World Para Nordic Skiing Homologation Guide Version 2017

Homologation of courses for World Para Nordic Skiing (WPNS)

(Para Cross Country Skiing and Para Biathlon for skiers with impairments)

1 General

In general, the philosophy for FIS homologation, and the requirements and recommendations for stadium and course design applies to World Para Nordic Skiing as well. IBU requirements for stadium, range and course design are also applicable, particularly on IBU venues.

See **FIS Homologation manual** for:
- Philosophy of Homologation
- Course Design Criteria
- Design of courses
- Stadium
- Waxing cabins, Ski test area, warm up course
- Practicing homologation skills

However, since certain classes and categories have clear physical limitations, the courses must in general be made easier, with special attention to fast downhill sections, sharp curves, and steep or long up hills. The following sections will describe areas within homologation work that specifically should be considered when designing courses for Paralympic Nordic Skiing athletes.

2 Definitions

2.1 HD (height difference) is the difference in height between the lowest and highest points of a competition course.

2.2 MC (Maximum climb) is the climb with the highest partial height difference, in other terms, the biggest uphill. The uphill can be interrupted by a section of undulating terrain that does not exceed 200 m in length or a downhill that does not exceed 10 m PHD.

2.3 TC (Total climb) represents a total of all climbs on the course.

3 Classification

Paralympic Nordic Skiing athletes are classified according to the following table:

Category	Class	Region Impairment	Main sport equipment and degree of impairment
Standing	LW2	Impairments in one lower limb (ex. above knee)	Skiing with 2 skis and 2 poles
	LW3	Impairments in both lower limbs	Skiing with 2 skis and 2 poles
	LW4	Impairments in one lower limb (ex. below knee)	Skiing with 2 skis and 2 poles
	LW5/7	Impairment in both upper limbs	Skiing with 2 skis and no poles
	LW6/8	Impairment in one upper limb	Skiing with 2 skis and 1 pole
	LW9	Impairment in one upper limb and one lower limb	Equipment of choice, but with 2 skis
Sit ski	LW10, 10.5	Impairments in both lower limbs (no sitting balance)	Using sit-ski
	LW11, 11.5	Impairments in both lower limbs (fair sitting balance)	Using sit-ski
	LW12	Impairments in both lower limbs (good sitting balance)	Using sit-ski
Visually Impaired	B1	Slight to no light perception in either eye	Must ski with a guide Must wear blackout glasses
	B2	Up to visual acuity of 2/60 and/or visual field of less that 5 degrees	May ski with a guide
	B3	Up to visual acuity of 6/60 and/or visual field of less that 20 degrees	May ski with a guide

4 World Para Nordic Skiing Event Distances and Recommended Courses

The table below shows the standard event distances that are used at WPNS World Cup, World Championships and Paralympic Winter Games.

Courses:	**LW 10-12**	**800m, 2.0km, 2.5km, 3.0km**
	LW 2-9 / B1-3	**1200m, 2.0km, 2.5km, 3.0km, 4.0/5.0km**

4.1 Cross Country Skiing

	Competition	Class	Gender	Total Distance	Course		Loops
1	**CC Sprint**	LW 10-12	men	800m (+/-300m)	sit ski	800m (+/-300m)	1
	Qualification (all)	LW 10-12	women	800m (+/-300m)	sit ski	800m (+/-300m)	1
	Semifinal B1-3 (best 8)	LW 2-9	men	1200m (+/-400m)	standing	1200m (+/-400m)	1
	Semifinal LW (best 12)	B1-3	men	1200m (+/-400m)	standing	1200m (+/-400m)	1
	Final B1-3 (best 4)	LW 2-9	women	1200m (+/-400m)	standing	1200m (+/-400m)	1
	Final LW (best 6)	B 1-3	women	1200m (+/-400m)	standing	1200m (+/-400m)	1

2a	**CC Short**	LW 10-12	men	5km	sit ski	2.5km or 5km	2 or 1
		LW 10-12	women	2.5km	sit ski	2.5km	1
		LW 2-9	men	5km	standing	2.5km or 5km	2 or 1
		LW 10-12	men	5km	standing	2.5km or 5km	2 or 1
		LW 10-12	women	2.5km	standing	2.5km	1
		LW 10-12	women	2.5km	standing	2.5km	1

2b	**CC middle**	LW 10-12	men	7.5km	sit ski	2.5km	3
		LW 10-12	women	5km	sit ski	2.5km	2
		LW 2-9	men	10km	standing	2.5, 3.3 or 5km	4,3 or 2
		B1-3	men	10km	standing	2.5, 3.3 or 5km	4,3 or 2
		LW 2-9	women	7.5 km	standing	2.5 or 5km	3
		B 1-3	women	7.5 km	standing	2.5 or 5km	3

3a	**CC long**	LW 10-12	men	15km	sit ski	3.0km	5
	sit ski	LW 10-12	women	12km	sit ski	3.0km	4

3b	**CC long**	LW 2-9	men	20km	standing	4 or 5km	5 or 4
	standing	B1-3	men	20km	standing	4 or 5km	5 or 4
		LW 2-9	women	15km	standing	3 or 5km	5 or 3
		B 1-3	women	15km	standing	3 or 5km	5 or 3

4	**Relay**	mixed (330 %)	classic	5km	sit ski	2.5km	2
	2 x 2.5km classic +		free	5km	standing	2.5km	2
	2 x 2.5km free	open (370 %)	classic	5km	sit ski	2.5km	2
			free	5km	standing	2.5km	2

4.2 Biathlon

	Competition	**Class**	**Gender**	**Total Distance**	**Course**		**Loops**
6	**BT Sprint**	LW 10-12	men	7.5km	sit ski	2.5km	3
	Penalty loop	LW 10-12	women	6.0km	sit ski	2.0km	3
	150m	LW 2-9	men	7.5km	standing	2.5km	3
		B1-3	men	7.5km	standing	2.5km	3
	2 shootings	LW 2-9	women	6.0km	standing	2.0km	3
		B 1-3	women	6.0km	standing	2.0km	3

7a	**BT middle**	LW 10-12	men	12.5km	sit ski	2.5km	5
		LW 10-12	women	10km	sit ski	2.0km	5
	Penalty loop	LW 2-9	men	12.5km	standing	2.5km	5
	150m	B1-3	men	12.5km	standing	2.5km	5
	4 shootings	LW 2-9	women	10km	standing	2.0km	5
		B 1-3	women	10km	standing	2.0km	5

7b	**BT Pursuit** 2 day Pursuit Penalty loop 150m 4 shootings	LW 10-12	men	12.5km	sit ski	2.5km	5
		LW 10-12	women	10km	sit ski	2.0km	5
		LW 2-9	men	12.5km	standing	2.5km	5
		B1-3	men	12.5km	standing	2.5km	5
		LW 2-9	women	10km	standing	2.0km	5
		B 1-3	women	10km	standing	2.0km	5

7c	**BT Sprint Pursuit** Same day Pursuit Qualification + Final Penalty loop 80m 2 shootings	LW 10-12	men	2.4 - 3.0km	sit ski	800m (+/-200m)	3
		LW 10-12	women	2.4 - 3.0km	sit ski	800m (+/-200m)	3
		LW 2-9	men	3.6 - 4.8km	standing	1200m (+/-400m)	3
		B1-3	men	3.6 - 4.8km	standing	1200m (+/-400m)	3
		LW 2-9	women	3.6 - 4.8km	standing	1200m (+/-400m)	3
		B 1-3	women	3.6 - 4.8km	standing	1200m (+/-400m)	3

8	**BT Individual** Penalty 1 minute 4 shootings	LW 10-12	men	15km	sit ski	3.0km	5
		LW 10-12	women	12.5km	sit ski	2.5km	5
		LW 2-9	men	15km	standing	3.0km	5
		B1-3	men	15km	standing	3.0km	5
		LW 2-9	women	12.5km	standing	2.5km	5
		B 1-3	women	12.5km	standing	2.5km	5

5 Course width categories

Course widths for particular competition formats should conform with the following table:

Category	**Minimum course width**			**Used for**
	Uphills	**Undulated terrain**	**Downhills**	
sit ski	3 m	3 m	3 m	Sit ski only (2 tracks) Relay classical technique
sit ski	5 m	5 m	5 m	Sprint, Pursuit (3 tracks)
standing classical	3 m	3 m	3 m	Interval start (2 tracks)
standing classical	5 m	5 m	5 m	Sprint, Pursuit (3 tracks)
standing free	6 m	6 m	6 m	individual, standing only (1 track along the side of the entire course)
standing free	9 m	9 m	6 m	Sprint, Pursuit, standing only (1 track along the side of the entire course)
sit ski + standing classical	3m	3m	3m	Interval Start, Relay (2 tracks)
sit ski + standing classical	5 m	5m	5 m	Pursuit, Sprint (3 tracks)

Category	Minimum course width			Used for
	Uphills	Undulated terrain	Downhills	
sit ski + standing free	3m + 6 m	3m + 6m	3m + 6 m	Interval start (2 tracks for sit ski, 1 track for standing)
sit ski + standing free	3m + 9 m	3m + 9m	3m + 9 m	Pursuit, Sprint (2 tracks for sit ski, 1 track for standing)

6 Standing and Visually Impaired categories

In general, the Standing and Visually Impaired categories can ski on courses that are very close to FIS / IBU homologation standards. However, design considerations in the following areas should be considered:

- Fast down hills with curves and corners that can be difficult and unsafe for Visually Impaired skiers
- Use of shorter loops such that Visually Impaired skier more easily can become familiar with the course
- Reduction of A-climbs (should be replaced by B-climbs)
- Range for TC should in general be in the low range (for example 150 – 180 m for 5 km)

7 Norms WPNS Cross-Country and Biathlon courses.

7.1 Norms for LW 2-9 / B1-3 (Standing and Visually Impaired) Cross-Country and Biathlon courses

The HD, TC and MC of the homologated competition courses should be within the following norms:

Course	TC	MC	HD	Hills
5.0 km	140 - 180	40	75	0-1 A hill, 4-6 B hills, 0-2 C-hills
4.0 km	100 - 150	40	60	0-1 A hill, 3-5 B hills, 0-1 C-hills
3.0 km	80 - 110	30	50	2-4 B hills, 0-1 C hill
2.5 km	75 - 90	30	50	2-3 B hills, 0-1 C hill
2.0 km	50 - 80	30	50	1-3 B hills, 0-1 C hill
1.4 km	0-60	35		
WC: In case the above-mentioned courses aren't available, the following courses can also be used.				
3.3 km	90 - 130	30	50	3-5 B hills, 0-1 C hill
3.75km	100 - 135	40	50	0-1 A hill, 3-5 B hills, 0-1 C-hills
7.5 km	200 - 250	40	75	0-1 A hill, 6-10 B hills, 0-2 C hills
10 km	250 - 350	40	75	0-1 A hill, 8-12 B hills, 0-2 C hills

7.1.1 A-climbs definitions:
A= Major uphills = PHD > 30 m, gradient 9 - 18 %, normally broken with some short undulating sections less than 200 meters in length or a down hill that does not exceed 10 m, PHD. Normally the maximum PHD should not exceed 80 m. The average gradient of an A climb including undulating terrain sections must be 6-14%.

7.1.2 B-climb definitions:
B = Short uphills 10 m < PHD < 29 m, gradient 9 - 18 %
B-climbs can also permit sections with gradients of less than 9% providing that the B-climb includes some sections with a gradient of 9% and the average gradient is > 6%.

7.1.3 C-climb definitions:
C = Steep uphills 4m < PHD < 10m, gradient > 18%.
Climbs with < 4 m PHD will be included as undulating terrain or as part of an A- or B-climb.

7.1.4 Undulating Terrain (UT): A combination of flat and rolling terrain including short climbs, flat sections and downhills. Terrain with gradient < 9 % and climbs < 10m PHD with gradient ≥ 9% can be included.

7.2 Norms for LW 10-12 Cross-Country and Biathlon courses.

The HD, TC and MC of the homologated competition courses should be within the following norms:

Course	TC	MC	HD	Hills
3.0 km	35-65	15	40	1 – 2 A hills, 2 – 4 B hills
2.5 km	30-60	15	40	0 – 1 A hills, 1 – 3 B hills
2.0 km	25-55	15	40	0 – 1 A hills, 1 – 3 B hills
800 m	0 - 30	15		
WC: In case the above-mentioned courses aren't available, the following courses can also be used.				

5 km	60 - 120	15	50	1 - 2 A hills, 3 – 6 B hills
3.75	45-70	15	40	1 – 2 A hills, 2 – 4 B hills
3.33 km	35-70	15	40	1 – 2 A hills, 1 – 3 B hills

7.2.1 **Courses for the sit-ski category can not follow FIS homologation rules** due to the fact that sit-skiers have no use of their lower body, and push/pull themselves forward with poles from a sitting position (on their sledge).

The categories for A, B and C hills are therefore:

A-hills 10 – 15 m PHD and gradient between 4 – 12 %
B-hills 4 – 9 m PHD and gradient between 4 – 12 %
C-hills 2 – 4 m PHD distance < 30 m long and gradient > 12 %, **maximum 16 %**
Climbs with < 4m will be included as undulating terrain or as part of an A or B climb.

7.2.2 The following points should also be considered when designing courses for the sit-ski category:

- Sit ski courses should be placed on undulating terrain (not long flat courses) so that skiers have chances to rest. The 1/3 up, 1/3 down, 1/3 UT criteria applies equally to sit ski courses.
- up hills should in general not be steeper than **10 - 12 %** gradient
- A-hills should not be too long (**not over 200 m in length**)
- down hills should have straight run-outs preferably with a slight uphill to break the speed, the hills should not be steeper than 12 – 14 % gradient
- corners and turns should be placed where the speed is slow.
    - Corners on flat part of the course should optimally not be less than 90° angle (larger angle required for downhill corners). This applies in the stadium as well, for example for lapping or into the shooting range. (NOTE: If you as a standing skier are poling without using the legs, the skis should easily follow the track both in curves/bends in flat parts and also in down hills – if we have to "work" with the legs, a sledge will have problems).
    - Banking can help the skier make a sharp or a high-speed turn.
    - Sit ski turns of 180° can be made at the top of climbs where speed is very low.
    - **The minimum radius of a turn in a flat section or downhill section shall be 15m.**
- Courses should be long and flowly rather than full of sharp turns and steep uphills
- Junctions and merging zones require special placement and design and should occur in areas of lower speeds.

8 Stadium layout

In contrast to the newest development of stadiums and course layouts for FIS competitions, it is less important to ski through the stadium often, since most WPNS races are interval start races. Since WPNS events are divided into 6 categories (3 for men and 3 for women), it is difficult for announcers and spectators to follow the event if several categories are starting, passing through the stadium or finishing at the same time. For competitions with small fields, this situation can however be solved by letting each category finish the race before the next one starts.

A special consideration should be given to the transition and staging area for the sit-ski category. This should be provided with an easy and flat access to start & finish areas, with nearby covered and heated area for transition from wheelchair to sit-ski, as well as storage of wheelchairs.

9 Biathlon Range

Since WPNS Competitions usually include both disciplines, stadium layout normally requires consideration of both biathlon and cross-country skiing formats. Venues with established biathlon ranges are ideal if the terrain and stadium access is suitable for sit ski courses and sufficient stadium space exists for cross-country formats. Cross-country skiing stadia may also be used where there is sufficient space to install the 10m WPNS Biathlon Range and 150m/100m penalty loop. This requires a minimum of 27m x 62m for the World Cup range (10 LW 10 VI lanes) or 27m x 73m for World Championships and Paralympic Winter Games range (12 +12 lanes) ***plus*** space for a 150m penalty loop within 20m after the exit from the range.

10 Homologation Process of WPNS PWG and WCH courses

At PWG and WPNS WCH all Cross-Country and Biathlon competitions shall be carried out on WPNS homologated courses.

10.1 Responsibility

For the highest level, Paralympic Winter Games (PWG), World Ski Championships (WCH) competitions the IPC/WPNS STC is responsible for the execution of the Homologation process. That includes the appointment of the WPNS Homologation Inspector (WPNS HI), the homologation reports and the final acceptance of the courses. A person named by IPC/WPNS STC will be responsible for the final acceptance.

The IPC Headquarters is responsible for issuing a ***WPNS Homologation Certificate*** to the organizer for each homologated course.

11 Guidelines for the organization, education and appointment of WPNS Homologation Inspectors (WPNS HI)

11.1 The authority of the Homologation Inspector.

The WPNS HI is the representative of the IPC/WPNS STC to the Organizer. The HI inspector guarantees that the homologated course meets the standards laid down in the WPNS Rules and this manual. The HI will remain in charge of the homologation process until the final homologation report has been submitted.

11.2 Qualifications required for WPNS HI:

The WPNS HI must have a valid WPNS TD-license and a FIS TD or an IBU TD license and be actively involved in course design.

11.3 The Homologation Inspector Organization structure.

The responsibility for all WPNS HI matters belongs to the WPNS Nordic STC.

11.4 The WPNS HI Education Process

The Education Process provides the HI with the theoretical and practical knowledge necessary to carry out their assigned duties required to complete the WPNS Homologation Process. The WPNS STC is responsible to arrange possibilities to educate interested WPNS TD's.

11.5 Appointment of WPNS HI

The WPNS HI for PWG and WCH is proposed by the WPNS STC to the IPC Governing Board which decides. The WPNS HI would normally be the same person as the WPNS RD during these Games.

If the organiser intends to use a qualified consultant to complete the design process, then the appointed HI and the course designer must be different such that the HI is not inspecting their own work. WPNS may recommend qualified course designers to organizing committees.

It is satisfactory if the HI consults with the local project team to guide them towards a good design plan, however if the HI is also used in a planning and consulting capacity those rates must be negotiated separate from the daily fee associated with the inspection visits (see 11.6).

11.6 Reimbursement of WPNS HI

During official inspection visits, the WPNS HI has a right to reimbursement per WPNS rule 304.1.1. for their travel expenses (highway taxes included), as well as free accommodation and meals during the assignment. (train, first class; for longer distances air fare, tourist class; or payment of a per kilometer fee of 0.60€ or equivalent). In addition, a fixed daily rate of 80€ is added for the travel days to and from, as well as each day of the assignment, which includes postage charges for mailing reports, etc. Double charges (e.g. traveling home on the same day as the last working day) are not permitted. If overnight accommodation during the journey to and from the assignment is necessary, this must be justified and reimbursed separately. The maximum payment for personal vehicle transportation cannot exceed the equivalent cost of an airfare in economy class or car rental.

12 Procedure for WPNS CC and BT course homologation

Appointment of WPNS HI:	Once an organizer for PWG and WCH is confirmed the WPNS STC makes a proposal to the Governing Board
Official announcement:	The IPC Headquarters officially informs the Organizing Committee about the name of the WPNS HI.
First contact:	The OC gets in contact with the WPNS HI and makes a proposal for the first site visit.
Field work:	During the design and construction process, the HI will liaise with the OC design team and will normally make one or more inspection visits during and at the completion of the design and construction process to review progress, provide input and feedback, and together with the OC design team finalize the required documentation.
Final inspection:	The final inspection will be made by the OC, the WPNS HI and the WPNS Technical Delegate appointed by WPNS for this competition.
Report:	The WPNS HI sends the report of the final inspection to the WPNS Nordic STC for approval.

Documentation:	The FIS Homologation software shall be used. All recorded data shall be put into the program to produce the required course plan and profiles and technical data. In addition, course maps and stadium drawings shall be provided.
Certification:	When the WPNS STC has approved the course, the IPC Headquarters will send out a letter of confirmation for each homologated course. The certification is valid for 5 years.

13 Duties and Responsibilities of the Organiser

To begin the homologation, process the Organiser must identify the key persons who will make up the onsite course design and homologation team and the key individual who will be the contact. This team should include the following skill/knowledge representation:

- high level racing experience
- extensive knowledge of the venue and existing trails
- mapping, surveying and GPS data management
- project budget authority
- detailed documentation management

This team or individual must review the WPNS Homologation Guide and the FIS Hg Manual, and WPNS Competition Rules sections 202.1.2.2 and sections 311 and 312 with a focus on the terrain requirements and the steps to be followed with an assigned HI. This review should include a clear assessment of what terrain is available for re-design consideration and what land ownership or lease agreements, or constraints are in place. Good quality mapping materials (both paper and electronic versions are crucial to an efficient and effective planning process, the production of these materials and the production of any resulting maps and stadium drawings is the responsibility of the local Team, and *not* the responsibility of the HI. These maps and stadium layouts will be submitted to WPNS with the HI's report. In addition to the maps the HI must be provided with the accurate distance and elevation data for each course. A digital elevation model with 1-2 m resolution (or 2m contours) is preferable. Handheld GPS elevations or those taken from Google Earth plots do not have the required level of accuracy for elevation data needed for the Hg software, which generates the official course profile and calculates the course stats of MC, TC, and HD. The process of data collection must be discussed early on with the HI so that time and money are not wasted on gathering useless data.

Depending on the scope of work to be performed and the competition level being sought there may be additional visits and planning sessions so that the product represents the best of all relevant input.

The OC should then contact the WPNS HI to discuss the homologation plan before initiating the work. The following information must be made available:

- Name and address of their official contact person for course design and homologation process,
- the proposed competition maps and all the engineering data used to produce them,
- a proposed stadium layout,
- the planned infrastructure for the competition site.

Commence with a detailed evaluation and preliminary design phase that includes input from the appointed HI or a qualified course designer. If a course designer is to be contracted, then be sure that they are well informed and experienced with the WPNS Hg and FIS Hg standards and the current expectations of homologation. The appointed HI and the course designer must be different such that the HI is not inspecting their own work.

A qualified course designer or hands on developer will have their professional per diem rate or all inclusive project fee that will represent an additional planning and/or construction cost for the organiser.

The plans of the course must be produced in good time and drawn at a scale of 1:10 000. The profiles should be drawn at a scale of 1:50 000 horizontally and 1:5000 vertically.

The Organiser must supply these course maps, indicating on them the total climb (TC), the height difference (HD) and the maximum climb (MC) so the inspector can check the figures. The location of the following climbs must be shown on the profile:

- A major uphills
- B short uphills
- C steep uphills
- Dowhills
- Undulating Terrain

The Organiser must supply copies of the approved course maps and the homologation report to its TD. A graduated scale and a north direction arrow must be included.

14 Duties and Responsibilities of the WPNS Homologation Inspector

Following the receipt of the Organisers' initial information, the inspector will develop a detailed plan for an inspection schedule together with the Organiser.

The inspector, when required, should send examples of approved technical maps and technical data to the Organisers.

The inspector must submit the following documents to the WPNS Nordic STC:

- the completed homologation report
- the final course maps and profiles
- a final stadium plans with layouts for all the scheduled competitions.

15 Duties and Responsibilities of the WPNS Nordic STC

- To notify inspectors of their appointment and to provide them with rules and guidelines that outline the homologation process, including sample documents, maps and report forms.
- To notify the Organiser of their appointed inspector and to provide the Organiser with the **WPNS Homologation Guide** and the **FIS Homologation manual**.
- To receive completed homologation reports from the inspectors and to do the final approval.
- To send out a letter of confirmation for each homologated course to the Organiser and the appointed WPNS Technical Delegate of this competition.

The certification is valid for 5 years.

16 Contacts

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