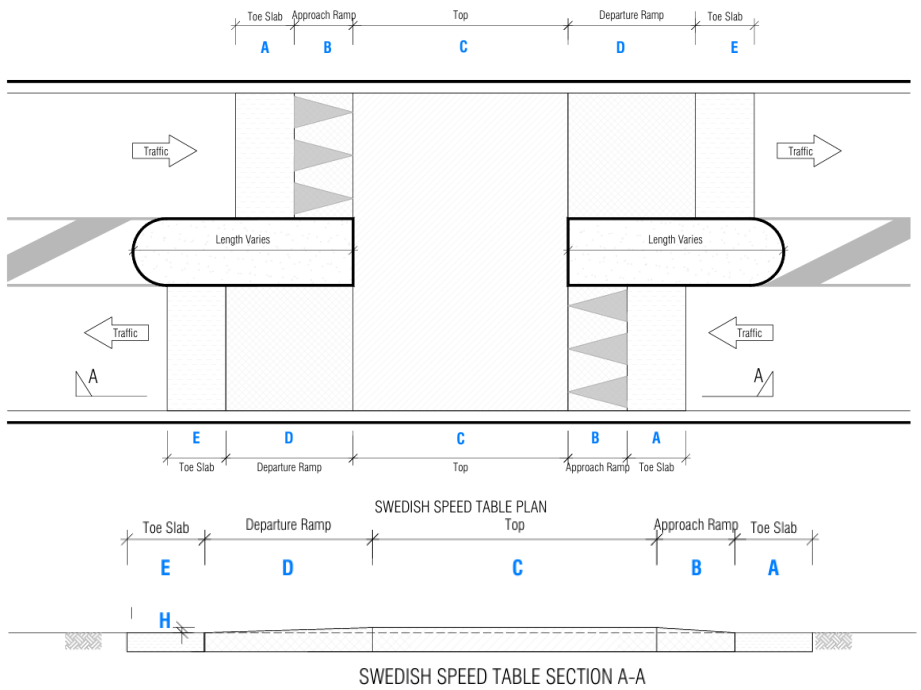


Table PN02-1: RSP Profiles

Type	Approach Speed (4) (km/h)	Profile (1)				
		Nominal grade change	Approach ramp	Top (2)	Departure ramp	
					Swedish (3)	Standard
1S	70 - 80	1:25	1875 x 75	6000	4500 x 75	
1	70 - 80	1:25	1875 x 75	6000		1875 x 75
2S	60	1:20	1500 x 75	6000	3000 x 75	
2	60	1:20	1500 x 75	6000		1500 x 75
3S	50	1:15	1125 x 75	4000	3000 x 75	
3	50	1:15	1125 x 75	6000		1125 x 75
4S	<50	1:15	1500 x 100	4000	4000 x 100	
4	<50	1:15	1500 x 100	6000		1500 x 100

1. Ramp profiles are given as length and height in mm relative to the mean gradient of the road surface over a length of 2.0 m adjoining the ramp.
2. Top dimension may be extended through an intersection if the entire intersection is to be raised.
3. Swedish table profiles: Departure ramp length is the minimum; height is the maximum.
4. Approach speed may be either a posted speed limit or a measured or predicted operating speed.

Design & construction including site surveys

LIDAR smart phone survey & design guidance

- Consistent dimensions to ensure consistent effects
- Requirement for checking during and after construction
- Accessibility: crossfall experienced by pedestrians defined

Road drainage design guidance

- Catchpits or kerb block inlet and outlet systems for by-pass drains
- Effects on Overland Flow Paths to be considered

Standard engineering details

- Reviewed and updated
- Geometry, construction details, drainage options for concrete or asphalt

Vibration remedial

RSP too high, too steep

- Resident issue was supported by vibration testing
- Design remedial – keep table top, reduce grade and height of ramp, regrade approach road to meet higher toe of ramp
- Length of regrade matched to wheelbase of bus

Vibration remedial

Quality workmanship

- Accurate set-out and check formwork
- Concrete ramp and toe slab dowelled and cast
- Asphalt approaches milled and machine-laid
- Completed over two nights

Better, Faster, Cheaper

In-situ concrete

- Optimise design and construction methodology

Pre-cast concrete

- Evaluate casting, delivery, installation, costs

Asphalt

- Ensure design and construction consistency

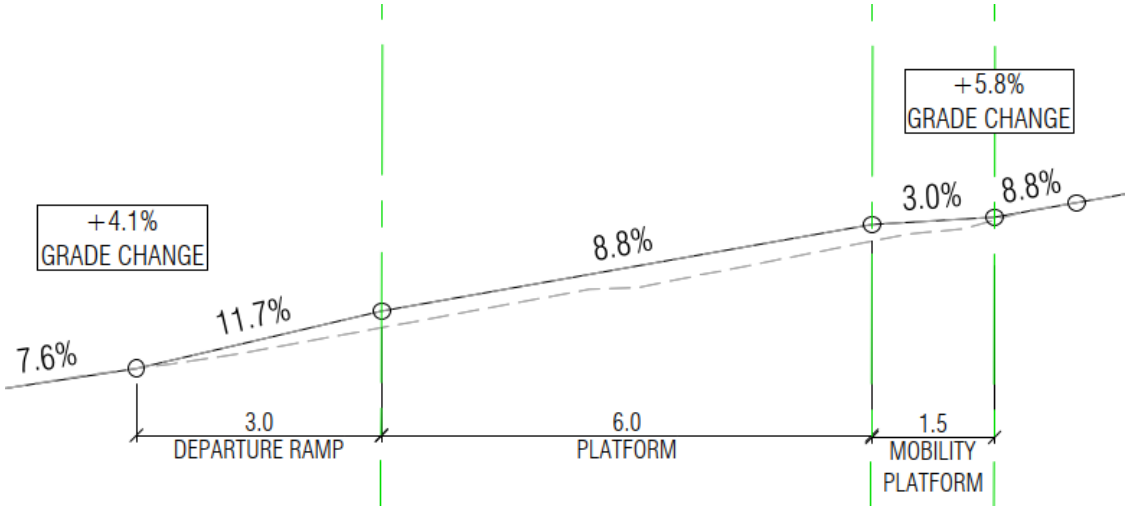
Rubber

- Work with suppliers
- Evaluate in comparison with other materials

Innovation – Wheelchair Friendly

Accessible crossing on a steep road

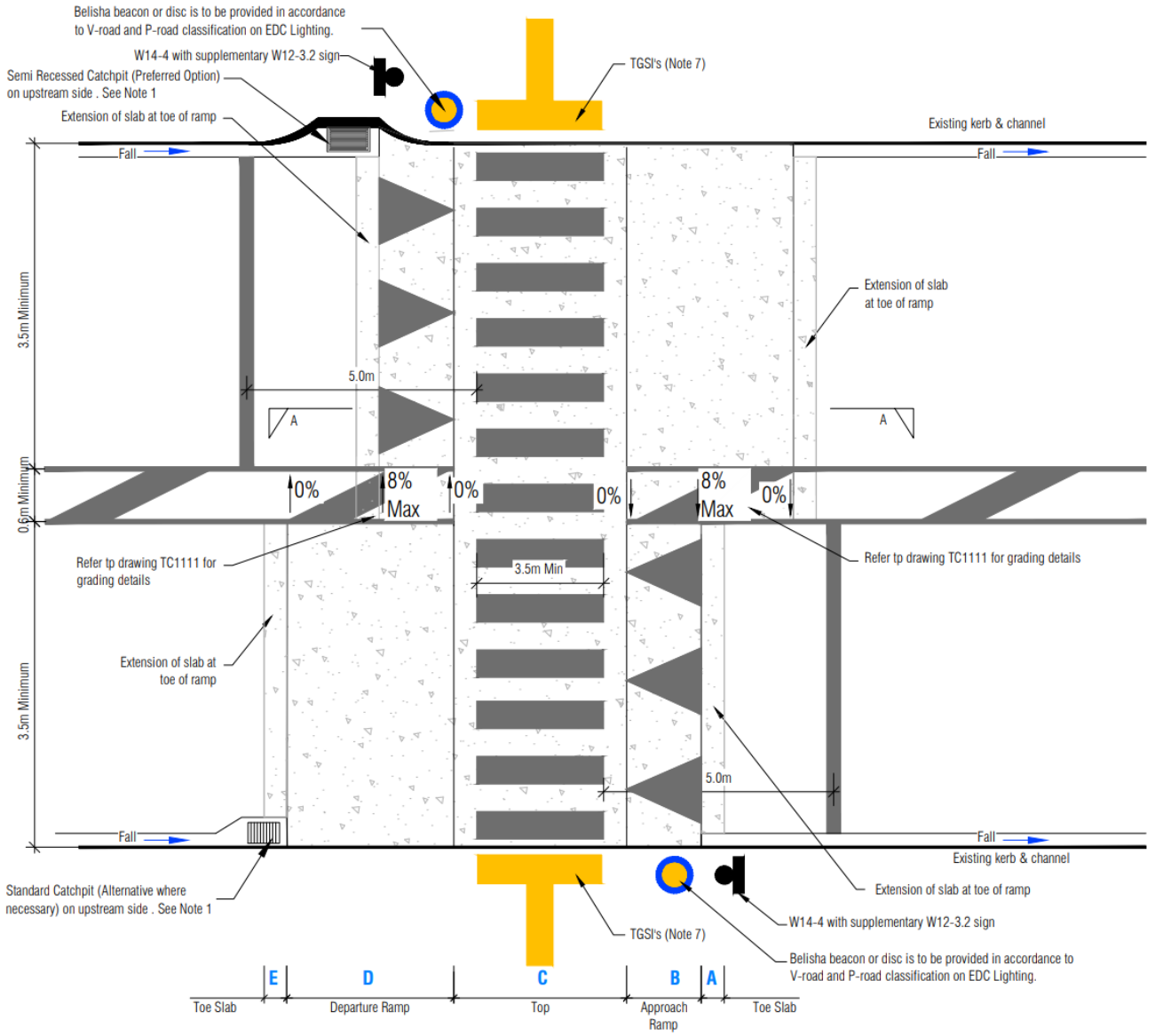
- Many path users need a crossfall that is 3% or less
- On a steep road, only a ramp can provide that
- Marking the zebra on the ramp provides that accessible grade
- Similar treatment works at steep side roads



Innovation – Swedish table on narrow road

Too narrow for a refuge island?

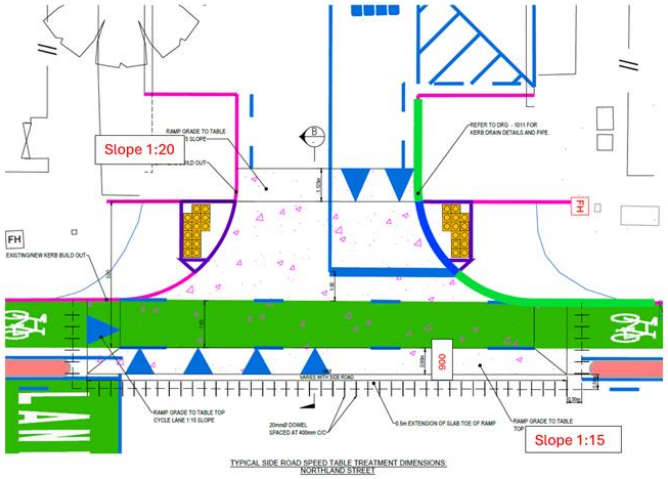
- Where a Swedish table is preferred but a refuge island won't fit, this detail can be used
- Care is needed to ensure lane discipline can be expected – an intersection close to the crossing could be a problem for right-turn traffic
- Motor-cycle stability should not be a problem, with a smoothed median grade change
- An example in Auckland was successful at a signalised crossing



Innovation – Side road with cycleway

New cycleway, steep side roads

- Arterial road cycleway crossing several side roads, some steep
- Safety for cyclists, footpath users and turning traffic
- Ramp within width of separator buffer
- Ramps in cycleway to alert users
- Crosswalk grades kept accessible



TYPICAL SIDE ROAD SPEED TABLE TREATMENT DIMENSIONS:
NORTHLAND STREET

Thank you