KOOTENAY ADAPTIVE SPORT ASSOCIATION

ADAPTIVE TRAIL STANDARDS - 2020

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ACKNOWLEDGMENTS

KASA MANDATE: To promote physical literacy and elevate the human spirit through facilitated learning experiences in a barrier free environment. To advocate and educate in support of adaptive sport and recreation by providing resources, organizing events and programs, and building a safe and inclusive community.

The Kootenay Adaptive Sport Association would like to thank the following organizations and individuals for their contributions to the assembly of these Adaptive Trail Standards:

KOOTENAY ADAPTIVE SPORT ASSOCIATION

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STARR TRAIL SOLUTIONS

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TRAIL HOLISTICS

Mark Wood - Trail Designer

LIFETIME OUTDOORS

Jeff Cook - Trail Designer, Trail Builder

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ADAPTIVE MOUNTAIN BIKES AND DIFFERENTIATING FACTORS

Adaptive Mountain Bikes (aMTB): Adaptive Mountain bikes are three and four wheeled cycles that provide a broad range of riders who may not otherwise ride a standard mountain bike due to physical, intellectual, neurological and sensory abilities. The Kootenay Adaptive Sport Association (KASA) has developed a comprehensive set of trail standards to assist in the planning, design, and construction of safe and fun adaptive mountain bike trails based on the following:

- *Adaptive mountain bikes accelerate slower, decelerate faster, are wider, longer and heavier than two wheeled bikes;*
- *Some models require the rider to take their hand(s) off the handlebars in order to pedal with the hand cranks. As such, a aMTB rider cannot easily pedal while navigating a turn, and requires appropriate (trail specific) entry speed to corners, berms and features to allow enough momentum to carry the bike through;*
- *Sight lines for adaptive riders are approximately 1.0m (3 ft) above the tread surface. This requires consideration in trail sections of significant undulation, high vegetation, intersections, etc..; and*
- *Adaptive mountain bikes are primarily 3-wheeled in nature, and prone to tipping when off-camber at low speeds. aMTB riders will be strapped into their equipment, so any tipping of the bike will also tip the rider, which can be dangerous.*

Hazards + Ride Arounds: The most pressing consequence for aMTB is tipping over in areas of exposure, which could result in aMTB (and rider) rolling down an embankment. This also is applicable to raised, off-camber features. It is recommended to provide a less consequential fall zone below any such feature and aMTB tread width ride arounds for any feature requiring a specific skill set or momentum to clear (i.e. gap jumps, non-rollable jumps with large lips), narrow wooden stunts, or off-camber raised features.

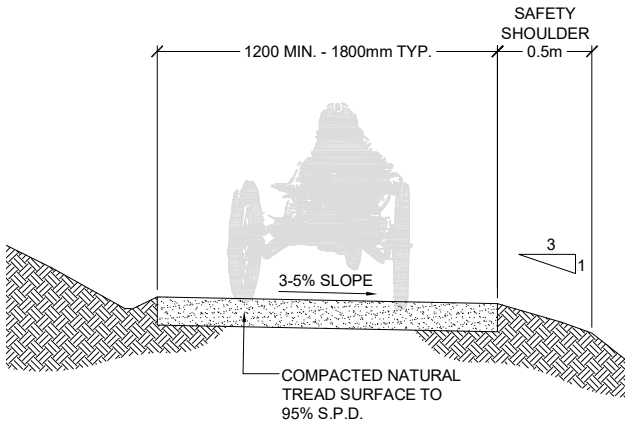


Figure 1 – Typical aMTB Trail Section

RECOMMENDED TRAIL WIDTH

The majority of aMTB equipment require a minimum 1.0m (40") width for chokes, pinches and a minimum 1.2m (48") tread width required for general riding performance. **Figure 1** and **Figure 2** indicate general aMTB trail width recommendations based on difficulty rating. Refer to **Appendix A**: Trail Difficulty Rating System.

RECOMMENDED aMTB TRAIL WIDTH		
GREEN	BLUE	BLACK
1.80 m | 6 ft | 72 in	1.50 m | 5 ft | 60 in	1.20 m | 4 ft | 48 in

Figure 2 – Recommended aMTB Trail Width

CAMBER

Traversing off-camber terrain can be difficult on aMTB. The following guidelines pertain to off-camber trail construction:

- *Bench cut trail should be firm and compacted to full trail tread width with out-sloping at minimal angle as required for drainage (3-5% slope, 1.25-2.85 degrees). Less out-sloping is preferred;*
- *Confirm there will be adequate speed to carry aMTB through off-camber trail section exceeding 8% slope (5 degrees) *Momentum reduces tipping hazard;*
- *Eliminate off-camber or one-sided TTF/obstacles exceeding 12% Slope (8 degree camber angle), or provide full aMTB tread width ride-around*
  (Refer to **Figure 3** *and* **Appendix A: aMTB Trail Difficulty Rating System** *- Obstacles to match spec to trail difficulty); and*
- *Gradually transition off-camber trail features (returning to minimum cross slope), to allow pedal stroke before onset of next feature or trail section.*

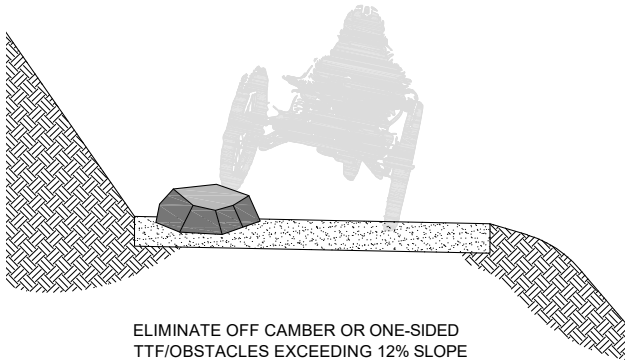


Figure 3 – Off-Camber Hazard

CORNERS | BANKS | BERMS

Speed:

- *If entry speed is too slow in relation to the bank gradient, the rider will be drawn into the drainage/low point of berm, and risk tipping inward;*
- *Corners need to accommodate the physical aspects of the aMTB bike (rolling resistance, weight) throughout the radius to ensure acceleration through the corner; centrifugal force maintains the aMTB's position on the bank; and*
- *aMTB cannot easily be pedaled mid turn; berm exit needs to be lower than the entry (Refer to* **Figure 4***).*

Radius:

- *The ideal radius range for aMTB corners is 6-7.5m (20-25 ft) as berm size and trail speed increases, tighter radii can be achieved; and*
- *Any radius less than 4.6m (15ft) will require higher level of rider ability, and/or result in 2-point turns (Refer to* **Figure 4***).*

Shape:

- *A linear banked berm shape is preferred over "Concave" or "Scooped" berm design. Linear berms present less risk of tipping. Applicable to full width/large berms. Ensure that aMTB is able to achieve support on all wheels throughout the banked turn;*
- *The bank height and angle need to accommodate the ride speed, increasing with the rider's momentum throughout the radius of the corner, to a maximum slope of 60% slope (30 degree slope angle); and*
- *Due to the limited riding dynamics and turn radius of aMTB equipment, flat and outsloping corners should be avoided when possible during ascending and descending. Banked corners allow physics to help the aMTB complete the turn faster when descending. Small berms and extra material on the outside of climbing turns (even to partial thread width) can help aMTB achieve tighter turning radius, reducing the need for 2-point turns on switchbacks (Refer to* **Figure 5***).*

Grade Reversals:

- *Drainage Deflection - Any grade reversal at the entry/exit points of a berm must be symmetrical within the trail tread (uniformly span the entire trail width at the same height) and set back far enough that the rider has adequate time to "set up" when entering/exiting the berm; and*
- *Grade reversals should not slow the aMTB rider enough to necessitate additional pedaling before exiting the corner.*

Rollers:

- *Roller spacing and height to be determined onsite based on anticipated rider speed. aMTB are longer than standard bikes, requiring longer spacing of rollers to ensure rear wheel and front wheels of the bike are not being forced in opposing directions simultaneously;*
- *Ensure rollers are gradual rather than abrupt, in profile;and*
- *Use cascading rollers to ensure rider can obtain momentum to carry over the flat and uphill portion of roller without pedaling (Refer to* **Figure 6***).*

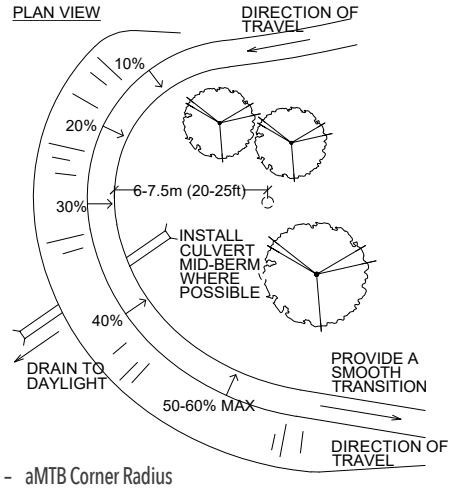


Figure 4 – aMTB Corner Radius

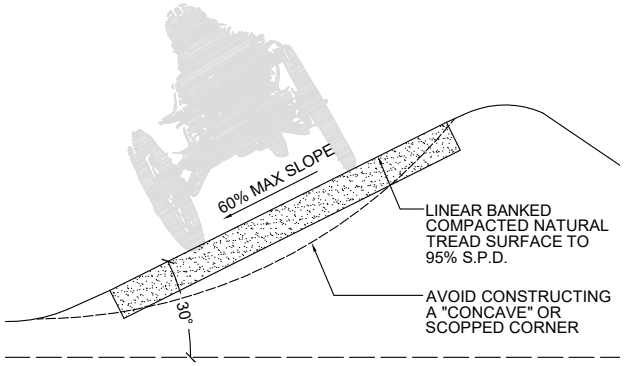
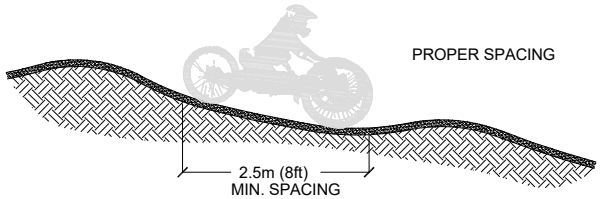


Figure 5 – aMTB Berm



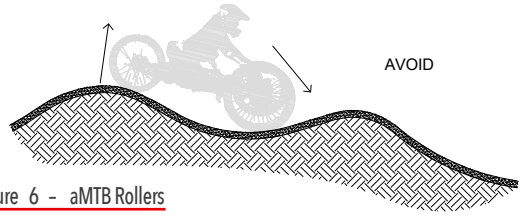


Figure 6 – aMTB Rollers

APPENDIX A - ADAPTIVE MOUNTAIN BIKING (AMTB) TRAIL DIFFICULTY RATING SYSTEM

	aMTB WHITE	aMTB GREEN	aMTB GREEN SQUARE	aMTB BLUE	aMTB BLACK	aMTB DBL BLK	aMTB DBL. BLK
TRAIL WIDTH: (ave/min)	1.8m+ (72"+)	1.8m/1.5m (72"/60")	1.7m/1.4m (66"/54")	1.5m/1.2/ (60"/48"+)	1.2m/1m (48"/40")	1.1m/0.98 m (44"/38.5")	<0.98m (<38.5")
TREAD SURFACE:	hardened or surfaced	firm and stable	mostly stable some variability	mostly stable some variability	widely variable	widely variable and unpredictable	widely variable and unpredictable
OBSTACLES (TTF):	no obstacles	obstacles full width 2" or less / no asymmetrical tread areas	obstacles full width 5" or less / partial width 2" or less	obstacles full width 8" or less / partial width 3" or less	obstacles full width 12" or less / partial width 6" or less	obstacles full width 12" or less / partial width 10" or less / assistance recommended	impassable obstacles / assistance required
UNAVOIDABLE BRIDGES: (wider if not straight)	1.8m+ (72"+)	1.5m+ (60"+)	1.5m+ (60"+)	1.4m+ (54"+)	1.2m+ (48"+)	1m+ (40"+)	<0.98m (<38.5") possible
MAX TRAIL GRADE:	10% (6 deg)	15% (8.5 deg)	20%+ (11 deg)	20%+ (11 deg)	20%+ (11 deg)	25%+ (14 deg)	25%+ (14 deg)
CAMBER: TURNS, BERM & TTF	level	only enough to drain	Some off camber possible: max 36.5% (20 deg)	Some off camber possible: max 36.5% (20 deg)	Some off camber likley: max 58% (30 deg)	Off camber certain: 58%+ possible (>30 deg)	Off camber certain: 58%+ possible (>30 deg)
CAMBER: TRAIL STRAIGHTAWAYS	level	only enough to drain	max outslope 5-8% (3-5 deg)	max outslope 5-8% (3-5 deg)	max outslope 8-14% (5-8 deg)	max outslope 8-14 % (5-8 deg)	14%+ (> 8 deg) outsloping possible
MIN FLAT CORNER RADIUS:	7.5m (24.5 ft)	6m (20 ft)	6m (20 ft)	6m (20 ft)	6m (20 ft)	4.5m (15 ft)	4m (13 ft)
MIN BERM CORNER RADUS:	n/a	n/a	6m (20 ft)	4.5m (15 ft)	4.5m (15 ft)	<4m (13 ft)	< 3m (10 ft)
EXPOSURE:	no exposure	no exposure	no exposure	minimal exposure	exposure likely	exposure likely	exposure likely
RECOMMENDED EQUIPMENT: *Riders may choose to take equiment on trails falling outside of recommended trail difficulty at their own risk, but in this case support rider always recommended. !							

RECOMMENDED EQUIPMENT / CATEGORY DESCRIPTIONS (LEGEND)

WHEELCHAIR:
- Manual wheelchair (with or without front wheel attachment)
- Powerchair
- Scooter
- Any other mobility related device

CROSS-COUNTRY (RECUMBENT / COMBINED CRANK & STEERING):
- **One wheel in the front** and two in the back
- Front wheel drive
- Seating – recumbent type seating with legs straight ahead
- Full or no suspension depending on brand

ALL-MOUNTAIN (RECUMBENT / COMBINED CRANK & STEERING):
- **Two wheels in the front** and one wheel in the back
- Rear wheel drive
- Seating – recumbent type seating with legs straight ahead
- Full suspension or rear suspension only depending on brand

ALL-MOUNTAIN (KNEELING / HANDLEBARS W/ SEPARATE CRANK):
- Two wheels in the front and one wheel in the back
- Rear wheel drive
- Seating – kneeling with cranks below you and handlebar above
- Full suspension or rear suspension only depending on brand

BOWHEAD ALL ELECTRIC
- Two wheels in the front and one wheel in the back
- Articulating front end
- Full electric with hand twist throttle; no crank; Rear wheel drive
- Seating – recumbent type seating with legs straight ahead
- Full Suspension